The Impact of the Capital Regulations on Banking Risk and Banking Performance

Empirical Evidence from the OECD and the MENA Countries

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Doctor of Philosophy in Finance

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by

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Author‘s Declaration

I declare that this thesis is a presentation of original work, and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as references.

Signed: Yousuf Mohammed Al Balushi

October 2018

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Abstract

The banking regulations have been developed over the last decades as reflected in the amendments of the Basel Accords Framework that is the most voluntary adopted international banking regulations. The new amendments have paid more attention to the banking capital framework as one of the major approaches to strengthen the stability of the banking system. Bankers have been pressurised to either increase regulatory capital or shrink investment in risky assets over the last decade. Yet, the recent wave of bank failures or restructurings indicates that previous regulations had not produced the desired results. Do the new capital regulations produce satisfying outcomes in terms of influencing the banking risk behaviour and improve banking performance level? This research aims to contribute to the Banking Capital, Risk Management, and Banking Performance literature by providing empirical evidence on the consequences of banking capital regulations on banking risk behaviour and banking performance using the most recent dataset (2003 to 2014). The research presents the experience of banks from financially developed markets, which are represented by banks from countries that are members of the Organisation for Economic Co-operation and Development (OECD), and banks from less-developed markets, which are represented by banks from the Middle East and North Africa countries (MENA), over a sample period that covers the transformation period before and after the implementation of the Basel Accords II, the Basel Accords II.5, and the Basel Accords III respectively. The analysis in this research uses a panel-based random effects model with error terms clustered at the firm level to accounts for the heterogeneity effects that derive from different ownership nature, regulatory pressure period, and economic and financial development level of countries.

The empirical results of this research show that capital level could impact banking risk-level. However, this impact does not necessarily imply that high-capital banks are associated with less risk. Besides, not all undercapitalised banks are found to be associated with less risk during the post period of new reforms in the capital regulations. From the perspective of banking performance, the results show that the capital level influences the banking performance. The results show that this capital-performance nexus varies according to the capitalisation level. Undercapitalised banks are found to be associated with high earnings and low costs, while better-capitalised banks found to be associated with low earnings and high costs. Besides, the results of this research emphasise the importance of considering other heterogeneity factors to assess the impact of the capital and its regulations. The results show that ownership profile, capitalisation levels, and the level of economic and financial developments in a country are important factors to understand the capital and risk nexus as well as the capital and performance nexus.

Keywords: banking capital regulations, risk behaviour, banking performance

Table of Contents

Author's Declaration **3**

Acknowledgement **5**

Abstract **7**

Table of Contents **9**

Lists of Tables **13**

Lists of Figures **15**

1. Chapter 1: Introduction **18**

1.1. Introduction: 18

1.2. Research Objectives: 20

1.3. Research Questions: 20

1.4. Methodology and Key Findings: 23

1.5. Contributions: 24

1.6. Thesis Structure: 27

2. Chapter 2: Background Information – Banking Business and Financial Regulations **30**

2.1. Introduction 30

2.2. Banking Business and Financial Regulations: 30

2.2.1. Why Do Banks Exist? 30

2.2.2. The Riskiness of Banking Business 32

2.2.3. Costs of Failure in a Banking Business 34

2.2.4. Why Do Banks Involve Themselves in Risky Activities? 36

2.2.5. Why Do Banks Need to be Regulated? 40

2.2.6. Why is There Need to Regulate Banking Capital in Particular? 42

2.3. Development of Banking Regulatory Capital Framework 43

2.3.1. Basel I: Credit Risk-Based Capital 44

2.3.2. Basel II: Sensitive Risk-Based Capital 46

2.3.3. Basel III: Quality of Risk-Based Capital 51

2.4. Banking Sector in the Organisation for Economic Corporation and Development (OECD) Countries versus the Middle East and North Africa (MENA) Countries 54

3. Chapter 3: Literature Review and Hypotheses Development **64**

3.1. Introduction: 64

3.2. The Impact of the Capital on Banking Risk: Moral Hazard Issue: 64

3.3. The Impact of the Capital Regulations and Heterogeneity of Banking Institutions 69

3.3.1. Heterogeneity of Banking Institutions: Ownership Structure 70

3.3.2. Heterogeneity of Banking Institutions: The Regulatory Environment 72

3.3.3. Heterogeneity of Banking Institutions: Quality of Legal Environment and Level of Financial Developments in a Country 73

3.4. The Impact of the Capital on Banking Risk: Heterogeneity of Banking Institutions 74
3.4.1. The Impact of the Capital on Banking Risk: Does Ownership Matter? 75
3.4.2. The Impact of the Capital on Banking Risk: Regulatory Environment 85
3.4.3. The Impact of the Capital on Banking Risk: Economic and Financial Development Level of Countries 89
3.5. The Impact of the Capital on Banking Performance: Expected Bankruptcy Cost, Monitoring Incentive and Cost of Capital 93
3.6. The Impact of the Capital on Banking Performance: Heterogeneity of Banking Institutions 99
3.6.1. The Impact of the Capital on Banking Performance: Does Ownership Matter? 100
3.6.2. The Impact of the Capital on Banking Performance: Regulatory Environment 108
3.6.3. The Impact of the Capital on Banking Performance: Economic and Financial Development Level of Countries 112
3.7. Summary 115
4. Chapter 4: Research Methodology 120
4.1. Introduction: 120
4.2. Research Method: 121
4.2.1 Data Collection Method: 121
4.2.1.1 Collection of Data and Sampling Process 121
4.2.1.2 Research Variables and Measurement 124
4.3 Data Analysis Method: 143
4.3.1 The 1st Design of Panel-Based Model: Pooled Ordinary Least Squares Model 146
4.3.2 The 2nd Design of the Panel-Based Model: Fixed Effects Model 147
4.3.3 The 3rd Design of Panel-Based Model: Random Effects Model 150
4.4 Criteria for Selecting the Most Appropriate Estimation Method: 151
4.5 Selecting the Most Appropriate Panel-based Regression Model: 155
4.5.1 Testing Appropriateness of the Fixed Effects Model Relative to the Pooled OLS Model 155
4.5.2 Testing Appropriateness of the Random Effects Model Relative to the Pooled OLS Model 156
4.5.3 Appropriateness of the Fixed Effects Model relative to the Random Effects Model 157
4.6 Regression Diagnostic Tests: 159
4.6.1 Testing for Heteroskedasticity, and Serial Correlation 159
4.6.2 Estimating Clustered Variance-Covariance 162
4.6.3 Appropriateness of the Robust Fixed Effects Model relative to the Robust Random Effects model 166
4.6.4 Testing for Time-Fixed Effects 167
4.7 Summary and the Overall Research Method Framework: 167

5 Chapter 5: Empirical Results and Discussions on the Impact of Capital on Banking Risk 172

5.1 Introduction 172

5.2 Comparison Data of Different Groups 174

5.3 Descriptive Statistics 177

5.4 Bivariate Analysis: 180

5.5 Empirical Analysis: 183

5.5.1 The relationship between the capital level and risk: Moral Hazard Hypothesis versus Regulatory Hypothesis 184

5.5.2 Ownership Perspective: The results of the impact of the capital on the risk level in different ownership perspectives: Does the ownership matter? 192

5.5.3 Policy Perspective: The relationship between the capital level and the risk level: is there any impact on changes in the capital regulations? 205

5.5.4 Bank-size perspective: The relationship between the capital level and risk level: Does bank-size matter? 233

5.5.5 Economic and Financial Development Perspective: The relationship between the capital level and the risk level: Does financial development matter? 238

5.6 Summary: The results of the impact of capital on the banking risk: 247

6 Chapter 6: Empirical Results and Discussions on the Impact of Capital on Bank Performance 252

6.1. Introduction 252

6.2 Comparison Data of Different Groups 253

6.3 Descriptive Statistics 256

6.4 Bivariate Analysis 257

6.5 Empirical Analysis 259

6.5.1 The relationship between the capital level and bank performance: Expected Bankruptcy Cost Hypothesis: 260

6.5.2 Ownership Perspective: The results of the impact of the capital on the banking performance in different ownership perspectives: Does the ownership matter? 268

6.5.3 Policy Perspective: The relationship between the capital level and banking performance: is there any impact on changes in the capital regulations? 278

6.5.4 Bank-size perspective: The relationship between capital and banking performance: Do bank-size matter? 310

6.5.5 Economic and Financial Development Perspective: The relationship between the capital level and the banking performance: Does financial development matter? 315

6.6 Summary: The results of the impact of the capital on banking performance: 326

7 Chapter 7: Conclusions, Implications, and Recommendation for Future Studies 332

7.2 Introduction: 332

7.3 Research Questions and Methodology: 332

7.4 Conclusion on the impact of the capital on the banking risk: 333

7.5 Conclusion on the impact of the capital regulations on banking performance: 339
7.6 Contribution and Implications: 345
7.7 Limitation of the Research and Recommendation for the Future Studies: 350
8 References: 353
9 Appendixes 371
I. Appendix: Summary of Variables, Definition, and Data Source 371
II. Appendix: The Implementation of the Basel Accords 373
III. Appendix: Trends in Key Variables 375
IV. Appendix: Comparing Two Sample Means: Independent Samples 385
V. Appendix: Descriptive Summary per year 388
VI. Appendix: The Correlation Matrix for the OECD Banks and the MENA Banks 389
VII. Appendix: Identifying the Most Appropriate Panel-based Model: 393
VIII. Appendix: The Relationship between the Capital Level and Banking Risk 409
IX. Appendix: The Relationship between the Capital Level and Banking Performance 428
X. Appendix: Conglomerate Index of Financial Structure 456
XI. Appendix: Regulatory Reforms in the MENA Countries 462
XII. Appendix: The relationship between the capital level, risk level, and banking performance 467

Lists of Tables

TABLE 2-1: AVERAGE RATIO OF BANK CONCENTRATION OVER THE PERIOD (2000 TO 2014): 56
TABLE 2-2: BANKING SECTORS INDICATORS IN THE MENA COUNTRIES OVER THE PERIOD (2003 TO 2014): 59
TABLE 3-1: SUMMARY OF NULL HYPOTHESES THAT EXAMINE THE IMPACT OF BANKING CAPITAL ON THE RISK LEVEL. 93
TABLE 3-2: SUMMARY OF NULL HYPOTHESES THAT EXAMINE THE IMPACT OF BANKING CAPITAL ON THE PERFORMANCE LEVEL. 115
TABLE 4-1: SUMMARY OF VARIABLES, DEFINITION, AND EXPECTED SIGN ACCORDING TO HYPOTHESES 141
TABLE 4-2: SUMMARY OF MAJOR DIFFERENCES BETWEEN POOLED OLS MODEL, FIXED EFFECTS MODEL, AND RANDOM EFFECTS MODEL: 152
TABLE 4-3: SUMMARY OF COMPARISON BETWEEN PANEL-BASED ESTIMATION METHODS 154
TABLE 5-1: TEST OF DIFFERENCES IN MEANS: 175
TABLE 5-2: TEST OF DIFFERENCES IN MEANS USING WRT: 176
TABLE 5-3: DESCRIPTIVE STATISTICS: 178
TABLE 5-4: PEARSON CORRELATION MATRIX: 181
TABLE 5-5: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (ALL BANKS) OVER THE SAMPLE (2003 TO 2014): 185
TABLE 5-6: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR THREE SAMPLES: ALL BANKS, LISTED BANKS, AND UNLISTED BANKS RESPECTIVELY) BANKS DURING THE SAMPLE PERIOD 2003 TO 2014: 194
TABLE 5-7: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR THREE SAMPLES: ALL BANKS, LISTED BANKS, AND UNLISTED BANKS RESPECTIVELY) DURING THE SAMPLE PERIOD 2003 TO 2014: 195
TABLE 5-8: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR DOMESTIC-OWNED BANKS ONLY) DURING THE SAMPLE PERIOD 2003 TO 2014: 202
TABLE 5-9: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR THREE SUBSAMPLES: A SUBSAMPLE FOR THE PERIOD (2005-2008), AND A SUBSAMPLE FOR THE PERIOD (2009-2012) RESPECTIVELY): 206
TABLE 5-10: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR THREE SUBSAMPLES: A SUBSAMPLE FOR THE PERIOD (2005-2008), AND A SUBSAMPLE FOR THE PERIOD (2009-2012) RESPECTIVELY): 207
TABLE 5-11: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR A SUBSAMPLE FOR THE PERIOD (2003-2008), A SUBSAMPLE FOR THE PERIOD (2009-2014): 216
TABLE 5-12: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR A SUBSAMPLE FOR THE PERIOD (2003-2008), A SUBSAMPLE FOR THE PERIOD (2009-2014): 217
TABLE 5-13: THE SUBSAMPLE THAT IS USED TO EXAMINE THE PRIOR- AND POST-PERIOD OF IMPLEMENTING THE FRAMEWORK OF THE BASEL ACCORDS II. 224
TABLE 5-14: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR A SUBSAMPLE OF BANKS THAT APPLIED THE BASEL ACCORDS II): 226
TABLE 5-15: THE SUBSAMPLE THAT IS USED TO EXAMINE THE PRIOR- AND POST-PERIOD OF IMPLEMENTING THE FRAMEWORK OF THE BASEL ACCORDS III 228
TABLE 5-16: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND RISK (FOR A SUBSAMPLE OF BANKS THAT WERE IMPLEMENTING THE BASEL ACCORDS II AND THEN THEY SHIFT TO APPLY THE BASEL ACCORDS III IN 2013 AND 2014): 230
TABLE 5-17: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND BANKING RISK (FOR THE WHOLE SAMPLE WITH CONSIDERATION FOR CAPITALISED BANKS AT DIFFERENT BANK-SIZE): 235

TABLE 5-18: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND THE RISK LEVEL (FOR SUBSAMPLES OF BANKS DURING THE SAMPLE PERIOD 2003 TO 2014 ACCORDING TO REGION):............................240
TABLE 5-19: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND THE RISK LEVEL (FOR SUBSAMPLES OF BANKS DURING THE SAMPLE PERIOD 2003 TO 2014 ACCORDING TO REGION):............................241
TABLE 5-20: SUMMARY OF THE EMPIRICAL RESULTS ON THE IMPACT OF THE CAPITAL ON THE BANKING RISK 247
TABLE 6-1: TEST OF DIFFERENCES IN MEANS USING T-STATISTICS: 254
TABLE 6-2: TEST OF DIFFERENCES IN MEANS USING WILCOXON RANK SUM TEST:.............................255
TABLE 6-3: DESCRIPTIVE STATISTICS:...256
TABLE 6-4: PEARSON CORRELATION MATRIX:..258
TABLE 6-5: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FULL SAMPLE): 262
TABLE 6-6: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR THREE SAMPLES: ALL BANKS, LISTED BANKS, AND UNLISTED BANKS RESPECTIVELY):..269
TABLE 6-7: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR THREE SAMPLES: ALL BANKS, LISTED BANKS, AND UNLISTED BANKS RESPECTIVELY):..271
TABLE 6-8: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR THREE SAMPLES: ALL BANKS, LISTED BANKS, AND UNLISTED BANKS RESPECTIVELY):..274
TABLE 6-9: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR A SUBSAMPLE OF DOMESTIC-OWNED BANKS): 276
TABLE 6-10: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR THREE SUBSAMPLES: A SUBSAMPLE FOR THE PERIOD (2005-2008), AND A SUBSAMPLE FOR THE PERIOD (2009-2012)): 279
TABLE 6-11: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR THREE SUBSAMPLES: A SUBSAMPLE FOR THE PERIOD (2005-2008), AND A SUBSAMPLE FOR THE PERIOD (2009-2012)): 281
TABLE 6-12: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR THREE SUBSAMPLES: A SUBSAMPLE FOR THE PERIOD (2005-2008), AND A SUBSAMPLE FOR THE PERIOD (2009-2012)): 283
TABLE 6-13: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR A SUBSAMPLE FOR THE PERIOD (2003-2008), A SUBSAMPLE FOR THE PERIOD (2009-2014): 291
TABLE 6-14: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR A SUBSAMPLE FOR THE PERIOD (2003-2008), A SUBSAMPLE FOR THE PERIOD (2009-2014): 293
TABLE 6-15: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR A SUBSAMPLE FOR THE PERIOD (2003-2008), A SUBSAMPLE FOR THE PERIOD (2009-2014): 295
TABLE 6-16: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR A SUBSAMPLE OF BANKS THAT APPLIED THE BASEL ACCORDS II): 302
TABLE 6-17: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR A SUBSAMPLE OF BANKS THAT SHIFT TO APPLY THE BASEL ACCORDS III): 305
TABLE 6-18: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND BANKING PERFORMANCE (FOR THE WHOLE SAMPLE WITH CONSIDERATION FOR CAPITALISED BANKS AT DIFFERENT BANK-SIZE): 312
TABLE 6-19: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR SUBSAMPLES OF BANKS DURING THE SAMPLER PERIOD 2003 TO 2014 ACCORDING TO REGION):..........................316
TABLE 6-20: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR SUBSAMPLES OF BANKS DURING THE SAMPLER PERIOD 2003 TO 2014 ACCORDING TO REGION):..........................318
TABLE 6-21: RELATIONSHIP BETWEEN THE CAPITAL LEVEL AND PERFORMANCE (FOR SUBSAMPLES OF BANKS DURING THE SAMPLE PERIOD 2003 TO 2014 ACCORDING TO REGION):............................323
TABLE 6-22: SUMMARY OF THE EMPIRICAL RESULTS ON THE IMPACT OF THE CAPITAL ON BANKING PERFORMANCE 326

Lists of Figures

FIGURE 2-1: MAJOR COMPONENTS OF THE REGULATORY CAPITAL FRAMEWORK ACCORDING TO THE BASEL I 45
FIGURE 2-2: MAJOR COMPONENTS OF THE REGULATORY CAPITAL FRAMEWORK ACCORDING TO BASEL II 48
FIGURE 2-3: MAJOR COMPONENTS OF THE REGULATORY CAPITAL FRAMEWORK ACCORDING TO THE BASEL III 52
FIGURE 2-4: TIMEFRAME OF DEVELOPMENT OF BASEL ACCORDS 53
FIGURE 2-5: AVERAGE VALUES OF RATIO MARKET CAPITALISATION TO GDP OVER THE PERIOD 2004 TO 2014 AND TOTAL NUMBER OF SHARE TRADED TO GDP OVER THE PERIOD 2004 TO 2014 57
FIGURE 3-1: THE MAIN THEORETICAL PERSPECTIVE ‘OF THE RESEARCH 117
FIGURE 4-1: COMPONENTS OF THE RESEARCH METHODS 121
FIGURE 4-2:STATISTICAL TESTS TO SELECT THE MOST APPROPRIATE PANEL-BASED REGRESSION MODEL 158
FIGURE 4-3: THE RESEARCH METHODS 168
FIGURE 4-4: THE RESEACH METHODOLOGY FRAMEWORK 170

Chapter One: Introduction

A. Research Objectives and Questions

B. Methodology, Key Findings, and Contribution

C. Thesis Structure

1. Chapter 1: Introduction

1.1. Introduction:

The banking industry is perhaps the most regulated among the financial service industries. Over the past three decades, financial regulations have changed significantly, especially with respect to the banking capital regulations. These capital regulations started developing considerably with the introduction of the Basel Accords I in 1988 by the Basel's Committee. The Basel Accords I stated standards and guidelines for determining the banking capital framework. These regulations aim to maintain the stability of the banking system via enhancing banking capital to gain public confidence in the capability of banks to absorb financial distress (BCBS 1988).

From a theoretical perspective, there is divided opinion regarding the implications of imposing more capital regulations. Some have claimed that imposing more capital regulations provides protection to depositors and debtholders, reduces banking default probability, and promotes more economic growth (e.g. Townsend, 1979; Gale and Hellwig, 1985; Williamson, 1986; Lindquist, 2004; Jalilian et al., 2007; Fonseca and González, 2010; Jokipii and Milne, 2011). In contrast, another group of critics has emphasised that imposing more regulations is not an effective option. For instance, Barth et al., 2008; Claessens et al., 2010; Thompson, 2010; Moshirian, 2011; among others, argued that capital regulations could encourage banks to seek regulatory arbitrage and change their practices accordingly. For instance, allowing for specific off-balance-sheet activities without increasing the regulatory capital requirement had changed the risk behaviour of bankers (Agoraki et al., 2011; Karim et al., 2013; Zhao and He, 2013). Thus, questions on the effectiveness of capital regulations to maintain the financial stability are still a concurrent debate in the literature and empirical studies. In view of these arguments, there should be understating for these regulations and their implications for banking risk behaviour and banking performance.

The overall purposes of this research are categorised into associative and descriptive purposes. From the associative perspective, this research aims to address the implications of capital regulations by analysing and investigating the impact of the capital and its regulations on banking risk and performance. This analysis aims to provide recent empirical evidence on the capital-risk nexus and the capital-performance nexus. These two nexuses are key parts of this research. The thesis assesses the relationship between capital and risk. This relationship provides an indication of the impact of the capital on banking risk level. The presence of a positive association in the capital-risk nexus is an indication of the involvement of high-capital banks in more risky activities. This analysis is expanded to consider the risk behaviour of pressurised banks that are not meeting the regulatory capital requirements. It is expected that pressurised banks will limit their involvement in risky activities especially during the period when banks are asked to meet the new regulatory capital requirements as per the Basel II, Basel II.5, and Basel III. The effective impact of the capital regulations is expected to be reflected in the risk level of banks.

Similarly, the thesis assesses the relationship between capital and performance. This relationship provides another aspect of potential impact for the capital and its regulations on banking performance. The presence of a negative association in the capital- performance nexus is an indication of potential costs that are paid in response to meeting the regulatory capital regulations. Another objective of this research is descriptive in which the research aims to identify the risk-based and performance-based characteristics of banks that comply with regulatory requirements. This research examined both these nexuses with consideration for other factors that could reflect the heterogeneity of banking institutions. The heterogeneity of banking institutions could explain divergent responses of banks to changes in the capital and its regulations. There are three main factors that are considered to explain the potential divergent responses of banks to the capital level. These are the ownership, restrictiveness of the regulatory environment and economic and financial development in countries. Hopefully, the results of this research will add to the literature on how best the banking industry ought to be overseen by regulatory and supervisory authorities. Chapter Seven summarises the empirical contribution of this research.

1.2. Research Objectives:

This research is conducted based on academic studies in the capital literature, banking risk literature and banking performance literature. These three areas are examined with consideration to the following main objectives of the research:

1) To assess the implications of the capital regulations for banking risk and the implications of the capital regulations for banking performance.
2) To examine the risk behaviour (and the performance level) of banks pressurised to meet the capital requirements.
3) To explore the change in the relationship between capital and banking risk (banking performance) with consideration of the heterogeneity of banking institutions. In view of this objective, the following three sub-objectives are considered:
    A. To explore the relationship between capital and banking risk (and banking performance) among banks with different ownership profile.
    B. To evaluate the impact of the banking capital frameworks, which are introduced by the Basel Accords II, II.5 and III, on banking risk (and banking performance).
    C. To demonstrate the influence of quality of legal system and development of the financial markets on the impact of the capital on banking risk (and banking performance).
4) To enhance the understanding of the impact of the capital on banking risk and the impact of the capital on banking performance.

1.3. Research Questions:

The following research questions have been developed to achieve these objectives:

Q1. What is the impact of the capital on banking risk? Is there a significant relationship between capital level and banking risk?

Banking capital is determined based on requirements as per the Basel Accords Framework. This framework has been developed to reflect the riskiness of banking assets, in which banks are not allowed to get involved in riskier business unless more capital is provided. From a theoretical perspective, this framework is used as a means to constrain bank managers' adverse selection in their asset-liability portfolio. This interaction between the capital and risk is expected to be more reflective of banking risk level, especially in the new capital frameworks. The capital framework has been improved over time to be a more sensitive risk-based capital framework, as has been the objective of Basel Accords II and III. This research questions whether the capital level influenced the risk-taking level and constrained banks from being involved in more risk. The research also considers comparing the risk level of both undercapitalised banks and better-capitalised banks over a period that experienced different capital frameworks. This comparison aims to examine the risk behaviour of banks with different levels of regulatory pressure.

Q2. What is the impact of the capital on banking performance? Is there a significant relationship between the capital level and performance level?

The capital regulations aim to promote more financial stability via building up the capital level to reduce the default probability. The capital regulations have been developed over time to form a well-functioning framework. The outcomes of the framework would be reflected in improving banking performance. This research questions the consequences of imposing more capital and its impact on banking performance. In view of developments in the banking capital framework, this research examines the impact of capital regulations and its amendments on performance from both perspectives of banking profit and cost. This examination is also conducted with consideration of the variation in the regulatory pressure that is experienced by a bank. Undercapitalised banks are more pressurised to meet the capital requirements compared to banks that are already meeting the regulatory capital requirements. The research examines whether better-capitalised banks have better ability to utilise their resources and perform better than undercapitalised banks.

Q3. Is the capital-risk nexus (and capital-performance nexus) homogeneous? Does the capital-risk nexus (and capital-performance nexus) vary according to heterogeneity factors?

The capital-risk nexus (and capital-performance nexus) has been examined from a homogeneous perspective in which all banks are expected to either be bound or not bound by capital regulation. In this research, the analysis of these nexuses is expanded to examine whether the capital-risk nexus (and capital-performance nexus) differs across different types of banks, period, or countries. In this perspective, the following three questions are considered:

Q3.A. Does the capital-risk nexus (and capital-performance nexus) differ across banks with different ownership profile?

Q3.B. Does the capital-risk nexus (and capital-performance nexus) differ across periods that experienced different regulatory pressure?

Q3.C. Does the capital-risk nexus (and capital-performance nexus) differ across countries that have a different level of legal quality and different level of economic and financial development?

Banks differ from different perspectives. Each bank has a different level of competitive advantages (and disadvantages) that reflect their heterogeneity in their decision-making process. The heterogeneity of banks will be reflected ultimately in their response to the regulatory requirements. The heterogeneity of banking institutions could explain divergent responses of banks to changes in the capital and its regulations.

1.4. Methodology and Key Findings:

The above research questions will be investigated in the form of hypotheses. Chapter Three elaborates in detail the relevant hypotheses for each of the above research questions. The hypotheses are tested using panel data for commercial banks over the sample period 2003 to 2014 (i.e. 12 years). The dataset includes all available banks in the Bank-Scope database. The data includes commercial banks that are operating in both the Organisation for Economic Corporation and Development (OECD) countries and the Middle East and North Africa (MENA) countries. The analysis in this research is based on a panel-based random effects model with error terms clustered at the firm level to account for the heterogeneity in banking institutions.

The results of this research present several important points. Regarding banking risk, the results show that capital and risk are associated significantly. This result suggests that capital level impacts banking risk-level. However, this impact does not necessarily imply that high-capital banks are associated with less risk. The results show evidence that not all high-capital banks are associated with low risk during the sample period. Bank managers are found to reduce their riskiness in specific types of banking activities, while they become involved in other activities that still keep their portfolio risk. Besides, the results show that the capital-risk nexus varies according to the capitalisation level. Undercapitalised banks, which failed to meet the minimum regulatory capital requirements, are found to be associated with a different level of riskiness compared to better-capitalised banks that met the minimum regulatory capital requirements. Undercapitalised banks are found to be associated with high risk, while better-capitalised banks are found to be associated with low risk. However, the results show that not all banks adopted the same risky behaviour. The capital-risk nexus should be assessed with consideration of other heterogeneity factors that could provide a better understanding of the variation in the bank riskiness. The results show evidence that ownership profile; regulatory pressure periods and the level of economic and financial development of countries are critical heterogeneity factors that should be considered in the assessment of the capital-risk nexus.

From the perspective of banking performance, the results show that the capital level influences the banking performance. Increasing the capital level is found to be associated positively with banking profit level and negatively with banking cost. However, the results show that this capital-performance nexus varies according to the capitalisation level. Undercapitalised banks are found to be associated with high earnings and low costs, while better-capitalised banks are found to be associated with low earnings and high costs. These results imply that undercapitalised banks are able to utilise their resources to generate high earnings and operate at lower costs during the sample period (i.e. 2003 to 2014). In terms of heterogeneity of banking institutions, there is no evidence of heterogeneity in the capital and performance nexus according to the ownership profile. The results showed that regulatory restrictions do not influence the performance of all banks. However, the results show that the economic and financial development level does influence both the banking performance level and the capital-performance nexus. Further details on the empirical results of this research are provided in Chapter Five and Chapter Six. Chapter Seven presents the implications of these empirical results and their contribution to the literature.

1.5. Contributions:

Due to the concurrent developments in banking regulations, banks are required to form their asset and liability portfolios with consideration to maintaining financial stability. This research aims to provide a better understanding of the implications of the recent regulatory changes in capital regulations. The research addresses the implications of the banking capital regulations on both banking risk behaviour and performance level. The results of this empirical research contribute to the banking literature from different perspectives.

First, this research examines the impact of capital on banking risk (and banking performance) of both undercapitalised banks, which are not meeting the minimum capital requirements, and better-capitalised banks that are already meeting the minimum capital requirements. Previous studies focus either on undercapitalised banks or better-capitalised banks, whether prior to or post the period covered by the Basel Accords I. Indeed, they used a single approach to identify capitalisation level. However, each approach has its own advantages and drawbacks. For the purpose of developing an inclusive understanding of the risk behaviour (and performance) of capitalised banks, this research adopts four different approaches to determine banks with different capitalisation level: Jacques and Nigro's approach, the Prompt Corrective Action (PCA) Approach, Ediz's probabilistic approach and the standard approach. In addition, the research considers banks (both undercapitalised and better-capitalised banks) having different asset-based sizes to examine if there is any difference in the behaviour of undercapitalised banks versus better-capitalised banks at banks with different asset sizes.

Second, this research chapter provides a better understanding of the capital-risk nexus (and the capital-performance nexus) via considering factors that could reflect the heterogeneity of banking institutions. This research accounts for ownership profile to examine the capital-risk nexus (and the capital-performance nexus) for banks with different types of ownership profiles: listed banks, unlisted banks, and domestic-owned banks. This research adopts a dataset that includes 194 listed banks versus 252 unlisted banks and 359 domestic-owned banks versus 87 foreign-owned banks. Empirically, there are limited studies that considered different ownership profiles in their examination of the relationship between capital levels and risk level, especially after the recent regulatory reforms in the Basel Accords. Montgomery, 2005; Altunbas et al., 2007; and Iannotta et al., 2007 are the few main empirical studies that provide evidence on the relationship between capital levels and risk level with consideration to the different type of ownership profiles. On the other hand, Fries and Taci, 2005; Pasiouras and Kosmidou, 2007; Semth and Philippatoes, 2007; Pasiouras et al., 2009; and Dietrich and Wanzenried, 2011 are the main studies that account for ownership and capital level aspect in their analysis of banking performance. However, these studies need to be re-examined due to several considerations. The focus of the previous studies was on the impact of the capital level on banking risk (and banking performance) either: (i) during the transformation period, before and after the implementation of the Basel Accords I or (ii) only the post-period of implementing the Basel Accords I. These studies covered the period between the 1980s and 1990s.

Nevertheless, the capital framework has changed significantly since the introduction of the Basel Accords II in 2004, the Basel Accords II.5 in 2009 and the Basel Accords III in 2010. As discussed later, the Basel Accords II and II.5 introduced a set of disclosure requirements, and it provides more guidelines to support regulatory and supervisory authorities. In addition, both the Basel Accords II.5 and III imposed more restrictions to improve the quality and quantity of the regulatory capital requirements. The inclusion of these reforms into the Basel Accords should enhance governance and supervisory environment as banks are obliged to disclose their risk status. The impact of the new reforms should be more optimal in the mitigating risk-taking behaviour of banks and promote better banking performance. These reforms provide a strong motivation to examine the influence of the capital requirements, which are based on the Basel Accords II and III, on both banking risk and performance. Thus, this research contributes to the current literature via examination of the risk-taking behaviour and banking performance of banks during both restrictive and less restrictive regulatory periods. Regulators and supervisors are concerned about the potential consequences of their policies for banking risk and performance.

Finally, this research is based on banks from 45 different countries. These countries have heterogeneity in their financial development. The organisational structure of banks in developing markets differs from those in well-developed markets. For example, Brock and Suarez, 2000; and Nikiel and Opiela, 2002; showed that studies in well-developed financial systems may not apply to other countries. Unlike the previous studies, which focused on analyses of banks from developed countries, empirical evidence in this research is based on a more comprehensive based sample that includes banks from both developed countries, which are represented by banks from countries that are members of the Organisation for Economic Co-operation and Development (OECD), and developing countries, which are represented by banks from the Middle East and North Africa (MENA) countries, over the sample period

2003 to 2014.[1] The consideration of banks from both developed and developing countries provides an assessment for the effectiveness of the capital requirement as a macro-prudential tool to influence the risk-taking behaviour of banks in groups of countries which are experiencing a different level of economic and financial development.[2]

There is a lack of recent studies that have considered the above elements. This research fills this gap by examining the implications of the recent reforms in the capital framework on the riskiness of banks and their performance with consideration of all the above perspectives. The research provides empirical results and evidence on differences in risk-taking behaviour and banking performance level according to the ownership profile, regulatory pressure period and the economic and financial development level of countries. The analysis in this research is based on the random effects model with error terms clustered at the firm level to account for the heterogeneity effects that derive from different ownership natures and periods with different regulatory pressures. The clustered random effects model is also corrected to account for both within-cluster correlations and heteroskedasticity in the error terms.

1.6. Thesis Structure:

The remaining part of this thesis is structured as follows: Chapter Two provides an overview of banking business and financial regulations in general and capital regulations. The chapter ends with an outline of the main characteristics of banking sectors in both countries that are members of the Organisation for Economic Co-operation and Development (OECD) and developing countries, which are represented

[1] Montgomery, 2005; Altunbas et al., 2007; and Iannotta et al., 2007, which are the main papers that consider ownership profiles in their study on the relationship between capital levels and risk-level, examined Japanese and European banks. Similarly, Fries and Taci, 2005; Pasiouras and Kosmidou, 2007; Semth and Philippatoes, 2007; Pasiouras et al., 2009; and Dietrich and Wanzenried, 2011 which are the main papers that consider ownership profiles in their study for the relationship between capital level and banking performance, examined only European banks. Most of the studies that examined the relationship between the capital regulation and risk were conducted in developed countries, for example, the USA and European countries.

[2] Further discussion on the development of the regulatory environment in these countries is provided in Chapter Two. In addition, there is a discussion on the purpose of selecting banks from these countries and its characteristics.

by banks from the Middle East and North Africa (MENA) countries, over the sample period 2003 to 2014. Chapter Three considers the previous literature in three areas: banking capital, banking risk and banking performance. Based on these three areas, the research hypotheses are developed to answer the research questions. The methodology chapter is the fourth chapter of this thesis. It provides a detailed presentation of the research processes that are applied to answer the research questions and achieve the objectives. Chapter Five and Chapter Six present empirical evidence on the risk-taking behaviour and banking performance respectively. Finally, Chapter Seven summarises the main findings and their implications. In addition, it outlines the main limitations of this research and makes recommendations for future studies in the scope of the banking capital regulations, financial stability, and performance.

Chapter Two: Background Information - Banking Business and Financial Regulations

A. Banking Business and Financial Regulations

B. Development of Banking Regulatory Capital Framework

C. Banking Sector in the Organisation for Economic Corporation and Development (OECD) countries Versus the Middle East and North Africa (MENA) countries

2. Chapter 2: Background Information – Banking Business and Financial Regulations

2.1. Introduction

This chapter provides background information about banking business and financial regulations. It is not limited to provide descriptive information on banking business and financial regulations. It presents contemporary discussions that have been carried out in banking literature about the banking business, their riskiness and recently adopted banking regulations. The chapter includes three main sections as follows: Section 2.2 emphasises the nature of the banking business and why there is a need for it to be regulated. Section 2.3 focuses in particular on the banking capital regulations and recent reforms in the regulations. Finally, section 2.4 provides an overview of the banking system in the OECD countries versus the MENA countries. These countries are accounted for in this research to examine the impact of banking capital on risk behaviour and banking performance.

2.2. Banking Business and Financial Regulations:

2.2.1. Why Do Banks Exist?

Banks play a fundamental role in the economy by providing financial services that would be difficult to be obtained by individuals alone. Banks offer a variety of services which varies across countries; but their primary function, as stated in banking law in most central banks, is to reallocate funds between depositors and lenders. Depositors look to save their funds while lenders look for a source of funds. Banks intermediate both parties to facilitate a channel of transmitting funds from surplus units, who are depositors, to deficient units, who are lenders. This channel is referred to as a lending channel in the banking literature. This lending channel is beneficial for parties, depositors and lenders. Depositors can save their funds and obtain rewards in the form of interests. Lenders can use this channel as a source of funds.

Banks can carry their intermediary role within this channel at a lower cost via utilising advantages of economies of scale and having the privilege of asymmetric information. Theoretically, banks could enjoy the benefit of cost reduction via spreading their cost over a broader base of deposits and loans. As this large base is diversified, according to portfolio theory, it would reduce the cost of risk management, and it enables banks to offer services at less financial costs (McAllister and McManus 1993). This advantage, which refers to economic of scales, has been examined and assessed by various authors (see, e.g. Hughes and Mester, 1998; Jafry et al., 2008; Hughes and Mester, 2013; Davies and Tracey, 2014) among others). Besides, banks have the advantage of better access to information from both depositors and lenders. Both parties are approaching banks. Banks are able to match between funding preferences of both parties. Thus, banks enjoy having more information than depositors and lenders. Both depositors and lenders have a lack of information about each other. It would be difficult for them to match their funding preferences by themselves. This advantage, which refers to asymmetric information, has also been discussed in the literature (see, e.g. García-Marco and Oca~na, 1999; Marcucci and Quagliariello, 2009; Lee et al., 2011; and others). Banks employ both advantages to play the intermediary role and facilitate the lending channel smoothly.

Besides the above stated traditional role, the banking business has shifted significantly to consider more sophisticated financial services (e.g. money changes, financial commitments, derivatives and other financial contracts). Firms are needed for such types of financial services to support their investment strategies and enhance risk management techniques. Indeed, the period between the nineteen-seventies to nineteen-eighties experienced enormous new financial innovations which were invented by banks to enhance risk management practices (Duffie and Rahi 1995). Accordingly, banks become offering a collective of different financial services. They become known as universal banks. Universal banks integrate both intermediation services in the lending channel as well as fee-based services. Without banks, the intermediation and diversification of financial services would be too costly to be obtained.

2.2.2. The Riskiness of Banking Business

Even though banks play a crucial role in the economy via facilitating the lending channel and offering diversified financial services, their business is associated with various kinds of risks. Pyle (1971) and Hart and Jaffee (1974) highlighted that banks are associated with two broad forms of risk: idiosyncratic risks and aggregate risks. Pyle, (1971) and Hart and Jaffee (1974) classify banking risk into these two forms based on the argument of the portfolio theory. According to the portfolio theory, assessment of a portfolio risk should account for both unsystematic (i.e. idiosyncratic) and systematic risks (i.e. aggregate). In view of this theory, both Pyle (1971) and Hart and Jaffee (1974) showed that banking assets and liabilities could be viewed as different types of securities which form a banking portfolio. This banking portfolio is associated with idiosyncratic risks, which are also known as unsystematic risks, and it refers to risks of adverse performances due to the unique characteristics of a specific asset. According to portfolio theory, by Markowitz, (1952), this form of risks could be diversified, i.e., it could be minimised by forming a portfolio of different assets to obtain an overall lower risk via utilising adverse movements within a given portfolio.

On the other hand, aggregate risks, which are also known as systematic risks, refer to risks that arise from adverse movements in economic or market events. These adverse movements will impact on prices of financial instruments that are held by an institution. Sharpe, (1964) has highlighted that these risks cannot be diversified by forming a portfolio because these adverse movements could impact all institutions. Applying these concepts in banking business, banks are threatened by a number of idiosyncratic risks that are related to banking activities. For instance, the capability of lenders to repay borrowed funds is a matter of concern for both bankers and depositors; especially when portions of lending activities are funded by deposits. Yet, bankers are still offering lending services and working to manage the risk of incapability of lenders to meet their obligations which could cause credit risk. Bankers also face mismatching issue which arises from different liquidity preferences of both lenders and depositors. Lenders tend to prefer using funds for a more extended period which might not be matching the preferences of depositors. Depositors prefer to withdraw their funds even without prior notice. Thus, there is a risk that a bank might not be able to meet the depositor’s needs and its obligations. Bankers work to maintain matching between these preferences by using other marketable financial instruments. Yet, these instruments need to be more tradable to be converted easily into cash at a minimum cost. Otherwise, bankers will face liquidity risks which could threaten their ability to carry out their operations in the short term.

In terms of systematic risks, banking business is also threatened by different economic and market events (e.g. unexpected change in interest rates, changes in money supply, changes in oil prices, etc.). These events would impact adversely on prices of different marketable instruments (e.g. equities, bonds, currencies, commodities, etc.). Banks hold such type of instruments for different purposes (e.g. non-interest-based income, financing sources, diversification purposes, etc.). The volatility of market events would cause the bank financial losses in the value of these instruments. Since these events will impact all banks in the industry, bankers could not avoid or minimise these risks via diversification strategies.

In respect to undiversified risks, bankers have invented new financial instruments (e.g. derivatives contracts, off-balance-sheet commitments) to manage riskiness of banking business and hedging against an unexpected adverse movement in market events (see, e.g., Merton, 1995; Instefjord, 2005; Wagner and Marsh, 2006). Most of these instruments were developed during the period of nineteen-seventies to nineteen-eighties (Duffie and Rahi 1995). Although these instruments could be useful tools to reduce the total risk of an individual bank, they are designed to transfer risk to other parties rather than reducing it (Duffee and Zhou 2001). These instruments are contractual commitments in which one party will get a right to buy or sell a given instrument at predetermined prices and conditions. A number of studies reported that these innovative financial instruments could change the risk behaviour of bankers and increase riskiness of banking business (see e.g., Santomero and Trester, 1998; Cebenoyan and Strahan, 2004; Bedendo and Bruno, 2012; Michalak and Uhde, 2012; Uhde and Michalak, 2010; Karim et al., 2013; Le et al., 2015 as empirical studies). In view of these studies, it has been observed that the development of financial instruments has changed both the nature of banking activities and the type of banking riskiness. The banking portfolio has become more interrelated than before, in which a certain type of risk in banking business could lead to or enlarge another type of risks and affect other banks too (see, e.g. Barnhill Jr and Maxwell, 2002; Carling et al., 2007; Breuer et al., 2010 among others).

2.2.3. Costs of Failure in a Banking Business

Inappropriate management of these risks could disturb the intermediary role of the banking business. This disturbance might cause issues according to the nature of banking activities. The disturbance could be costly from a micro-economic perspective as well as a macroeconomic perspective. The first perspective is related to potential insolvency issues that could impact an individual bank, while the second perspective is related to instability issues that could spread across the whole banking industry.

From the micro-economic perspective, an excessive involvement of a bank in risky activities could disturb depositors' confidences, who are expecting the bank to be a safe-keeper for their savings. Loss of confidence could make depositors, who are representing a major source of funding in the banking lending channel, to withdraw their savings. Empirical studies supported this view and found that the withdrawal rate was high in risky banks especially after crises period (see, e.g. Saunders and Wilson, 1996; Martinez Peria Maria and Schmukler Sergio, 2002; Shimizu, 2009). In theory, Diamond and Dybvig, (1983) showed that crowding demand to withdraw deposits could pressurise banker's capability to meet the demand of all depositors since most of the funds are lent out to others. The experience of the recent financial crisis (2007/28) has shown that depositors could be influenced strongly even by press rumours about the safety of a bank (Shimizu 2009). Such uncertain information could impact on depositors' expectations who might withdraw collectively once they receive uncertain adverse information about a bank's safety (Chari and Jagannathan 1988). In response to high deposit withdrawals, a bank might be forced to borrow from others even at a higher rate or sell its assets even at a lower value (Kaufman 1994). Such reactions would threaten the bank's liquidity position and could create insolvency issues which eventually impact on a bank's capability to meet its obligations. Diamond Douglas and Rajan Raghuram, (2005) pointed-out that illiquidity and insolvency issues interact and cause each other. Accordingly, consequences of inappropriate risk management in the banking business is not limited to distress private interests (i.e. the capability to offering banking business at a profit), but it also impacts adversely on public interests (i.e. safeness of depositors' fund).

From a macroeconomic perspective, the potential costs of inappropriate management for the riskiness of banking business would be more serious and could threaten the whole banking industry. Literature has highlighted a number of theoretical explanations for the potential consequences of an insolvent or illiquid bank on other banks in the industry. Mishkin (1992) argued that the failure of a firm could result in an increase of uncertainty, a decline in prices of financial instruments and an increase in interest rates. Altogether, these factors would increase the potentiality of adverse selection issues as stakeholders would be unable to assess firms' position appropriately. Stockholders will be less willing to make decisions to avoid adverse selections. Accordingly, depositors (due to uncertainty and being less informed) would question the capability of other banks (Jacklin and Bhattacharya 1988). Similar worries would impact on investment or lending decisions of other non-banking institutions (e.g. institutional investors and creditors). They would have fears that financial instruments or collaterals of a particular bank could be less valued than their actual values (see, e.g. Shin, 2009; Goldsmith-Pinkham and Yorulmazer, 2010).[3] The reluctance of depositors and non-banking institutions to finance (except at high-interest rates) could lead to banks finding difficulties in obtaining funds from the secondary markets (see, e.g. Goldsmith-Pinkham and Yorulmazer, 2010). Economists argue that difficulties in obtaining funds could threaten the level of aggregate lending and cause credit crunch (see, e.g. Ivashina and Scharfstein, 2010; Cornett et al., 2011; Iyer et al., 2013).

Costs of inappropriate management of the riskiness of banking business would impact on the real economy and impact adversely on an aggregate economic position

[3] Empirically, Shin (2009) argued that in the case of Northern Rock, a UK bank which experienced financial difficulties in September 2007, institutional investors play a role in the bank's run issue. They denied collectively lending the bank, and they cut their exposures at the bank. Goldsmith and Yorulamzer (2010) have supported the same point and they found that investors respond to the market news. Accordingly, those banks, which rely on funding from wholesale markets, are significantly affected by reaction of investors.

(Mishkin 1992). Kupiec and Ramirez (2013) found that banks failure has a long run negative effect on the economic growth of a country. No surprise to find in the history that financial crises are linked to banking business (Rethel and Sinclair 2012).[4] Cost of failing a bank could exceed the limit of inducing insolvency of an individual bank. It could extend to threat interests of depositors, creditors, investors and other stakeholders. More seriously, it threatens the stability of the whole banking industry which would eventually impact the real economy. The riskiness of the banking business reflects the importance of the banking business in the economy, and hence, it has gained attention when compared to other financial institutions.

2.2.4. Why Do Banks Involve Themselves in Risky Activities?

Bankers have a substantial responsibility to manage banking activities appropriately. As discussed above, the cost of a bank failing would be serious at both the microeconomic level and macroeconomic level too. Yet, the banking history shows that banks are involved in risky activities that harm themselves as an individual bank as well as the whole industry (Rethel and Sinclair 2012). Why do banks get involved in risky activities, with businesses that could lead to a serious cost of failure? The literature has highlighted several incentives that could explain risk-taking behaviour.

The first explanation is the issue of conflict of interests in managerial contracts. Jensen and Meckling, (1976) used the theory of agency and theory of propriety rights to develop a theory of ownership structure.[5] The later has contributed to explaining the issue of managerial conflict of interests in firms. This conflict is raised as a result of

[4] Rethel and Sinclair (2012) argued that the development of financial markets and regulations influenced on the risk behaviour of banks and caused more financial crises. They have discussed that the financial crises are related to banking business.

[5] Theory of agency refers to the dilemma which exists once the agent (who is delegated by a principal) works for his own interests rather than the principal's interests. This theory was developed by the efforts of both Ross (1973) and Mitnick (1975). The former showed the economic perspective of agency theory and later showed an institutional perspective of agency theory. Mitnick B. M. (2013) has discussed the origin and development of both aspects of the theory. Theory of property rights refers to contractual relations which determine usage and ownership of resources. This concept has been discussed extensively in several studies which examine ownership rights and economic behaviour. Jensen and Meckling (1976) highlighted a paper of Furubotn and Pejoich (1972) who summarised studies in this area.

separating management from owners. Owners (the principal) delegate managers (the agent) to perform firms' services on their behalf. This contracting relationship has given managers several benefits to exert more effort for the best interest of the firm. Dewatripont and Tirole (1994) pointed out that those managers could be motivated to do the agent role to gain monetary benefits (e.g. bonuses) or private benefits (e.g. having control rights). According to the theory of agency, contracting characteristics between the principal and the agent would impact on the agent's behaviour. For example, managers could be motivated to select activities that would maximise their own benefits even though these activities might not be in the best interest of the owners. This adverse selection would impact the value of the firm unfavourably. Jensen and Meckling (1976) argued that appropriate contracting relations and monitoring agents' behaviour would enable the principal to resolve the agent's adverse incentives.

In the banking industry, bankers, who are managers and acting as the agents of shareholders, are delegated to take decisions in favour of banks. They are getting well-paid monetary benefits to exert more effort to carry-out the intermediary banking role at profits. Yet, bankers are blamed for directing banking business towards risky activities (e.g. dealing with low-quality lending, speculative trading contracts, etc.). Guay (1999) pointed-out those bankers accepted to invest in these activities as long as they had positive net present values. These activities will enable them to maximise returns and accordingly, a higher compensation will reward them in a short period. A number of empirical studies showed that adopted structure of compensation scheme influences differently on risk behaviour of bankers (see, e.g. Sullivan and Spong, 2007; Fortin et al., 2010; Guo et al., 2014) among others).

Besides explaining managerial incentives, Theory of ownership structure, by Jensen and Meckling (1976), has also explained the risk-taking incentive of managers in a firm with mixed financial structure (debts and equities). They argued that a conflict of interests is also associated with the existence of a debt contract. This contract will amend the firm's ownership structure which is changed when sources of finance are varied between equity claims and debt claims. In the debt contract, equity-holders are still enjoying the controlling advantage as well as the advantage of limited liability.

The former provides equity-holders with controlling rights to direct a firm's activities. The later protects equity-holders against any losses that could be more than their investment. Debt-holders could be subjected to hazards because shareholders could utilise their controlling rights (with limited liabilities) to direct a firm into high-risk-based activities. These activities could have an undesirable impact on the overall value of the firm which could threaten the debt-holders' interests. This view is also supported by Green and Talmor (1986) who found that risk incentive increases as debt financing increases. In this respect, Galai and Masulis (1976) showed that the characteristics of this debt contract make equity-holders to be viewed as a holder of a call option on the firm's value. They will receive whatever is left from the firm value after paying debt-holders. Since the equity-holders are in charge of directing the firm's activities, they would be motivated to invest in activities that would maximise the residual amount after paying its obligations. On the other side, debt-holders are worried that these activities could result in depreciation of the firm value which could be insufficient to cover the firms' obligations. Moreover, it is here that the interests of equity-holders and debt-holders may diverge. Based on the argument of Galai and Masulis (1976), Jensen and Meckling (1976) emphasised that the nature of this relationship between shareholders and debt-holders makes shareholders (the agent) invest in more opportunities that maximise their equity value even though the overall firm values could be reduced. Smith Jr and Warner (1979) argued that debt contracts should be written to control the conflict between debt-holders and shareholders.

Applying the above concept to the banking industry, banks are financed by equity-holders as well as debt-holders. Those debt-holders are mainly depositors and corporate debt-holders. Depositors are claimed not being protected from potential banking adverse selection, while corporate debt-holders tend to protect their interests via imposing covenants (see, e.g. Ho and Singer, 1982; Kalay, 1982; Billett et al., 2007; Qi et al., 2011). The covenants can be used as a contractual device that restricts banker's decisions (e.g. imposing financial restrictions), and it will motivate a bank to monitor its activities and ensure meeting its restrictions (Rajan and Winton, 1995; Gârleanu and Zwiebel, 2009). Empirically, a number of studies found covenants contribute to reducing risks (Berger and Udell, 1990; Goyal, 2005; Menkhoff et al., 2006; Ono and Uesugi, 2009).[6]

The third explanation for the risk-taking incentive is an existence of asymmetric information, whether in managerial contracts or debt contracts. Asymmetric information exists once one party (an insider) has more information than another (outsider) about a given task.[7] Jensen and Meckling (1976) highlighted the issue of self-interest in the case of asymmetric information. In such a case, managers (the agent) would have more information than owners (the principal) about the riskiness of a given business. Owners have no perfect information to observe managers' efforts. If owners have not spent on monitoring managers' actions, the managers might not behave as the owners expect. Their decisions are based on their own interests even though these decisions might have an adverse impact on the firm as a whole.

Jensen and Meckling (1976) emphasised the importance of a monitoring system to enable the principal to resolve the agent's adverse incentives. Aligned with this argument, Hill and Jones (1992) argued it would be more difficult for stakeholders (other than the owners) to monitor the agent (managers). Dealing with a less informed party, who have no perfect information, could make the gent have more incentive in risk-taking.[8] Applying this concept to the banking industry, banks differ from other financial firms by having asymmetrically uninformed depositors. Depositors are considered to be a part of debtholders who finance lending activities. Compared to corporate debtholders, depositors are asymmetrically uninformed (Jacklin and Bhattacharya 1988). In other words, they are not informed about the banks' asset

[6] There are also others who argued that covenants could also be associated with a higher default because of over unreliable valuing for covenants especially during a competitive environment (see, e.g. Berger and Udell, 1990; Manove and Padilla, 1999; Manove et al., 2001; and Jimenez and Saurina, 2004 among others).

[7] This concept is the main argument of asymmetric information which is developed by the efforts of Akerlof, 1970; MA Spence, 1973; and Stiglitz, 1975. Akerlof (1970) showed that asymmetric information could make the party with more information to take adverse selection that would be his own best interests. MA Spence (1973) and Stiglitz (1975) showed the role of signaling and screening behaviour of a party with more information that could send imperfect information about their performance for private benefits.

[8] This concept is the main argument of signal theory in economic, by MA Spence (1973), which is based on a moral issue that could make a party with more information to convey the second party with information that hampers the ability of another party to judge his/her actual performance and efforts.

quality and managerial decisions because the bank's assets and liabilities are not traded (Gorton 1988). Besides, depositors might not have the relevant skills to analyse a bank's position.[9] Many authors emphasised that information disclosure about firms' activities and their risk profile would contribute to reducing monitoring costs, and hence, banks demotivated to increase their risks (see, e.g. Estrella, 2004; Nier and Baumann, 2006; Barakat and Hussainey, 2013 among others).

2.2.5. Why Do Banks Need to be Regulated?

Understanding the riskiness of banking business, the cost of failure of this banking business, and risk-taking incentive are critical to recognise drives for regulating banking business. The earlier sections highlight several points that reflect the importance of regulating the banking business. Banks need to be regulated for different reasons, including:

> One of the reasons why banks need to be regulated is the crucial intermediary role of the banking business in facilitating the nation's lending channel. Banks tend to provide the intermediation and diversification of financial services that are benefited by different stakeholders. These services could be costly to be obtained without the banking business.[10] Thus, regulators aim to ensure soundness and smooth running of the nation's lending channel. Banking history shows that risky banking behaviours could be costly and cause instability not only of an individual bank but to the whole financial system.[11] Economists argue that risk-taking banking incentives could have a long

[9] Jacklin and Bhattacharya (1988) have pointed-out that asymmetric uninformed depositors could also impact of on a banker's ability to observe the true needs for liquidity. Banks should have sufficient liquid assets that cover the needs of deposits; otherwise, they will face shortage issues.

[10] Section 2.2.1 "*Why Do Banks Exist*" explains the role of the banking business to facilitate the funding channel which can be impractical to manage without banks.

[11] Section 2.2.3 "*Cost of Failure in a Banking Business*" discussed further potential costs of insolvency in the banking business.

run adverse effect on the economic growth of a country (see, e.g. Ivashina and Scharfstein, 2010; Cornett et al., 2011; Iyer et al., 2013).

Regulators also aim to maintain the stakeholders' confidence. As stated in the previous section "*Cost of Failure in Banking Business*", an excessive involvement of a bank in risky activities could disturb the confidence of stakeholders that are dealing with banking institutions. The experience of the recent financial crisis (2007/08) has shown that depositors could be influenced strongly even by press rumours about the safety of a bank (Shimizu 2009). Unless the market confidence on the banking system is maintained, crowding demand to withdraw deposits could pressurise banker's capability to meet the demand of all depositors and it might dysfunction operations of the banking business as a whole.[12]

Furthermore, the nature of the banking business is associated with conflict of interests that induce banks to be involved in risky activities as discussed in the previous section "*Why Do Banks Involve in Risky Activities*". In response to the potential adverse risk behaviour, regulators work on behalf of the public to protect the public interests form adverse consequences of banking issues in managerial self-interest. Especially, the public (e.g. depositors) are not in a position to control or even monitor banking activities (Freixas 2008, p. 309). Regulations are imposed in an attempt to protect stakeholders' interests that could be ignored in managerial decisions as a result of imperfect contracting in the principal-agent relationship.[13]

The above points emphasise the main drives that induce regulators to impose more regulatory requirements in the banking business. Regulators aim to maintain the soundness of the banking business to ensure that it is carried out safely and smoothly. (Goodhart 1998) pointed out that the public would prefer imposed systems of

[12] Section 2.2.3 "*Cost of Failure in a Banking Business*" explained how the loss of the confidence could impact adversely on the banking business.

[13] Section 2.2.4 "*Why Do Banks Involve in Risky Activities*" discussed potential risk-taking incentives that could explain risk-taking behaviour in the banking business.

regulation rather than having an unregulated financial system. Over banking history, it is observed that more banking regulations are imposed in response to potential causes that could enlarge costs of failure in the banking business.[14] It is unsurprising to observe that after each banking crisis, more banking regulations are imposed.

2.2.6. Why is There Need to Regulate Banking Capital in Particular?

As highlighted in the previous sections, separation of the ownership and control and changes in the ownership structure in which debt-holders are more involved in financing banks could induce banks to undertake more risky activities. According to the theory of separation of ownership and control by Fama and Jensen (1983), equity-holders have the controlling advantage to direct a firm's activities with limited liability. Thus, they might be motivated to select activities that would maximise their own benefits even though these activities might not be in the best interest of others. In view of this theory, banking literature has discussed drives of using banking capital regulations as a prudential tool that aims to make shareholders meet their responsibility of taking the risk. For instance, insurance theories emphasised that banks must have enough financial capital to act as a net safety to protect depositors and debt-holders from most of the risks in its asset portfolio (see, e.g., Townsend, 1979; Gale and Hellwig, 1985; Williamson, 1986). Capital buffer theories suggest that banks are required to hold capital that is sufficient to reduce default probability and reflect positively the ability of a bank to meet its potential losses. (see, e.g. Lindquist, 2004; Fonseca and González, 2010; Jokipii and Milne, 2011).

Furthermore, others highlighted the importance of balancing banking activities and its associated risk in which banks are required to increase their capital as they increase exposures of banking business (see, e.g. Hancock and Wilcox, 1994; Das and Sy, 2012; Eberlein et al., 2013). Whereas, others argued that banks would prefer zero capital if these banks were in an unregulated environment (see e.g. Wallace, 1978; Marcus, 1984; Saunders et al., 1990; Fraser and Zardkoohi, 1996; and Repullo, 2004).

[14] Section 2.3 "Development of Banking Regulatory Capital Framework" presents more details on the development of the banking capital regulations over the last three decades.

These arguments emphasise that banking capital could be used as an instrument to demotivate banks to get involved in risky projects and protect the interests of other stakeholders. Regulatory authorities and supervisory parties pay high attention to regulative aspects of banking capital. The last decades have experienced noticeable developments in the banking capital regulations as presented in the next section.

2.3. Development of Banking Regulatory Capital Framework

The development of the banking regulatory capital framework started with the establishment of the Basel's Committee that is in charge of framing the Basel Accords in banking regulations. The origin of the establishment of the Basel's Committee refers to the period of disruption in the international financial market, particularly after the breakdown of the Bretton Woods System in 1973. In this particular year, floating exchange rates were allowed. Some banks, which were invested in the international market, experienced heavy losses in the foreign currency relative to their capital (BCBS 2014). In 1974, a group of 10 countries' central banks responded to this distress by forming a committee that was later called the Basel Committee. This committee has encouraged for consistency in prudential banking regulations to avoid potential regulatory arbitrage that could exist due to inconsistency in regulatory requirements in the international market. Especially, the period from the 1970s up to the early 1980s was characterised by a growing international portfolio lending (Eichengreen 1991). In the early 1980s, several countries were unable to pay back their lending obligations (Eichengreen 1989, p.227). The international financial market experienced the International Debt Crisis. The banking industry faced difficulties with absorbing losses of unpaid loans. The Committee responded to this crisis by highlighting the importance of enhancing banking capital to gain public confidence in the capability of banks to absorb financial distress. This argument is based on the concept that a high capitalised bank is more capable of meeting financial distress, and accordingly, a stable banking system will be maintained (Ethan Barnaby 1992). Thus, the Committee has worked to define major guidelines and standards to formulate capital adequacy system.

2.3.1. Basel I: Credit Risk-Based Capital

In July 1988, the Basel Committee presented the first Basel Accord (Basel I) that stated the standards and guidelines for determining the regulatory capital of a bank. The Committee has adopted a risk-weighted asset framework to determine the required regulatory capital. Based on this framework, risk-weighted assets are computed by adjusting each asset class for risk exposure. Then, the total risk-weighted asset is used to determine the regulatory capital. This capital is considered to be the minimum required capital that should be held by a bank. Since Basel I was prepared during the period beheld International Debt Crisis, it is observed that this version of Accord focused only on credit exposures and prescribed a minimum risk-adjusted capital of 8 percent of the risk-weighted assets:

Regulatory Capital = 8% of Credit Risk-Weighted-Assets

= 8% [Credit Risk + Credit Equivalent Amount]

Equation (2-1)

Where, Credit Equivalent Amount =

Counterparty Exposure * Counterparty Risk Weighted

The risk-weighted framework comprises aggregate risk and counterparty risk. The former was concerned to overall exposures of an individual bank. [15] The latter covers potential exposures that could arise if the counterparty defaults to meet its contractual obligations. The central focus of Basel I was only on aggregate credit exposures and credit counterparty exposures in its risk-weighted- assets (BCBS 1988). The aggregate credit exposures were classified into different risk categories (e.g. sovereign, banks, mortgage, and corporation). The credit counterparty exposure was a function of current exposure (i.e. current market value) and estimated future exposure. This exposure is converted into an equivalent credit amount by a counterparty risk-

[15] Accordingly, aggregate credit risks represent the risk of potential losses in an individual bank due to the failure of borrowers to meet their obligations (e.g. loans, bonds).

weighted scale (referred to as Credit Conversion Factor). Then, the credit equivalent amount is placed in the respective credit risk-based categories (Figure 2-1).

The capability of the first Basel Accord to maintain banking stability was doubted. The framework focused only on credit exposures as a direct specific risk and these exposures were identified based on predetermined fixed-weighted risk (mainly 0%, 10%, 20%, 50%, and 100%). This fixed, predetermined system treats all exposures by the same weighted-risk without considering the variation of risk over time. It did not also

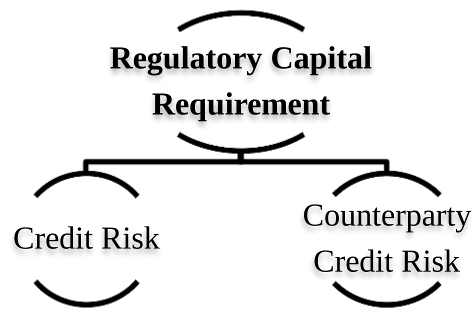

Figure 2-1:Major components of the Regulatory Capital Framework According to the Basel I

Source: made by the author

account for on and off-balance-sheet exposures that are related to market activities (e.g. interest rates, foreign exchange, commodities, etc.). These exposures were considered to be an overall risk that could impact the whole market, and hence, it is not related to the credit risk (Gleeson 2010, p.176). These activities found to increase banking exposures (Mohanty and Song 2002). Although Basel I recommended national supervisors to assess these exposures based on their own evaluations, the period between the nineteen-seventies to nineteen-eighties experienced enormous new financial innovations that changed risk management practices in the banking industry (Duffie and Rahi 1995). Indeed, most of these instruments were invented by bankers.

2.3.2. Basel II: Sensitive Risk-Based Capital

In the light of significant transformation in risk management practices, Basel I had been amended over time to strengthen risk coverage, especially in 1996. In this particular year, the Basel Committee introduced the final version of guidelines to incorporate market risk into the regulatory capital (BCBS 1996). According to this amendment, the market risk is defined as “risk of losses in on and off-balance-sheet arising from movements in market prices”, (BCBS 1996, p.1). The amendments focused mainly on interest rate related instruments, equities, foreign exchange rate and commodities. These instruments were weighted based on either the Standardised Method (SA) or Internal Model Method (IMM). The standardised method relies on ratings of external rating agencies to estimate weighted-risk of banking exposures. Adopting ratings of external rating agencies aims to make adequacy capital system more risk-sensitive rather than fixed risk-based capital of Basel I (SCHOONER 2010, p. 149). In contrast, the Internal Model Method (IMM) is based on a bank’s internal risk management models, and it is subject to approval from national authority. The committee conditioned that this method was used as long as a bank had sufficient capability to run an integrated risk management system under the supervision of a regulatory supervisor (BCBS 1996, p.38). The Committee recommended adopting specifically Value-at-Risk (VAR) as a key internal method to measure market risk. Banks are required to disclose the VAR values of their trading portfolio. Theoretically, after implementation of the amendments of 1996, bankers would be expected to be demotivated to involve themselves in risky trading activities to avoid reporting high VAR values. They would be expected to replace risky investments with less risky investments. Thus, these amendments aim to make the regulatory capital framework more risk sensitive.

In June 2004, the second Basel Accord (Basel II) was introduced, and it incorporated amendments of 1996 with new standards in a more comprehensive and sophisticated framework. The committee aims, with this version of the accord, to strengthen the soundness and stability of the banking system (BCBS 2006, p.2). Alongside the guidelines for identifying the capital requirement, the Accord also introduced guidelines for supervisory review and market discipline to strengthen the assessment of risk management in the banking industry. Regarding the capital framework, it can be observed that Basel II prescribes several major changes to utilise the advantage of amendments of 1996 that make the capital framework more risk-sensitive. Accordingly, Basel II has allowed both credit risk and market risks to be measured by either Standardised Method (SA) or Internal Model Method (IMM) or a mixture of both methods. Besides, the new accord accounted for operational risk to be included in the capital adequacy system. It defined the operational risk as "risk of losses due to inappropriate internal process in banking activities." And Basel II proposed three optional methods to be used in the measurement of operational exposures (BCBS 2006, p.144). Thus, the overall aggregate exposures of an individual bank are measured by considering credit risk, market risk and operational risk. In respect of counterparty risk, Basel II expands the scope of counterparty risk, which was limited to credit risk in Basel I, and incorporated it with amendments of 1996. It defined counterparty risk as "risk of a counterparty to a transaction could default before the final settlement of the transaction's cash follow" (BCBS 2006, p.19). Thus, counterparty's transactions could be associated with credit exposures (e.g. financial guarantees, securitisation, standby letter of credit, etc.) as well as market exposures (e.g. trading or hedging derivatives transactions on interest rates, foreign exchanges, equities, and commodities). The overall banking exposures are capitalised over two steps: firstly, estimating exposures of banking activities transaction. Then, the estimated exposure is multiplied to either standardised weighted-risk (i.e., standardised method) or internal rating-based approach (internal model method). Accordingly, the total of a risk-weighted asset is decomposed as follows:

$$\textbf{Regulatory Capital} = \textbf{8\% Risk-Weighted-Assets}$$

$$\textbf{Regulatory Capital} = \textbf{8\%}\ [\sum \boldsymbol{W_i CR} + \sum \boldsymbol{CCF_i\ CCR} + \textbf{MR} + \textbf{OR}]$$

Equation (2-2)

Where,

(W_i) is Weight of Credit Risk for Asset i, (CR) is Credit Risk

(CCF) is Credit Conversion Factor (CCR) is Counterparty Credit Risk

(MR) is Market Risk, (OR) is Operational Risk

The additional components in this formula aim to enhance risk coverage in the calculation of risk-weighted assets and accordingly determine adequate regulatory capital (Figure 2-2).[16] Similarly to Basel I, it is observed that counterparty credit risk is converted into an equivalent amount via Credit Conversion Factor (i.e. risk-weighted scale). Then, the equivalent amount is weighted according to ratings of external agencies rather than fixed weighting as was the case with Basel I. Indeed, Basel II outlined three methods to estimate exposures of counterparty transactions (BCBS 2006, p.254). Although Basel II recommended a more stochastic method to improve

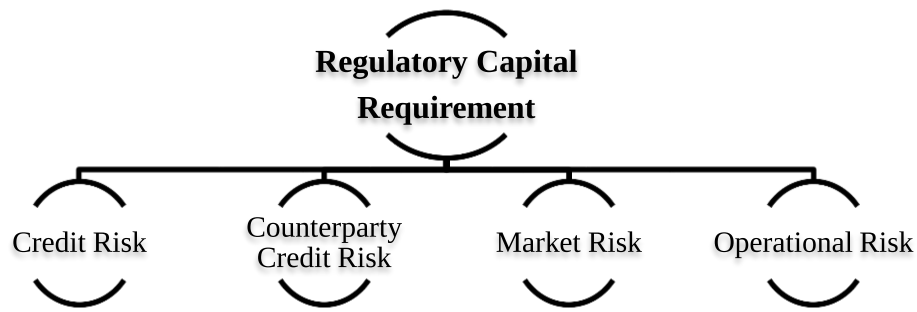

Figure 2-2: Major components of the Regulatory Capital Framework According to Basel II

Source: made by the author

measurement of actual risk coverage in the regulatory capital framework, researchers and practitioners pointed out that Basel II did not get a sufficient chance to be evaluated. According to the survey of Financial Stability Institutes, few countries started implementing Basel II in 2005/2006 while the recent financial crisis was in 2007 ((FSI), 2012). Since Basel II adopted some of the same methods that were proposed by previous amendments of the Basel Accord, the recent financial crisis (2007/2008) highlighted the major limitations for each part of the Basel's risk framework. For instance:

16 The formula is according to the definition of Basel II, International Convergence of Capital Measurement and Capital Standards, Page163, BIS (final version June 2006).

- ✓ **Credit Risk** was determined based on weighted risk according to ratings of external credit rating agency. Before the recent financial crisis, some researchers discussed reliability and consistency of rated financial instruments that are measured by rating agencies (Sironi and Zazzara, 2003; Poon and Firth, 2005; Blume et al., 1998; Perraudin and Taylor, 2004). They investigated whether rated instruments reflect for actual exposures. Since 2007/2008, this discussion has been highlighted again. The ratings of these agencies were claimed to be unreliable and misstated, especially the period before the financial crisis (BCBS, 2013b; Wojtowicz, 2014; Lutzenkirchen et al., 2013). In particular, the weighted-risk for the high rated securities was said to be too low while the weighted-risk for the low-rated securities too high. Thus, the extent of the new reforms making credit ratings more accurate is still debatable (Boylan 2012).

- ✓ **Market Risk** was determined based on Value-at-Risk (VAR), which is the key recommended approach to measure market risk profile according to guidelines of the Basel Committee. VAR is criticised for not accounting for default during a stressed period that could impact negatively on the creditworthiness of either counterparty for a transaction. The evidence shows that VAR misestimated banking exposures and hence the regulatory capital underreported their true level (e.g., (Alexander and Baptista, 2006; Santos et al., 2012; McAleer et al., 2010; Mariathasan and Merrouche, 2014; Kadam and Lenk, 2008) among others). There is a concurrent discussion in the literature, especially after the recent crisis, suggesting different models that could be used to ensure accuracy of VAR models to capture banking exposures (e.g. see (Wong, 2010; Escanciano and Olmo, 2010; Cifter, 2011; da Veiga et al., 2012; Colletaz et al., 2013; Louzis et al., 2014) among others). However, the extent to which these models are accurate and not be misused to understate the actual values of VAR is still debatable (Kaplanski and Levy 2007).

- ✓ **Counterparty Risk**: Counterparty Risk: Basel II is criticised for not considering the potential losses that affect the creditworthiness of a counterparty in the risk framework. Off-balance-sheet instruments (e.g. securitisation, guarantees, re-securitisation and other derivatives contracts) make the banking industry more interlinked. Basel II is blamed for charging a lower Credit Conversion Factors for these off-balance-sheet instruments (Casu et al., 2011; Minton et al., 2009a; Nijskens and Wagner, 2011; Mayordomo et al., 2014). Charging a lower rate for these instruments led to reducing the capital charge and encouraged bankers to use excessively these instruments inappropriately. Securitised and re-securitised instruments were used by bankers to minimise banking loans to obtain a lower capital charge (Acharya et al., 2013; Acharya and Richardson, 2009).

Based on these limitations, economists and researchers both agreed that a capital requirement of Basel II could not be sufficient to cover banking exposures. Indeed, even banks who met Basel regulatory capital requirement experienced financial difficulties as the capital they hold was inadequate to cover losses during the stressed period (Acharya et al., 2014; Alexander et al., 2013a). Accordingly, the Basel Committee has responded to these limitations by a number of adjustments. The Committee issued a new amendment to Basel II's framework in 2009, referred to as Basel II.5. This version of the Basel Accord has paid particular attention to market and counterparty risks. In response to limitations related to market risk, Basel II.5 has requested banks to meet some standards to enhance the computation of market risk exposure (BCBS 2009, p.14). For example, the concept of Stressed Value-at-Risk (S-VAR) is introduced to account for stressed scenarios in the measurement of market risk. S-VAR aims to account for losses that are not accounted for by the standard Value-at-Risk tool (VAR). This S-VAR is done by conducting multiple stress testing scenarios. In response to limitations related to the counterparty risk, Basel II.5 recommends higher risk weights to be charged for securitisation, and re-securitisation exposures (BCBS 2009, p.4). Besides, amendments of 2009 recommend additional disclosure requirements, especially in off-balance-sheet exposures, to improve risk valuation practices (BCBS 2009, p.24). These adjustments are expected to impact bankers risk behaviour, especially after the recent financial crisis.

2.3.3. Basel III: Quality of Risk-Based Capital

In December 2010, the proposed guidelines and standards of the third Basel Accord (Basel III) were finalised. Basel III addresses a number of new norms which aim to promote a more resilient banking system by focusing on four parameters: capital, leverage, liquidity and funding (BCBS 2011). These norms were not introduced in the previous versions of the Basel Accord. The first two parameters are a part of capital management, while the last two parameters are related to liquidity management and liability management respectively. Regarding capital management, Basel III introduces a more restricted definition for capital's components with consideration to an additional capital buffer. The financial crisis of 2007/2008 revealed that the quantity and quality of capital under the previous Basel Accords were insufficient (BCBS 2011). Basel III prescribes an increase of required regulatory capital from 8% to 10.5% of risk-weighted-asset, in which:

Regulatory Capital = 10.5% of Risk-Weighted-Assets

$$\textbf{Regulatory Capital} = 10.5\% \left[\sum W_i CR + \sum CCF_i\, CCR + MR + OR\right]$$

Equation (2-3)

This regulatory capital requirement comprises minimum total capital and capital buffer. The minimum total capital should be at least 8%, comprising: 6% tier one and 2% tier two capital. In addition, Basel III introduces a capital buffer requirement of 2.5% of risk-weighted assets as a conservation buffer. Supervisors restrict banks' distributions (e.g., dividends, bonus, and share buybacks) when the capital falls within the range of conservation buffer, even during an unstressed period. During periods of excessive credit growth, bankers are required to hold an extra buffer, up to a further 2.5%, as a countercyclical buffer to enhance banking stability. Both types of capital buffer intend to reduce the pressure on the minimum total capital during a stressed time. In order to improve quality of the regulatory capital, Basel III recommends that at least 4.5% out-of-the 6% of tier one capital and 2.5% of the capital buffer should be from common equity and retained-earnings (BCBS 2011, p.55). In other words, banks are required to hold 7% of total common equity and retained-earnings as a high-quality capital.

Alongside this minimum regulatory capital requirement, an additional capital requirement is charged for liquidity, funding and leverage position. Illiquidity and excessive leverage were the major characteristics of the banks that faced difficulties during the recent financial crisis (e.g. (BCBS 2011), among others). Thus, the liquidity and funding requirements aim to ensure the availability of liquid assets while leverage requirement seeks to reduce leverage position (BCBS 2011, p.61). The Accord also has highlighted the need to enhance further the capital requirement for Global Systemic Financial Institutions (GSFIs) that have excessive interconnectedness with other banks. Compared to the previous Accords, Basel III prescribes to increase both the quantity and quality of the regulatory capital requirements (Figure 2-3).

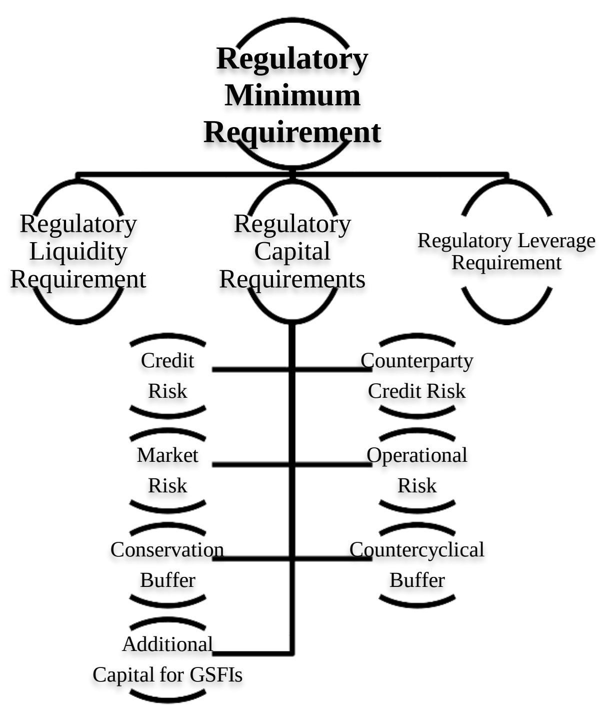

Figure 2-3: Major components of the Regulatory Capital Framework According to the Basel III
Source: made by the author

Furthermore, Basel III addresses some additional reforms to enhance risk coverage, especially in a market exposures. Some of these reforms are introduced in the Basel's amendment in 2009. For example, it proposes to consider the following standards in determining the regulatory capital requirement particularly for counterparty exposures and bank's derivatives:[17]

- Formulating the regulatory capital based on stressed parameters (using the Stressed Value-at-Risk framework) to avoid charging low capital during the stressed financial period.
- Determining the regulatory capital with consideration of the interconnectedness of banks in derivatives markets. The accord encourages bankers to conduct derivatives transactions through central counterparties as the transactions through the central counterparties will be less risk-weighted.

Noticeably, amendments that are made in the capital adequacy system have been refined significantly. While the Basel Accord started as predetermined fixed credit-risk-weighted capital, Basel III, which will be implemented over a phased period up-to 2019, now emphasises on quality and quantity of sensitive risk-weighted capital (Figure 2-4). Within this period of development of the banking regulatory capital

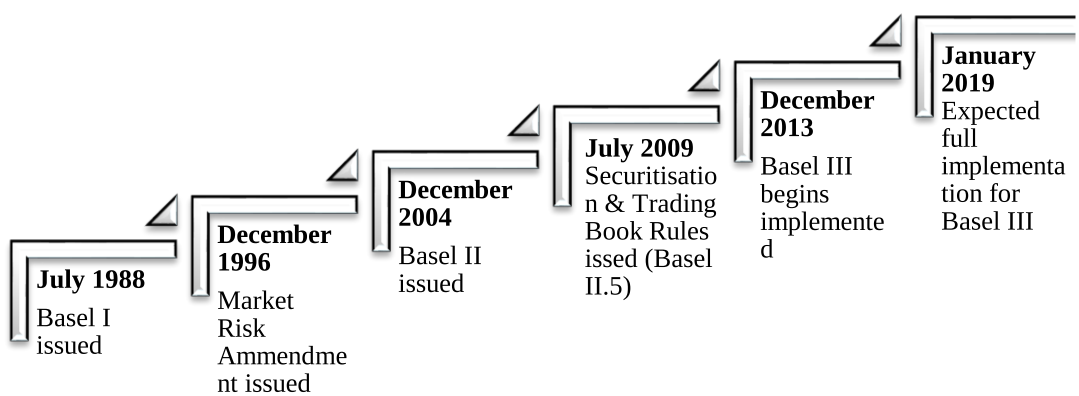

Figure 2-4: Timeframe of Development of Basel Accords
Source: made by the author

[17] For further details refer to "*A global regulatory framework for more resilient banks and banking systems*", *Page 3, BIS (version June 2011)*.

framework, there is a need for empirical studies that examine and assess the role of the changes in the regulatory capital framework in making the banking system more stable and enhances banking performance.

This research will investigate the transformation period between Basel II and III (i.e. 2003 to 2014). As discussed above, this period experienced significant changes in the regulatory capital framework. These changes encourage examining the sensitivity of the capital to influence banking risk behaviour and banking performance. The capital requirement would be expected to contribute to stabilising the banking system and enhancing banking performance. Indeed, the Basel Committee has emphasised that stability of the banking system is a fundamental objective of the committee since the first Basel Accord (BCBS 1988, p.1). The details of the empirical studies in this topic are elaborated in Chapter Three.

2.4. Banking Sector in the Organisation for Economic Corporation and Development (OECD) Countries versus the Middle East and North Africa (MENA) Countries

This research chapter is based on a more comprehensive based sample that includes banks from both developed countries, which are represented by banks from countries that are members of the Organisation for Economic Co-operation and Development (OECD), and developing countries, which are represented by banks from the Middle East and North Africa (MENA) countries, over the sample period 2003 to 2014. The consideration for banks from both developed and developing countries provides an assessment of the effectiveness of the regulatory capital as a macro-prudential tool to influence the risk-taking behaviour of banks and their performance level. Especially, these countries have different financial structure and they are at different stages of economic and financial development. From one side, the OECD countries include countries that are more developed from a legal perspective in which they associate with high institutional quality and better corporate governance.[18] On the other side, the

[18] The OECD refers to the Organisation for Economic Co-operation and Development (OECD) which includes 34 states of high-income economies and has a very high score of Human Development Index.

MENA countries include countries that have less developed legal perspectives.[19] Examination of bank's behaviour, in these two subsamples, is of interest in several aspects.

Firstly, the MENAs' banks are operating in a highly concentrated market. Table 1 shows the average concentration ratios of the MENA over the period 2000 to 2014.[20] While Egypt, Lebanon, Morocco, Saudi Arabia, Tunisia and the United Arab Emirates have a concentration ratio ranging between 43.50% and 69.98%, bank concentration for all other MENA's countries exceeds 75%. Some argue that banks, in concentrated markets, are more empowered to boost lending rate which will increase default risk especially in less competitive markets (e.g. (Boyd and De NicolÓ, 2005; Wolfe et al., 2006; Maria Soledad Martinez and Mody, 2004)). Stiglitz and Weiss (1981) show that a high lending rate increases the riskiness of banking portfolio because of funding low-quality borrowers who might induce into more risky projects. While Martinez-Miera and Repullo (2010) argued that a new entry in a very concentrated market could contribute to reducing the probability of bank failures. In this regard, some studies reported that market concentration is associated with greater banking stability (e.g., (Beck et al., 2006a; Berger et al., 2009b; Jiménez et al., 2013)).[21]

Secondly, financial systems in the MENA region are still not well developed (Naceur and Ghazouani 2007). The stock markets in this region are relatively small. Figure (2-5) shows, in panel (A), the market size for the MENA countries in terms of average values for ratio market capitalisation for all listed firms to Gross Domestic

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[19] The Middle East and North Africa (MENA) region contains 22 countries and occupies an area from the Atlantic Ocean to the Arabian Sea. The following countries are included in the MENA: Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Israel, Jordon, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates, West Bank and Gaza and Yemen. Although Israel and Malta are geographically located in the MENA, they are not considered to be among the MENA subsample in the regression analysis of this research. Israel has joined the OECD on 7th September 2010 and Malta is considered to be developed county according to the World Bank.

[20] Concentration ratio defined as assets of three largest banks as a share of assets of all commercial banks in a country.

[21] These studies provided international evidence on the impact of market concentration on financial stability. However, they have not examined the MENA countries extensively. Beck et al. have not stated which countries they included in their sample. Berger et al.'s sample includes only three countries from the MENA (mainly Kuwait, Qatar and the United Arab Emirates). Jimenez et al.'s sample includes only Spanish banks.

Table 2-1: Average Ratio of Bank Concentration over the period (2000 to 2014):

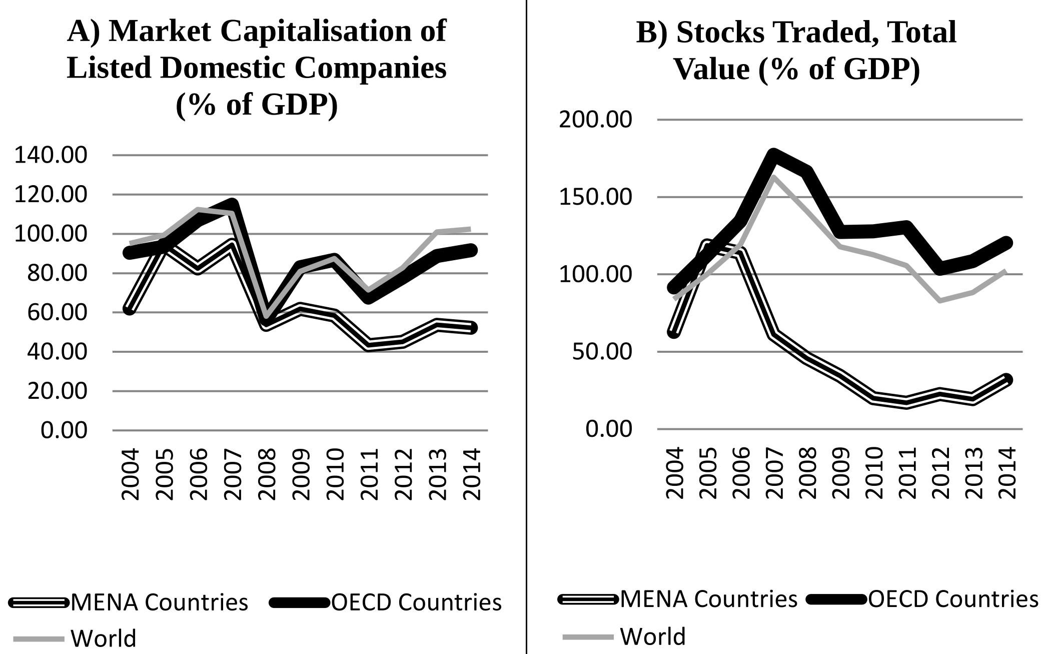
Countries	Bank Concentration (%)	Countries	Bank Concentration (%)
Algeria _a	75.29	Morocco	69.98
Bahrain	82.99	Oman	76. 60
Djibouti _d	96.85	Qatar	89.64
Egypt	59.37	Saudi Arabia	56.35
Iraq _c	87.07	Sudan _a	89.93
Jordan _a	91.25	Syria _b	77.91
Kuwait	86.05	Tunisia _a	43.50
Lebanon	49.91	Emirates	53.98
Libya _a	86.07	Yemen _a	89.10

Source: The World Bank; Financial Development and Structure Database (September 2015 Version) and the table is made by the author.
Note: All the above values are average values of the sample period of 15 years (2000-2014). Some variables in certain countries contain missing values. Accordingly, the average value is computed based on the available data. The remarked values are calculated based on the following sample period: (a) average value based on 14 years data, (b) average value of 10 years data, (c) average value of 9 years data, (d) average values of 5 years data, and (n.a.) no data available. All values are in the form of a percentage.

Products (GDP). It is observed that the MENA's markets have the lowest market size compared to developed countries, represented by the OCED countries and the rest of the World. The market size of the MENA region varied between 43% and 94% over the last ten years. Indeed, it was less than 60% over the previous five years. In contrast, this range varies between 67% and 114% in the OCED states and ranges from 70% to 110% in the rest of the world over the same period (except during the crisis period in 2007). Besides, capital markets in the MENA region were characterised as being the least liquid market. According to a ratio of traded shares to GDP, the MENA is the least liquid market. Figure (2-5) shows, in panel (B), that the proportion of traded shares to GDP in the MENA markets are as low as 20% of GDP since 2010. The same ratio was as high as 120% in both the OCED countries and the rest of the world over the last ten years. Furthermore, there is the lack of active bond markets in the MENA region and there is limited use for long-term debt (Awartani et al. 2016). Lack of well-developed financial markets in the MENA region makes the role of a banking sector more crucial. In this regard, Stulz (2000) argued that banks, in less developed financial markets, have a more central role in providing funding to enhance economic growth. Accordingly, distress of the banking sector in this region has a greater impact on development and economic growth as a whole.

Figure 2-5: Average values of ratio market capitalisation to GDP over the period 2004 to 2014 and Total number of share traded to GDP over the period 2004 to 2014

A) Average values of ratio market capitalization to GDP over the period 2004 to 2014	B) Total number of share traded to GDP over the period 2004 to 2014



Source: The World Bank, World Development Indicators (Version June 2016), and the graphs are made by the author.
Notes:

- Data from the end of year values and proportioned to GPD.
- Abbreviations: MENA countries: The Middle East and North Africa Countries
  OECD countries: Organisation for Economic Co-operation and Development's countries
- The sample of MENA countries includes 12 MENA countries. The market values for the following countries were unavailable: Algeria, Djibouti, Iraq, Kuwait, Lebanon, Libya, Morocco, Sudan, Syria, and Yemen.

Thirdly, the financial structure, in most of the MENA countries, is characterised as a bank-based financial system with low levels of economic development. According to the Conglomerate Index of Financial Structure, the financial systems in the MEAN countries, except for Saudi Arabia, are undeveloped and bank-based-financial systems.[22] In other words, the banking sector in these countries is the main funding channel that mobilises savings, allocates capital and provides risk management

[22] Conglomerate Index of Financial Structure (CIFS) is a quantitative approach, developed by Demirguc-Kunt and Levine that aims to identify the orientation of the financial system in a country. CIFS is constructed based on size, activity, and efficiency of both the stock market and banking sector development. Refer to Appendix XI for further details of how this index is computed and the results are attached.

vehicles. Indeed, some of these countries have a high level of state-owned-banks. Farazi et al. (2013) found that states banks have significant market shares in Egypt, Qatar, UAE, Morocco and Tunisia while the banking sector is dominated by state-owned-banks in Algeria, Libya, and Syria. The existence of state-owned banks would raise concern on the performance of the banking sector in these countries in allocating resources and managing risk appropriately, especially since most of these countries are associated with low institutional quality (Gazdar and Cherif 2015). Demirguc-kunt and Levine (1999) argued that the banking system in less developed financial systems is not expected to work as efficiently as the banking system in the more advanced financial structure. This view is also supported by Haselmann and Wachtel (2010) and Agoraki et al. (2011) who argued that banks behave differently according to the different legal environment and institutional settings. A banking sector in the MENA region is not only characterised as operating in a less developed financial structure, but it is also a concentrated sector with low institutional quality. Thus, it is more likely to be associated with deficient in risk management system.

Table (2-2) shows the average value of ratio bank non-performing loans / gross loans over a period of 12 years (2003 to 2014). It is observed that, on average, the MENA countries reported the highest level of nonperforming loans (mainly 8.76%) compared to banks at countries with middle-income level, countries with high-level income and the world as a whole. Indeed, average non-performing loans in Algeria, Djibouti, Egypt, Tunisia and Yemen exceed 10%. In contrast, average non-performing loans in Jordon, Kuwait, Lebanon, and the United Arab Emirates are higher than 5% which is more than the average ratio at banks of the world as a whole. On the other hand, the capital level in this region varies substantially across countries but, on average, it is higher than banks at high-income level countries (see Table 2-2). Algeria, Egypt, Lebanon, Morocco and Tunisia have the lowest level of capital to assets ratio which is lower than 8%, while Bahrain, Jordan, Kuwait, Oman and the United Arab Emirates reported, on average, the highest level of capital to assets ratio which exceeds 12%. These characteristics of the banking sector in the MENA provide initial motivation to examine the risk-taking behaviour of banks in this region in comparison to banks from the OECD countries.

Table 2-2: **Banking sectors indicators in the MENA countries over the period (2003 to 2014):**

Countries	**The average value of nonperforming banking loans to gross loans (%)**	**The average value of bank capital to total assets (%)**
Algeria _c	14.22	7.40
Bahrain _b	4.60	12.80
Djibouti _c	11.82	n.a.
Egypt, Arab Rep.	16.04	5.78
Jordan	7.39	11.22
Kuwait	5.89	12.01
Lebanon	8.28	7.76
Morocco	9.29	7.81
Oman	4.50	13.10
Qatar _b	1.70	n.a.
Saudi Arabia	2.35	11.58
Tunisia	17.12	7.58
United Arab Emirates	7.14	13.83
Yemen, Republic _b	20.39	8.86
MENA countries	**8.76**	**9.63**
Low income	9.17	11.73
Middle income	5.27	10.10
High income	2.82	7.35
World	4.00	9.18

Source: The World Bank; Financial Development and Structure Database (September 2015 Version) and the table is made by the author.

Note: All the above values are based on average values of the sample period of 12 years (2003-2014). Yet, some variables in certain countries contain missing values. Accordingly, the average value is computed based on the available data. The remarked values are computed based on the following sample period: (a) average value based on 11 years data, (b) average value of 7 years data, (c) average value of 6 years data, and (n.a.) no data available. All values are expressed in the form of a percentage.

Development of the Regulatory Environment in the MENA Countries

Although the regulatory environment developed in all countries, there was a time gap in the implementation of the new amendments. Aligned to the crucial role of the banking sector in the MENA, there have been calls for developing banking sector in this region (e.g. (Creane et al., 2004; Bourgain et al., 2012)). The regulatory environment in the MENA countries has experienced noteworthy regulatory reforms over the last decade (2004-2014). However, some MENA countries are still in the early stages of regulatory developments. Regulatory and supervisory authorities in the MENA countries have worked to comply with international regulatory requirements, particularly Basel Accords, to enhance the regulatory environment of the banking sector. As highlighted in the previous section (2.3), the Basel Committee on Banking Supervision (BCBS), a committee in charge of framing the Basel Accords, has introduced several reforms to improve the Capital Framework. The MENA countries have adopted the Basel Accords to build up banking capitalisation levels to enhance the stability of this critical sector of the financial system. All the MENA countries have adopted the Basel Accord I which was introduced internationally in 1988. Although Basel Accords I prescribed 8% as a minimum capital requirement, some of the MENA countries encourage banks to build up capital levels of at least 12% as a minimum capital requirement as seen in Bahrain, Iraq, Jordan, Kuwait, Lebanon, Oman, Syria and West Bank and Gaza.

Subsequently, the capital framework was developed significantly after the introduction of the Basel Accords II in 2004.[23] In response to changes in the regulatory reform of the Basel Accords II, banking regulatory enforcements varies among the MENA countries. Kuwait was the first country in the region to implement the Basel Accords II in 2005 with a minimum capital adequacy ratio of 12%. Afterwards, Qatar and Sudan started to implement the Basel Accords II in 2006 with a minimum capital adequacy ratio of 10% and 8% respectively. At the time, international financial markets experienced a wave of financial distress in 2007/2008; more of the MENA countries started implementing Basel Accords II including Bahrain, Jordan, Lebanon, Morocco, Oman, Saudi Arabia, and the United Arab Emirates. In these countries, the minimum capital adequacy ratio was set to be above 8%, except in Morocco, and Saudi Arabia.

The experience of the financial crisis makes both regulatory and supervisory authorities more concerned to enhance the stability of the banking system. More countries in the MENA region started implementing the Basel Accords II. The United Arab Emirates started implementing the Basel Accords II in 2009, while Egypt, Tunisia and West Bank and Gaza started implementing the Basel Accords II in 2012. Besides, there are countries that increased their minimum capital requirements for banks starting from 2008 (e.g. Algeria, Djibouti, Jordan and Oman). Internationally,

[23] Refer to section 2.3.2 for further details on main changes in the Basel Accord II compared to the Basel Accord I.

the BCBS has worked to improve computation for capitalisation levels and strengthen monitoring and supervisory environment.

In 2010, the BCBS introduced new amendments that are known as Basel II.5 as pointed out in section 2.3.3. In the MENA region, the Basel II.5 were implemented mainly in Bahrain, Egypt, Kuwait, Lebanon, Saudia Arabia and the United Arab Emirates in 2012/2013. Along with the amendments of Basel II.5, the BCBS introduced guidelines and standards of the Third Basel Accord (Basel III) in December 2010. Several of the MENA countries started implementing Basel III and enforced banks to build up their capitalisation levels according to new reforms of Basel III. Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia and Tunisia started implementing Basel III in 2013/2014. Most of these countries enforced banks to increase their regulatory capitalisation up to 12%. Even though the BCBS encourages usage of the recent reforms in the Basel Accords, Algeria, Djibouti, Iran, Iraq, Libya, Syria and Yemen have remained using Basel Accords I until now. Yet, these countries worked to enhance other regulatory aspects. For instance, Iran, Libya, West Bank and Gaza and Yemen started adopting, for the first time, a deposit insurance scheme to promote more stability in the banking sector and protect consumers.[24]

Overall, the regulatory environment in the MENA has developed over the period 2004 to 2014. Banks have experienced more pressure to strengthen their capitalisation level and to comply with disclosure requirements according to international standards. The implication of these reforms in the MENA countries, which are characterised as having a bank-based-system, is not necessarily the same as in countries with market-based-system. Drumond and Jorge (2013) argued that implementation of new bank capital regulations could make banks account the cost of increasing capital requirements at their setting for lending rates. Banks might charge a higher lending rate which might arise concern on default risk. Indeed, banks in concentrated markets are more empowered to boost lending rate (e.g., (Boyd and De NicolÓ, 2005; Wolfe et al., 2006)). Policymakers are concerned about the impact of the regulatory reforms to promote more stability. This concern would be more demanded if the banking sector

[24] Appendix (XI) summarises the major regulatory reforms, particularly in capital requirements, in the MENA region over the last three decades.

represents the largest part of the financial system in a country. These regulatory reforms have reignited interests on the impact of regulatory capital on risk-taking behaviour and its consequences on banking performance. This research will focus more on the sample period that experienced changes in the regulatory capital as per Basel II. This relationship will be examined in countries that have a different level of economic and financial development.

Chapter Three: Literature Review and Hypotheses Development

A. Literature Review on Banking Capital and Banking Risk

B. Literature Review on Banking Capital and Banking Performance

3. Chapter 3: Literature Review and Hypotheses Development

3.1. Introduction:

This chapter provides an overview of the previous literature that has been done in three areas: banking capital, banking risk, and banking performance. These three areas provide insights to assess the implication of adopting banking capital, as an external prudential tool, to maintain the stability of the banking system. This research has paid more attention to the impact of the capital and its regulations on banking risk and banking performance. Section 3.2 reviews the literature on banking capital and banking risk to assess the impact of the capital and its regulations on banking risk. Section 3.3 provides further discussion on the main factors that could explain divergent responses of banks to changes in the capital and its regulations. Section 3.4 presents the testable hypotheses that explain the potential implications of the capital on the risk level with consideration for factors of heterogeneity banking institutions. The last two sections adopt the same focus on the impact of the capital on banking performance. Section 3.5 reviews banking capital and banking performance literature to assess the impact of the capital and its regulations on banking performance. The last section (3.6) presents the potential heterogeneity of the impact of the capital on banking performance level.

3.2. The Impact of the Capital on Banking Risk: Moral Hazard Issue:

Capital literature has discussed the role of the capital requirements, as an external prudential tool, in reducing risk-taking incentives. In this regard, Demsetz and Lehn (1985) argued that "systematic regulation provides some subsidised monitoring and disciplining of the management of the regulated firm." This argument implies that external governance plays a role in changing risk-taking incentives. Applying this concept to the banking sector, the capital requirements, as an external prudential tool, aim to maintain the stability of the banking system via asking banks to increase their capital level as they get involved in more risky activities. Hence, effective changes in the capital level should be reflected in changes in risk level to avoid further regulatory costs. In view of this role for the capital level, more studies examined the relationship between the capital and banking risk after the introduction of the first Basel Accords in 1988 and Basel I amendments in 1996. These accords introduced the concept of a regulatory capital according to the associated risk for a given type of asset. This risk-based capital aims to limit, if not to avoid, banking excessive risk-taking incentives without increasing the capital level.

From a theoretical perspective, there are several arguments of the effectiveness of risk-based capital to be used as a means to constrain bank managers' selection in their asset-liability portfolio. Kahane (1977), Koehn and Santomero (1980), and Kim and Santomero (1988) argued that miss weighting risk-based capital might encourage banks to form a more risky portfolio. Thus, increasing the capital ratio is not always associated with low risk. Nonetheless, Keeley and Furlong (1990) criticised the former authors for ignoring deposit insurance in their discussion. Keeley and Furlong (1990) argued that banks do not respond to changing capital requirements via increasing their portfolio risk. They pointed out that any increase in the portfolio risk will also lead to a rise in the cost of deposit insurance premiums that are paid by banks. Increases in the cost of deposit insurance premiums might demotivate banks to get involved in more risk. Accordingly, an increase in capital requirements can reduce risk-taking incentives. However, a deposit insurance scheme is not adopted in all countries. For example, many of the Middle East and North Africa (MENA) countries have no deposit insurance scheme (e.g. Djibouti, Egypt, Iraq, Kuwait, Qatar, Saudi Arabia, Syria, Tunisia and the United Arab Emeries). Indeed, all the remaining MENA countries, except Yemen, have adopted an explicit deposit insurance scheme without risk-adjusted premium.

Furthermore, some studies found that the implementation of deposit insurance scheme creates a moral hazard issue and it induces risk-taking incentives (see e.g. (Wheelock, 1992; Wheelock and Kumbhakar, 1994; Demirgüç-Kunt and Detragiache, 2002; Gueyie and Lai, 2003; Ioannidou and Penas, 2010; Chernykh and Cole, 2011)). In addition, Rochet (1992) highlighted the importance of considering the incompleteness of financial markets to assess the impact of the capital in reducing the risk level. He argued that proper risk weighting is crucial in case of an incomplete market. Risk-based capital could be less effective to change risk-taking incentive if risk weighting is not adequately defined. In this regard, Merton (1977) showed that mispricing deposit insurance schemes could create a moral hazard issue. This moral hazard issue arises because deposit insurance acts like a put option that secures a fixed premium in case of a bank run. Banks would be encouraged in risk-taking because deposit insurance will bear the cost of their risks. In the incomplete market assumption, the association of the capital with risk-taking behaviour is ambiguous.

Based on the above theoretical rationale, Nemours empirical studies examined the relationship between the capital level and risk. Empirically there is inconsistency in findings of studies that examined the impact of the capital on banking risk. These inconsistent results are examined in view of moral hazard and regulatory hypotheses. The former refers to the negative association between capital and banking risk. Undercapitalised banks would be more encouraged into risk at the cost of deposit insurance which will bear their risk. Thus, increasing the capital level will constrain banks from taking more excessive risks. Banks cannot involve more risky assets unless more capital is provided. Some studies found that increases in the capital level contribute to reducing the riskiness of those undercapitalised banks. Berger (1995), who examined the US commercial banks over the period 1983 to 1989, found that banks that increase their capital tend to reduce their portfolio risks. Jacques and Nigro (1997), who examined 2570 U.S. commercial banks from 1990 to 1991, found that risk-based-capital standards contribute significantly to increase capital ratios and decrease portfolio risks in commercial banks.

These findings are also supported by Aggarwal and Jacques (2001) who found that the U.S. banks significantly reduced their level of credit risk in 1993-1996 in response to Prompt Corrective Action (PCA) standards. The PCA are standards that enforce the U.S. adequately and undercapitalised banks to improve their capital level according to the regulatory requirements. Shim (2013), who examined the U.S. bank holding companies for the period 1992 to 2011, found that banks with lower credit exposure tend to maintain higher capital buffers. Recently, Hogan (2015), who used both accounting-based data and market-based data to examine the U.S. bank holding companies over the period 1999 to 2010, found a significant negative relationship between volatility of stock returns and capital levels. They also found a higher capital level associated with a lower default level as measured in terms of z-score.

Adopting the European banking dataset, both Williams (2004) and Agoraki et al. (2011) found supporting evidence for the moral hazard hypothesis. Williams (2004), who examined European saving banks over the period 1990 to 1998, found that thinly capitalised banks are poorly managed banks and they tend to make less-quality loans. Agoraki et al. (2011), who examined 546 European banks from 13 countries from 1998 to 2005, found capital requirements reduce banking risk which was measured in terms of nonperforming loans. In Asian countries, Konishi and Yasuda (2004) used market-based-data for 54 listed Japanese banks during the period 1990 to 1999 and they found that the implementation of the capital adequacy requirements reduced risk-taking at banks. Agusman et al. (2008), who also used market-based-data for 46 listed Asian banks during the period 1998 to 2003, found an insignificant negative relationship between capital and market risk which was measured in terms of the beta of the bank's stock returns. Lee and Hsieh (2013) used accounted-based-data for 2,276 Asian banks over the period 1994 to 2008 and they found a significant negative relationship between capital and risk for whole Asian banks in the sample.

On the other hand, several studies supported the regulatory hypothesis which refers to a potential tendency of banks to offset a regulatory action of increasing capital levels by increasing assets risk. Empirically, some studies supported the regulatory hypothesis and found a positive association between the capital and risk-taking incentives. For instance, Shrieves and Dahl (1992), who examined 1,800 holding banks over the period 1983 to 1987, found a positive association between changes in risk exposure and capital levels. They found this relationship even in banks that had capital levels over the minimum regulatory capital requirements. Flannery and Rangan (2008), who used market-based data for 153 of the U.S. holding banks over the period 1986 to 2001, found that banks capital ratios are reliably positively related to portfolio risk exposures during the sample period that followed the regulatory reforms for capitalisation prompt corrective action (in 1991) and depositor preference laws (in

1993). Furthermore, Hogan (2015), who also examined changes in capital levels and risk levels using a simultaneous equations system, found riskier banks hold higher level of capital and risk-based capital.

In the European banking sector, several empirical studies have similarly reported a significant positive relationship between capital levels and risk exposure. For instance, Iannotta et al. (2007), who examined 181 European banks over the period 1994 to 2004, found a significant positive relationship between capital levels and risk. Likewise, Altunbas et al. (2007) adopted the European banking dataset from 15 countries and they found evidence supporting the regulatory hypothesis. The same finding is also supported by Fiordelisi et al. (2011) who examined a larger sample of recent European banking dataset from 26 countries from 1995 to 2005. They found a positive relationship between capital and risk which is measured in terms of non-performing loans. However, Fiordelisi et al. (2011) did not find a significant association between capital levels and market-based risk indicators. In the Asian banking sector, Lee and Hsieh (2013) found a positive capital effect on risk (measured in terms of loan loss provisions) in lower-income countries. They pointed out these countries have a higher proportion for explicit deposit insurance. Theoretically, this positive relationship between the capital levels and risk is predicted by a number of theories. Shrieves and Dahl (1992) elaborated these theories which mainly referred to regulatory costs, unintended effect of minimum capital standards, bankruptcy cost avoidance and managerial risk aversion arguments.[25]

The above discussion highlights that the potential impact of the capital on the risk level varies between countries and over the sample period. The potential impact of the capital could be according to the moral hazard, or it could be according to the regulatory hypothesis. In case of moral hazard hypothesis, the capital is expected to play a prudential role that demotivates managers to get involved in excessive risk. In term of regulatory hypothesis, banks assess the cost of increasing capital levels to potential benefits of the desired level of total risk. Hence, banks might tend to

[25] They pointed out that this positive relationship could be among banks which operate near to regulatory capital requirements as well as banks whose capital level is over the minimum regulatory capital requirements.

compensate for an increase in regulatory costs by increasing assets risk. The statement of these hypotheses will be as follow:

> **Null Hypothesis 1**: The moral hazard hypothesis exists as there is a negative relationship between the capital and the risk level.
>
> **Alternative Hypothesis 1**: The regulatory hypothesis exists as there is a positive relationship between the capital level and risk level.

3.3. The Impact of the Capital Regulations and Heterogeneity of Banking Institutions

VanHoose (2007), who reviewed academic studies in bank capital regulations, criticised studies' representative models that were designed to yield the conclusion that all banks are either bound or not bound by capital regulation. He highlighted the importance of considering further factors that account for the heterogeneity of financial institutions. Ultimately, these factors would influence the impact of the capital level and its regulations on the stability of the banking system. In view of this argument, it is observed that the above empirical studies examined the relationship between the capital level and risk as a homogeneous relationship that could either be supporting the moral hazard hypothesis or the regulatory hypothesis. This research expands the analysis to examine the impact of the capital level on banking risk with consideration for other factors that could reflect the heterogeneity of banking institutions. The heterogeneity of banking institutions could explain divergent responses of banks to changes in the capital and its regulations. There are three main factors that are considered in this research: ownership profile, restrictiveness of the regulatory environment, and Economic and Financial Development level of countries where banks are operating. Further discussion on these factors is elaborated in the following sections.

3.3.1. Heterogeneity of Banking Institutions: Ownership Structure

The theory of the firm, by Jensen and Meckling (1976), suggests that the ownership structure impacts on the risk behaviour due to a conflict of interests between principle and agent. Managers could be motivated to invest in activities that would maximise their benefits even though these activities might not be in the best interest of the shareholders. Even shareholders, who are enjoying both controlling advantages and limited liability rights, might have incentives into risky activities at the cost of debt-holders. In this regard, Jensen and Meckling (1976) highlight the importance of monitoring mechanisms in reducing agency issues. Agency issue in financial intermediaries is critical. Andres and Vallelado (2008) argued that the complexity of banking systems increase the asymmetry of information, hence impact on the effectiveness of monitoring and disciplining bank managers.

Empirically, within the context of the banking sector, -Saunders et al. (1990) found that stockholder-controlled banks in the USA, banks whose managers hold a large proportion of bank's stock, have more risk-taking incentives especially during deregulation periods in 1979 to 1982. However, they did not discuss in their study the impact of the capital on risk-taking behaviour. Their sample did not include the period of introducing the regulatory capital which was implemented in 1988. Following Saunders et al.'s framework, Lee (2002) examined 65 of the U.S. banks over the period 1987 to 1996 and he also found that stockholder-controlled banks were associated with high risk (than managerially controlled banks). He reported that risk level reduced during the period 1991 to 1996 when several regulatory reforms occurred other than capital requirements. Aligned with this, Gorton and Rosen (1995) examined 458 of the U.S. well-capitalised banks, which meet the regulatory capital requirements, during the period 1984 to 1990. They found that managers at stockholder-controlled banks tend to take an excessive risk when their proportion of the ownership is significant enough to make outside discipline costly. Gorton and Rosen (1995) did not report any impact on the regulatory changes in risk-taking incentives. Anderson and Fraser (2000) examined 150 of the U.S. banks- and they found that managerial shareholding banks are positively related to risk level especially during the period of adopting a fixed rate deposit system. Yet, this relationship found to be negative after 1992 when more regulations changed including the implementation of the risk-adjusted deposit insurance system.

In contrast, empirical evidence has also reported risk-averse behaviour. Chen et al. (1998), who used 302 of the U.S. depository institutions over the period 1988 to 1993, found that banks with high managerial ownership were associated with high-risk level in the U.S. banks. They support their findings based on an argument of Smith and Stulz (1985), who argued that bank managers reduce their risk level if their portfolio is not well diversified. Similarly, García-Marco and Robles-Fernández (2008) found a negative relationship between shareholder concentration and risk-level. However, their study, which is conducted based on Spanish banks over the period 1993 to 2000, did not examine the impact of regulatory changes.

On the other hand, evidence from Asia has reported a positive relationship between concentrated ownership and risk level. Kim et al. (2007) examined 65 Japanese banks over the period 1983 to 1996. They found a positive relationship between bank risks and ownership concentration especially when the regulatory environment was less restrictive. Haw et al. (2010) showed that concentrated ownership banks be riskier in poor legal settings. In a more recent study, Agusman et al. (2014) examined 52 Indonesian banks over the period 1995 to 2003. They found a significant positive relationship between concentrated ownership and overall risk at recapitalised banks, which obtained government support to increase their capital. They also found all banks induced more credit risk and overall risk with reduced capital level. Chalermchatvichien et al. (2014) examined 68 Asian banks during the period 2005 to 2009 and they supported the existence of a significant positive relationship between the concentrated ownership banks and risk-level.

It is observed that the distribution of manager types could explain the variation in the risk level of banks with a different type of management as emphasised by Gorton and Rosen (1995). In this regard, Jeitschko and Jeung (2005) also argued that risk-taking incentives might increase or decrease according to who is dominating bank decision making. They show, in a theoretical framework, that bank managers at highly capitalised banks may prefer assets with a high-risk, high-return characteristic to meet their private interests. They argued that a managerial agency issue is critical in understanding the relationship between capital and risk. Therefore, this research ownership will be considered in testing for the potential impact of the capital level on banking risk.

3.3.2. Heterogeneity of Banking Institutions: The Regulatory Environment

As presented in Chapter Two, the regulatory capital framework has changed significantly after the introduction of the Basel Accords II in 2004, the Basel Accords II.5 in 2009 and the Basel Accords III in 2010. These accords are designed to be more reflective of banks' idiosyncratic risks. For example, the Basel Accords II and II.5 introduced a set of disclosure requirements and it provides more guidelines to support regulatory and supervisory authorities. In addition, both the Basel Accords II.5 and III imposed more restrictions to improve the quality and quantity of the regulatory capital requirements. The inclusion of these reforms into the Basel Accords should enhance governance and the supervisory environment as banks are obliged to disclose their risk status. The impact of these regulatory reforms should be reflected in the capital-risk nexus.

The previous studies, which are stated in the previous section 3.3.1, highlighted that banking risk also varied during the period that experienced different regulatory restrictions over the sample period (see e.g. (Saunders et al., 1990; Gorton and Rosen, 1995; Anderson and Fraser, 2000; Lee, 2002; Kim et al., 2007; Agusman et al., 2014)). However, these studies have not accounted for the capital-risk nexus in their analysis except Chalermchatvichien et al (2014) who examined 68 Asian banks following the introduction of the Basel Accords II (mainly from 2005 to 2009). They did not find any significant association between the capital level and risk. They argued that banks might not yet adjust their risk-taking behaviour to new regulatory requirements. In this regards, Saunders et al. (1990) argued that risk-taking decisions are endogenous decisions which are impacted by ownership structure and regulatory environment. In addition, Jeitschko and Jeung (2005) questioned the impact of capital on a risk level in a dominated regulatory environment. They expected that to be positively associated as regulators are more forbearing with well-capitalised banks compared to less capitalised ones.

This research will examine the risk level and the impact of the capital level on banking risk during the period that experienced regulatory reforms. Indeed, these regulatory reforms were found to be more restricted after the financial crisis 2007/2008 when more regulatory requirements were imposed.

3.3.3. Heterogeneity of Banking Institutions: Quality of Legal Environment and Level of Financial Developments in a Country

As has been emphasised earlier, the banking capital framework is a capital-risk based framework that is used as an external supervisory tool that could be used to govern banking exposures. Banking exposures are monitored in-a-way where banks are required to either increase the capital level or limit investments in risky assets to maintain the level of minimum regulatory capital requirement. However, a number of economists argue the effectiveness of corporate governance control and supervisory environment dependence on the quality of legal institutions; economic growth and development of the financial markets (see e.g. (Grossman and Hart, 1988; La Porta et al., 2000; Chinn and Ito, 2006; Haselmann and Wachtel, 2010; Cherif and Dreger, 2016)). La Porta et al. (2000) argued that arrangement for the quality of legal institutions and the development of the financial markets should be coordinated together to have more effective corporate governance and supervisory environment. The weakness of legal institutions, less developed financial markets and economic conditions might constrain banking operations and induce more operating risk (see (Fang et al., 2014)). Cubillas and González (2014) supported the view that cross-country heterogeneity in financial liberalisation (i.e. lessening restrictions on the financial regulations and financial markets) might affect risk-taking incentives differently across countries. In this regard, Lim et al. (2011) argued that effectiveness macro-prudential instruments depend on a degree of economic and financial development in a country. The effectiveness of the policies and regulations are rooted in the legal environment of each country. Hence the impact of a given policy or regulation is more questioned in a country with low-quality legal protections and less developed financial markets. Banks could change their investment for their interests in countries with low-quality legal protections. Houston, Lin et al. (2012) found empirical evidence that banks prefer to transfer their funds to a country where there are lenient regulations.

On the other hand, there are a number of authors that criticised that banking capital framework could encourage banks to seek regulatory arbitrage opportunities especially in markets where there are more off-balance sheet instruments. For example, (Berger and Udell, 1994; Jones, 2000; Acharya and Richardson, 2009; Hellwig, 2010; Rethel and Sinclair, 2012) among others pointed out that banks might seek opportunities to reallocate their banking portfolio and pursue financial activities that might not be risk-weighted properly to increase or maintain the same level of risky investments and reduce the regulatory capital requirement. The presence of such a regulatory arbitrage could raise concerns on the effective role of the capital as a controlling tool. However, not all countries have a developed financial market where banks can utilise the available financial activities for their own interests. These arguments imply that the heterogeneity of quality of the legal environment and the variation in the development of financial markets should be accounted to assess the effectiveness of the capital to influence banking risk. This research will enrich this aspect of the literature by examining the risk level and the impact of the capital level on banking risk for banks from countries with different levels of economic and financial development.

3.4. The Impact of the Capital on Banking Risk: Heterogeneity of Banking Institutions

The following sections present the testable hypotheses that explain the potential implications of the capital on the risk level with consideration for the above three factors of heterogeneity banking institutions. These factors are expected to provide a better understanding of the capital-risk nexus.

3.4.1. The Impact of the Capital on Banking Risk: Does Ownership Matter?

As discussed earlier in section 3.3.1, the previous studies showed that risk-level of banks vary according to share of managers from bank stocks. However, data about managers' proportion from stocks is not commonly available. Besides, the variation in the effectiveness of the internal monitoring environment is more observable in banks with consideration for different ownership profile. For instance, listed banks are more governed compared to unlisted banks. Listed banks are required to disclose publically their financial information. Unlike the previous studies, this research will examine the impact of the capital on banking risk with consideration for an ownership profile. Ownership literature shows that listed banks, unlisted banks, domestic-owned banks and foreign-owned banks have a different level of riskiness and performance due to the variation in the competitive advantages and disadvantages for each ownership profile. The ownership profile is considered because it reflects the heterogeneity of owners in risk-taking incentives in which each category of ownership profile might involve different levels of exposure. The following sections discuss the risk behaviour of banks with different ownership profiles and the impact of the capital on banking risk.

Banking Risk at Publicly Listed Banks versus Unlisted Banks:

Publically-listed banks are held by shareholders and managed by a board of directors. These banks have an advantage of raising funds via trading on stock exchanges which enables them to be more liquid and have better access to capital markets. In this regard, (Craig Nichols et al. 2009) argued that publically-held banks are enjoying a lower cost of capital than private banks. Furthermore, they are governed by the rules of the stock exchange. According to these regulations, they are required to disclose publically their financial information. On the other hand, unlisted banks, which are owned by private investors and managed by self-perpetuating management, are not obliged to disclose their financial information to the public. Based on agency theory, separation of the ownership and management creates a conflict of interest and increases information asymmetry, and hence managers might induce more risk-taking incentives unless there are adequate monitoring mechanisms (Jensen and Meckling 1976). Theoretically, market discipline, which involves disclosing publically all relevant information, works as an effective monitoring approach to manage banks' risk-taking incentives. It provides informative signals that enable stakeholders to consider the precarious position of a bank.

Empirical studies reported strong evidence that market discipline plays a crucial disciplining role to reduce the risk-taking incentives of banks. Nier and Baumann (2006), who examined 729 listed banks from 32 countries over the period 1993 to 2000, found that risk disclosure creates incentives for banks to reduce solvency risk by choosing a more substantial capital buffer. Curry et al. (2008), who examined the U.S. bank holding companies from 1988 to 1992, also found supporting evidence for the presence of market discipline. Forssbæck (2011), who examined 331 listed banks from 47 countries over the period 1995 to 2005, found that market discipline associated negatively with risk indicators. They reported the same finding even during the crisis period. At Asia markets, Wu and Bowe (2010), who examined 120 Chinese banks over the period 1998 to 2008, found significant evidence of market discipline through information disclosure and the interbank market. Besides, Hadad et al. (2011), who examined 104 banks in Indonesia over the period 1995 to 2009, found evidence of market discipline as higher deposit rate associated with higher default risk and liquidity risk. They found that market discipline is more pronounced in listed banks than unlisted banks.

However, there is a debate whether market discipline reduces risk-taking incentives (see e.g. (Evanoff and Wall, 2001; Benink and Wihlborg, 2002; Bliss and Flannery, 2002; Mendonça and Villela Loures, 2009)). In this respect, Iannotta et al. (2007), who examined 181 European banks over the period 1999 to 2004, found that listed banks tend to have lower quality assets in which they have higher loan losses. They argue that market discipline is ineffective in the case of banks that are enjoying explicit or implicit government guarantees. Aligned with this study, Barry et al. (2011), who examined 249 European banks over the period 1999 to 2005, found that there is no significant difference in risk between publicly-held and privately-owned banks. However, they argue that risk preferences vary according to the nature of the main controlling category of shareholders. They had found that listed banks, which have a higher equity stake from banking institutions, show lower credit risk compared to listed banks with institutional or families' investors. Barry et al. (2011) justified that banking institutions are more risk averse, possibly due to reputational concerns. The above discussion highlighted that the impact of market discipline varies among different ownership natures. Listed banks, due to effective market discipline, are expected to be less induced into risky activities compared to unlisted banks.

On the other hand, unlisted banks are closely held via fewer shareholders with managers who are likely to be among the shareholders Craig Nichols et al. (2009). Thus, the separation between ownership and management is less compared to listed banks. Shareholders more closely monitor managers. Accordingly, the management interests are more aligned with the interests of shareholders. Barry et al. (2011) argued that shareholders at unlisted banks have better access to managers' private information and, therefore, the later have less risk-taking incentives. In contrast, from the perspective of the debt-holders, it is easier to monitor the activities of listed firms rather than an unlisted one. Unlisted banks' management might work in their interests at the cost of debt-holders. Thus, they might be associated with high risk too. Empirically, there are limited studies which examined risk behaviours for listed and unlisted banks under ownership nature. Fraser and Zardkoohi (1996) found that saving and loans associations, which are unlisted, are less risky than listed banks, especially during the deregulation period in 1976-83. Esty (1997), who examined the U.S. loans and saving associations over the period of 1982 to 1988, found that stock-based thrifts are riskier than mutual-based thrifts. His study was conducted during the period that the regulatory capital did not implement. Nichols et al. (2009), who examined 1652 of the U.S. banks over the period 1992 to 2002, found that listed banks have a higher loan loss provisions than unlisted banks. Amadou Barry et al. (2011), who examined 249 European banks over the period 1999 to 2005, found that ownership characteristics are significant in explaining risk differences mainly for unlisted banks.

In view of this discussion, risk-taking preferences vary among listed banks and unlisted banks. The effective market discipline is expected to reduce risk-taking incentives in listed banks. In contrast, unlisted banks are self-perpetuating management, and they are not required to disclose their financial information to the public. Unlisted banks are expected to have a high incentive in risktaking due to ineffective monitoring environment. Accordingly, the ownership hypothesis for listed and unlisted banks will be as follow:

> **Null Hypothesis 2**: There is a negative association between listed banks and risk level.

Banking Risk at Foreign Banks versus Domestic Banks:

Foreign banks are subsidiaries formed by the parent bank in the home country. These banks are growing and spreading in a large number of countries Claessens and Van Horen (2014). The literature shows that the appearance of foreign banks improves a domestic banking system at different perspectives. The entry of foreign banks can enhance competition, promote more diversified services and, accordingly, induce domestic banks to improve their operations (see e.g. (Barajas et al., 2000; Manlagñit, 2011)). Foreign banks also play a role in stabilising the banking system. In this regard, Levy Yeyati and Micco (2007), who examined bank behaviour in developing countries, show that the penetration of foreign banks contributed to reducing risk levels and enhanced financial stability. Dinger (2009) found that a high degree of foreign bank penetration was associated with less aggregate liquidity problems in the domestic market. Levine (2001) argued that the presence of foreign banks plays a role in the improvement of a local banking system and promote economic growth.

Foreign banks are enjoying more competitive advantages compared to domestic banks. Berger et al. (2005a) expound several benefits that associate with foreign banks, including scale economies, diversified portfolio and better access to international funding. These banks are a part of large banking organisations. They have access to educated labour and use technology and automated banking services more than domestic banks (Havrylchyk 2006). Moreover, their managers are more skilful in using different risk management techniques (Banerjee and Velamuri 2015). Empirical studies show that foreign banks perform better than domestic banks at lower costs (see e.g. (Claessens et al., 2001; Maria Soledad Martinez and Mody, 2004; Sturm and

Williams, 2004; Bonin et al., 2005a; Bonin et al., 2005b; Fries and Taci, 2005; Berger et al., 2009a)). Thus, foreign-owned banks are more capable of stiff competition in the host country. This is because they are more able to utilise their competitive advantages in assessing risk and form a safer portfolio than domestic banks in each country (Detragiache et al. 2008). Besides, foreign banks are concerned about their risk behaviour to maintain their reputation worldwide (Mian 2006).

With these competitive advantages, some caveat that the appearance of foreign ownership could impact on risk-taking incentives of domestic banks. Penetration of the foreign banks might reduce the profitability of domestic banks (e.g. (Claessens et al., 2001; Weill, 2003; Sturm and Williams, 2004)). Claessens and Van Horen (2013) found that foreign banks outperform domestic banks in low-income countries with weak financial institutions. Whereas, domestic banks lack the advantages that are enjoyed by foreign banks. Hence, there is an argument that the appearance of foreign banks, especially in poorly regulated countries, might redirect their lending to the least creditworthy lenders which are associated with higher default risk (Mian 2003).

Empirically, a number of studies reported an increase in the risk of domestic banks as a result of foreign entry. Unite and Sullivan (2003), who examined 16 Philippine banks, found that increases in loan loss provisions of domestic banks are associated with foreign bank entry. With a larger sample, Claessens et al. (2001) examined banks from 80 countries over the period 1988 to 1995 and found that loan loss provisions are significantly lower than domestic banks in high-income countries. Similarly, Detragiache et al. (2008), who used a sample of 872 banks from 89 countries over the period 1995 to 2003, found that domestic banks provision more for bad loans than foreign banks in low-income countries. Recently, Serrano (2016) examined 85 banks in Mexico and Colombia over the period 2005 to 2014 and found that foreign banks allocate fewer provisions for non-performing loans. He observed that significantly sized foreign banks do have more risk-taking incentives, and these banks associate with higher bad loans. Given the above discussion, risk level foreign-owned banks are expected to differ from domestic-owned banks due to the variation in the level of competitive advantages. Comparing to foreign banks, domestic-owned banks lack competitive advantages that enable them to assess their portfolio more effectively. Accordingly, it is hypothesised that:

> **Null Hypothesis 3**: There is a positive relationship between domestic ownership and risk level.

The Impact of Capital and Differences in Ownership Characteristics

The previous discussion supports the potential response of banks to increases in capital level according to two main hypotheses: Moral Hazard Hypothesis and Regulatory Hypothesis. As presented in section 3.2, the empirical effect of the capital on banks' risk-taking behaviour was found to be inconsistent. Thus, a number of authors highlighted the importance of examining this relationship with consideration for other factors. Literature highlights the variation in the risk level of banks with a different form of ownership.[26] Each ownership profile has its competitive advantages that would influence their attitudes to manage capital and risk varies according to their objectives. There are good reasons that might make the impact of the external regulatory requirements, including the capital requirements, vary among banks with a different form of ownership.

Firstly, the strength of bank supervision could vary for different types of ownership. Foreign banks are subject to regulations and supervision of regulatory authorities at both home and host country compared to domestic banks. A number of authors highlighted potential variation in treatments of domestic and foreign banks. Mian (2003) argued that the home-country regulatory authorities, especially in developed countries, could be more effective in regulatory enforcement and bank supervision. He cautioned that the host-country regulators could have potential biases in the supervision of domestic banks versus foreign banks. The host-country regulators, especially in less developed countries, might be more lenient in their supervision and monitoring of foreign banks compared to domestic banks. Krimminger (2005) argued that that lack of information and coordination issues

[26] The last two sections discussed the variation in the risk-taking behavior of listed banks, unlisted banks, and domestic owned banks.

between host and home regulatory authorities could impact on the supervisory power and regulatory decisions of both host and home regulators. The host-country regulators have better knowledge to supervise effectively domestic banks and might delay interference on time. However, they might fail to take effective intervention actions against foreign banks.

Furthermore, Calzolari and Loranth (2011) pointed out that the type of organisational representations of a foreign bank (as a branch or subsidiary) can influence regulators' behaviour and their monitoring incentives. They argue that the appearance of a foreign branch is associated with softer regulations, especially if a home bank is highly profitable. A host-country regulator has less incentive to monitor a foreign branch than a home regulator since the home-country regulators are in charge of both domestic banks and their international branches. In light of this argument, a number of empirical studies show that foreign banks tend to be selective in their decision to operate at a given host-country. They tend to work in less regulated countries where they can utilise their competitive advantages. For instance, Bertus et al. (2008) found that the presence of foreign banks is less in countries with greater market discipline. Houston et al. (2012) found strong evidence that banks transferred their funds to markets with fewer regulations. Changes in regulatory restrictions and strength of supervision at a home country could impact on risk behaviour of foreign banks at host countries. Ongena et al. (2013) found that stricter banking regulation in a home country has an influence on banking activities in overseas markets. Specifically, they found that lower barriers to entry, tighter restrictions on bank activities and lower degree higher minimum capital requirements make cross-border banks lax their lending standards in foreign markets.

Secondly, diversification advantages vary among banks with different ownership structures. Foreign banks have a greater opportunity to diversify their portfolios in international markets. They have superior skills in risk management and enjoy a better diversification performance compared to domestic banks. Berger et al. (2010) found that foreign banks suffer less loss of profits and less increase in cost when they diversify. Pennathur et al. (2012) found that diversification structure differs significantly among foreign and domestic banks. They discovered that profitable foreign banks tend to have a higher share of fee income, while profitable local Indian banks tend to have less fee income. Garcia-Herrero and Vazquez (2013) also found that there is a systematic difference in risk-return performance between international banks in their home-countries vis-a-vis their subsidiaries at host-countries. They found that subsidiaries are more diversified and profitable, on average, but also riskier. Meslier et al. (2014) found that foreign banks benefit from shifting toward non-interest activities more than Philippines domestic banks. They found that revenue diversification and a shift toward non-interest income has a positive influence on the risk-adjusted profitability of banks. These studies highlight that foreign banks are in a better position to utilise their diversified portfolios which would enable them to alter their risk portfolios according to risk-based regulatory requirements.

A number of studies highlighted that publically-held banks are shifting toward more size-related diversification and revenue diversification. Yet some caveat that this tendency is associated with offsetting potential diversification benefits by higher volatile returns while they are operating with less capital. Demsetz and Strahan (1997) argued that large holding banks can operate with more leverage (i.e. less capital) and become involved in riskier (potentiality profitable) lending portfolio without increasing their risk because they are benefiting from their size-related diversification. Stiroh and Rumble (2006) found that holding banks are shifting toward noninterest income which enables them to gain higher risk-adjusted profits, but they found that marginal increases in noninterest income are still associated with a decline in risk-adjusted-profits. Baele et al. (2007) used market-based data and found that European listed banks are able to reduce their idiosyncratic risk by revenue diversification. Sanya and Wolfe (2011) used accounting-based data and found that listed banks in emerging economies benefit from revenue diversification to reduce solvency risk. Pennathur et al. (2012) found that public banks pursue more fee-based income when faced with poor quality loans. Shim (2013) found that diversified U.S. holding bank companies, which offer a growing range of noninterest products, are benefiting from their revenues diversification as associated with low insolvency risk.

In terms of state-owned banks, many studies highlighted that state-owned banks lack skills and experience in risk management; as a consequence, they are inefficient to manage diversified portfolios. Pennathur et al. (2012) found that state-owned banks have a lower share of interest income than privately-owned-banks in India. Saghi-Zedek (2016) found that diversification activities are associated with higher risk when banks have only families or states as controlling shareholders. From the view of these studies, diversification could impact on the risk behaviour of banks which is varied among banks with different ownership profile.

Thirdly, state-owned banks, compared to others, are enjoying implicit government support. From the development perspective, these banks are playing a social role in funding local projects to enhance economic growth, especially in less developed countries Gerschenkron (1962). However, state-owned banks are found to be influenced by politicians who are looking out for their own interests and direct these banks to projects that could be inefficient (e.g. (La Porta et al., 2002; Sapienza, 2004; Dinç, 2005; Khwaja and Mian, 2005; Cornett et al., 2010)). Mian (2003) pointed out that local authority would not threaten a government bank with the suspension of operations as they might threaten a private bank. Indeed, these banks have easy access to support from the governments. Several authors argued that public assistance impact on the strength of monitoring incentives. Demirgüç-Kunt and Detragiache (2002) argued that government support, in the form of deposit insurance, would lead to a weaker incentive to monitor banks and hence, it could create adverse incentives in risk-taking. This argument is also supported by Nier and Baumann (2006) who pointed out that explicit or implicit government support may limit banks incentives to change risk profile and hence reduce the influence of market discipline.

Thus, based on the above discussion, the reaction of banks to the regulatory requirements might not have the same impact, and it varies according to the nature of the ownership. There are empirical studies that reported significant variation in the relationship between capital levels and risk according to banks' ownership profile. For instance, Altunbas et al. (2007), who used European data for 15 countries over the period 1992 to 2000, found that the relationship between capital levels and risk varies significantly for banks with different ownership features. They found that commercial banks tend to have a significant positive relationship between capital level and risk exposure. However, co-operative banks tend to have a significant negative association between capital levels and risk exposure. Altunbas et al. (2007) pointed out that moral hazard issue could arise due to the existence of an agency issue between owners and stakeholders, while the regulatory hypothesis could be partly due to inefficient market monitoring. This result implies that managers, in countries with a less efficient regulatory environment, tend to utilise their competitive advantages to reform their risk portfolio that maximises their objectives. Similarly, Iannotta et al. (2007), who examined 181 European banks over the period 1994 to 2004, studied the effect of ownership structure on performance and risk. They found a significant difference in performance and risk between banks with different ownership nature. Iannotta et al. (2007) found public sector banks have poorer loan quality and higher insolvency risk than other types of banks. They reported a significant positive relationship between loans loss provision and capital levels. However, they have not examined whether this relationship varies among different types of banks. In the Asian banking sector, Montgomery (2005), who considered Japanese banks over the period 1982 to 1999, found that international banks are more sensitive, compared to domestic banks, to the core tier one capital requirements. They discovered that international banks with low core capital ratios tend to reduce their risk-weighted assets in the post-Basel I period (i.e., after 1988). However, they did not find any significant evidence that domestic banks were affected by the Basel requirements.

The above discussion highlights that strength of supervision, diversification advantages and government support could make banks respond differently to the same regulation according to the nature of the ownership. The variation in respond of banks to a given regulatory requirement could be due to competitive advantages and disadvantages of each bank that would impact on their risk attitudes toward regulatory requirements according to their objectives. It is hypothesised that:

> **Null Hypothesis 4**: The relationship between the capital and risk level does not vary among banks with different ownership profile.
>
> **Alternative Hypothesis 4**: The relationship between the capital and risk level varies among banks according to their ownership profile.

3.4.2. The Impact of the Capital on Banking Risk: Regulatory Environment

Section 3.3.2 questioned the relationship between the capital and risk during the period that experienced a different level of the regulatory restrictiveness. Section 2.3 reported the development in the capital regulations as per the Basel Accords. It is observed that the reaction of the Basel Committee to the financial crisis 2007/2008 was imposing more capital regulatory requirements as represented in the Basel Accords II.5 in 2009 and the Basel Accords III in 2010. Compared to the Basel Accords I and II, which were introduced before the crisis, the Basel Accords II.5 and III are more restrictive, in which more requirements were imposed to improve the quality and quantity of the capital requirements. These reforms have paid more attention to the importance of enhancing the banking capital level. This importance of the banking capital is based on the principle that a well-capitalised bank is more capable of absorbing banking difficulties (Ethan Barnaby 1992). Since the introduction of the Basel Accords II, the Basel Committee prescribed additional reforms in the regulatory capital framework. Basel II introduced consideration for lending and non-lending activities in the regulatory capital framework. The Basel Committee has also prescribed, in Basel II.5, to impose a higher weighted risk on some of the non-lending activities. In addition, the Committee prescribes to disclose more information on banking activities, including non-lending activities, to enable the public to assess banking institutions. The Basel Committee aimed to strengthen the capital framework, expand risk coverage that is accounted for in the capital framework, and increase transparency on banking capital base (BCBS 2011, p.2). These regulatory reforms reflect changes in the regulatory environment as a whole. In view of these reforms, the attitude of banks management was expected to change, especially after the financial crisis of 2007/2008. The regulatory environment, after the financial crisis, became more restrictive than before. Risk-taking decisions are expected to be influenced by prescribed regulatory changes in the risk-based capital framework. Eventually, the impact of these regulatory reforms should be reflected in the capital-risk nexus too.

Empirically, the literature discussed the risk level and the impact of the capital during the transformation period before and after implementation of Basel I (e.g.

(Hancock et al., 1995; Berger and Udell, 1994; Peek and Rosengren, 1995; Furfine, 2001, Blaško and Sinkey, 2006; Kishan and Opiela, 2006) among others) as well as the transformation period between Basel I and Basel II (e.g. (Jacques, 2008; Gambacorta and Mistrulli, 2004; Zicchino, 2006; Panagopoulos, 2010) among others). Theoretically, Basel II, Basel II.5 and Basel III differ significantly from Basel I. Basel II proposes adjustments to increase the sensitivity of the regulatory capital via incorporating external and internal ratings in the assessment of weighted-risks. Basel II.5 expands the risk coverage in the capital framework to account for market and counterparty risks. On the other hand, Basel III proposes adjustments to enhance the quality of the regulatory capital via an emphasis on components of the regulatory capital and using stressed parameters to determine weighted-risk. [27] Thus, the transformation period between Basel II and Basel III has experienced substantial reforms in capital regulations that are not yet investigated extensively. This research also examines the effectiveness of the capital framework to impact on the banking risk level. The risk level of banks is expected to be reduced after the introduction of the Basel Accords II, Basel II.5, and Basel III. The Basel Accords II is claimed to be more sensitive risk-based capital requirements, and they impose additional disclosure requirements that act as a monitoring tool. Besides, Accords III impose additional capital level and additional disclosure requirements on off-balance sheet activities to enhance the quality of the risk-based capital level. The proposed amendments to the Basel Accords are supposed to make the capital framework more sensitive risk-based capital, and hence they demotivate managers to be involved in excessive risk. Thus; it is hypothesised:

> **Null Hypothesis 5**: The relationship between the capital and risk level is expected to be negative after the introduction of the Basel Accords II, Basel II.5, and Basel III.

However, not all banks are expected to respond to regulatory reforms in the same manner. The committee specifies a minimum regulatory requirement that needs to be

[27] Details of main new regulatory restrictions in Basel II.5 and Basel III have been discussed in Chapter Two, Section 2.3 "*Development of Banking Regulatory Capital Framework*".

met by banks. Some banks might already meet the minimum regulatory capital requirements. Others are more pressurised to meet the regulatory requirements because they are undercapitalised banks. The capitalisation level reflects the regulatory pressure that has been experienced by a bank. This experience might be reflected in risk attitude and bank's risk-taking activities. Some argued that banks with different level of capitalisation might be associated with different risk attitude, and their risk-taking decisions might differ accordingly (see, e.g. Jacques and Nigro, 1997; McManus and Rosen, 1991; Dahl and Spivey, 1995; Rime, 2001). Unlike the previous studies, this research accounts for the risk behaviour of both undercapitalised and better-capitalised banks over the sample period that experienced a different level of regulatory restrictions.

Empirically, the literature review shows that undercapitalised banks, which are not meeting the minimum regulatory capital requirements, reduced their exposure in lending activities in response to the regulatory capital mainly due to the implementation of the first Basel Accord (see e.g. (Berger and Udell, 1994; Peek and Rosengren, 1995; Lown, 1996; Watanabe, 2007; Furfine, 2001; Haubrich and Wachtel, 1993; Hancock et al., 1995). Other empirical studies found that low-capitalised banks are more involved in securitised instruments to use them in reducing their lending exposures and obtain liquid fund. (see, e.g. (Merton and Bodie, 1992; Sinkey Jr and Carter, 2000; Bartram et al., 2009; Minton et al., 2009; Affinito and Tagliaferri, 2010; Acharya et al., 2013; Mayordomo et al., 2014)). Thus; undercapitalised banks might respond to the regulatory requirements via reducing their exposure to a particular type of activities, while they found to have more exposure in other types of non-lending activities.

On the other hand, Milne (2002) questioned the effect of the capital, as an incentive-based mechanism, on the banking portfolio choice especially if a bank has already held capital more than the regulatory requirement. Theoretically, better-capitalised banks are expected to have a low default probability. Unlike undercapitalised banks, better-capitalised banks are not pressurised to meet the regulatory capital requirements. Thus, they have a higher capability to be involved in more risky investments while they are still meeting the regulatory capital requirements. A number of studies found that high-capitalised banks are more involved in derivatives instruments (e.g. (Shrieves and Dahl, 1992; Adkins et al., 2007; Li and Marinč, 2014)). Aligned with these findings, Graham and Rogers (2002), and Stulz (1996) found that the firms that used hedging instruments to reduce default cost are more motivated to increase their debt capacity. Thus, it is expected that the behaviour of better-capitalised banks could differ from the behaviour of undercapitalised banks. A number of authors justified the positive relationship between the capital level and the risk level of better-capitalised banks. The main explanations that had been discussed in the literature are:

- Orgler and Taggart (1983) argued that the optimal banking capital is an increasing function of bankruptcy cost along with a trade-off between tax advantages, diseconomies of scale, deposit insurance, reserve requirements. Shrieves and Dahl (1992) pointed out that this increasing function could make banks, which have an optimal capital above the regulatory minimum capital requirement, increase their risk as the capital increased.
- Shrieves and Dahl (1992) found empirically that banks, whose capital is above the minimum regulatory requirement, mitigate the effect of increasing capital level by increasing risk level due to manager's private incentives.[28]
- Blum (1999) argued theoretically that bankers, who found raising capital is expensive, could be motivated in assets of high-risk high-return categories in order to compensate

[28] Sherieves and Dahl also discussed in their paper four potential arguments that could explain the positive relationship between capital and risk. The arguments are: Regulatory Cost Argument, Argument of Untended Effect of the Regulatory Capital, Bankruptcy Cost Avoidance Argument and Managerial Risk Aversion Argument. Some of these arguments apply to all banks while others are more applicable to well-capitalised banks. Yet, Sherieves and Dahl had not examined the whole of these stated arguments. They also have not discussed the possibility of distinguishing empirically between these arguments.

for additional regulatory cost and increase the rate of return.

Compared to the expected behaviour of undercapitalised banks, the above discussion clarifies the possibility of the variation of the risk level for banks with different levels of capitalisation. The risk level of undercapitalised banks is expected to be reduced after the introduction of the Basel Accords II, Basel II.5, and Basel. These banks are more pressurised to meet the regulatory requirements compared to the better-capitalised banks. The latter might not reduce their risk level after the introduction of the new amendments of the Basel Accords. The better-capitalised banks are less pressurised to meet the regulatory requirements. In response to new amendments of the Basel Accords, it is hypothesised that:

Null Hypothesis 6a: There is a negative relationship between undercapitalised banks and risk level during the post-period of introducing the regulatory reforms.

Null Hypothesis 6b: There is a positive relationship between better-capitalised banks and risk level during the post-period of introducing the regulatory reforms.

3.4.3. The Impact of the Capital on Banking Risk: Economic and Financial Development Level of Countries

Section 3.3.3 questioned the relationship between the capital and risk in countries with different levels of legal quality and different levels of economic and financial developments. Most of the empirical studies, as summarised in Section 3.2, are based on a single country (e.g. U.S. Banks) or a group of countries with the same level of economic and financial development (e.g. European countries or Asian countries). There are limited empirical studies that examined the banking risk with consideration to the differences in the quality of a legal environment in a country and variation in stages of economic and financial development.

The literature shows that more studies focused on examining lending decisions with consideration to cross-country variation in the legal environment and financial development level. For instance, Asli and Vojislav (1998), who examined firms from 30 countries during the period 1980 to 1991, found that firms use long-term financing in countries whose legal environment is efficient and have well-functioning institutions. Using bank-level data, JUN and E. (2007), who examined banks from 43 countries over the sample period 1994 to 2003, found that banks offer loans with longer maturities and lower rates in countries with high creditor protection rights. From the perspective of lending composition, Haselmann and Wachtel (2010) argued that banks which operated in a well-functioning legal environment are more willing to enterprise lending and other mortgages due to quality and enforceability of the legal system. They examined 432 banks from 20 countries for the year 2004. They found that banks in developed countries are more involved in mortgages, while banks in developing countries, where they have a low-quality legal system and high information asymmetry, are more involved in safe investments. Cubillas and González (2014), who examined banks from 83 countries over the sample period 1991 to 2007, found that financial liberalisation increases banking risk-taking incentive differently across countries. Financial liberalisation increases bank risk in developed countries via promoting banking competitions, while it increases the risk via expanding opportunities to invest in foreign banks and non-lending activities.

The results of these studies imply that banking decisions, on the type of activities to be involved, varied across countries with different levels of legal system and stages of developments in the economic and financial markets. Hence the reaction of banks to the regulations might differ too. In view of these results, the banking capital regulations and its impact on the risk level are expected to be more effective in developed countries rather than developing countries. Developed countries characterised as having an improved economic condition, well-functioning financial markets and a better-quality legal environment that contribute to strengthening the implementation of policies and regulations. It is hypothesised that:

Null Hypothesis 7: The relationship between the capital and risk level does not vary among countries with different economic and financial development level.

Alternative Hypothesis 7: The relationship between the capital and risk level varies among countries with different economic and financial development level.

Based on the alternative hypothesis, a negative relationship is expected between capital and risk level for banks in developed countries. The financial markets and banking system in developed countries are functioning well, and there is an effective legal and governance environment. In contracts, the impact of the capital requirements in developing countries might be less effective due to low institutional quality and governance. Thus, a positive relationship is expected between capital and risk level for banks in developing countries. This research will enrich this aspect of the literature by examining the risk level and the impact of the capital level on banking risk for banks from different countries; mainly banks from the Middle East and North Africa (MENA) countries and banks from the Organisation for Economic Co-operation and Development (OECD) countries. These countries have different financial structure and are at various stages of economic and financial development.

The financial structure, in most of the MENA countries, is found to be characterised as a bank-based financial system.[29] In a banking system country, banks are the major funding channel that mobilises savings, allocates capital and provide risk management vehicles. Thus, individuals and firms rely on banks to meet their financial needs. Policymakers in a bank-based system are more concerned about the stability of banks due to their crucial role as a major channel in facilitating funding and supporting

[29] This finding is obtained using the conglomerate index of financial structure (CIFS) of financial structure. The CIFS is a quantitative approach, developed by Demirguc-Kunt and Levine that aims to identify the development level of the financial structure of countries. The CIFS is constructed based on size, activity and efficiency of both the stock market and banking sector development. This index is used to assess the financial structure of all countries that are included in the sample of this research. Appendix (X) provides further details on the computation of the CIFS index and the obtained results are attached too.

economic growth. On the other hand, the economic growth and financial development in the MENA countries are still not as developed as is the case in the OECD countries. The financial markets are small-sized, and they lack a liquid market in the MENA countries.[30] Besides, they also have less active bond markets, and there is limited use for long-term debt Awartani et al. (2016). Compared to the OECD countries, which are characterised as having more financially developed markets, there is lack of adequate liquidity and capital markets in the MENA countries (see, e.g. (Ben Naceur et al., 2008; Awartani et al., 2016)).[31] From a legal environment perspective, the score of financial freedom, property's right and freedom from corruption in the MENA region are found to be lower than index scores in Europe, North America and the world average according to Index of Economic Freedom 2015 (see (Erdoğdu and Christiansen 2015)). Hence, the banking sector in the MENA region is not only characterised as being a bank-based system, but it is also operating in a less developed financial structure with low institutional quality. The variation in the legal environment and the development of financial markets will be considered in testing for the potential impact of the capital level on banking risk.

Table (3-1) summarises statements of all the above hypotheses that are related to the impact of the capital on the risk level.

No.	Statement of the Null Hypotheses on Banking Risk
1	$H_0 1$: There is a negative relationship between the capital and the risk level
2	$H_0 2$: There is a negative association between listed banks and risk level.
3	$H_0 3$: There is a positive relationship between domestic ownership and risk level.
4	$H_0 4$: The relationship between the capital and risk level does not vary among banks with different ownership profile.
5	$H_0 5$: The relationship between the capital and risk level is expected to be negative after the introduction of the Basel Accords II, Basel II.5, and Basel III.

[30] Chapter Two in Section 2.3 reported the average value of the market capitalisation ratio and a total number of shares traded in both MENA countries and the OECD countries over the sample period 2004 to 2014. The results show that the market size for the MENA countries, in terms of average values for ratio market capitalisation, have the lowest market size compared to developed countries, represented by the OECD countries and the rest of the world. Further details are presented in the stated section.

[31] Further details on characteristics of a banking system in the MENA countries compared to the OECD countries are given in Chapter Two, Section 2.3.

6	$H_0 6a$: There is a negative relationship between undercapitalised banks and risk level during the post-period of introducing the regulatory reforms.
7	$H_0 6b$: There is a positive relationship between better-capitalised banks and risk level during the post-period of introducing the regulatory reforms.
8	$H_0 7$: The relationship between the capital and risk level does not vary among countries with different economic and financial development level.

Table 3-1: Summary of null hypotheses that examine the impact of banking capital on the risk level.

3.5. The Impact of the Capital on Banking Performance: Expected Bankruptcy Cost, Monitoring Incentive and Cost of Capital

Examination of the relationship between banking capital and bank performance has gained higher interests after the introduction of the banking regulatory capital requirements. The banking capital framework, which was introduced in 1988 as an external prudential tool, aims to improve banking position by imposing higher capital requirements aligned with their involvement in risky activities to maintain financial stability and reducing the potentiality of banking failures. As presented in Chapter Two, this risk-based capital framework has been developed over time to be a more sensitive risk-based capital framework. The outcomes of building up the banking capital level, as per regulatory requirements, are expected to be reflected in improved economic performance (Jalilian et al. 2007). However, some pointed out a negative impact of building up a capital level. They argued that high capital level might limit lending growth, increase lending cost, limit economic growth and create competitive obstacles (e.g. (Cosimano and Hakura, 2011; Vassiliadis et al., 2012; Sutorova and Teply, 2013; Angelini et al., 2015)). In view of these divergent sights, the consequences of imposing more capital and its impact on banking performance are still questioned.

Applying the banking capital framework is expected to impact the performance level. The banking capital framework is based on a risk-weighted-asset scheme in which each risk-weighted asset is computed by adjusting the asset class for risk exposure. Banking supervisors then use the total risk-weighted assets to determine the minimum capital requirement of a bank. Hence, this risk weighting scheme affects not only the capital amount but also the allocation of the banking portfolio. Accordingly, applying the banking capital framework will make the banks rearrange their banking portfolio to at least meet the regulatory requirements. In response to these requirements, banks might expand their lending activities with better or worse quality of lending (as argued by Hughes et al. (1995); Kopecky and VanHoose (2006)), or increase their interest margin spread (as argued by Demirguc-Kunt et al. (2003)), or reduce dividends and utilise their retained earnings to build the capital level (as argued by Berger (1995)) etc. Eventually, the portfolio and returns structure will be changed, and these changes are associated with different risk-return characteristics that will influence banking costs and profits. In the following section, there is a review of the literature on banking capital and bank performance that examine the potential impact of banking capital and its regulations on banking performance.

Capital literature has discussed the impact of the capital on banking performance from different perspectives. After reviewing the literature, three main aspects are found that are used to explain the impact of the capital on the banking performance, as discussed in the following section: expected bankruptcy cost, monitoring incentive and cost of capital. The impact of the capital on the performance level is explained in view of the expected bankruptcy cost argument. This argument is based on theories that suggest increasing the capital level tends to improve survival probability (see, e.g. Marini (2003)). Accordingly, high-capital banks are considered to be associated with higher survival probability since they have a low leverage position. Hence, those high-capital banks experience fewer bankruptcy costs. Their high capital acts as a buffer against unexpected losses. Aligned with this argument, Fries and Taci (2005) pointed out that these high-capital banks are also able to obtain funding at lower costs compared to other banks because they are perceived as less risky. This argument is also supported by Berger (1995), who highlighted that high-capital banks pay relatively low rates on their uninsured debts and have better earnings since their creditworthiness is higher than low-capital banks. These views emphasise that high capital banks tend to be associated with less expense since they pay fewer interest expenses, and their cost of funding is expected to be low due to the lower leverage level. Accordingly, the expected bankruptcy cost argument expects that high capital banks are regarded as low cost and high-profit banks. On the other hand, low capital banks face less survival probability because they are more likely to have higher bankruptcy costs in responding to large losses. Hence, their cost of funding would be higher than the high-capital banks. Based on the expected bankruptcy cost argument, those low capital banks are expected to be associated with the high cost and less profit level.

Besides, the impact of the capital on the performance level is also examined from the perspective that capital plays a monitoring role. This perspective is based on theories that view the capital as a prudential monitoring tool that strengthens bank governance and improves its relationship with creditors (see, e.g. (Santos, 2001; Mehran and Thakor, 2011; Acharya et al., 2012)). Theoretically, increasing the capital level strengthens bank governance in which both bank managers and regulatory and supervisory authorities monitor risk-taking activities. Indeed, the regulatory and supervisory authorities might intervene if the capital level is falling below the regulatory level. High-capital banks are expected to be more interested in safer investment opportunities to avoid regulatory costs and interferences. In addition, banks could hold high-capital to signal better creditworthiness (Berger 1995). Hence, creditors for those high-capital banks would have less incentive to monitor them. Boot et al. (1999) pointed out that creditors tend to have a better relationship loan with a bank that has a higher capital level. Accordingly, high-capital banks are more able to build-up their capital level less expensively when there is a regulatory pressure to increase banking capital level. In view of the monitoring incentives argument, those high capital banks, which are more likely to adhere to the regulatory capital requirements, are more able to run their business in a more efficient manner to minimise any additional costs for a given level of output and maximise their profit level.

On the other hand, low-capital banks are expected to have low governance due to high leverage position and creditors have more incentives to monitor such banks. Those low-capital banks might not get funding more easily. In this regard, Hughes et al. (1995) argued that risk-averse managers might be willing to trade off low earnings to reduce insolvency risk and avoid the regulatory cost. These managers might prefer to incur additional costs (e.g. screening and monitoring costs) to improve the quality of their assets and reduce the risk level. Based on this argument, it is implied that banks with less capital, which are more likely to breach the regulatory capital requirements, tend to reduce their risk level through additional costs of improving asset quality; and hence they are expected to be associated with the high cost and less profit.

In contrast, some arguments suggest that bank capital might not always associate positively with profit level. Baumol et al. (1970) argued that capital is an expensive source of funding if it is based on an external source of funding. The external source of funding is associated with several significant transaction costs, e.g. underwriting costs, discount prices of the market value for new issues and other processing costs. Baumol et al. (1970) suggest that the required rate of return on new capital is higher if the external source of funding is used rather than retained earnings. Based on this argument, it implies that low capital banks might work on improving their performance to meet the market higher rate of return and avoid regulatory costs. Aligned with this argument, Berger (1995) argued that an increase in the capital level reduces the risk level; and hence the market's required expected rate of return will be low as long as investors are risk-averse. Thus, high capital banks might not necessarily associate with better performance.

In terms of the cost level, Calem and Rob (1999) pointed out the negative impact of the capital on the risk behaviour of banks. They argued that increasing the capital level could be costly when banks increase their portfolio risk. High-capital banks might be involved in high-risk banking activities, and their profit level is more likely to be affected negatively. Aligned with this argument, both Saunders and Schumacher (2000) and Brock and Suarez (2000) pointed-out that operating costs could also increase in response to increases in the capital level. They argued that because of the relative high cost of equity capital, banks might tend to charge a high premium in the banks' net interest margin (NIM) to cover the cost of holding high capital. Thus, an increase in the capital level could cause an increase in the banking intermediation costs at a given market. In support of this argument, Drakos (2002) and Demirguc-Kunt et al. (2003) found that high capital banks tend to charge high rates on loans and/or pay less on deposits.

Empirically, contradictory evidence on the relationship between capital and banking performance is found. Several empirical studies found evidence supporting the expected bankruptcy cost argument. For instance, Kwan and Eisenbeis (1997), who examined USA banks over the period 1986 to 1995, found that banks with more capital operated at a lower cost compared to others. Nikiel and Opiela (2002) and Fries and Taci (2005) also found evidence that those European high-capital banks were associated with low costs during the period 1997-2000 and 1994-2001, respectively. They were able to borrow at lower costs because they were perceived to be less risky banks. While in terms of profit level, more studies found that high capital banks are associated positively with profit level. Berger (1995), who examined the U.S. commercial banks over the period 1983 to 1989, found banks that increased their capital level had better earnings because high-capital level reduced expected bankruptcy costs and hence they were able to obtain lower interest premium on uninsured debts. Berger and DeYoung (1997) also reported that the U.S. high-capital banks found to have a better performance during the period 1985 to 1994. In addition, Färe et al. (2004) found that profit inefficiency of the U.S. commercial banks during the 1990s was significantly less when the regulatory capital was considered. And recently, Beltratti and Stulz (2012), who examined why some banks performed better than others during the financial crisis 2007/2008, found that the U.S. banks with more capital performed better during the crisis period. Berger and Bouwman (2013), who examined the U.S. banks during the period 1984 to 2010, found that capital improves the profitability of small banks during both regular and crisis period and it improves medium banks during crisis period only.

Adopting European banking dataset, Goddard et al. (2004); Grigorian and Manole (2006); Iannotta et al. (2007); Pasiouras and Kosmidou (2007); and Athanasoglou et al. (2008) found that well-capitalised European banks are more profitable. From Asian banks, Lee and Hsieh (2013) found that high-capital banks in low-income countries are associated with high profitability too. Demirguc-Kunt et al. (2003) examined 1,400 banks from 72 countries during the period 1995 to 1999. They found that high capital banks are associated with high net interest margin because they face fewer bankruptcy costs. Other studies found similar results using a sample of banks from developing countries. For example, Carvallo and Kasman (2005), who examined banks in developing countries from Latin America during the period 1995 to 1999, found that underperformed banks tend to be undercapitalised banks. Their result implies that better-performed banks tend to be better capitalised. García-Herrero et al. (2009) found better-capitalised Chines banks tend to be more profitable during the period 1997 to 2004. Beltratti and Stulz (2012), who examined 164 banks from 32 countries over the period from July 2007 to December 2008, found that high capital banks are associated with better performance. These studies support the idea that the level of capitalisation is a good indicator of banking performance in which better-capitalised banks are expected to run their operations more efficiently as reflected in a better performance level.

On the other hand, the literature shows that there is a negative relationship between banking capital and performance level. Färe et al. (2004), who examined U.S. commercial banks over the period 1990 to 1994, found that risk-based capital standards had a significant negative impact on profit level. Pasiouras et al. (2009) also provided international evidence via examining 615 banks from 74 countries over the period 2000 to 2004. They found a negative impact when increasing the capital level, where countries with stricter capital requirements were found to be less profitable. In European banks, Goddard et al. (2013) found evidence that high-capital banks were associated with less performance over the period 1992 to 2007. In terms of the cost level, Brock and Suarez (2000), who examined Latin America banks over the period 1991 to 1996, found that an increase in the capital level led to an increase in the cost of intermediation. They found that Latin America banks responded to this high intermediation cost by charging a high-interest rate spread. A similar result was found by Claessens et al. (2001), who examined banks from eighty different countries over the period 1988 to 1995. In addition, Semih Yildirim and Philippatos (2007), who examined banks from 12 different countries over the period 1993 to 2000, found that high-capital banks are associated with high cost. An increase in the cost level is an indication of a negative impact of the capital level on banking cost. Altunbas et al. (2007), who examined European banks during the period 1992 to 2000, found that not all high-capital European banks are performing well. They found that high-capital commercial banks are inefficient banks in manging their profitability level, while high-capital co-operative banks are efficient. Thus, increases in the capital level might engage banks in inefficient behaviour that could impact their performance level.

The above discussion highlights the potential impact of the capital on banking performance (from profit and cost perspective). Bank management takes decisions to adopt strategies that require rearranging their banking portfolio to at least meet the regulatory requirements. However, these rearrangements might associate positively or negatively with banking profit or cost optimisation as explained by the expected bankruptcy cost argument and cost of capital. The former accounts the capital to act as a buffer against unexpected losses that increase the banking survival probability. Hence, high-capital banks are perceived as less risky banks and they enable to operate at a lower cost. Alternatively, a negative relationship is expected between the capital level and performance level. This case would exist if increasing the capital level is costly for a bank. A high-capital bank might involve in high-risk banking activities in an attempt to compensate for the increased cost of funding. These activities might eventually impact negatively on banking performance. The impact of the capital level on banking performance is examined in view of the following statements:

> **Null Hypothesis 8**: There is a positive relationship between the capital and performance level due to the expected bankruptcy cost.
>
> **Alternative Hypothesis 8**: There is a negative relationship between the capital level and performance level due to high cost of capital.

3.6. The Impact of the Capital on Banking Performance: Heterogeneity of Banking Institutions

This research also expands on the examination of the capital-performance nexus via considering factors that account for the heterogeneity of financial institutions. Section 3.3 discussed the importance of considering other factors that could reflect the heterogeneity of banking institutions in an attempt to explain divergent responses of banks to changes in the capital and its regulations. As stated earlier, there are three main factors that are considered in this research: ownership profile, restrictiveness of the regulatory environment and Economic and Financial Development level of countries where banks are operating. Further discussion on these factors is elaborated in the following sections.

3.6.1. The Impact of the Capital on Banking Performance: Does Ownership Matter?

The purpose of considering ownership profile in the evaluation of the capital and performance nexus is to account for factors that reflect the heterogeneity of banking institutions. These factors could explain the variation in the relationship between risk-based capital regulations and banking performance. On the one side, banking capital literature shows that both positive and negative association are expected in response to the impact of capital and banking performance. From a practical perspective, bank management takes decisions to adopt different strategies that require rearranging their banking portfolio to at least meet the regulatory capital requirements. These rearrangements might link with banking profit or cost optimisation. However, management decisions are heterogeneous, and they vary according to competitive advantages and monitoring system in a given bank. On the other hand, banking performance literature has discussed banks privileged with different competitive advantages according to their ownership profile, and their performance varies accordingly (e.g. (Berger et al., 2000; Claessens et al., 2001; Miller and Parkhe, 2002; Micco et al., 2007; Semih Yildirim and Philippatos, 2007; Ariff and Luc, 2008; Craig Nichols et al., 2009) among others). This research chapter utilises both bank capital literature and bank performance literature to assess if the impact of the capital on the banking performance varies according to the ownership profile. In the following part of the chapter, there is further discussion on the difference in banking performance according to the ownership profile.

Banking Performance at Listed Banks versus Unlisted Banks:

As stated earlier, listed banks are held by shareholders and managed by a board of directors. Agency theory explains potential self-interests of the management to bear more risk once the ownership is separated from the management and decision-making process (Jensen 1986). The absence of discipline and lack of monitoring empower the management to pursue its interests with less intensity to improve performance (Jensen, 1986; Fama and Jensen, 1983). Listed banks are governed by rules of the stock exchange. According to these regulations, they are required to disclose publically their financial information. In contrast, unlisted banks, which are owned by private investors and managed by self-perpetuating management, are not obliged to disclose their financial information to the public. Theoretically, market discipline, which involves communicating publically all relevant information, works as an effective monitoring approach to provide informative signals that enable stakeholders to consider a precarious position of a bank. Accordingly, list banks are more concerned to improve their performance level to signal positive messages to stakeholders.

Empirical studies examined banking performance in different countries. For instance, Goddard et al. (2004), who examined both the profitability of European banks over the period 1992 to 1998, found that there is little evidence of variation in profitability by ownership except for German banks. They discovered that Germany's saving and corporative banks are less profitable than commercial banks. In addition, Semih Yildirim and Philippatos (2007) did not find statistically significant results. They discovered that listed banks are more profitable, but they are associated with high cost. On the other hand, Fu and Heffernan (2009) found that Chinese banks that undergo listing banks recorded better performance during the period 1997 to 2004. Ariff and Luc (2008) found empirical evidence on the profitability of Chinese joint-stock banks over the period 1995 to 2004. Craig Nichols et al. (2009), who examined cost level for 2,273 U.S. commercial banks over the period 1992 to 2002, also found that listed banks are enjoying a lower cost than private banks. In addition, Pasiouras et al. (2009), who examined 615 listed banks from 74 countries over the period 2000 to 2004, found evidence on increases of profitability level in listed banks in countries that enhance banking regulations in market discipline and empower the supervisory role in the market.

However, there is a debate on the effectiveness of the market discipline and its influence on bank management (see, e.g. (Beck et al. 2006b)). From developing countries, a dataset, Lin et al. (2005) found no difference in the capital-performance relationship across Taiwan's banks with different ownership profile over the period that experienced the implementation of the Basel Accords I (i.e., 1993 to 2000). García-Herrero et al. (2009) who examined Chinese banks over the period 1997 to 2004, found there are no significant differences in the performance of listed and unlisted banks. Altunbas et al. (2007) also obtained similar results in their study that examined 15 European banks during the period 1992 to 2000. However, these studies examined the pre- and post-period of the Basel Accords I, when there was no emphasis on the role of market discipline. From a theoretical perspective, the effects of the market discipline should be more reflective after the implementation of the Basel Accords II and III, since regulators authorities and supervisors paid more attention to the corporate governance and banks were asked to disclose their relevant information. The effective market discipline motivates banks to improve their performance to signal positively to stakeholders. In contrast, unlisted banks are self-perpetuating management, and they are not required to disclose their financial information to the public and, hence, their performance could be influenced negatively. In view of the above discussion, the variation of banking performance between listed banks and unlisted banks could be hypothesised as follow:

> **Null Hypothesis 9**: There is a positive association between listed banks and banks performance.

Banking Performance at Foreign Banks versus Domestic Banks:

The banking literature has addressed several reasons that explained the variation in the performance level between foreign-owned banks and domestic-owned banks. As discussed earlier, the literature has highlighted several competitive advantages of foreign-owned banks that enhance their role in a local banking system (see, e.g.

(Claessens et al., 2001; Berger et al., 2005a; Detragiache et al., 2008)). Those competitive advantages (e.g. scale economies, diversified portfolio and better access to international funding, skilled labour, advanced risk management technology, etc.) enable foreign-owned banks to have better performance compared to domestic-owned banks. In addition, Claessens et al. (2001) argued that market inefficiency and relaxed prudential requirements that exist in developing countries enable foreign banks to outperform domestic banks. However, Claessens et al. (2001) pointed out that foreign banks might be associated with higher overhead costs due to informational disadvantages, which are caused by geographical and cultural differences, especially in developing countries. Furthermore, foreign banks are concerned about their risk behaviour to maintain their reputation worldwide (Mian 2006). Hence, foreign banks work to benefit from their risk management skills to improve their performance level. These arguments are examined empirically using the null hypothesis that expected a positive association between foreign ownership and bank performance. (Berger et al. 2000) referred to this hypothesis as the global advantage hypothesis. It suggests that foreign banks enjoy global advantages that certify their quality and improve their performance level more than domestic-owned banks.

Empirically, several studies found evidence supporting the global advantage hypothesis. Claessens et al. (2001), who examined banks from eighty different countries over the period 1988 to 1995, found that the performance level of foreign banks differs in developed countries compared to developing ones. They discovered that foreign-owned banks are associated with higher profit compared to domestic banks in developing countries, but the case is the opposite in developed countries. Several studies support this view, and they found that foreign banks, in developing countries, perform better than domestic banks. For example, (Maria Soledad Martinez and Mody 2004) for Latin America banks, (Fries and Taci 2005) for East European banks, (Grigorian and Manole 2006) for Central and Eastern European banks, (Berger et al. 2009a) and (Lin and Zhang 2009) for Chinese banks. Even in developed countries, several empirical studies found that foreign banks are performing better than domestic banks. See, for example, (Nikiel and Opiela 2002) for Poland banks, (Hasan and Marton 2003) for Hungarian banks, (Sturm and Williams 2004) for Australian banks. Semih Yildirim and Philippatos (2007), who examined banks from 12 developing countries over the sample period 1993 to 2000, found that foreign banks are more cost-efficient than domestic banks. However, they found that domestic banks are more profitable relative to foreign-owned banks during the same period.

On the other hand, an alternative hypothesis, which is known as home field advantage, as suggested by Berger et al. (2000), expected that domestic-owned could have a better performance than foreign-owned banks. This hypothesis is based on Hymer's (1960) argument (cited in Miller and Parkhe (2002)). Hymer (1960) argued that national firms enjoy more informational advantages about their country in terms of its economy, its laws, its culture, its language, its politics, etc. Berger et al. (2000) referred to this informational advantage as field advantage that makes domestic banks more profitable because foreign-owned banks face more cost due to informational disadvantages. They claimed that foreign banks face operational issues and monitoring difficulties that are caused due to geographical and cultural barriers. These barriers could be in the form of managerial turnover issues, diseconomies of retail operations, additional regulatory limits or requirements and monitoring costs that are associated with the evaluation of oversea managers who are working in a distant market. These difficulties could increase banking cost of foreign-owned banks and reduce their performance too. Miller and Parkhe (2002) supported this argument, and they pointed out that the competitiveness of both home and host country influences the performance level of foreign-owned banks.

Domestic-owned banks also enjoyed the advantages of being more focussed and have better lending and depositing relationships with local customers Hsiao et al. (2015). Field advantage hypothesis proposes that domestic banks could perform better as they can master national level advantages. This hypothesis has been supported in empirical studies. For instance, Berger et al. (2000), who examined banks from five different countries from Europe and the United States over the sample period 1990 to 1998, found that domestic banks have a higher profit. They examined banking performance by disaggregating the results by the nationality of foreign countries and they found that domestic banks were more profitable than foreign banks for most of the foreign banks but not all. Claessens et al. (2001), who examined banks form 80 countries over the period 1988 to 1995, supported Berger et al.'s (2000) findings. Claessens et al.

(2001) found that foreign banks had less profitability in developed countries. Miller and Parkhe (2002) also found that foreign banks had higher interest margins and overhead expenses than domestic banks in developing countries. They also found evidence that the U.S. owned banks were more profitable than other foreign-owned banks during the period 1989 to 1996. More recently, Hsiao et al. (2015), who examined 107 Chinese banks during the period 2007 to 2012, found that foreign banks were the least profitable during the post period of the financial crisis 2007. They pointed out that customers prefer to deal with domestic banks in which a large customer's base obtains their lending and fee-based services from local banks.

Both above hypotheses emphasise that ownership matter and banking performance in foreign-owned-banks are expected to differ from domestic-owned-banks. Domestic-owned banks lack competitive advantages that could enable them to improve their performance level. In contrast, foreign-owned banks enjoy more competitive advantages that allow them to enhance their performance level. It is hypothesised that:

> **Null Hypothesis 10**: There is a negative relationship between domestic ownership and banking profit and a positive relationship with cost level.

The Impact of the Capital and Differences in Ownership Characteristics: Signaling Hypothesis

The previous discussion supports the potential response of banks to increases in capital level according to two main hypotheses: the expected bankruptcy costs hypothesis and cost of the capital hypothesis. As presented in section 3.5, the empirical effect of the capital on banking performance was found to be inconsistent. Literature highlights the variation in the banking performance of banks with a different form of ownership.[32] Each ownership profile has its competitive advantages that would influence their attitudes to manage capital and risk varies according to their objectives. In view of these competitive advantages, banks might view the changes in the capital

[32] The last two sections discussed the variation in banking performance of listed banks, unlisted banks and domestic owned banks.

level from different perspectives. For instance, Berger (1995) argued that bank management might signal about future cash flow information (e.g. expected revenues, costs or risk level) through capital decisions. Compared to badly-performed banks, it might be less costly for well-performed banks to signal for their quality via having a high capital level. Based on this argument, high capital is an indicator of banks quality and high capital banks are expected to be associated with better performance. Berger (1995) refers to this argument as "Signaling Hypothesis".

In view of the signalling hypothesis, listed banks are governed internally via market discipline and externally via regulatory capital requirements. Market discipline involves the disclosure of relevant information to the public while meeting regulatory capital requirement implies being supervised by regulators. Listed banks are expected, theoretically, to be more motivated to improve their performance to signal good news to their stakeholders and avoid any regulatory constraints by regulators. While, unlisted banks lack market discipline and their management might have less incentive to maintain their performance. Consistent with this argument, Craig Nichols et al. (2009) provided another explanation of potential variation in the capital-performance nexus according to the ownership profile. They argued that private equity capital is more costly than the equity capital of listed banks. They pointed out that investors would ask for a higher premium to hold equity capital of unlisted banks compared to listed banks. The later has better access to the capital market, more liquid capital and hence they face a lower cost of capital; while unlisted banks face higher transaction cost to increase their equity capital. Therefore, the impact of increasing the capital level might not be the same for all banks.

On the other hand, banks are required to maintain their capital level within the regulatory capital requirement. Banks that fail to meet the capital requirements are subject to regulatory constraints (e.g. limits on bank growth or dividends, regulatory costs) unless more capital is provided. Compared to unlisted banks, listed banks are governed internally via market discipline and externally via regulatory capital requirements. Accordingly, listed banks are expected to be more motivated to improve their performance compared to unlisted banks to avoid such regulatory constraints and signal good news to their stakeholders.

In term of foreign-owned banks, the literature has also highlighted the importance of considering ownership as one of the critical determinates of banking performance. Foreign-owned banks enjoy global advantages that enable them to outperform domestic-owned banks, as presented earlier. They have the privileges of better risk management, operational techniques and corporate governance; these advantages allow them to have better ability to access the capital market and meet the regulatory capital requirements. Grigorian and Manole (2006) argued that well-capitalised foreign-owned banks are more likely to have a better quality of the portfolio, and they deal with borrowers who have better creditworthiness. Thus, their performance is expected to be higher than domestic capitalised banks. On the other hand, Berger et al. (2000) argued that home supervision and regulations might motivate some foreign banks to enjoy the global advantage and operate at countries with less restriction. Thus; foreign banks might involve in more risk in these countries, and they are less profitable than domestic banks.

The above discussion highlights the variation in the ability of banks to fund their capital level. This variation could be due to competitive advantages and disadvantages of each bank that would impact on their risk attitudes toward capital requirements according to their optimization objectives. Accordingly, the null and alternative hypotheses will be as follow:

> **Null Hypothesis 11**: The relationship between the capital and performance level does not vary among banks with different ownership profile.
>
> **Alternative Hypothesis 11**: The relationship between the capital and performance level varies among banks according to their ownership profile.

3.6.2. The Impact of the Capital on Banking Performance: Regulatory Environment

Changes in the regulatory environment are another aspect that is considered in this research to examine the impact of the capital level and its regulations on banking performance. As presented in Chapter Two, the period from 2003 onwards has experienced significant capital formation process. Policymakers have worked to improve the regulatory and supervisory environment as per the Basel Accords during the last three decades to promote stability in the banking sector. For instance, as elaborated earlier in Chapter Two, the banking capital framework has been developed from a risk-based capital framework as introduced in the Basel Accords I (1988) to a more sensitive risk-based capital framework in the Basel Accords II (in 2004). Finally, it is presented as a high-quality risk-based capital in the Basel Accords III (in 2010). Gorton and Claessens, (1998) argued that imposing higher capital level to promote financial stability might not be associated with improvement in banking performance. Banks are still involved in risky activities because they might be costly for them to meet the regulatory requirements.

Theoretically, increasing the capital level is costly as argued by Baumol et al. (1970) and it is also associated with additional administrative cost. Herring (2005) pointed out that the new reforms of the Basel Accords II are based on more advanced models, and it requires enhancing the internal monitoring system. These banks need more skilled labour to operate and monitor their risky activities. Although such costs need to be paid to enhance the financial stability, banks might respond to regulatory requirements either by limiting their exposure at the cost of being inefficiently small banks or by being involved in more risky activities to an attempt to recover the additional costs associated with the additional regulatory requirements (Gorton and Claessens 1998). Blejer (2006) emphasised that policymakers should pay attention to banking economic performance as they focus on financial stability. On the other hand, others supported that the regulatory reforms in the capital framework would support the role of the regulatory requirements to enhance the stability of banking and banking performance too (e.g., Cooper et al., 1991; Pasiouras, 2008; and Ben Naceur and Kandil, 2009).

This research will examine the consequences of these regulatory changes on banking performance during the prior- and post-period of new reforms in the capital regulations. The performance level of banks is expected to be increased after the introduction of the Basel Accords II, Basel II.5 and Basel III. The proposed amendments to the Basel Accords are supposed to make the regulatory capital be more sensitive risk-based capital, and additional supervisory amendments are imposed to enhance supervisory and governance environment. These amendments aim to promote financial stability and improvement in banking performance. Yet, these additional amendments and associated increases in the capital level could have a negative impact on the banking costs during the post-period of introducing the regulatory changes. It is hypothesised:

> **Null Hypothesis 12**: The relationship between the capital and performance level is expected to be positive after the introduction of the Basel Accords II, Basel II.5, and Basel III.

Since 2004, higher capital requirements have been emphasised by regulators in the form of regulatory requirements as per the Basel Accords. Yet, banks are at different levels of capitalisations. Some of them are already meeting the regulatory capital requirements; while others are more pressurised to meet the regulatory capital requirements. For the purpose of controlling the variation in banks behaviour, the capitalisations level is considered too. Performance of undercapitalised banks is expected to be different compared to better-capitalised banks that are already meeting the capital requirements.

Based on the expected bankruptcy costs argument, undercapitalised banks, which are not meeting the regulatory capital requirements, are expected to be associated with high costs. It would be more costly for them to obtain funding. They are required to pay high premiums for funding due to their high leverage level. Hence, they tend to be associated with high operating costs. Undercapitalised banks are expected to reduce their risk level after the introduction of new regulatory reforms. Thus, they are expected to be involved in less risky assets that are associated with low earnings. The ability of undercapitalised banks to manage their activities to perform well is questioned. Carvallo and Kasman (2005) found that badly performed banks were characterised as undercapitalised banks. Others argued that undercapitalised banks are more pressurised to meet the regulatory requirements; hence they tend to utilise their current resources to meet the requirements. Hai-Chin (2000) pointed out that the bank could view profitability as an indicator of the low probability of failure. Undercapitalised banks might work on utilising their resources in activities with high-income earnings that could be used to offset the regulatory capital requirements and relevant regulatory costs. This result is consistent with Ariff and Luc (2008); Shim (2010); Goddard et al. (2013) who found that low-capital banks correlated positively with high-profit level. In term of cost, undercapitalised banks, which are not meeting the regulatory capital requirements, could respond to regulatory requirements via reducing this risk level through additional costs of improving their asset quality; and hence their cost level could be high. The new reforms of the Basel Accords II and Basel Accords III asked banks to disclose their activities, especially off-balance sheet activities. Thus, those undercapitalised banks are expected to work on improving their internal monitoring system to reduce their risk level to an acceptable level as per the regulatory requirements.

In terms of better-capitalised banks, the expected bankruptcy cost argument expected that those better-capitalised banks are associated with less cost. Besides, their capital level acts as a buffer that makes them gain higher creditworthiness (Mian 2003). Thus, better-capitalised banks are expected to utilise their resources to perform well at lower costs. This argument is supported by Kwan and Eisenbeis (1997) and Barth et al. (2004) who found that high capitalised banks operated better than others. Better-capitalised banks are not expected to be involved in more risky activities because the new amendments to the Basel Accords are claimed to be a more sensitive risk-based capital framework. Thus, better-capitalised banks are less likely to be involved in more risky activities that could impact negatively on its profit (or cost) level, especially during the period that experienced more regulatory restrictions (i.e. during the post period of introducing the Basel Accords II.5 and Basel Accords III). However, the literature shows the point of view of others who argued that better-capitalised banks could tend to associate with excessive resources that might not be utilised well. Fries and Taci (2005) pointed out that high-capital banks are perceived by the public to be less risky banks. They tend to keep high capital to signal positively to the public and regulators for having high net safety level. The above discussion clarifies the possibility of the variation in the performance level for banks with different level of capitalisation. In this research, there will be further investigation on the banking performance of both undercapitalised and better-capitalised banks during the post-period of introducing the Basel Accords II, the Basel Accords II.5 and the Basel Accords III. It is hypothesised that:

> **Null Hypothesis 13a**: There is a negative relationship between undercapitalised banks and performance level during the post-period of introducing the regulatory reforms.
>
> **Null Hypothesis 13b**: There is a positive relationship between better-capitalised banks and performance level during the post-period of introducing the regulatory reforms.

The performance level of undercapitalised banks is expected to be reduced after the introduction of the Basel Accords II, Basel II.5 and Basel III. Those banks are pressurised to meet the regulatory requirements. According to the Basel capital framework, they are required to either reduce their risk level or increase the capital level. Reduction in the risk level implies the involvement in low-risk low-income activities. Thus, their earnings might be affected negatively. On the other hand, increasing the capital level for undercapitalised banks is more costly compared to others as the bankruptcy cost argument expects it. Thus, a negative relationship is expected between undercapitalised banks and performance level during the post period of the Basel II, Basel II.5 and Basel III. On the other hand, the better-capitalised banks are expected to be associated positively with the performance level even after the introduction of new reforms of the Basel Accords. These banks are less pressurised to meet regulatory requirements. They can increase their capital level at a lower cost due to low leverage position as per the bankruptcy cost argument. Low costs enable them to run their business more smoothly, and they tend to utilise their resources to signal to the public and the regulatory parties that they are doing well. Thus, the relationship between better-capitalised banks and performance level is expected to be positive during the post-period of introducing the regulatory reforms.

3.6.3. The Impact of the Capital on Banking Performance: Economic and Financial Development Level of Countries

Although banking capital regulations are adopted by all banks in different countries, the impact of the regulations should be assessed with consideration to the potential differences in the environmental conditions across countries. As discussed in Section 3.3.3, the legal environment and development of the financial and economic condition could impact on the effectiveness of the regulatory tools. Dietsch and Lozano-Vivas (2000) suggested that environmental variables should be accounted for to assess the differences in the performance level of banks in different countries. This suggestion is also supported by Amel et al. (2004) and Košak and Zorić (2011) who examined determinants of banking profitability using across countries dataset. They found that differences in regulations, institutions and markets across countries should be accounted for to assess the banking performance.

A number of studies found that environment and institutional framework could impact on the economic performance (see e.g. (Dietsch and Lozano-Vivas, 2000; Nikiel and Opiela, 2002; Yildirim, 2002; Tortosa-Ausina, 2003; Carvallo and Kasman, 2005; Hahn, 2007; Ariff and Luc, 2008; Mwega, 2011; Fethi et al., 2012)). However, most of these studies are based on a dataset from a single country, and they paid more attention to determinants of performance. Barth et al. (2004); and Barth et al. (2008) argued that the consequences of applying banking regulations could be viewed in banking profitability. Pasiouras et al. (2009) pointed out that little attention has been given to comparative studies that examined the impact of the regulatory environment. They examined banking performance in 74 countries over the period 2000 to 2004. Pasiouras et al. (2009) found that banking regulations, which are related to the Basel Accords II, enhanced market discipline and increased both cost and profit level. However, their studies are based on a sample period 2000 to 2004 when the Basel II had been introduced but not yet implemented effectively. More recently, Mwega

(2011) found evidence on the beneficial effects of capital restrictions on banking performance. Mwega (2011), who examined only European countries over the period 2000 to 2008, found that the impact of the capital restrictions on banking profitability was more pronounced in countries with a higher quality of institutions. These results imply that the effectiveness of the capital regulations would be less effective to impact on the banking profitability in countries with low quality of institutions. Barth et al. (2013b), who examined banks from 72 countries over the period 1999 to 2007 using a dataset from a periodical survey answered by regulatory authorities in each country, found that capital regulations impact positively on banking profitability. In their studies, Barth et al. (2013b) did not account for the fact that the impact of the capital regulations varies among countries with different level of regulatory restrictions.

Besides, the above studies covered the period that experienced the Basel Accords II reforms. More regulatory restrictions were imposed during the post period of 2008, as stated in Chapter Two. Countries have worked to improve their legal environment (e.g. legal rights, strengthen legal enforcement and governances) and enhance the growth of their economic and financial conditions (e.g. expanding their market size, diversifying financial products, institutional technology). This research expands the dataset to account for all regulatory reforms in the Basel Accords during the period 2004 to 2014 with consideration for countries from both developed (represented by countries from the Organisation for Economic Co-operation and Development (OECD)) and developing countries (the Middle East and North Africa (MENA) countries) that have a different level of legal enforcement and different level of economic and financial development. Developed countries are characterised as having a developed economic condition, well-functioning financial markets and a better-quality legal environment that contributes to strengthening the implementation of policies and regulations. The MENA countries are among those countries that are associated with less financial development (see, e.g. (Ben Naceur et al., 2008; Cherif and Dreger, 2016)). The financial structure in the MENA is a banking-based system in which banks play a major financial mechanism that channel funding within a country. In a banking system country, banks are the major funding channel that mobilises savings, allocates capital and provides risk management vehicles. Thus, individuals and firms rely on banks to meet their financial needs. In such a bank-based system, policymakers are concerned about performance and cost level of banks; since they play a crucial role in facilitating funding and supporting economic growth. The MENA countries are not only a bank-based system, but there is lack of adequate liquidity and capital markets in these countries (see, e.g. (Ben Naceur et al., 2008; Awartani et al., 2016)). Thus, a well-functioned banking system is essential in these countries.[33]

On the other hand, most of the OECD countries are well-functioned banks in a financially developed market. The financial structure in the OECD is a market-based system in which financial markets play a major role in facilitating the funding channel and easing risk management. This market-based system plays a key role in facilitating funding and supporting economic growth (see, e.g. (Vitols, 2005; Lee, 2012)). Besides, the OECD countries are more developed from the economic and legal perspective in which they are associated with high institutional quality and better corporate governance. Banks in such an environment could benefit from business opportunities and could impact on their performance (see, e.g. (Boehmer et al., 2005; Müller and Uhde, 2013)). Brock and Suarez (2000) and Nikiel and Opiela (2002) supported the fact that studies in a well-developed financial system may not apply to other countries. The organisational structure of banks in developing markets differs from those in well-developed markets. Brock and Suarez (2000) pointed out that banks in developed countries, where a banking system is adequately managed and regulated, tend to increase their cost of intermediation in response to increases in the capital level. They doubted that the impact of the capital ratios could be reflected in the banking cost of developing countries due to the inadequately regulated and supervised banking system. In view of these arguments, it is hypothesised that:

> **Null Hypothesis 14**: The relationship between the capital and performance level does not vary among countries with different economic and financial development level.

[33] Further details on characteristics of a banking system in the MENA countries are given in Chapter Three.

Alternative Hypothesis 14: The relationship between the capital and performance level varies among countries with different economic and financial development level.

Table (3-2) summarises statements of all above hypotheses that are related to the impact of the capital on the performance level.

No.	Statement of the Null Hypotheses Banking Performance
1	$H_0 8$: There is a positive relationship between the capital and the performance level
2	$H_0 9$: There is a positive association between listed banks and performance level.
3	$H_0 10$: There is a negative relationship between domestic ownership and banking profit, and it is a positive relationship with cost level.
4	$H_0 11$: The relationship between the capital and performance level does not vary among banks with different ownership profile.
5	$H_0 12$: The relationship between the capital and performance level is expected to be positive after the introduction of the Basel Accords II, Basel II.5, and Basel III.
6	$H_0 13a$: There is a negative relationship between undercapitalised banks and performance level during the post-period of introducing the regulatory reforms.
7	$H_0 13b$: There is a positive relationship between better-capitalised banks and performance level during the post-period of introducing the regulatory reforms.
8	$H_0 14$: The relationship between the capital and performance level does not vary among countries with different economic and financial development level.

Table 3-2: Summary of null hypotheses that examine the impact of banking capital on the performance level.

3.7. Summary

This chapter presented the theoretical background that will be used to answer the research questions. It is observed that there is no single theory that could be used alone to explain the association of the capital, risk and performance. The capital literature, risk management literature and banking performance literature are used to provide an explanation for the association of the banking capital with risk (and performance) from different perspectives. For example, the banking capital-risk nexus is explained from the perspective of the moral hazard argument, bankruptcy cost argument, managerial risk aversion argument and monitoring incentive argument. On the other hand, the banking capital-performance nexus is explained from the perspective of bankruptcy cost argument, monitoring incentive argument and cost of capital. Indeed, it is observed that some of these theoretical aspects are interrelated to explain both capital-risk nexus and capital-performance nexus. Based on these theories, several hypotheses are formulated that would help to answer the research questions.

This research is not limited to address whether the association between banking capital and risk (and the association between banking capital and performance) meet the regulatory expectations. The research expands its analysis to examine these associations with consideration for other factors that account for the heterogeneity of financial institutions. Three factors are accounted for in this research: ownership nature, the restrictiveness of the regulatory environment and economic and financial development of a country. As discussed in the chapter, these factors could add understanding to the impact of the banking capital on risk behaviour and banking performance. Considering these factors does not imply they are superior. Yet, this research will use these factors in an attempt to add understanding of the variation in the capital-risk nexus and capital-performance nexus. The predefined hypotheses will be tested empirically in Chapter Five and Six to achieve the objectives of this research. The next chapter presents the adopted methodology to test these hypotheses. Figure (3-1) summarises the theoretical framework that will be applied in this research.

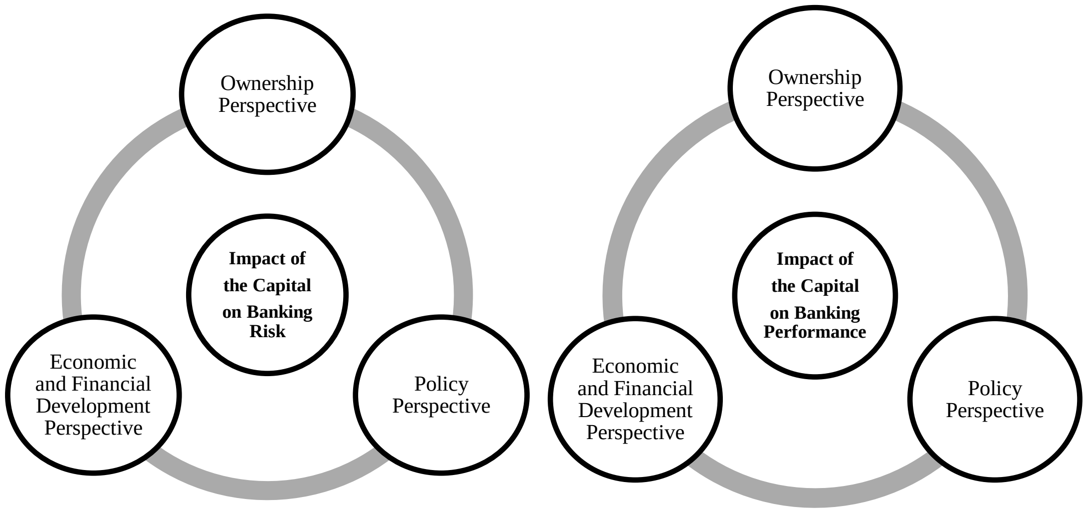


Figure 3-1: The main theoretical perspective ‘of the research
Source: made by the author

Chapter Four: Research Methodology

A. Research Approach

B. Data Collection Method

C. Data Analysis Method

4. Chapter 4: Research Methodology

4.1. Introduction:

Methodology in the research context refers to both a systematic approach and theoretical analysis of the methods and its procedures that are applied to answering the research questions (Frankfurter 2007). The research methodology is not limited to describing the methods, but it also provides the theoretical analysis that explains the reasoning of applied methods to arrive at the research answers. The methodology chapter is the documentation of the data collection and data analysis tools that are used in the research. Proper documentation for the methodology is essential in different aspects. Systematic documentation is a useful mean to enable comparability and reproducibility of research results. This documentation also adds more creditability of a given dataset and accordingly more reviews would be carried either for potential usage a dataset or potential improvements for data processing. Indeed, any potential issues in a given dataset could be identified readily and hence would provide a potential to handle such an issue more appropriately in future studies.

This chapter provides a detailed presentation of the research processes that were applied to achieve the objectives. There is a detailed presentation of the sampling aspects, collected data, and the research methods that were applied to data analysis. There is also elaboration for the adopted procedures to verify the validity of the methods and reliability of the results. The chapter structure is organised as follow: the process of collecting data and sample sizing are presented in section 4.2.1.1 The research variables, and measurements are presented in section 4.2.1.2. Further discussion of applied research methods is presented in section 4.3. This section also includes the general form of the panel-based model that is used to conceptualise the relationship between the variables. The criteria for selecting the most appropriate estimation method are discussed in section 4.4. The selection of the most appropriate regression model is discussed in section 4.5. Section 4.6 presents the statistical tests to examine the validity of the assumptions that were adopted in the research methods. The overall summary of the /research methodology framework is present in section 4.7.

4.2. Research Method:

The documentation for the research methods is elaborated to include all procedures that are adopted over the whole stages of the research. The research methods are classified into two main stages: data collection and data analysis (See,

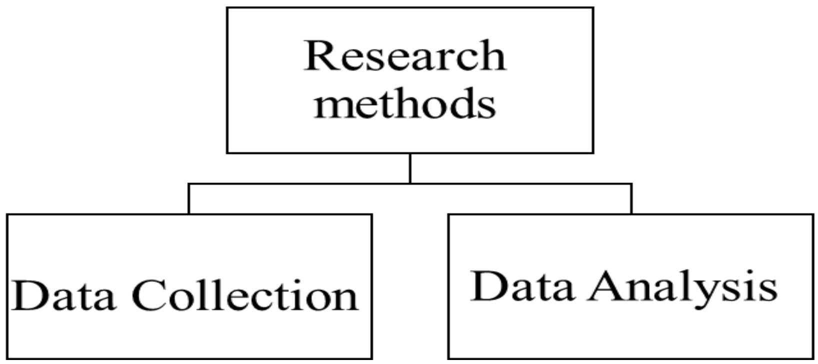


Figure 4-1: Components of the research methods

Source: made by the author

Figure 4-1). The data collection stage includes collection procedures that contain details on the source of data, characteristics of the populations, sampling process, the time-frame of the sample, how sample size was determined and adopted variables and its measurements. At the data analysis stage, there is further discussion about procedures adopted for analysis, identifying tools that were used, reasoning, and its process. Testing for validity and reliability of the research findings is another critical part of the data analysis stage. In the following section, there are details of the research methods used at both stages.

4.2.1 Data Collection Method:

4.2.1.1 Collection of Data and Sampling Process

This research used a panel-based dataset to empirically examine the impact of the capital on the behaviour of banks using multiple observations across time for each bank in the sample. Panel-based data enables an examination of this impact with consideration for the possible individual and time heterogeneity of banks, if any, in responding to the regulatory changes. The following section provides further details of panel data collection and the size of the sample.

In this research, the data collection method depended on the secondary data. A panel dataset is obtained from the Bank-Scope database over the sample period of 2003 to 2014 (i.e. 12 years). The Bank-Scope is the most comprehensive global database for banking financial statements.[34] This dataset includes all commercial banks that are operating in both the Organisation for Economic Corporation and Development (OECD) countries and the Middle East and North Africa (MENA) countries. The 12 years as a sample period is suitable to be examined for several reasons. Over this sample period, there were significant regulatory reforms (mainly the introduction of Basel II and Basel III). Furthermore, the financial crisis 2007/08 occurred during this time and banks experienced regulatory pressures. They were required to enhance their capital level and meet the regulatory requirements. The dataset includes 982 international and domestic commercial banks in which 504 of them are operating in the OECD countries. While there are 478 commercial banks are from the MENA countries. However, this sample became smaller after considering some selection criteria.

The sample included only commercial banks that were operating in both the OECD and MENA countries. There were 498 banks with a dataset of less than nine years, 258 of them being in the MENA. These banks, which have a dataset not covering the whole sample period, were excluded from the sample because they were covering a period that has not experienced changes in the regulatory pressure that occurred as a result of the implementation of the Basel II Accords.[35] Besides, 38 banks were newly opened, taken over, or exited the market with 11 of them from the MENA countries. The purpose of excluding these banks was to have a more consistent sample and avoid having duplicated records. The final sample dataset included a panel of 446 commercial banks, which had a 12-year annual dataset at the Bankscope database.

[34] All data are obtained from the same data source. Bankscope is a private financial database that is managed by Bureau Van Dijk. The data are obtained on 1st May 2015 from 56th software version.

[35] Indeed, there are 279 banks, among those banks that have a dataset of less than nine-year, have a dataset of less than six-year.

There were 235 of them operating from 27 of the OECD countries for a total of 2,820 bank-year observations. Whereas, 211 commercial banks were from 21 countries in the MENA region for a total of 2,532 bank-year observations. The dataset included all the following type of banks: 87 foreign-owned banks vs 359 domestic banks, 194 listed banks vs 252 unlisted banks, and 39 state-owned banks.

The final sample dataset included all active banks that operated in both the OECD and MENA countries over the sample period 2003 to 2014. As pointed out earlier, several banks were excluded from the sample. The sample does not include banks that were taken over or exited the market. Over the sample period, there were local banks merged with other banks to form a more efficient bank and avoid competitive constraints. On the other side, there were foreign banks faced local enforcement, and they did not continue their operations in certain MENA countries. However, exclusion of these banks from the sample is criticised to creates selection biases which are known as survival biases. The latter refers to potential misestimation of statistical inferences due to lack to account some parties in the sample. The sample includes banks that survive over the sample period and exclude others since they no longer exist in a given market. Overlooking some banks might hide the behaviour of these banks in responding to regulatory changes. However, the significant impact of these excluded banks is subject to their size in the population. The number of taken over or excited banks were less than 8% of the total commercial banks in the sample.

As it is observed above, the dataset had a fixed number of time periods (T) and large cross-sectional units (N). Such a type of panel dataset is known as “Short panel dataset”. The total observations were determined as a product of (T) and (N), i.e., (TN). However, there are some missing observations for some variables, which were adopted in this research, due to the unavailability of this data. Hence, the number of observations for some variables is less than total observations (TN) in the dataset. Before conducting the regression analysis, the missing values were deleted based on what is known as “listwise deletion” approach. According to this approach, an entire cell in a given sample is deleted if there are any missing values in that cell. The cost of deleting missing values is to reduce the number of available observations in the sample and hence weakens the power of adopted statistical tools. Yet, there are no observations that were not available for all cross-sectional units (N) for each period (T). The panel is unbalanced if there are some missing observations for a certain number of variables during certain years. From an empirical perspective, many of the studies are based on the unbalanced dataset.[36] Yet, most of the econometrics tools suited for both balanced and unbalanced datasets as reported in the following parts of this chapter.

4.2.1.2 Research Variables and Measurement

This section specifies both dependent and independent variables that were identified based on banking literature to examine the relevant hypotheses that are identified in Chapter Three. This section outlines definitions, measurements, and indicators for each variable.

A) **Dependent Variables**: these are variables that represent the outcomes that need to be examined, and their variations are affected by other independent variables. In the context of this research, the risk level and performance level are the main dependent variables that will be examined regarding the impact of the capital in the banking industry. The Risk Level is proxied alternatively by using two measurements: credit risk and assets portfolio risk. Besides, three indicators are adopted to proxy the performance level. The literature shows different indicators to measure the risk level and performance. However, not a single measure is considered to be a perfect indicator of the underlying dependent variable. Each alternative has its characteristics and limitations. Therefore, this research uses multiple indicators to examine different aspects of both risk and performance level. The definition and characteristics of each variable are discussed below:

I) Credit risk is the focal source of risks for banks since it is a major part of the banking business. It is measured by the ratio of non-preforming loans to total assets ($NPLs_{i,t}$). None-performing loans

[36] Refer to Appendix (XII) on details of empirical studies that are based on the unbalanced dataset in the literature of Banking Risk and Efficiency.

represent the total bad debts that are not paid by creditors. Banks are obligated to make provisions for past loan losses or expected losses in the following year. Berger and DeYoung (1997) point out that non-preforming loans (NPLs) are difficult to be manipulated by managers since loans are recorded regularly as non-performing if the payment is due after a certain period. An increase in the amount of NPLs indicates that a bank is dealing with less quality lending activities which are associated with a higher level of credit risk. Thus, the increase of ($NPLs_{i,t}$) ratio shows that a bank is involved in more risky activities relative to their total resources.[37] Banks with effective risk management and monitoring systems would be expected to have low ($NPLs_{i,t}$) ratio. The same measurement is used in a number of empirical studies (e.g. Berger, 1995; Aggarwal and Jacques, 2001; Fiordelisi et al., 2011).

II) Portfolio Risk is a more comprehensive risk indicator that captures the allocation of assets across different risk categories. It is measured by *risk-weighted assets to total assets ratio* ($RWAs_{i,t}$). Risk-weighted assets represent assets that are weighted according to associated risk to reflect the real asset portfolio exposure to potential losses according to standards of the Basel Accords.[38] Jacques and Nigro (1997) point out that the $RWAs_{i,t}$ ratio captures not only the allocation of assets across different risk categories, but it reflects the quality of assets too. An increase in the RWAs/Assets shows increases in the overall proportion of risky assets in the bank's portfolio. Banks with effective risk management and monitoring systems would not increase their ($RWAs_{i,t}$) ratio unless they have sufficient capital as per the guidelines of the Basel Accords. The same variable is used in some

[37] Banks' level of credit losses differ in a sample includes different sizes of banks. A relative value in the form of ratio accounts of such differences, and it expresses credit losses relative to total resources of each bank in the sample.

[38] Chapter Two provides further details on the computations of the risk-weighted assets as per standards of the Basel Accords.

of the empirical studies including (Berger, 1995; Jacques and Nigro, 1997; Aggarwal and Jacques, 2001; Rime, 2001).

The literature shows different risk indicators. However, not a single measure is considered as a perfect indicator of the risk level. Each risk indicator has its characteristics and limitations. For example, the $RWAs_{i,t}$ ratio differs from the $NPLs_{i,t}$ ratio in different perspectives. The non-performing loans ($NPLs_{i,t}$) ratio focuses on the risk of core banking activities which is lending activities. In addition, Rajan and Dhal (2003) pointed out the classification of loans as non-performing loans may not be consistent across countries due to different accounting approaches, and national regulatory might use different criteria to identify non-performing loans. On the other hand, risk-weighted assets ($\mathrm{RWAs_{i,t}}$) ratio, which is the second risk indicator in this research, it is a more comprehensive risk indicator that accounts all risk-weighted assets in a bank especially those are computed based on the standards of the Basel Accords II and III. It is also computed consistently across all countries since it is based on the guidelines of the Basel Accords. Unlike the non-performing loans/Asset ratio, the risk-weighted assets ratio is an ex-ante indicator of risk which it reflects the current risky assets in a particular bank that might potentially cause losses. This research accounts for both risk indicators in which the limitations of one indicator is covered by another.

In term of measuring the banking performance indicators, this research adopts two different optimisation concepts to evaluate banking performance: profit-based and cost-based indicators. Profit-based indicators are based on the assumption that a well-performed bank is the one which has better management for its revenues and costs to improve its profit in a given year. It is measured by using the following two variables:

I) **Return on Assets** (**ROA**) is one of the profit-based performance indicators. It reflects the operational performance of a bank in which it evaluates the ability of the bank to obtain maximum returns from available resources. It is measured as *net income to total assets*, which is known as the ratio of return on asset (ROA). An increase in the ROA is an indication of a good performance in which banks utilise their resources to increase profitability levels. A decrease in the ROA is an indication of a bad performance. The ROA is one of the most common variables that is used by regulators and financial analysts to indicate profitable banks and their sustainable economic growth (Rhoades 1985). It is also a mirror that reflects the banks' management capabilities to utilise their competitive advantages, and run banking operations in a given market (García-Herrero et al. 2009). There are a number of studies using this ratio in their measurement for the performance level (e.g., Berger, 1995; Rime, 2001; Nikiel and Opiela, 2002; Goddard et al., 2004; Lin et al., 2005; Ariff and Luc, 2008; Athanasoglou et al., 2008; Shim, 2010; Dietrich and Wanzenried, 2011; Lee et al., 2013). The comprehensive usage of the ROA allows for comparing the result of this research to other studies.

II) **Net Interest Margin** (**NIM**) is used in many empirical studies as a profit-based indicator. Dietrich and Wanzenried (2011) point out that the ROA reflects usage of bank management for real investment resources, while NIM focuses mainly on profit that banks generate from interest-based activities. Both interest rate revenues and interest rate expenses reflect the bank's management decisions (García-Herrero et al. 2009). It is measured as interest income minus interest expenses dived by interest-bearing assets. Demirguc-Kunt et al. (2003) point out that the Net Interest Margin (INM) is normalised by interest-bearing assets since it focuses on the lending operations of a bank. This margin accounts for the gap between what banks receive as interest income and what banks pay as interest expenses. NIMs are high if banks charge a high-interest rate on lending and/or reduce interest rates on deposits. A positive gap also indicates that a bank is managing it's intermediary's role between lending funds and depositing uses, and it generates a high income. However, a negative gap reflects bad performance in which a bank unable to manage its interest-based activities, and it is not able to cover its expenses.

However, others pointed out that the Net Interest Margin (INM) should be interpreted with caution. Maria Soledad Martinez and Mody (2004) interpreted high NIM as indicative of a high cost of using banking services. This high NIM implies that it is costly for users to obtain banking services. Others argued that a high NIM influence adversely on growth banking services (see, e.g., Saunders and Schumacher, 2000; Brock and Suarez, 2000; Maria Soledad Martinez and Mody, 2004). The same measurement is used in several empirical studies (e.g. Brock and Suarez, 2000; Saunders and Schumacher, 2000; Demirguc-Kunt et al., 2003).

In addition to this, this research assesses the banking performance from a cost perspective. Cost-based performance is based on the assumption that a good bank is one which is able to minimise its costs to total resources that are used in a given year. It is measured by the following variable:

III) **Total Cost to Assets** (**TCA**) focuses more on total operating costs for a bank. The NIM is criticised that it focuses on interest-bearing assets and might not reflect differences in performance level. Brock and Suarez (2000) argue that it is impractical to compare the NIM of different banks because banks do not charge the same and only one rate for loans (or deposits), but the rates change according to customers, period, and product. Furthermore, Demirguc-Kunt et al. (2003) criticised NIM in respect of it might reflect changes in banking activities rather than changes in performance once a bank charges special rates for customers who are simultaneously using other banking income-based activities. As an alternative indicator of performance, the TCA is used to measure banking performance in managing its operating costs. Banks with high-operating costs are performing less compared to banks that have low costs for a given level of resources. Total costs include the sum of labour (personnel) expenses, capital costs (i.e., fixed assets), and financial expenses (i.e., interest expenses, and other non-interest expenses).[39] Fries and Taci (2005) suggested accounting for a cost-based indicator because it reflects other dimensions of improvement in bank performance. A number of studies used this ratio in their measurement for cost-based indicators (e.g., Nikiel and Opiela, 2002; Fries and Taci, 2005; Ariff and Luc, 2008; Pasiouras et al., 2009).

B) **Independent Variables**: these variables are considered to be inputs that are used to explain variations in the dependent variables, and hence, they are also known as explanatory variables. In the context of this research, there are several factors that impact on bank behaviour in risk management and banking performance. These factors represent characteristics that are derived from both microeconomic aspects (bank-level variables) and macroeconomic aspects (country-level variables). The literature has highlighted that banks tend to have a target level for their risk that differs from the risk level at the beginning of the period (Shrieves and Dahl 1992). This target level is not observed directly, but it can be observed by a set of observable factors that impact it. The literature has also discussed several determinants that impact the banking operations and their performance level. In this research, there are a number of factors, which are explanatory variables, which are considered in observing banks' behaviour in risk management and assessing their performance level. The explanatory variables and their impacts are identified according to the literature. These variables are the following:

I) Capital Level: one of the main variables that this research aims to examine the impact of the capital level on both the risk level and performance level. It is measured by the *ratio of equity capital to total assets* (CAP) in book values. This ratio is expected to affect the level

[39] The total cost also includes capital expenditure, e.g. fixed assets. However, many of the fixed assets value are missing observations; hence they are excluded to avoid the underestimated value of total costs.

of risk because banks tend to manage their capital to avoid regulatory costs of breaching the minimum requirements of risk-based capital. However, the literature shows that the impact of the capital level on risky behaviour is ambiguous. Theoretically, stricter capital management aims to reduce the bank's exposure level. Hence; an increase in the capital level is expected to associate negatively with exposures to risk. However, a neutralising effect of increasing the capital level might is also expected. High capitalised banks might induce banks to be involved in more risky activities and investments for purpose generating a higher return to offset the cost of increasing capital. A higher capital level is, therefore, also expected to associate positively with risk levels.

In term of banking performance, the literature discusses the impact of banking capital and its regulations on performance. Banks might rearrange their portfolio and change their returns structure to increase their capital level and meet regulatory requirements. As discussed in the literature, the increases in the capital level tend to improve survival probability (Marini 2003). Hence, high-capital banks tend to be associated with less expenses since they pay less interest expense, and they have better earnings since their creditworthiness is higher than low-capital banks (Berger, 1995; Fries and Taci, 2005). Thus; the increase in the capital level is expected to have a positive impact on banking performance. However, bank capital might not always associate positively with the performance level. Baumol et al. (1970) argue that the capital is an expensive source of funding if it is based on the external source of funding in which increase in the capital level is associated with high costs and less earning. Thus; the capital- performance nexus would be expected to be negative too.

The *ratio of equity capital to total assets* (CAP) is used in a number of empirical studies as a proxy for capital level in both risk management literature (see, e.g., Shrieves and Dahl, 1992; Berger, 1995; Kwan and Eisenbeis, 1997; Fiordelisi et al., 2011) and banking performance literature (see, e.g. Berger, 1995; Berger and DeYoung, 1997; Brock and Suarez, 2000; Drakos, 2002; Lin et al., 2005; Altunbas et al., 2007; García-Herrero et al., 2009; Lee, 2012).[40]

II) **Size** is considered as one of the controlling variables that should be accounted for to understand the behaviour of banks in a given sample. The literature shows that banks with a big balance behave differently from small banks. Large-banks tend to have more competitive advantages. These banks claim to have better investment opportunities, well-diversified portfolios, and easy access to finance. Hence, the size of a bank might have an impact on risk levels for a number of reasons. Large banks are better diversified than small banks (Demsetz and Strahan 1997). Hughes and Mester (2013) argue that large banks enjoy economies of scale and spreading overhead costs. Diversified portfolios enable these banks to absorb systematic shocks. Moutsianas and Kosmidou (2016) found that an increase in size is associated with less volatility in profits. Size is expected to have a negative effect on risk level.

In term of banking performance, large banks are expected to have higher levels of performance due to competitive advantages. Unlike small banks, which have the limitations of competitive advantages, large banks are more able to raise their capital level less expensively. They can utilise their advantages to invest in more diversified products and improve their performance level. This argument is supported by a body of literature which finds that large banks have better performance than others (see, e.g., Goddard et al.,

[40] There are different indicators to measure risk level and performance too. Each indicator has its characteristics and limitations. As stated earlier, the $RWAs_{i,t}$ ratio differs from the $NPLs_{i,t}$ ratio in different perspectives. Besides, there are other risk indicators such as sovereign risk, and counterparty risk. Similarly, there are different performance indicators. As independent variables, this research accounts for one indicator as a risk indicator and another one as a performance indictor. The results of this research can be robust by considering other independent variables that measure a risk (and performance) level.

2004; Micco et al., 2007; Athanasoglou et al., 2008; Pasiouras et al., 2009). However, others argue that large banks are associated with higher operating cost (e.g., Chen et al., 2005; Stiroh and Rumble, 2006; Pasiouras and Kosmidou, 2007; García-Herrero et al., 2009).

This study used the natural logarithm of *total assets* (TA) to capture the size effect.[41] Total assets (TA) reflect the size of banking activities. This variable is also used in many empirical studies in the banking capital literature (e.g., Shrieves and Dahl, 1992; Kwan and Eisenbeis, 1997; Jacques and Nigro, 1997; Aggarwal and Jacques, 2001; Rime, 2001; Konishi and Yasuda, 2004; Altunbas et al., 2007; Iannotta et al., 2007; Flannery and Rangan, 2008; Agoraki et al., 2011; Fiordelisi et al., 2011; Shim, 2013).

III) Diversification Level: A difference in the level of product diversification is another relevant factor that could influence on a risk target level.[42] Banks adopt a different level of diversification according to their portfolio choices. A banking portfolio combines diverse lending and non-lending activities to spread the banking risk to a wider range of products. The primary purpose of the divarication is to reduce potential risk levels. This study uses ratio *non-interest income to total income* (NII) to measure the diversification level.[43] An increase in this ratio indicates that the bank is involved more in non-lending activities. The coefficient of this variable is expected to be negative. In other words, banks that manage their income

[41] The logarithm of the total asset is the most popular indicator that is used to measure firm size in banking empirical studies. This common usage for the variable will allow for the comparison of the results of the studies with previous empirical studies.

[42] The diversification level might differ significantly across banks. The sample includes both domestic and foreign banks and banks from different countries. The literature shows that foreign banks might have competitive advantages in having skilled labour to run noninterest based activities. Furthermore, banks in developed countries have a wider range of products to invest. This variable is included to capture the potential impact of banks strategies on products diversification to manage their risk level.

[43] Total income includes total interest income and total non-interest income in which non-interest income is the sum of fee-based incomes that include fees and commissions, trading income, and other non-interest income.

diversification portfolio are more capable of managing their risk levels and reducing them. On the other hand, DeYoung and Roland (2001) argue that one of the reasons that fee-based income might cause an increase in the risk level is regulators who do not ask banks to hold additional capital against fee-based activities (see, e.g., Acharya and Richardson 2009; Acharya et al. 2013). Some empirical studies found a positive relationship between diversification level and risk exposure (e.g. Demsetz and Strahan 1997; DeYoung and Roland 2001; Stiroh and Rumble 2006). Diversified banks are also expected to have better performance due to the utilisation of diversified products to improve their performance and reduce banking operating costs (see, e.g., Carvallo and Kasman 2005; Micco et al. 2007; Beltratti and Stulz 2012). The ratio *non-interest income to total income* (NII) is also used in the empirical studies (Demsetz and Strahan 1997; Lepetit et al. 2008; Pennathur et al. 2012; Meslier et al., 2014).

IV) Regulatory Pressure is another of the main variable that this research aims to examine the impact of on both the risk and performance levels. As stated earlier in the literature review, the banking sector as a whole has experienced remarkable regulatory reforms over the last few decades. Banks are required by law to meet the requirements of the Basel Accords II and III. The literature highlights that such regulatory pressures are expected to have a substantial impact on risk and performance. The literature shows several approaches to capture the potential effect of regulatory pressure. These approaches can be classified into four categories: Jacques and Nigro’s approach, the Prompt Corrective Action (PCA) approach, Ediz’s probabilistic approach, and standard approach. Each approach has its limitations and advantages as discussed below:

Jacques and Nigro’s Approach of identifying undercapitalised banks based merely on one factor which is the risk-based capital ratio. According to this approach, any bank with a risk-based capital ratio less than the minimum regulatory requirement is considered to be an undercapitalised bank.[44] This approach is adopted by Jacques and Nigro (1997), who suggested examining the regulatory pressure for banks according to their capital level. They measure regulatory pressure using the following two variables:

I. ***Regulatory Pressure for Undercapitalised Banks***: $Reg_{i,t}^{Under} = (\frac{1}{RBC} - \frac{1}{MRBC})$ for all banks with a total risk-based capital ratio (RBC) of less than the minimum risk-based capital ratio (MRBC), otherwise zero.

II. ***Regulatory Pressure for Better-capitalised Banks***: $Reg_{i,t}^{Over} = (\frac{1}{MRBC} - \frac{1}{RBC})$ for all banks with a total risk-based capital ratio (RBC) of more than the minimum risk-based capital ratio (MRBC), otherwise zero.

Jacques and Nigro (1997) examined the regulatory pressure in this form based on the argument of McManus and Rosen (1991) who argued that banks' risk behaviour differs according to the level of their regulatory capital. Banks with the regulatory capital ratio above the minimum regulatory requirement have a different level of portfolio risk compared to banks with regulatory capital above the requirements. The undercapitalised banks are pressurised to increase their capital ratio if they fail to meet the minimum regulatory requirement, and hence they are expected to reduce their risk level in order to avoid breaching the regulatory requirement. On the other hand, better-capitalised banks, which are already meeting the minimum regulatory requirements, are not constrained by the regulatory pressure. These banks are expected to

[44] The risk based-capital ratio varies among countries. Appendix II shows the minimum regulatory requirement of each country over the sample period. In this research, the adopted value of the minimum regulatory requirement varied across countries over years as per to the legal requirements of each country in every year. The definition of risk-based capital ratio changed as per to a given version of Basel Accords.

be involved in more risky activities compared to others. Although this approach is direct and simple, in reality, regulatory authorities rely on more than one criterion to identify undercapitalised banks as pointed out by Peek and Rosengren (1996).

The Prompt Corrective Action (PCA) approach: Aggarwal and Jacques (2001) define undercapitalised banks according to the definition of the Prompt Corrective Action (PCA) act which is a U.S. regulatory law that mandate penalties against undercapitalised banks. Unlike Jacques and Nigro's approach, the PCA approach defines undercapitalised banks based on three ratios: total capital ratio, tier1 capital ratio, and leverage ratio.[45] The PCA act defines a bank to be undercapitalised if it has less than 8% of the total capital ratio, less than 4% of tier1 capital ratio, and less than 4% of the leverage ratio. A number of studies used these standards to identify undercapitalised banks (e.g. (Dahl and Spivey 1995; Rime 2001). Accordingly, a pressurised bank based on this approach is defined as follow:

> ***Regulatory Pressure for Undercapitalised Banks***: $Reg_{i,t}^{PCAU}$= 1 if a bank fails to meet all or any of the three ratio requirements (i.e., above the minimum of total risk-based capital ratio, above 4% of tier 1 capital ratio, above 4% of the leverage ratio), otherwise zero.

The advantage of this approach is that it is not based on one single factor to identify undercapitalised banks.

[45] These ratios are also adopted at the Basel Accords except the leverage ratio which was not the compulsory requirement in the Basel Accords I and II. In 2013, the Basel Accords III introduced the leverage ratio requirement. Thus; this ratio might not be available for all banks in the sample. For the purpose of consistency, this research adopts a general definition of the leverage ratio, which is total Tier1 Capital to Total Assets, as a proxy for the regulatory leverage ratio for all banks in the sample.

Ediz's Probabilistic Approach: the above previous approaches are based on a cut-off point to distinguish between undercapitalised banks and better-capitalised banks. Yet, there might be banks that have a regulatory capital level that is just at the minimum capital requirement. Though they are meeting the minimum capital requirement, any probability of downturn, due to unobserved factors, could locate these banks into undercapitalised banks. Based on this concept, a probabilistic approach is proposed by Ediz et al. (1998), who used a quarter-based data for UK banks for period 1989 to 1995, followed by Rime (2001) who used an annual based data for USA banks for the same period. Ediz et al. (1998) argued that banks tend to have a target ratio that is expected to be above the minimum capital ratio. Banks experience a higher regulatory pressure once its target capital level is close to breaching. Breaching the target ratio attracts the attention of regulators as it signals that a given bank is more involved in risky activities. Ediz et al. (1998) suggested a way to measure this target ratio by adding the minimum capital requirement one time-series standard deviation of the bank's total capital ratio. Banks, which have a capital ratio less than the target ratio, are more pressurised to maintain their capital level according to the requirements. Both Ediz et al. (1998) and Rime (2001) reported significant results on the risk behaviour of such pressurised banks. They define banks that face the regulatory pressure via adopting a dummy variable in which

> ***Regulatory Pressured Banks***: $Reg_{i,t}^{Ediz} = 1$ if a bank's capital ratio is less than one bank-specific standard deviation above the minimum capital requirement, otherwise zero.

These are banks that are more likely to preach the minimum capital requirement in case any volatility of relevant unobserved factors. Hence; it is expected that these banks are less likely to be involved in more risky activities (i.e., expected negative coefficient). A similar approach is also adopted by Flannery and Rangan (2008).[46]

Standard Approach: unlike the previous approaches, this approach is simple and direct, and focuses on banks that are already meeting the regulatory capital requirements. This approach is used to obtain a robust result on the behaviour of better-capitalised banks. Those banks are measured by a dummy variable in which:

> ***Regulatory Pressure for Better-capitalised Banks***: $Reg_{i,t}^{mcr}$ = 1 if a bank's capital ratio equal to or more than the minimum capital requirement, otherwise zero.

All the above approaches aim to capture the risk behaviour of both undercapitalised and better-capitalised banks. This research will examine all the above approaches to obtain reliable results. Each approach has its own advantage. For instance, the first approach has the advantage of considering separately the behaviour of both undercapitalised and better-capitalised banks. However, Rime (2001) criticised such an approach as being less reliable in case of having a limited number of undercapitalised banks in a given sample. The second approach has the advantage of considering more than one factor to specify undercapitalised banks. The third approach accounts for banks that are not meeting their target capital ratio. Furthermore, the research covers a sample period that experienced several regulatory changes (e.g., introduction and implementation of Basel Accords II and III). In addition, banks experienced a more unstable economic environment during the financial crisis period 2007/2008. Therefore; the probabilistic approach, which accounts for the risk behaviour of banks with a higher probability to breach the regulatory requirement, is

[46] Flannery and Rangan (2008) had not computed the standard deviation, but they accounted for the pressured banks that have a capital ratio does not exceed the minimum capital requirement by at least 1.5%.

also one of the major interest of this research. Reduction in the risk levels of the undercapitalised banks (more pressurised banks) during the regulatory pressure period provides an indication that banks respond to the regulatory requirements.

In term of the performance level, banks with different level of capitalization are expected to have a different level of performance too. Undercapitalised banks might work on utilising their resources to involve in activities with high-income earnings that could be used to offset the regulatory capital requirements and relevant regulatory costs. This argument is supported by Ariff and Luc (2008); Shim (2010); and Goddard et al. (2013) who found that low-capital banks correlated positively with high profit. Better-capitalised banks have a greater incentive to maintain their soundness, and they are expected to be more averse (Fries and Taci 2005). Hence, they might not be efficient to utilise their resources.

V) Ownership: The literature review shows that banks with different ownership profiles may behave differently in term of risk levels and have varying levels of performance. In this research, ownership is measured by a dummy variable (DV) that indicates a given category of ownership profile. Three different ownership categories will be examined in this research. The first type of ownership category includes domestic-owned banks. This category is indicated by a value of unity for domestic ownership ($DV_{i,t}^{Doms}$), and zero otherwise. Domestic-owned banks are expected to be less superior in risk management skills compared to foreign-owned banks. The later has better access to diversified services and funding too. The coefficient of the ($DV_{i,t}^{Doms}$) is expected to be positively associated with the risk level and negatively with performance level. The same measurement is used in studies such as Levy Yeyati and Micco, 2007; Dinger, 2009; and Serrano, 2016. The second type of ownership category includes publically-listed banks. This ownership category is indicated by a value of unity for publically listed banks ($DV_{i,t}^{PLB}$), and zero otherwise. Publically-listed banks have different monitoring mechanisms that might impact on their risk behaviour and performance level. Publically listed banks are hypothesised to be less risky and have better performance than unlisted banks. The coefficient of the ($DV_{i,t}^{PLB}$) is expected to be negatively associated with the risk level and positively with performance level. A similar measurement is also used in Fraser and Zardkoohi, 1996; Esty, 1997; Iannotta et al., 2007; and Amadou Barry et al., 2011.

Beside to above bank level independent variables, macro controlling variables are also considered. These are external controlling variables that reflect country-specific macroeconomic characteristics. The sample includes commercial banks from different countries. Macroeconomic variables aim to control for country differences in term of the following variables:

VI) Inflation rate (INFL): is a proxy of the price stability of goods and services. It is measured by the consumer price index to reflect the annual percentage change in the cost of the consumers' goods and services in a country. The sample includes countries with different level of inflation rate. High inflation rate increases the incentive for saving and decrease demand for lending. GonzÁLez (2009) pointed out that increases in the inflation rate could decrease lending activities and hence banks involved in less lending activities that are associated with less risk level. The coefficient of the inflation rate is expected to be negative in the risk equation. In term of performance, Demirguc-Kunt et al. (2003) showed that banks' profitability is greater in the inflationary environment. They also found that banks tend to have wider margins. This variable is also used by Demirgüç-Kunt and Detragiache, 2002; Demirguc-Kunt et al., 2003; GonzÁLez, 2009; and Lee and Hsieh, 2013.

VII) Growth Rate of Gross Domestic Products (GDP): is the growth of the gross domestic product in a country. It is used as a proxy to examine the impact of fluctuation in economic activities on both capital and risk levels. It is measured as the annual growth rate of GDP in a country. In term of risk level, a higher rate of growth GDP reflects the growth of economic activities, and hence more debtors are able to meet their obligations (Chortareas et al. 2011). Accordingly, banks tend to have a lower potentiality of default and less risk. In term of performance, banks are expected to have wider opportunities to lend and invest in countries with higher GDP growth. This variable is used in studies that examined banking risk and banking performance too (see, e.g., Iannotta et al., 2007; Agoraki et al., 2011; Chortareas et al., 2011; and Lee and Hsieh, 2013)**.**

VIII) Interest Rate Spread (**IRS**): is used to account for the fact that the sample includes banks from different countries in which each country charges different interest rates. Both banking total costs and margins are affected by the spread between the interest rate of funding and lending. Maria Soledad Martinez and Mody (2004) argued that the impact of high spreads is more likely to serve for developing countries where equity-market as a source of funding is not well-developed. Banks in developing countries charge a high margin to cover their operating expenses and improve their profitability level (Hawtrey and Liang 2008). Brock and Suarez (2000) pointed out that high spread supports stability for the banking system and adds to the profitability level. According to the World Bank, interest rate spread defines as a difference between the interest rate charged by banks on loans of the private sector and the interest rate paid by savers on deposit. This variable is used in empirical studies (e.g., Brock and Suarez, 2000; Saunders and Schumacher, 2000; and Hawtrey and Liang 2008).

The previous section provides an overview of the variables that are adopted in this research. A summary of all variables is presented in Table (4-1). The table also includes adopted abbreviations for each variable that are used frequently in this thesis. The following sections present the adopted models that are used to analyse the collected data.

Table 4-1: Summary of variables, Definition, and expected sign according to hypotheses

Classification	**Variable**	**Data Definition**	**Expected sign in relation to risk indicators (relevant tested hypotheses[1])**	**Expected sign in relation to performance indicators (relevant tested hypotheses)**
Dependent Variables				
Risk	NPLs/ Asset	NPLs-to-total assets	-	-
	RWAs/ Asset	Risk-weighted Assets –to- total assets	-	-
Performance Level	ROA	Net Income –to-total assets	-	-
	NIM	Interest income minus interest expense divided by interest-bearing assets	-	-
	TCA	Total cost-to-total assets Where total costs are the sum of total interest expenses, total non-interest expenses, and personnel expenses	-	-
Bank Control Variables				
Capital	Cap	Equity-to-total assets	Negative (H1, H5, and H7)	Positive (H8, H12, and H14)
Size	Log Asset	Log of total assets	Negative	Positive
Profitability[2]	ROA	Net Income –to-total assets	Negative	-
Riskiness[3]	NPLs/ Asset	NPLs-to-total assets	-	Negative
Diversification	NII ratio	Non-interest income-to-total income	Negative	Positive
Regulatory Pressure[4]	REGU	Dummy variable with a value equal to $\mathrm{Reg}_{i,t}^{\mathrm{Under}} = (\frac{1}{\mathrm{RBC}} - \frac{1}{\mathrm{MRBC}})$ for all banks with a total risk-based capital ratio (RBC) of less than the minimum risk-based capital ratio (MRBC), otherwise zero.	Negative (H6a)	Positive (H13a)

	REGO	Dummy variable with a value equal to $Reg_{i,t}^{Over} = (\frac{1}{MRBC} - \frac{1}{RBC})$ for all banks with a total risk-based capital ratio (RBC) of more than the minimum risk-based capital ratio (MRBC), otherwise zero	Positive (H6b)	Negative (H13b)
	PCAU	Dummy variable with a value equal to $Reg_{i,t}^{Under}$= 1 if a bank fails to meet all or any of the three ratio requirements (i.e., above the minimum of total risk-based capital ratio, above 4% of tier 1 capital ratio, above 4% of the leverage ratio), otherwise zero.	Negative (H6a)	Positive (H13a)
	REG-Ediz	Dummy variable with a value equal to $Reg_{i,t}$ = 1 if a bank's capital ratio less than one bank-specific standard deviation above the minimum capital requirement, otherwise zero	Negative (H6a)	Positive (H13a)
	REGmcr	Dummy variable with a value equal to $Reg_{i,t}^{Over}$ =1for all banks with a total risk-based capital ratio (RBC) of more than the minimum risk-based capital ratio (MRBC), otherwise zero	Positive (H6b)	Negative (H13b)
Bank Ownership	DV_i^{PLB}	A value of unity for publically listed banks in stock exchange markets, and zero otherwise.	Negative (H2)	Positive (H9)
	$DV_{i,t}^{Doms}$	A value of unity for domestic ownership, and zero otherwise. A bank is considered to be a domestic bank if more than 50% of shares are held by domestic owners.	Positive (H3 and H4)	Negative (H10 and H11)
Macro Controlling Variables				
Inflation	INFL	Measured by the consumer price index to reflect the annual percentage change in the cost of the consumers' goods and services in a country.	Negative	Positive
GDP Growth %	GDPG	The annual growth rate of Gross Domestic Products	Negative	Positive
Interest Rate Spread	IRS	The difference between the interest rate charged by banks on loans to private sector customers and the interest rate paid by commercial or similar banks for demand, time, or savings deposits.	Negative	Positive

Notes:
1 Summary of hypotheses statements of baking risk and performance are stated in Table (3-1) and (3-2) respectively.
2 It is used only in the banking risk equation.
3 It is used only in the banking performance equation.
4 Four different approaches are used to measure regulatory pressure. Each approach is examined in a single model.
5. Bank-level data were obtained from the Bankscope database, ownership variables from Claessens and Van Horen database on bank ownership, and macro control data were obtained from the World Bank Database.

4.3 Data Analysis Method:

The discussion in literature review highlights that banking capital framework and its regulations are developed to enhance banking stability, limit excessive risk-taking behaviour, and improve performance. As pointed out in the literature, the impact of the capital could vary among banks according to bank-specific characteristics. This research examines the differences in risk-taking behaviour in responding to capital at the different type of bank ownership, and over a period that experienced regulatory reforms. Given that, a general form of the static panel-based linear model is expressed as follow:

$$Y_{i,t} = \beta_0 + \beta_k \boldsymbol{X}_{i,t}^{k} + u_{i,t} \qquad \text{with } u_{i,t} = \partial_i + \varepsilon_{i,t}$$

(Equation 4-1)

Where, ($Y_{i,t}$) is dependent variable for a given bank (i) at year (t), ($\boldsymbol{X}_{i,t}^{k}$) is a vector of the independent variables that explain the dependent variable for a given bank at a given period, (∂_i) unobserved individual-specific effects, and ($\varepsilon_{i,t}$) is the random error term. ($u_{i,t}$) is a composite error term which combines both (∂_i) and ($\varepsilon_{i,t}$). Furthermore, (β_0) is intercept, and (β_k) are slope coefficients to be estimated. As stated in the previous section, the dependent variables are proxy for the risk level and performance level in which each one of them is measured using alternative indicators as follow:

Risk Level measured by:

Model I: using ratio ($NPLs_{i,t}$)

Model II: using ratio ($RWAs_{i,t}$)

Performance level measured by:

Model I: using ratio ($ROA_{i,t}$)

Model II: using ratio ($NIM_{i,t}$)

Model III: using ratio ($TCA_{i,t}$)

Alternative measurements are used as robust and for complementary purposes in which one covers limitations of another indicator. The study aims to investigate the impact of the capital on the risk and performance levels empirically. For the risk level, the explanatory variables comprise: ($CAP_{i,t}$) capital level, ($B_{i,t}^{K}$) a vector of bank-level characteristics representing size, profitability, diversification, and regulatory pressure, and ($\boldsymbol{C}_{i,t}^{k}$) a vector of variables that reflect the macroeconomic conditions representing inflation rate, and annual growth of the gross domestic product. On the other side, the explanatory variables for the performance level comprises ($CAP_{i,t}$) capital level, ($B_{i,t}^{K}$) a vector of bank-level characteristics representing size, riskiness, diversification, and regulatory pressure, and ($\boldsymbol{C}_{i,t}^{k}$) a vector of variables that reflect the macroeconomic conditions representing interest rate spread.

Besides, a dummy variable ($DV_{i,t}^{Own}$) is added to both the risk level and performance level to account for the ownership profile. The ownership variable is included to account for the heterogeneity of banks in term of their risk behaviour (and performance level) according to their ownership profiles. Accordingly, the equation (4-1) can be rewritten to include the stated variables as follow:

$$RISK_{i,t} = \beta_0 + \beta_1 CAP_{i,t} + \beta_2 \boldsymbol{B}_{i,t}^{k} + \beta_3 \boldsymbol{C}_{i,t}^{k} + \beta_4 DV_{i,t}^{Own} + u_{i,t}$$

(Equation 4-2)

$$Performance_{i,t} = \beta_0 + \beta_1 CAP_{i,t} + \beta_2 \boldsymbol{B}_{i,t}^{k} + \beta_3 \boldsymbol{C}_{i,t}^{k} + \beta_4 DV_{i,t}^{Own} + u_{i,t}$$

(Equation 4-3)

Each of the above regression models contains a composite error term ($u_{i,t}$) that control for omitted variables and random measurement error. Hsiao (2014; 31) argued that different factors could be observed or unobserved and they could influence on the result of the outcome of individuals (i.e., cross-sectional units) in a given panel-based model. These factors are critical because they might influence other variables, and hence invalid estimators are obtained. Besides, it is impractical to include all these factors in a single model. Thus; the effects of these factors are accounted for in the first component of the composite error term as unobserved individual-specific effects (∂_{i}). It is important to notice that this component includes factors that are time-invariant variables that are fixed over the time. In other words, variables that are the same for a given cross-sectional unit through time as defined by Hsiao (2014).[47] The second component of the composite error term is the random error term ($\varepsilon_{i,t}$) that captures remainder disturbance which accounts for potential imperfect measurements of its explanatory variables ($\boldsymbol{X}_{i,t}^{k}$) and all other omitted time-varying variables.

The above two equations (4-2 and 4-3) are estimated at three different designs of the panel based model according to the assumptions made on individual-specific effects (∂_i). The panel-based models deal differently with the individual-specific effects that reflect observed and unobserved heterogeneous factors of cross-sectional units in the sample. These factors are subject to the influence of other regressors in the model, and hence they could impact on the validity inferences. There are three standard designs of the panel-based model that could be adopted to control the impact of the heterogeneous factors. The first design of the panel-based model (I) is considered to be a baseline model. It assumes that individual-specific effects are uncorrelated (i.e. $\mathrm{E}(\partial_i \ |x_{i,t}) = 0$) and there is no serial correlation in the composite error term (i.e. $\mathrm{Cover}(u_{i,t}|u_{i,s}) = 0$). This baseline model is known as a pooling model in which it is estimated by combining both cross-sectional and time-series data. The second design of the panel based model (II) is a fixed effects model that assumes both observable and unobservable individual-specific effects are not changed over time within each bank (i.e. $\mathrm{E}(\partial_i \ |x_{i,t}) \neq 0$). There is also no serial correlation in the composite error term (i.e. $\mathrm{Cover}(u_{i,t}|u_{i,s}) = 0$). The third design of the panel based model (III) accounts for individual-specific effects (i.e. $\mathrm{E}(\partial_i \ |x_{i,t}) = 0$) and it is considered to treat for potential serial correlation in the composite error term (i.e. $\mathrm{Cover}(u_{i,t}|u_{i,s}) \neq 0$). This model is known as a random effects model. These three models are estimated, and the most appropriate model will be chosen based on a systematic comparison as discussed later in section (4.5). The procedures of estimation

[47] Woolridge (2002) stated that different names are used to refer to the term "unobserved individual effects" such as unobserved effects, unobserved heterogeneity, and latent variables.

method for each one of these three designs of the panel based model are shown in the following parts.

4.3.1 The 1st Design of Panel-Based Model: Pooled Ordinary Least Squares Model

The first design of the panel based model is based on combining all observations across banks and over the years to obtain a greater sample size that enables assessing the relationship between the dependent variable and independent variables, to get more reliable estimates (Baltagi 2001). In this specification, the model assumes that the capital level has the same impact on all banks in different countries over the sample period. Empirically, this assumption is reflected in having common intercept and slop that remain constant over time and across all cross-sectional units. This pooled model is estimated using Ordinary Least Squares (OLS) method. The later is a method that estimates the parameters of an underlying population model by minimising the sum of the squared differences between actual observations and the predicted values that are obtained by the sample-based model:

$$\sum_{i=1}^{n}(Y_{it} - \hat{\beta}_0 - \hat{\beta}_k X_{i,t}^{k})^2$$

(Equation 4-4)

This estimation method provides unbiased and efficient estimators as long as Gauss-Markov assumptions have been satisfied. These assumptions are:

i. **Linearity Assumption**: the model in the population is a linear model that is estimated based on a random sample.
ii. **Exogeneity Assumption**: the random error term ($\varepsilon_{i,t}$) in the estimated linear model has an expected value of zero, and it is independent from all explanatory variables in all time periods and the unobserved effects ($E(\varepsilon_{i,t} | x_{i,t}, \partial_i)=0$).
iii. **Multicollinearity Assumption**: no perfect linear relationships exist among the independent variables.

iv. **Homoskedasticity Assumption**: the variance of the error term is constant for every ith observation (Var$\left(\varepsilon_{i,t} \middle| x_{i,t}, \partial_i\ \right) = \sigma^2$).
v. **Nonautocorrelation Assumptio**n: there is no autocorrelation over time (Corr$\left(\varepsilon_{i,t}, \varepsilon_{i,s} \middle| x_{i,t}, \partial_i\ \right) = 0$).

These core assumptions imply that the random error term ($\varepsilon_{i,t}$) are independently and identically distributed (iid) with zero conditional means and homogeneous variance (0, σ^2).[48] Besides to these Gauss-Markov assumptions, which are common in all underlying examined panel-based models, the pooled OLS model differs from others in the term of treatment for the individual-specific effects in which the pooled OLS model assumes that:

A) Unobserved individual-specific effect (∂_i) has a zero expected value, and it is uncorrelated with independent variables (i.e. E$\left(\partial_i\ \middle| x_{i,t}\right) = 0$).
B) No serial correlation in the composite error (i.e. Cover$\left(u_{i,t} \middle| u_{i,s}\right) = 0$).

The first assumption will be relaxed in the fixed effects model, while the second assumption is relaxed in the random effects model as discussed later. The pooled OLS model uses all these assumptions to provide the estimated value of coefficients ($\hat{\beta}_0$) and ($\hat{\beta}_k$).

4.3.2 The 2nd Design of the Panel-Based Model: Fixed Effects Model

The second design of the panel based model accounts for unobserved individual effects within each bank. Practically, risk levels and banking performance might be influenced by other unobservable variables such as internal managerial skills, the strength of internal governance, and supervisory power (e.g. (Laeven and Levine, 2009; Barakat and Hussainey, 2013)). These variables reflect factors, which tend to not change over time, might influence other observable variables in the model. Banks

[48] An observation is independent when its occurrence does not depend on other observations. An identical distribution in which each observation has the same probability of occurring. The assumption of the independently identically distribution implies that there are no further correlations between measures (Bell, A. & Jones, K. 2015).

tend to behave differently due to these factors, and hence they reflect unobservable individual heterogeneity within each bank. In equation (4-1), the variable (∂_i) captures all unobserved time-invariant variables. The pooled OLS model has assumed zero expected value for (∂_i), and it assumes there is no correlation between unobservable factors (∂_i) and other explanatory variables ($X_{i,t}$). Estimators of pooled OLS model could be biased because it ignores the influence of unobservable variables (∂_i).[49] Fixed effects model accounts for the effect of unobservable factors that could be correlated to both dependent and independent variables (i.e. $\mathrm{E}(\partial_i \mid x_{i,t}) \neq 0$). This model provides a tool for removing all unobservable biases, and hence it provides unbiased estimators.

The fixed effects model is based on the assumption that there are no changes over time within each bank in all observable and unobservable variables. This approach enables the model to remove the unobservable effects and control for the average differences between banks in both observable and non-observable variables.[50] For example, the fixed effect model removes slow moving macroeconomic factors, which is the case of most national-level data that is not changed across all cross-sectional units, and dummy variables. Thus; such type of variables cannot be included in the fixed effects model.[51] Yet, the econometrics literature recommends using the period dummy to capture the influence of aggregate variations that vary across time but are common to all cross-sectional units (e.g. Wooldridge 2002, p.2010). In the light of the empirical aspects of this research, the risk level (and performance level) could be influenced by slow-moving variables such as developments in the regulatory

[49] The presence of a fixed unobserved individual-specific effect (∂_i) in each period (t) in equation (4-1) might influence on the exogeneity assumption, homoskedatisity assumption, and no correlation assumption. As a result, the composite error ($u_{i,t}$) might not have the same variance, and/or it is correlated over time. The violation of these assumptions will cause inconsistency and biases in the estimated coefficients of the underlying model.

[50] In other words, the fixed effects model has the advantage of eliminating unobserved effects, and hence it focuses on the variation within each bank.

[51] This is one of the limitations of within estimation approach that is used to estimate the fixed effects model. There is another approach that could be used for estimating the fixed effects model and it is known as the Least Squares Dummy Variable (LSDV) method. The LSDV method could be used to estimate the fixed effects model, and it takes into account invariant variables and/or dummy variables. However, this method is not feasible for a panel data with a large number of cross-sectional units (N) since it is required to include (N-1) dummy variables in the underlying regression. Hence, there more loss of degree of freedom (Baltagi 2001, p.13; Wooldridge 2002, p.446).

environment at a particular country in a given year. These changes might not be attributed to explanatory variables in the fixed effects model. Thus; The time fixed effects, which is measured as a dummy variable, play a predominant role to account for temporal variations in the risk level (and performance level) that could be due to unobserved changes at a particular time. Thus; the equation (4-1) is fitted to include time fixed effects as follow:

$$Y_{i,t} = \beta_k \boldsymbol{X}_{i,t}^k + (\textstyle\sum_{j=1}^{T-1} \partial_i \, d_{j,it}) + \varepsilon_{i,t} \qquad \textbf{(Equation 4-5)}$$

Where, (∂_i) is the coefficient on the dummy variable. The later indicates one for the year (t), and zero otherwise. One year data is eliminated to avoid multicollinearity issue.

In addition, regulatory pressure and ownership variable are primary variables to be examined in the study to account differences in the risk level (and performance level) among banks with different level of capitalisation and different profiles of the ownership. The regulatory pressure and ownership profiles are measured by a dummy variable. The dummy variable in the fixed effects model cannot be used because it does not change over time. The fixed effects transformation by definition eliminates any constant variable over time. In other words, any variable that does not change over time will be replaced by zero in the fixed effects transformation. Any time-constant variable is not allowed in the fixed effects model. Wooldridge (2003, p.428) suggests that such a time-constant variable should interact with a variable that varies over time in the fixed effects model. Accordingly, the regulatory pressure dummy variable $(DVREG_{i,t}^{K})$ and ownership variable $(DV_{i,t}^{Own})$, which are time constant variables, can be interacted with the capital level $(CAP_{i,t-1})$. Accordingly, the equation (4-5) can be expanded to include the interaction term as follow:

$$\boldsymbol{Y_{i,t} = \beta_k X_{i,t}^k + \left(\textstyle\sum_{j=1}^{T-1} \partial_i \, d_{j,it}\right) + \beta_{k+1}(DV_{i,t} * CAP_{i,t-1}) + \varepsilon_{i,t}}$$

(**Equation 4-6**)

This equation is estimated by the fixed effects model with consideration for different categories of capitalised banks and ownership profiles.

4.3.3 The 3rd Design of Panel-Based Model: Random Effects Model

The third design of the panel based model differs from the second design in considering another aspect of the unobserved variables. The random effects model assumes that unobserved individual-specific effects (∂_i) are uncorrelated with the independent variables in all time periods. These unobserved effects are random, and they reflect individual differences that could vary among cross-sectional observations by different degrees. Thus; the expected value of these unobserved effects is assumed to constant (i.e. $\mathrm{E}\left(\partial_i \,\middle|\, x_{i,t}\right) = \beta_0$). There is no need to eliminate these unobserved effects; otherwise, inefficient estimators are obtained (Wooldridge 2003). However, including the time-invariant (∂_i) in the composite error term ($u_{i,t}$) in each period will make the composite error serially correlated across time. This correlation makes the OLS estimators are no longer best liners biased estimators.[52] The equation (4-1), which has the serial correlation issue in the error term, can be estimated by the Generalized Least Squares (GLS) transformation. The former aims to eliminate serial correlation in the composite error term by multiplying both sides of the regression in equation (4-1) by an inverse of square root of the variance-covariance structure for the composite error term in which it will be homoscedastic and uncorrelated serially.[53] Algebracally, this transformation is more complicated. Yet, the ramdom effects model is define as follow:

$$\boldsymbol{Y_{i,t}^{*}} = \boldsymbol{\beta_0^{*}} + \boldsymbol{\beta_k X_{i,t}^{*k}} + \boldsymbol{u_{i,t}^{*}}$$

(**Equation 4-7**)

[52] According to the Gauss-Markov assumptions, the error term is required to be serially uncorrelated (i.e. Cover$\left(u_{i,t} \middle| u_{i,s}\right) = 0$) to obtain the best linear unbiased estimators (BLUEs). Otherwise, the changes in explanatory variables could not determine changes in the dependent variable.

[53] The random effect model is also known as an error component model that aims to make the composite error term to be homoscedastic and serially uncorrelated.

where, $\Omega^{-1}$is the inverse of the variance-covariance structure, $Y^{*}_{i,t} = \Omega^{-1}Y_{i,t}$, $\beta^{*}_{0} = \Omega^{-1}\beta_{0}$, $\boldsymbol{X}^{*k}_{i,t} = \Omega^{-1}\boldsymbol{X}^{k}_{i,t}$, and $u^{*}_{i,t} = \Omega^{-1}u_{i,t}$. All observations in this equation are wieghted by ($\Omega^{-1/2}$). The error term in this equation is serially uncorrelated and homoskedicatic. From a practical perspective of the capital-risk nexus and capital-performance nexus, the random effects model is suitable to consider for heterogeneity of the impact of the capital level that is expected to vary according to the capitalisation level, an ownership profile, and regulatory pressure period. Unlike the fixed effects model, the random effects model has the advantage of considering any constant variable to be included in the model such as dummy variables. Accordingly, the equation (4-7) can be expanded to include the ownership dummy variable as follow:

$$\boldsymbol{Y^{*}_{i,t} = \beta^{*}_{0} + \beta_{k}X^{*k}_{i,t} + \beta_{k+1}DV^{Own}_{i,t} + u^{*}_{i,t}}$$

(**Equation 4-8**)

Compared to previous Gauss Markov assumptions, the random effects model imposes more assumptions which specify how to deal with unobserved effects. These assumptions still imply that the error term ($u^{*}_{i,t}$) are independently, and identically distributed with zero conditional means (0, σ^{2}). All these assumptions aim to obtain more consistent and efficient estimators. Table (4-2) summarises the main differences between the above three designs of the panel based model.

4.4 Criteria for Selecting the Most Appropriate Estimation Method:

The above section presents different forms of the panel-based regression models that vary according to the assumptions for dealing with unobserved individual specific-effects (∂_{i}). The inclusion of (∂_{i}) makes the structure of the error term more complex, and accordingly, the standard OLS method cannot be used to estimate the models that account for (∂_{i}). Hence; other estimation methods need to be considered. Compared to the pooled OLS model, both the fixed effects model and random effects

Table 4-2: Summary of major differences between Pooled OLS model, Fixed Effects Model, and Random Effects Model:				
S	**Element**	**Pooled OLS Model**	**Fixed Effects Model (FE)**	**Random Effects Model (RE)**
1	Unobserved individual-specific effects (∂_i)	No further assumption made about (∂_i) and they are considered as a part of the residual term ($u_{i,t}$) with zero expected value, i.e., they are assumed not to exist.	(∂_i) are treated as a fixed term that needs to be swept out since they are assumed to have a non-zero expected value, and hence they could be correlated to ($X_{i,t}$).	(∂_i) are treated as randomly drawn from a population and have a non-zero value, and hence it could cause serial correlation in the error term ($u_{i,t}$). Thus; they are corrected to be uncorrelated with ($X_{i,t}$).
2.	Hetero-geneity	It does not account for individual heterogeneity in the model.	It rules out individual heterogeneity in the model.	It is suitable to account for individual heterogeneity in the model.
3.	Sample variation	It utilises a pooled average variation in the sample.	It utilises only the within-group variation.	It utilises both within and between group variation.
4.	Estimators of the model	Pooled estimators are unbiased only under standard assumptions. However, the OLS model could be biased because it ignores the potential influence of (∂_i).	FE estimation is unbiased, consistent, but not efficient because it eliminates fixed effects in the model.	RE estimation is unbiased, consistent, and efficient because it accounts for fixed effects in the model.

model account for (∂_i) and additional computational procedures are required to estimate such models. The estimation of the fixed effect model, which is expressed in equation (4-6), and the random effect model, which is expressed in equation (4-7), are based on estimating components of the variance structure.[54] In practice, this variance structure is unknown. This unknown variance structure could be estimated using the Ordinary Least Squares (OLS) method. The OLS method, as stated earlier, is an

[54] Note that the estimation of the fixed effects model and the random effects model is based on the components of the variance structure. Thus; the same estimation method could be used to estimate these models. Hsiao (2014) shows how to estimate both the fixed effects model and the random effects model using the GLS method.

estimation method that estimates parameters of an underlying model by minimising the sum of the squared differences between actual observations and the predicted values that are obtained by the sample-based model. It is based on homoscedastic variance with no serial correlation. Yet, it is more realistic to account for heteroskedasticity variance especially in a panel-based structure where the error variance is more likely to vary with cross-sectional units (Greene 2000, p.599).

The OLS is biased and inconsistent in the appearance of heteroskedasticity and serial correlation in the variance structure; and hence further adjustments need to be made in the underlying OLS model to correct the variance-covariance structure of estimators to obtain more valid, efficient and consistent estimators of the standard errors. The corrected variance-covariance structure is known as the clustered variance-covariance structure which is estimated based on the residuals of the ordinary least squares model.[55] This clustered variance-covariance has the advantage of accounting for both heteroskedasticity and within-cluster correlation. However, this method is based on no assumptions to control for within-cluster correlation, i.e., it allows for arbitrary correlation within a cluster, and the form of this correlation could vary from cluster to cluster. This unspecified correlation implies that there is no correlation between observations ($u_{i,t}$) and ($u_{k,t}$). The observations are independent across all clusters. Nevertheless, this limitation can be treated by including the time dummies in the regression model as proposed by Petersen (2009). There are statistical tests that could be used to assess the need for including time dummies as elaborated in Section 4.6. Table (4-3) summarises the main characteristics, which are reflecting advantages and disadvantages, of the OLS method versus Robust Cluster OLS method.

The choice of the most appropriate method is made by selecting the method that has characteristics that fit with the design of this current research. Sample size, panel structure, and spherical error term are the main characteristics that are accounted for to select the most appropriate method for this current research. In term of sample size, the literature has not specified for a specific limit that could define the sample size to

[55] The OLS estimates with the cluster-robust standard errors are obtained at the Stata Statistical Software via using the command ***reg y x, vce(cluster id_clu)*** for pooled OLS model.

Table 4-3: Summary of comparison between panel-based estimation methods		
Estimation Methods	**The OLS Method**	**Robust Cluster OLS Method**
Sample size	Require large sample size to be efficient and consistent	Require large sample size to be efficient and consistent
Panel Structure	Fit for short panel data structure	Fit for short panel data structure
Spherical error term assumptions	Assume for homogeneity and correlation of the error term	Account for heterogeneity and within the correlation of the error term
Number of clusters	Not applicable	Require a large number of cluster

be large enough. The literature shows several empirical studies that use statistical simulating methods, e.g. Monte Carlo method, to assess outcomes of an underlying method using repeated random sampling techniques to measure the effectiveness of a given estimation method. Such studies classify a sample with a maximum of 500 observations to be a finite sample use (e.g., (Kezdi, 2003; Beck and Katz, 1995), and others classify a sample with a maximum of 800 observations as the finite sample size (e.g. Reed and Ye 2011). Compared to the previous relevant empirical studies in the banking capital literature, a minimum of 1,000 bank-year observations is considered to be a large sample (e.g. (Kwan and Eisenbeis, 1997; Rime, 2001; Drakos, 2002; Demirguc-Kunt et al., 2003; Peria and Mody, 2004; Lin et al., 2005; Iannotta et al., 2007; Semih Yildirim and Philippatos, 2007; Dietrich and Wanzenried, 2011; Flannery and Rangan, 2008; Fiordelisi et al., 2011; Hogan, 2015)). Based on these empirical references, the current research uses at minimum 800 bank-year observations (in some variables, e.g. ratio of risk-weighted assets) and maximum of 2,860 bank-year observations in panel data for banks operating in both the OECD countries and the MENA Countries. This sample size is used to obtain efficient and consistent estimators as possible. In term of panel structure, the panel dataset in this research is a short panel-based dataset in which the number of periods (T) is less than cross-sectional units (N). The existence of the spherical error term is another critical factor that should be considered to select the most appropriate estimation methods. In light of the above discussion, the following points are highlighted:

- The standard OLS method would not be suitable to be considered in case there is a spherical error term. The panel-based dataset includes the effects of unobserved heterogeneity cross-sections and/or over time. These characteristics are not considered in the standard OLS method which is based on homogeneity and uncorrelated correlation.
- Adjusted OLS method that accounts for spherical error by using the clustered standard error. It accounts for heterogeneity and within the correlation of the error term. It can be estimated consistently whether with a large number of clusters or small size of the cluster as pointed out by Cameron and Miller (2010).

There are statistical tests that could be used to test the existence of homogeneity and uncorrelated correlation in a given model as discussed in Section 4.6. This research will conduct these statistical tests and accordingly, decide which one of these two estimation methods is the most suitable method.

4.5 Selecting the Most Appropriate Panel-based Regression Model:

The above three linear panel models are the main standard panel-based models that could be used to answer the research questions. As discussed in the previous section, these three models treat differently for the individual-specific effects that could be fixed effects or random effects. There are several statistical mechanisms that could be used to examine the existence of these effects. The following section discusses how to examine these effects in a given panel dataset to decide which one of these three models is the most appropriate.

4.5.1 Testing Appropriateness of the Fixed Effects Model Relative to the Pooled OLS Model

The assessment of the significance of the fixed effects model against the pooled OLS model can be done using an analysis of covariance (ANCOVA) F-statistic test.

This test aims to examine the role of existence fixed effects in a model to improve the goodness of fit of a model compared to the pooled OLS model.[56] Based on this test, the fixed effects model is preferred if unobserved fixed effects (∂_i) are nonzero. The fixed effects model has the advantage of eliminating for such unobserved time-invariant effects. The existence of these effects results in biased pooled estimators. Thus; it is essential to examine the existence of fixed effects. Moulton and Randolph (1989) show that F-test can be hypothesised as follow:

$$H_0 : (\partial_i) = 0$$

This null hypothesis suggests that there are zero unobserved effects in the underlying linear model against the one-sided alternative hypothesis, i.e. $H_0 : (\partial_i) > 0$. The ANCOVA F-statistic test is the analysis of variance that is computed based on two residuals sums of squares: Pooled OLS residuals sum of requires and the residuals sum of squares for the fixed effects model. If the p-value of this F-statistic is less than 0.05 (i.e. significance level), then the null hypothesis is rejected. A significant F-statistic test implies that fixed effects are non-zero, and hence the Pooled OLS model will be biased. In this case, the fixed effects model will be more appropriate to deal with non-zero fixed effects.

4.5.2 Testing Appropriateness of the Random Effects Model Relative to the Pooled OLS Model

Before adopting the random effects model, it is required to assess the appearance of the random effects. Wooldridge (2010) argued that the pooled OLS model is preferred if the random effects model does not contain any unobserved effects (∂_i). He showed that appropriateness of the random effects model against the pooled OLS model could be hypothesised as follow:

$$H_0 : Var\,(\partial_i) = \sigma_\partial^2 = 0$$

[56] The goodness of fit reflects variability between observed values and the expected value from an underlying model. It is measured commonly by the coefficient of (R^2) in regression analysis.

This null hypothesis suggests that there are no individual specific variance components. This presumption implies that the composite error term ($u_{i,t}$) in a linear model would not be expected to have serially correlated with individual effects (∂_i); and hence a pooling dataset would be more appropriate to obtain efficient estimators. The Lagrange Multiplier (LM) test, which was introduced by Breusch and Pagane (1980) and modified by Baltagi and Li (1990), is used to test this hypothesis.[57] The LM test statistic is conducted to examine for the existence of heterogeneity. This heterogeneity effect is more appropriate to present in a random effects model rather than the pooled OLS model.

However, the Breusch and Pagane LM test is criticised for assuming the alternative hypothesis to be two-sided. Indeed, it is suitable only for the balanced dataset. Honda (1985) suggested considering the one-sided alternative hypothesis. Honda test has the advantage of not assuming the normality assumption in the disturbance term.[58] Both the Lagrange Multiplier (LM) test and the Honda test are viewed as a chi-squared based ($n\chi^2$) with the degree of freedom of the number of independent variables (k). If the p-value of this statistic is less than 0.05 (i.e. significance level), then the null hypothesis is rejected, and the random effects model is preferred.

4.5.3 Appropriateness of the Fixed Effects Model relative to the Random Effects Model

The appearance of unobserved invariant effects (∂_i) makes an impact on the validity of estimated results. As shown above, each of the fixed effects model and the random effects model deals differently with unobserved effects. In the fixed effects model, heterogeneity elements, which have time-invariant characteristics, are removed as they might bias the outcomes. Whereas, the random effects model considers the appearance of constant unobserved effects with zero correlation between unobserved

[57] Baltagi and Li (1990) modified Berusohe and Pagane Test to account for the joint effect of both individual effects (∂_i) and appearance of serial correlation in the random error term (ε_{it}). Both (∂_i) and (∂_i) are assumed to be independent of each other.

[58] Empirically, this test is conducting using xttest1 command in Stata (V14.2).

effects and explanatory variables. The fixed effects model will not be an appropriate model if the error term contains invariants elements that might correlate with other explanatory variables. It also will not be an appropriate model if the underplaying variables are not changing (or changing slowly) within each entity.

Huasman (1978) proposed a test to compare the fixed effects model with the random effects model to choose the most efficient one. The null hypothesis of Huasman test states that individual effects (∂_i) are uncorrelated with any explanatory variables in the underlying model. If this null hypothesis is true, then the random effects model is appropriate. Yet, if there is any correlation, then the fixed effects model has the advantage of eliminating individual effects to obtain consistent estimates. The null hypothesis is rejected if the p-value of Huasman statistic is less than 0.05 (i.e. significance level). In the case of rejecting the null hypothesis, then the fixed effects model is preferred. Figure (4-2) summarises statistical tests that are used to decide which one of the three panel-based regression models is the most appropriate.

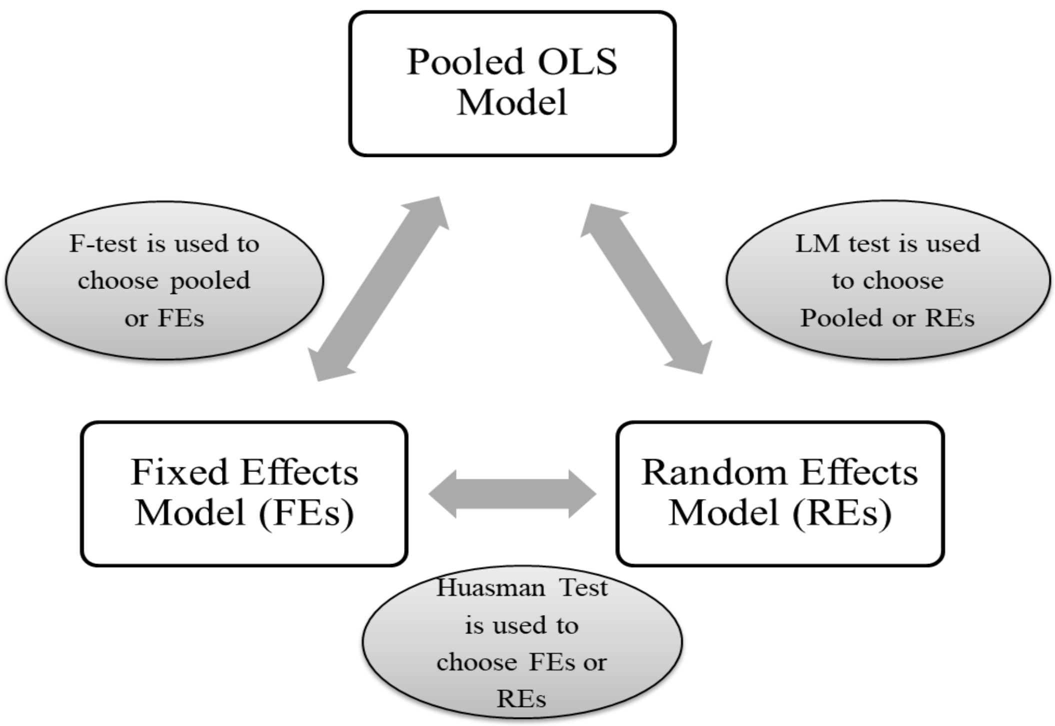


Figure 4-2: Statistical tests to select the most appropriate panel-based regression model
Source: made by the author

4.6 Regression Diagnostic Tests:

All the above models are based on certain core assumptions, mainly linearity, exogeneity, multicollinearity, homoskedasticity, and non-autocorrelation. Several statistical tools could be used to assess some of these underlying assumptions. These tools are a set of procedures that seek to ensure that the validity of the estimated models. These procedures are known as regression diagnostic tests. Diagnostic tests could include tests that aim to assess the validity of statistical assumptions for the underlying model. There are tests which also examine how the underlying estimated coefficients behave differently when the specifications of an underlying model are changed. These changes could be associated with a potential modification in specifications of a given underlying model or strengthening their validity of a given underlying model (Lu and White 2014). The following section summarises the main statistical tests that have been considered to assess the above three estimable regressions:

4.6.1 Testing for Heteroskedasticity, and Serial Correlation

All the above three designs of the panel based model are based on the assumptions of homoscedasticity and no serial correlation. The error term is assumed to be identically independent over cross-sectional observations (i) and unrelated over time. Baltagi (2001) argued that these assumptions are very restrictive for panel-based models. He pointed out that panel-based models contain different cross-sectional groups in which there is the potentiality of presence for a heteroscedasticity issue too. The latter refers to a possible variability of the variance in the composite error term as given variables change in the underlying model. The heteroskedasticity raises as a result of the variability of the variance in the composite error term whether in term of (σ_u^2) that is varying with the cross-sectional unit (i), or (σ_ε^2) is varying with the cross-sectional unit (i), or both (σ_u^2) and (σ_ε^2) are varying with the cross-sectional unit (i). From a preapical perspective, for example, the variation in the risk level or variation level across banks could differ across banks according to the size of the capital level.

The appearance of the heteroskedasticity results is critical because it results in having inefficient estimators and invalid standard errors (Moulton 1986).

On the other hand, Beck and Katz (1995) pointed out another limitation of the standard panel-based data is the potential appearance different degree of serial correlation due to the variation of cross-sectional groups. This view is also supported by Bell and Jones (2015) who argued that the hierarchical data structure is more likely to be dependent over time.[59] In addition, serial correlation issues could also be raised due to the inclusion of the time-invariant (∂_i) in the composite error term ($u_{i,t}$). These factors are assumed to be unobserved common factors (∂_i) and independent. However, if these common factors are correlated, the error term will no longer be independent; and hence these factors drive to serial correlation over the years for a given cross-sectional unit (Wooldridge 2006). The presence of the serial correlation in a linear model could cause biases in the standard errors and hence to have less efficient estimators especially in a dynamic model that contains lagged values of the dependent variable.

Therefore, testing for heteroskedasticity and serial correlation is critical.[60] The coefficient estimates will lose their efficiency due to lack of exploiting all information in an underlying variance structure when the heteroskedasticity and serial correlation issues are not considered while they exist in reality. In addition, the invalid standard errors cause biases in obtaining reliable p-values that are used in the statistical testing significance of the hypotheses, including hypotheses related to some diagnostic tests. Thus; ignoring testing these characteristics could result in incorrect judgments, and hence this is associated with type I error in which a true null hypothesis is rejected incorrectly. In the following section, discuss appropriate tests that could be used to verify these assumptions.

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[59] A hierarchal data structure is a data structure in which there are variables describing cross-sectional units, and these units are a part of a larger group.

[60] Inoue and Solon (2006) pointed out that most of the empirical studies, which adopted the fixed effects model, have not considered the serial correlation issue. This point is also supported by Kezdi (2003) who found that few empirical studies took serial correlation into account when estimating the standard errors.

4.6.1.A The heteroskedasticity Test:

The heteroskedasticity is tested based on the hypothesis that variances in the underlying model are the same across the whole sample. i.e.

$$H_0 : Var(u_{i,t}) = \sigma_i^2 = \sigma^2$$

This hypothesis is tested differently for the fixed effects model and the random effects model. Regarding the fixed effects model, this hypothesis is tested using the Modified Wald Test. This test examines variances in cross-sectional groups in a fixed effects model. Laskar and King (1997) found that this statistic has the advantage of being less sensitive to the violation of the normality assumption. If the p-value of this statistic is less than 0.05 (significance level), then the null hypothesis is rejected, and heteroskedasticity exists. Whereas, testing heteroskedasticity in the random effects model is complicated. Hsiao (2014) pointed out that modelling heterogeneity across groups (i) and over time (t) is one of the most challenging issues in the panel data analysis as it requires the knowledge about the way in which the composite error term processes. Nevertheless, the random effects model could be estimated using robust standard errors that account for both heteroskedasticity and serial correlation. Further discussion of the robust standard errors is elaborated in the next section (4.6.3).

4.6.1.B The Serial Correlation Tests:

The serial correlation is tested based on the hypothesis that there is no serial correlation in the underlying model. i.e.

$$H_0 : E(u_{i,t}u_{i,s}) = 0 \text{ , for all t > s}$$

There are a number of serial correlation tests are used for linear panel-based data. The Wooldridge test, which is proposed by Wooldridge in 2003, is suitable for short panels (where T < N) in both fixed effects and random effects models. This test also is suitable for both balanced and unbalanced datasets. It not affected by the appearance of the cross-sectional heteroskedasticity in the error term. Furthermore, Drukker (2003) found that the Wooldridge test has good size and power properties in a reasonable sample size. His analyses are based on a short panel with at least 1000 observations. If the p-value of Wooldridge statistic is less than 0.05 (significance level), then the null hypothesis is rejected, and the serial correlation exists.

4.6.2 Estimating Clustered Variance-Covariance

As discussed earlier, ignoring the possible appearance of the heteroscedastic or serial correlation model is crucial. It could result in having inefficient estimators, biased standard errors, and invalid statistical inferences. Hence, the standard Ordinary Least Squares (OLS) method would not provide optimal estimators when the errors are not identically distributed (i.e. heteroscedastic error), and/or they are dependent (i.e. correlated). In other words, the covariance variance matrix (Ω) is no longer a homoscedasticity-based structure and/or uncorrelated structure. Indeed, the estimated coefficients will be overestimated or underestimated the true coefficients (Bertrand et al., 2004; Petersen, 2009; Cameron and Miller, 2010). More importantly, biased estimators are associated with invalid OLS standard errors and invalid test statistics. Further adjustments need to be made in the underlying OLS model for the purpose of correcting the standard errors to obtain more efficient estimators and valid statistical inferences. These adjusted models are known as robust models that aim to provide accurate assessments when the standard models are miss-specified. Petersen (2009) pointed out that the best way, which is also adopted in empirical finance studies, to deal with a potential source of heteroscedastic and/or serial correlation in a given model is via using standard errors clustered by cross-sectional units (i).[61]

The clustered standard errors have the advantage of controlling for both correlations between observations that are grouped in a cluster and accounts for the general pattern for heteroskedasticity. Clustered standard errors are obtained via

[61] Petersen (2009) pointed out that the standard errors can be clustered by two approaches: clustering using one dimension only, which is cross-sectional units for the short-panel dataset, or clustering using two dimensions mainly cross-sectional units and time periods. The standard errors of both approaches are accounted to be unbiased. He argued that both approaches could be used in which standard errors clustered by two dimensions could be used as a robustness check for the other approach. His analyses are based on a short panel-based model that has a limited time periods (T) and a large number of cross-sectional units (N).

clustering a given dataset. Clustering is a statistical approach to subsampling observations to fall into one group that is known as a cluster. The identity of this cluster should not be changed over time, and within each cluster, there are a number of individual units. Wooldridge (2010, p.853) pointed out that the short panel dataset, where the number of crossectional units is more than time periods, can be used in a cluster-based model in which each cross-sectional unit is viewed as a cluster, and within each cluster, there are a number of time periods. The general form of a clustered model can be expressed in a panel-based framework as follow:

$$\boldsymbol{Y_{i,g} = \beta_k X_{i,g}^k + u_{i,g}}$$

(**Equation 4-9**)

Where, ($Y_{i,g}$) is (N_gx1) vector for the dependent variable, (i) refers to within cluster subscript that refers to time period in the panel-data framework (i =1, 2, ..., I), and (g) refers to number of clusters in the given dataset (g = 1, 2, …, G). Each cross-sectional unit is viewed as a cluster in the panel-data framework. ($\boldsymbol{X}_{i,g}^k$) is a matrix of (N_gx [K + 1]) vector of independent variables, and ($u_{i,g}$) is a (N_gx1) vector of the clustered error term. There are (N_g) observations within each cluster (g), and there are ($M = I * G$) observations in the entire sample. The clustered error term in this model is based on the following two main components mainly:

$$\boldsymbol{u_{i,g} = \partial_g + \varepsilon_{i,g}}$$

(**Equation 4-10**)

Where, (∂_g) is a cluster-specific error, and (ε_{ig}) is clustered idiosyncratic term for the cluster (g). The clustered error term is characterised to account for all the within-cluster correlations that could result from the presence of cluster-specific effects (∂_g) or due to correlation in random shock (ε_{ig}). Comparing to the standard variance-covariance structure, the clustered variance-covariance has the advantage of capturing the unspecified correlation between observations on the same cross-sectional unit (g) in different years (i) i.e. the correlation between ($u_{i,g}$) and ($u_{j,g}$) within each cross-sectional unit.

From an empirical perspective, a random sample of banks could contain responses of banks to a given policy ($x_{i,t}$) in which the effect of the underlying policy on the outcomes within a cluster might be correlated due to unobserved cluster-specific effects (e.g. macroeconomic, and governance factors that vary over time but they do not change across all entities.). These factors reflect heterogeneity at both bank-level dataset and country level dataset. It might be impractical to measure and include all these factors into a single regression. Having such unobserved fixed cluster-effects could make the impact of the underlying policy will not be only on an individual observation but, affecting a group of observations over time within each cluster. Thus; the cluster-robust standard error considers for the serial correlation within each cluster, and accordingly the overall clustered variance-covariance structure (Ω_g) accounts for both the variance of the clustered composite error term (i.e., $Var[u_{ig}]$) and its covariance (i.e. $Cov[u_{i,g}, u_{j,g}], j \neq i$). Neglecting the later, as it was the case in the standard panel-data linear model, leads to obtaining misleading standard errors.

Beside within-cluster correlation, the clustered variance-covariance (Ω_g) also has the advantage of accounting for an unknown form of a variance, i.e. it allows for the general pattern for the heteroskedasticity of the variance structure. The general pattern of the heteroskedasticity reflects for a possible variability of the variance in the composite error term change as a given variable change in the underlying model. Wooldridge (2010, p.867) pointed out that the clustered idiosyncratic term in the composite error term has a possibility of heteroskedasticity that could be a function of cluster-specific factors. The cluster-specific factors are common factors that reflect observed and unobserved heterogeneity factors of clusters in the sample.

Thus, the overall clustered variance-covariance is corrected to account both within cluster correlation and heteroscadisity factors. In the econometrics literature, different methods are adopted to estimate this unknown cluster-robust for the variance-covariance matrix that is also known as sandwich estimators due to the physical appearance of the calculation formal (see the below equation [4-11]). Petersen (2009) reviewed and compare different methods that are used to estimate standard errors in the appearance of within-cluster correlation in panel datasets. Wooldridge (2010, p.879) showed that the general form of the estimated heteroskedasticity autocorrelation consistent estimator for unknown covariance matrix with the cluster-robust option is defined as:

$$\boldsymbol{Var}[\widehat{\boldsymbol{\beta}}] = \left(\sum_{g=1}^{G} \boldsymbol{X_g}'\boldsymbol{W^{-1}}\boldsymbol{X_g}\right)^{-1}\boldsymbol{W^{-1}}\Omega_g\,\boldsymbol{W^{-1}}\left(\sum_{g=1}^{G} \boldsymbol{X_g}'\boldsymbol{W^{-1}}\boldsymbol{X_g}\right)^{-1}$$

(**Equation 4-11**)

Where, (X_g) is a matrix of all regressors for group g with a vector of (N_gx[1+K]), (W^{-1}) is weighting matrix that incorporate assumptions of heteroskedasticity and correlations, $\Omega_g = \sum_{g=1}^{G} X_g \hat{u}_{i,g}\hat{u}_{i,g}'{}' X_g$ in which ($\hat{u}_{i,g}$) is the observed residuals. This equation (4-11) does not require any specifications of a model's residuals. The residuals that are used in this equation refer to the residuals of a given underlying panel-based model. In other words, a pooled panel-based cluster model uses residuals of the pooled model, fixed-effects residuals are used at clustered fixed effect model, and random-effects residuals are used at the clustered random effect model.[62] The cluster-based model is based on the following core assumptions :

i. **Linearity Assumption**: the model in the population is a linear model that is estimated based on a random sample in a cross-sectional dimension.
ii. **Exogeneity Assumption**: the expected value of the clustered idiosyncratic term for (g) cluster ($\varepsilon_{i,g}$) in the estimated linear model is zero (E$\left(\varepsilon_{i,g} \middle| x_{i,g}, \partial_g\right)$)=0), and the observations in one cluster are independent from all observations in all other clusters but they are not assumed to be independent from observations within each cluster.
iii. **Multicollinearity Assumption**: no perfect linear relationships exist among the independent variables.

[62] The variance matrix estimator, which accounts for both the heteroscedasticity and the serial correlation robust, is computed in the Stata statistical package by using the command xtreg option cluster (name of cross-sectional unit).

iv. **Clustered Errors Assumption**: the variance of the error term is not constant for every ith observation. The clustered error term is allowed to have different variances (i.e. (Var$\left(u_{i,g} \middle| x_{i,g}, \partial_g\right) = \Omega_g$)).

v. **Autocorrelation Assumption**: there is no autocorrelation between clusters (E$\left(u_{i,g}u_{j,g'} \middle| x_{i,g}x_{j,g}\right) = 0$ for i≠j), but there is a constant interclass correlation between cluster (Correl($u_{i,g}u_{j,g'}$)$= \rho = \sigma_\partial^2/(\sigma_\partial^2 + \sigma_u^2) \neq 0$).

Based on these assumptions, the cluster error term ($u_{i,g}$) are considered to be independently and identically distributed (iid) with zero conditional means and homogeneous variance (0, σ^2). In addition, the treatment for the unobserved a cluster-specific error (∂_g) differs according to the framework of the underlying model: the pooled OLS model, the fixed-effects model, and the random-effects model.

4.6.3 Appropriateness of the Robust Fixed Effects Model relative to the Robust Random Effects model

After considering the clustered robust model, the decision of choosing the fixed effects model or random effects model will be based on a modified version of the Hausman Test. The standard Hausman test is based on the assumption that the error term is identically independently distributed. However, this assumption is no longer stands in case of appearance of the heteroskedasticity and/or serial correlation. Both (∂_g) and ($\varepsilon_{i,g}$) in the clustered robust model, which is defined in equation (4-9), are no longer homogeneous and uncorrelated. As pointed out earlier, the standard Hausman Test is based on the difference between the fixed effects estimator and random effects estimators. Wooldridge (2010, p.868) proposed an alternative approach to estimate the robust Hausman Test for a cluster-based random effects model. If the p-value of Wooldridge statistic is less than 0.05 (i.e. significance level), then the fixed effects model is preferred.[63] Hoechle (2007) pointed out that this test could be used even in the appearance of the cross-sectional dependence.

[63] The test for robust Hausman Test can be obtained at the Stata Statistical Software via using the command xtoverid.

4.6.4 Testing for Time-Fixed Effects

Time effects dummies are required to be included in the fixed effects model for the purpose of capturing the potential aggregate influence of time-fixed effects. The time-fixed effects could explain temporal variations in a dependent variable at a particular time. Ignoring these effects, if they exist, could result in having biased estimates.[64] The Wald statistic can be used to examine the existence of time-fixed effects. This statistic is based on the concept of comparing the differences between the two models. One model accounts for the inclusion of joint parameters, while the second model is restricted to remove them. The Wald statistic characterized to be valid even once the normality assumption is not met and the data is unbalanced (Baum 2001). A significant Wald-test implies that the time-fixed effects are non-zero, and hence they are required to bed included in the model. If the p-value of this statistic is less than 0.05 (i.e. significance level), then time-fixed effects need to be included in the model.

4.7 Summary and the Overall Research Method Framework:

This chapter aims to identify the most appropriate methodology to be followed in this research to perform the empirical work that answers the research questions and achieve the objectives. The research aims to investigate the impact of the capital on risk and banking performance. Research methods in data collection and analysis are based on a quantitative deductive approach. The quantitative research variables are collected primarily from secondary sources of data. The sources of the data in this research are "bankscope" database and annual reports of central banks. Different quantitative analyses are used to perform the empirical work and obtain conclusive findings and answer the research questions.

[64] Wooldridge (2006) pointed out that inclusion of the time fixed effects is equivalent to estimating the fixed effects model using two-way effects that account for both allows for the intercepts to vary over entities (i) and time (t) too.

The quantitative analyses, which are used to test the underlying hypotheses empirically, are conducted using univariate analysis, bivariate analysis, and multivariate analysis respectively. The univariate analysis is an analysis of one variable. It provides a summary for each variable in the sample. This analysis aims to have a general view of the major characteristics of each variable. These characteristics presented in the form of a statistical summary. These statistics include the mean, median, minimum and maximum values. These values indicate the central tendency of each variable. In addition, the value of standard deviation is reported to get an indication about variance among observations of each variable. All the previous statistics are also reported for two subsamples which are obtained by dividing the main sample into Organisation for Economic Cooperation and Development (OECD) counties vs the Middle East and North Africa (MENA) countries. The purpose of this sub-classification refers to comparative purposes.

Beside the univariate analysis, there will be a bivariate analysis that provides a summary of the potential relationship between pairs of variables in the sample. This analysis aims to examine the degree of correlation that could exist between any two independent variables in a regression model. The Pearson Correlation Coefficient (PCC) is the main analytical tools that are used to measure the degree of the

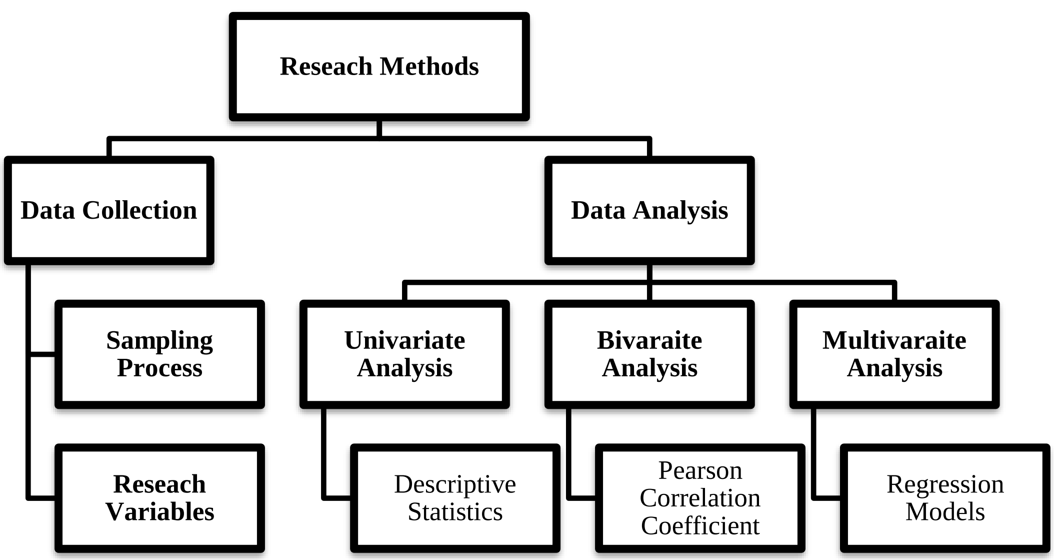

Figure 4-3: The Research Methods
Source: made by the author

correlation. Both univariate analysis and bivariate analysis are pre-posted analyses that are conducted before the multivariate analysis. The multivariate analysis uses more than two variables to describe a given dataset using statistical tools. A regression model is a primary tool in the multivariate analysis. It is used to examine potential changes in a dependent variable as a result of changes in the independent variables.

This research is based on short panel-based regressions, where the number of cross-sectional units (N) is more than the number of time periods (T). Instead of investigating research questions in a single particular regression model, which could be associated to with several limitations, three standard forms of panel-based regression models are considered mainly: pooled OLS model, fixed effects model, and random effects model. Section 4.3 presents how these three forms of the models differ in term of their treatment for individual-specific effects. Section 4.4 specifies the main criteria that are considered to select the most appropriate method of estimation for this research. The selection for the most appropriate model will also be made based on statistical mechanisms that examine the potential existence of the individual effects in an underlying model relative to other as discussed in Section 4.5.

These models are estimated using the Ordinary Least Squares (OLS) method. This method is commonly used in the literature, and it is used in this research as starting standard method of estimation. Nevertheless, the OLS is based on restrictive assumptions, and these assumptions need to be verified. A number of regression diagnostic tests will be made to ensure that the validity of adopted assumptions to estimate the coefficients. Section 4.6 provided further details of all statistical tests that are used in this research. These diagnostic tests are the primary guidelines to select the most appropriate estimation method. There are different methods for estimating a given regression. A summary of the overall research methods that are used in the data collection and analysis is summarized in Figure (4-5). The following diagram (4-6) presents the overall framework for the research methodology adopted to conduct this research. The next chapter will discuss the empirical results of this research.

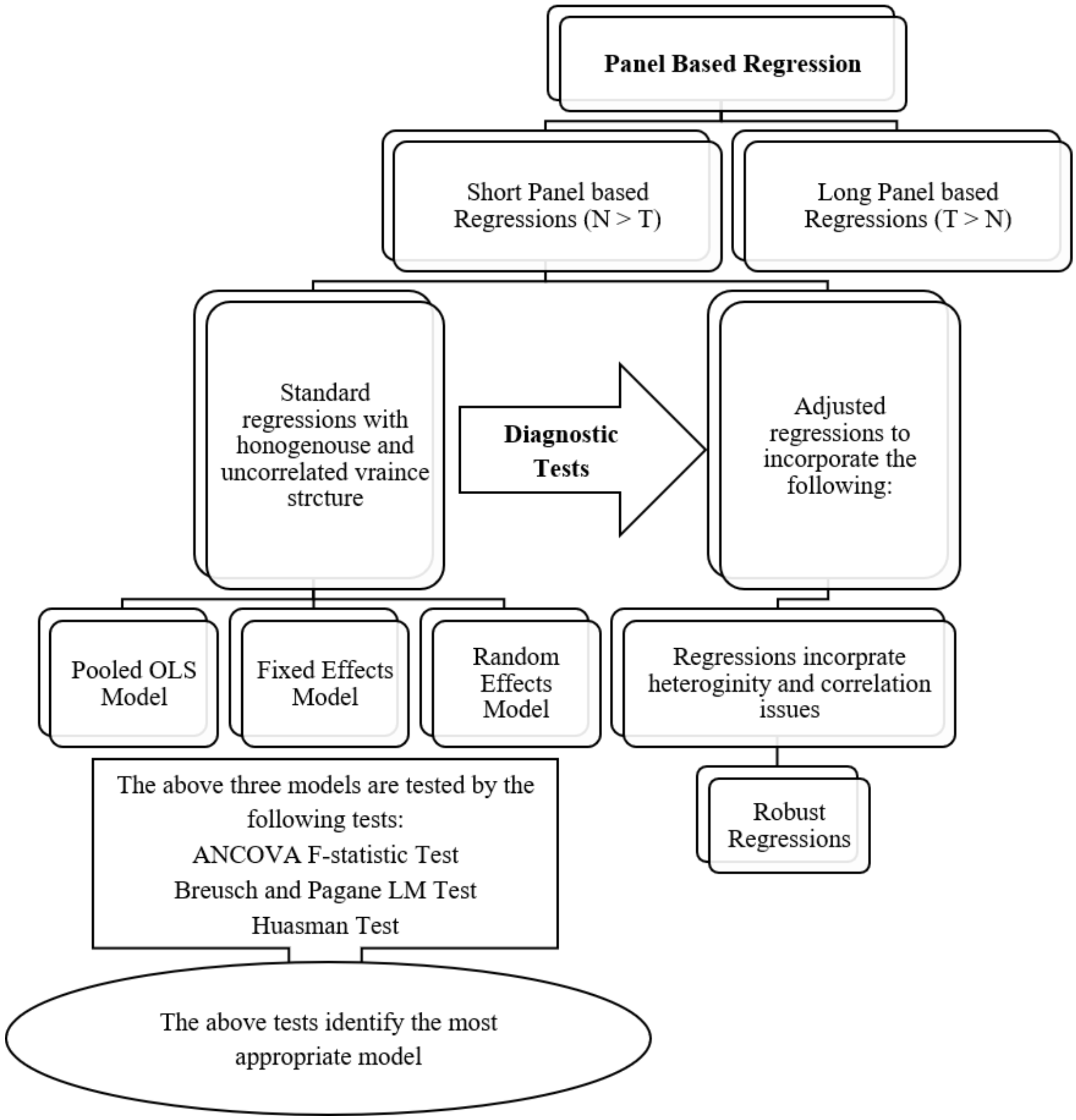

Figure 4-4: The Reseach Methodology Framework

Source: made by the author

Chapter Five: Empirical Results and Discussions on the Impact of the Capital on Banking Risk

A. Does Ownership Matter?

B. Impact of Changes in the Basel Accords?

C. Does Economic and Financial Development Level of Countries Matter?

5 Chapter 5: Empirical Results and Discussions on the Impact of Capital on Banking Risk

5.1 Introduction

This chapter presents empirical evidence on the risk-taking behaviour in banking over the sample period 2003 to 2014. This period covers the recent reforms in the Basel Accords framework. These reforms aim to maintain the stability of the banking system via the use of banking capital as one of the major micro-prudential tools to improve the bank's ability to absorb potential exposures. This prudential tool has been developed to reflect the riskiness of banking assets in which banks are required to increase their capital level when they are involved in more risky assets. Such a requirement is imposed to constrain banking exposures until more capital is provided. So, it is natural to observe that all the recent reforms of the Basel Accords have paid more attention to increase the quality and quantity of the capital requirements. However, does a capital requirement play a role in influencing the risk-taking behaviour to enhance the stability of the banking sector? This question is the primary focus of this chapter.

The chapter aims to examine the relationship between the capital level and risk to assess the impact of the capital on the banking risk-taking behaviour. This relationship is also examined for banks that experienced a different level of regulatory pressure. Over the last two decades, banks have experienced remarkable regulatory reforms. Banks are required by law to meet the requirements of the Basel Accords II, Basel Accords II.5, and Basel Accords III. Some banks are pressurised to meet these reforms more than others. As stated earlier in Chapter Four, this research adopts different approaches to measure regulatory pressure. The regulatory pressure is examined using four different approaches as follow:[65]

> **Model 1**: examines the regulatory pressure as captured by the variable (REGU) for undercapitalised banks and the variable (REGO) for better-

[65] A further discussion on the measurement of each approach is discussed in Chapter Four "*Research Methodology*".

capitalised banks. Both variables are defined according to Jacques and Nigro's approach.

Model 2: examines the regulatory pressure as captured by a dummy variable (PCAU) for undercapitalised banks. Those banks are defined as per the Prompt Corrective Action (PCA) approach.

Model 3: examines the regulatory pressure as captured by a dummy variable (REG-Ediz) that indicates for pressured banks as defined by the according to the probabilistic approach.

Model 4: examines the regulatory pressure as captured by a dummy variable (REG-mcr) that indicates for better-capitalised banks in which they have a regulatory risk-based-capital ratio above the minimum capital requirement.

Each of the above approaches is examined in a separate model. These models are also used to examine the capital-risk nexus with consideration for the differential in the ownership nature, regulatory pressure periods, and level of economic and financial development of countries.

The analysis in this chapter is based on a panel dataset comprising 446 banks in which 235 commercial banks from the Organisation for Economic Corporation and Development (OECD) countries, and 211 commercial banks from the Middle East and North Africa (MENA) countries over the sample period 2003 to 2014. The relationship between the capital and risk-taking level is estimated using the Equation (4-2) in which the risk level is the dependent variable. The risk level is examined using two different proxies: non-performing loans (NPLs) ratio, and risk-weighted asset (RWAs) ratio. As for explanatory variables, a set of four variables are used to examine variation in the risk level: bank size, the profitability of banks, diversification level, and regulatory pressure. Table (4-1) summarise the definition of each variable that is used in this chapter. Table (4-1) also includes adopted abbreviations for each variable that is used frequently in the remaining part of the chapter.

The remainder of the chapter is organised as follows. Section 5.2 compares data from different subsamples and test for significant differences in the means of the subsamples. Section 5.3 presents descriptive statistics for the variables that are used in the data analysis, and section 5.4 shows results of the bivariate analysis that aims to explore the degree of correlation that could exist between any two independent variables in a regression model to assess multicollinearity issues. The empirical results of regression analysis and discussion are presented in section 5.5. The chapter ends with a summary of the empirical results in section 5.6.

5.2Comparison Data of Different Groups

As a part of data analysis, the dataset is examined to assess if there are any significant differences in means in the given dataset. The research chapter will examine the capital-risk nexus in different perspectives, including ownership profile and countries with different economic and financial development levels. From the ownership perspective, this research chapter considers examining the capital- risk nexus in listed banks versus unlisted banks. A subsample of domestic-owned banks versus foreign-owned banks is also another aspect of ownership profile that is accounted for this research chapter. In term of the economic and financial development levels, the research examines the variation in the capital- risk nexus in banks operating in the OECD countries versus banks in the MENA countries. A parametric t-statistic and non-parametric Wilcoxon rank-sum (WRS) test are used to assess if there are any significant differences in means of two subsamples to obtain the robust result.[66] In case there is a difference between results for these two tests, this research will depend on the results of the non-parametric test, i.e., the WRS test. The WRS is valid for any form of distribution, and it is less sensitive to outliers (Wild Chris 1997).

Table 5-1 reports results of t-statistics for all underlying variables, while Table 5-2 shows the results of the WRS. Both tests are conducted to examine statistical

[66] Further details about t-test statistics and Wilcoxon Rank-Sum test is provided in Appendix IV.

Table 5-1: Test of differences in means using t-test:
This table presents the results of t-statistics test that is used to test statistical differences between the underlying subsamples. The null hypothesis of the t-statistics is $H_0: \mu_i - \mu_j = 0$, i.e., there is no difference in means between two subsamples. This test is conducted for each variable. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1).
Key result: the results report the statistical difference in means of the risk indicators among banks that have different ownership profile and banks that are operating in countries with different economic and financial developed level.

Univariate Statistics	NPLs /Assets	RWAs /Assets	EA Ratio	Log Assets	ROA	NII Ratio	Inflation Rate	GDP Growth Rate
Panel (A): Difference in Mean between the listed banks and unlisted banks (t-test) +								
Diff. Mean	0.0005	0.0108	1.4621 ***	-0.1493 ***	-0.0020 ***	-0.0276 ***	-0.0649	-0.6561 ***
p-value	(0.7048)	(0.5797)	(**0.0000**)	(**0.0000**)	(**0.0044**)	(**0.0000**)	(0.6054)	(**0.0000**)
Panel (B): Difference in Mean between the domestic banks and foreign banks (t-test) +								
Diff. Mean	0.0091 ***	-0.0616 ***	1.3635 ***	-0.6232 ***	0.0003	-0.0156 ***	0.8338 ***	0.4649 ***
p-value	(**0.0000**)	(**0.0195**)	(**0.0011**)	(**0.0000**)	(0.7771)	(**0.0185**)	(**0.0000**)	(**0.0147**)
Panel (C): Difference in Mean between the OECD banks and the MENA banks (t-test) +								
Diff. Mean	-0.0279 ***	-0.1115 ***	-8.7037 ***	1.7571 ***	-0.0109 ***	-0.0186 ***	-3.7782 ***	-3.4381 ***
p-value	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0004**)	(**0.0000**)	(**0.0000**)

Data source: Bankscope version 56th, 2015; World Banks Database as on December 2015
+ t-test for difference in means is conducted on the confidence level of 90%, 95%, and 99% using two-tailed tests. (*), (**), (***) indicates rejection of the null hypothesis at the 10, 5, 1% significance levels, respectively.

differences in means of all underlying variables for the following three subgroups that are considered in this research chapter:

A) Listed banks versus unlisted banks.
B) Domestic-owned banks versus foreign-owned banks.
C) Banks in the OECD countries versus those in the MENA countries.

As regards to subsamples of listed banks versus unlisted banks, the t-statistic test shows that there is no significant difference in means of the non-performing loans ratio, and the ratio of risk-weighted assets between subsamples of listed banks versus unlisted banks (see panel A at Table 5-1). However, the non-parametric WRS test shows that both risk indicators, which are the non-performing loans ratio, and risk-weighted assets ratio, are significantly different (panel A at Table 5-2). Both the t-statistic test and WRS test show that there is a significant difference in means of all other controlling variables except the inflation rate which is macroeconomic controlling variable. The t-statistic test shows that there is no statistically significant difference in means of the inflation rate in the underlying subsamples.

About foreign-owned banks versus domestic-owned banks, the results of the t-statistics test and WRS test were not consistent. The t-statistics test shows that there is a significant difference in means of two risk indicators, mainly non-performing loans ratio and risk-weighted assets ratio at a significant level of 1% (panel B at Table 5-1). On the other hand, the WRS test shows that the NPLs ratio has a statistically significant difference in means of domestic banks versus foreign banks (panel B at Table 5-2). The WRS test did not find a significant difference in means of risk-weighted assets

Table 5-2: Test of differences in means using WRT:
This table presents the results of the non-parametric Wilcoxon rank-sum test that is used to test statistical differences between the underlying subsamples. The null hypothesis of the Wilcoxon rank-sum test is $H_0: \mu_i = \mu_j$, i.e. the means of both samples are the same. This test is conducted for each variable. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1).

Key results: the results report the statistical difference in means of the risk indicators among banks that have different ownership profile and banks that are operating in countries with different economic and financial developed level.

Wilcoxon Rank-Sum test	NPLs /Assets	RWAs /Assets	EA Ratio	Log Assets	ROA Ratio	NII Ratio	Inflation Rate	GDP Growth Rate
Panel (A): Difference in Mean between the listed banks and unlisted banks+								
rank sum (1): listed banks	4623029	2363950	5954864	5965825	6374805	599522	5936748	6539974
rank sum (2): unlisted banks	4401847	1851206	7308961	7473695	6914785	691052	8185207	7763252
n1	2058	1563	2227	2241	2234	2208	2290	2324
n2	2190	1340	2923	2943	2921	2872	3024	3024
z-score	-6.2780	-4.1960	-4.1470	-2.9230	-11.625	-7.4450	2.6890	-5.7970
p-value	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0035**)	(**0.0000**)	(**0.0000**)	(**0.0072**)	(**0.0000**)
Panel (B): Difference in Mean between the domestic banks and foreign banks+								
rank sum (1): domestic banks	7011246	3550731	10291513	1148678	1052074	104004	1090424	11214381
rank sum (2): foreign banks	2013630	664425	2972313	1952739	2768850	250538	3217713	3088845
n1	3428	2431	4144	4176	4152	4086	4284	4308
n2	820	472	1006	1008	1003	994	1030	1040
z-score	8.6070	-1.2550	9.0150	-15.487	4.3290	-0.4790	10.869	6.8780
p-value	(**0.0000**)	(0.2093)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.6317)	(**0.0000**)	(**0.0000**)
Panel (C): Difference in Mean between the OECD banks and the MENA banks+								
rank sum (1): the MENA	5372920	1764374	8210849	3282708	7822345	619752	8585976	8949635
rank sum (2): the OECD	3651956	2450782	5052976	10156812	5467246	670822	5535979	5353591
n1	1941	981	2469	2478	2459	2399	2494	2528
n2	2307	1922	2681	2706	2696	2681	2820	2820
z-score	-31.374	-15.915	-34.7430	58.3630	-27.7870	-1.9710	-35.0860	-38.8240
p-value	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0487**)	(**0.0000**)	(**0.0000**)

Data source: Bankscope version 56th, 2015; World Banks Database as on December 2015
+ p-value for difference in means is conducted on the confidence level of 90%, 95%, and 99% using two-tailed tests. (*), (**), (***) indicates rejection of the null hypothesis at the 10, 5, 1% significance levels, respectively.

ratio. It is observed that this result is based on 472 observations due to missing values in a subsample of foreign-owned banks. In term of bank-level controlling variables, the results of both tests were not consistent. Based on the non- parametric test, the WRS test shows that all controlling variables have a statistically significant difference in means except in the ratio of total capital to assets and ratio of non-interest income to total income (NII ratio).

In respects to subsamples of banks operating in the OECD countries versus banks in the MENA countries, the results of t-test statistic report a significant difference in mean values for all variables between banks operating in the OECD countries and Banks in the MENA countries at a significant level of 1% (panel C in Table 5-1). The WRS test supports the same results. Overall, the above results report a statistical difference in means of the risk indicators among banks that have different ownership profile and those that are operating in countries with different economic and financial developed levels. Aligned with the objectives of this research chapter, the ownership profile, and economic and financial development levels are considered to examine the influence of the regulatory capital on the banking risk-taking behaviour.

5.3Descriptive Statistics

Table 5-3 reports the descriptive statistics of both dependent and independent variables using a panel dataset comprising 446 banks for 12 annual periods (2003 to 2014). These banks are from both the OECD countries and the MENA countries. From the descriptive statistical information, it is observed that the sample includes banks with a different level of non-performing loans (NPLs) ratio. The sample includes banks that have a different level of risk as measured by the NPLs ratio and RWAs ratio. On average, the banks have NPLs of 2.56% out of their total assets, and 66.61% of their assets are risk-weighted assets. These values differ slightly from the value of median, and this difference reflects the existences of differences in the risk level as indicated by the maximum and minimum values in Table 5-3. The sample includes banks that have the NPLs (RWAs) as low as 0.0010% (0.0070%) out of the total assets to banks with the highest level of the NPLs reaching up to 0.8707 (10.71) times total assets. On average, banks in the MENA were found to be riskier compared to banks in the OECD countries over the sample period 2003 to 2014.

In term of the capital level, the sample includes various banks that have an average equity level as much as 11.50 times of the total asset level with a maximum level of 99.44 times and a minimum level of -15.69 times.[67] At the same time, it is observed that banks in the MENA countries have, on average, a higher equity level than those in the OECD countries. The average of banking equity level in the MENA countries is about 16.03 times of the total assets (with a maximum of 99.44 times and minimum of -15.69 times), while the equity level is approximately 7.32 times of the total assets in the OECD countries (with a maximum of 80.55 times and minimum of -10.96 times). The sample also includes banks of different sizes. The bank size, which is measured in logarithm form of the total assets in the USD, ranges from 9.58

Table 5-3: Descriptive Statistics:
This table presents the descriptive statistics of both dependent and independent variables. These variables are measured based on an unbalanced dataset that contains annual observations of 446 banks over the period 2003 to 2014. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). Appendix V presents descriptive statistics for each variable per year.

Univariate Statistics	NPLs /Assets	RWAs /Assets	EA Ratio	Log Assets	ROA	NII Ratio	Inflation Rate	GDP Growth Rate
Panel (A): All Banks								
Obs.	4,248	2,903	5,150	5,184	5,155	5,080	5,314	5,348
Mean	0.0256	0.6661	11.4965	7.1774	0.0215	0.2452	3.8189	3.1241
Median	0.0139	0.6221	8.6900	7.4889	0.0161	0.2101	2.7855	2.6666
Std. Div.	0.0425	0.5245	11.9226	1.1205	0.0253	0.1873	4.5338	5.5166
Max	0.8707	10.7068	99.4400	9.5807	0.4904	0.9982	53.2310	104.4868
Min	0.0001	0.0007	-15.6900	3.7867	-0.1224	-0.7043	-10.0675	-62.0759
Panel (B): OECD's Banks								
Obs.	2,307	1,922	2,681	2,706	2,696	2,681	2,820	2,820
Mean	0.0128	0.6285	7.3238	8.0173	0.0163	0.2346	2.0457	1.4989
Median	0.0095	0.5655	6.1400	7.9022	0.0103	0.2109	2.0693	1.9724
Std. Div.	0.0136	0.6100	5.4516	0.5797	0.0224	0.1873	1.7357	2.2722
Max	0.1507	10.7068	80.5500	9.5807	0.3212	0.9721	12.6575	8.3956
Min	0.0005	0.0029	-10.9600	3.8108	-0.0771	-0.7043	-4.4799	-9.1325
Panel (C): MENA's Banks								
Obs.	1,941	981	2,469	2,478	2,459	2,399	2,494	2,528
Mean	0.0407	0.7399	16.0274	6.2602	0.0272	0.2550	5.8239	4.9370
Median	0.0242	0.7104	12.0900	6.2615	0.0235	0.2086	4.4905	4.4717
Std. Div.	0.0575	0.2775	14.9946	0.8050	0.0269	01867	5.7290	7.2387
Max	0.8707	3.6325	99.4400	8.0858	0.4904	0.9982	53.2310	104.4868
Min	0.0001	0.0007	-15.6900	3.7867	-0.1224	-0.5517	-10.0675	-62.0759

Data source: Bankscope version 56th, 2015; World Banks Database as on December 2015

[67] The negative value of the equity level reflects the potential accumulated losses in a given bank.

to 3.79 with an average value of 7.18. The descriptive summary (Table 5-3) also reports that banks on average are profitable with Return on Assets (ROA) ratio of 2.15 %. However, there are considerable differences among the profitable banks in which the highest level of the ROA reaches up to 49% out of the total assets, while the lowest level of the ROA is about -12% out of the total assets. In term of the diversification level, banks found investing in non-interest-based activities account for about 24.52 % out of total operating income. There are banks obtaining a profitable non-interest income as high as 99.82 % of the total operating income. Others made losses from these activities as much as -70.43 % of total operating income. On average, banks in the MENA found to be more profitable (as indicated by ROA ratio) and more invested in non-interest income (as indicated by NII ratio) compared to banks in the OECD countries over the sample period as indicated by mean values of ROA and NII in Table 5-3.

The table also shows the descriptive summary of macroeconomic variables. The sample includes diverse countries with different economic conditions. The average of the inflation rate, which is an indicator of the price stability of goods and services, is 3.82% (with a maximum rate of 53.23% and minimum of -10.07%). The MENA countries reported a higher inflation rate over the sample period. The average inflation rate in the MENA countries over the last 12 years is 5.82 % with a deviation of 5.73%, while the average inflation rate in the OECD countries is 2.05% with the deviation of 1.74 % over the same period. The high deviation in the sample indicates that the high variation among countries that are included in the sample. These countries also vary in term of economic growth. The average GDP growth rate for the whole sample is 3.12 %. Yet, the average value in the OECD countries is approximately 1.50% with a standard deviation of 2.27% comparing to 4.94% with the standard deviation of 7.24% in the MENA countries.

The above descriptive summary presents the central tendency of the underlying variables in the sample. Table 5-3 also reports the median, which is the midpoint of a dataset, of each variable. It is observed that there is no high deviation between the mean value and median value in most of the variables. The median is, by definition, less affected by outliers compared to the mean values. The closeness of the mean value to the median value indicates that there is less likely to be extreme values in a given dataset. The given deviations between the mean and median value might reflect the characteristics of banks in the sample. The sample includes banks from countries from a different level of economic and financial development.[68] In addition, Table 5-3 reports the spread of data via standard deviation statistics. Standard deviation reflects the spread out of a given data from the mean value. It is observed that there is not a very high deviation from the mean values.

5.4Bivariate Analysis:

The bivariate analysis aims to examine if there are any multicollinearity issues for a group of the variables that are adopted to examine the research hypothesis. Table 5-4 reports correlation coefficients for the set of the underlying variables, and these coefficients are measured according to the Pearson Correlation Method using the whole sample dataset over the period 2003 to 2014. Most of the correlation coefficients, especially the correlation between dependent variables and independent variables, were found to be statistically significant at 1%. The correlation matrix below shows that there is a significant positive relationship between the risk indicators, which is measured by the NPLs/Assets ratio and RWAs/Assets ratio, and the capital level, which is measured by the Equity/Assets ratio, at the significant level of 1%. The highest correlation coefficients between the dependent variables (i.e., NPLs ratio and RWAs ratio) and other independent variables were found to be less than 40%. However, most of the coefficients are below 17% except for three. The three coefficients are the association between (log assets and NPLs ratio at 39%), (NII ratio and RWAs ratio at 28%), and (Equity ratio and NPLs ratio at 26%). However, all these coefficients were found to be less if the subsamples of the OECD banks and the MENA banks are considered.[69] For instance, the correlation coefficient between the NPLs/Asset and the Log assets, which is reported as 39.05% for the whole sample, is

[68] As a robust test, a percentile approach could be used to test if the results of a given sample will affected in case removing a certain percentage of observations.

[69] Appendix VI reports the coefficient values for each subsample.

Table 5-4: Pearson Correlation Matrix:
This table reports correlation coefficients for the variables that are based on the sample of 466 banks over the period of 2003 to 2014 using Pearson Method. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). Appendix VI presents the correlation matrix for two subsamples: banks at the OECD's countries and the MENA countries.

	NPLs / Assets	RWAs / Assets	Equity / Assets	Log Assets	ROA Ratio	NII Ratio	REGU	REGO	PCAU
NPLs to Assets	1								
RWAs to Assets	0.1514***	1							
Equity / Assets	0.2616***	0.1685***	1						
Log Assets	-0.3905***	-0.1693***	-0.3927***	1					
ROA Ratio	0.1562***	0.1593***	0.2992***	-0.2347***	1				
NII Ratio	0.0155	0.2767***	0.1780***	-0.0940***	0.1717***	1			
REGU	0.0083	0.0146	0.0230	-0.0282*	0.0411**	0.0377**	1		
REGO	-0.1279***	-0.0989***	-0.1932***	-0.2881***	-0.1063***	-0.0379**	-0.1714***	1	
PCAU	-0.0525***	-0.0747***	-0.0606***	0.1721***	-0.0362**	0.0371**	0.1830***	-0.1419***	1
REG-Ediz	0.0151	0.0611***	0.0936***	-0.0127	0.0501***	0.0279	0.0996***	-0.6258***	0.1107***
REG-mcr	-0.0568***	-0.0648***	-0.1165***	0.1469***	-0.0912***	-0.0652***	-0.3402***	0.5039***	-0.5379***
Inflation Rate	0.1369***	0.0291	0.1001***	-0.3947***	0.1010***	0.1168***	0.0113	-1401***	0.0414**
GDP Growth Rate	0.1005***	0.0776***	0.1651***	-0.2155***	0.0655***	0.0770***	0.0169	-0.1378***	0.1107***

Notes:
(*), (**), and (***) indicates for the statistical significance level at 1, 5, and 10 % respectively.

Continued Table 5-4

	REG-Ediz	REG-mcr	Inflation Rate	GDP Growth Rate
REG-Ediz	1			
REG-mcr	-0.2927***	1		
Inflation Rate	-0.0043	-0.0224	1	
GDP Growth Rate	0.0568***	-0.0721***	0.1708***	1

Notes:
(*), (**), and (***) indicates for the statistically significance level at 1, 5, and 10 % respectively.

found to be about -17.52% in the subsample of the OECD banks, while it's found to be -26.98% in the MENA banks at a significant level of 1%. This result reflects the significant relationship between bank size and the level of NPLs in the MENA countries (Refer to Appendix VI).

Similarly, the correlation Equity ratio and NPLs ratio, which is reported as 26% for the whole sample, is found to be 13% in the subsample of the OECD banks and 15% for the MENA banks. While the correlation coefficient of NII ratio and RWAs ratio was found to be at 28% and 25% in the OECD banks and the MENA banks respectively (Refer to Appendix VI). The literature has not defined a specific level of this coefficient that could be referred to conclude the existences of the multicollinearity issue (Wooldridge 2003, p.98). Yet, some authors suggested that 0.90 - 0.80 as a cut-off to indicate a high degree of correlation (e.g. (Mason and Perreault, 1991; Kennedy, 1992)), while others consider 0.70 to be an indicator of high correlation (e.g. Tabachnick and Fidell 2013). Given these indicators, the coefficients in Table 5-4 are not reflecting critical issues in multicollinearity.

In short, all the above sections highlight characteristics of the underlying variables. The t-statistic test and the Wilcoxon rank-sum, which are discussed in section (5.2), show that there is a significant difference in means of key variables, both dependent and independent variables, between banks from different ownership profiles and countries with different economic and financial development levels. A descriptive summary of the underlying variables was presented in Section (5.3). In addition, the results of the bivariate analysis provide evidence of a significant association between the risk level and each of the independent variables as shown in Section (5.4). In the next section, all the above variables are used to conduct the multivariate analysis in the form of regression models to assess the research hypotheses.

5.5Empirical Analysis:

This section will discuss the empirical results of the multivariate analysis that aims to examine the impact of the capital on the risk-taking behaviour of banks. This capital-risk nexus is examined using multiple regression analysis. This analysis is carried out using the equation (4-2) that considers a number of variables to obtain a better understanding of the capital-risk nexus. This regression analysis is based on a sample that contains banks from both the OECD and the MENA countries over the sample period 2003 to 2014. This sample is used to assess the research hypotheses, which were discussed in Chapter Three, and answer the research questions. The summary of research hypotheses is given in Table (3-1). The following sections will present the empirical results for each hypothesis.

Before reporting the empirical results, note that Appendix VII presented the details on procedures and results of statistical tests that are carried out to identify the most appropriate panel-based model. The statistical tests show that firm-level clustered-based random effects model is the most appropriate. There are two indicators used to assess the goodness of a model; Wald statistics and R-squared. The goodness of the model refers to the fitness of a given statistical model to summarise how well the regression line fits a given set of observations in a sample as pointed out by Wooldridge (2002). The fitness requires accounting for non-zero variables. The descriptive statistics show that all variables are non-zero variables. Besides, The Wald chi-square statistic test provides an indicator of whether a given set of dependent and independent variables are significantly different from zeros. It is based on the null hypothesis that all the coefficients in the model are zero.[70] R-squared, which is a primary tool to measure the fitness of a model, is a percentage of sample variations in the dependent variable that is explained by independent variables (Wooldridge 2002, p.40). It ranges between zero and one. The following parts present the empirical results of firm-level clustered-based random effects model. The Wald chi-square statistic and R-square are reported in panel (B) of each table.

[70] If the p-value is less than the significance level (i.e., 0.0500), then there is no evidence to accept the null hypothesis, and the coefficients in the model are non-zero values.

5.5.1 The relationship between the capital level and risk: Moral Hazard Hypothesis versus Regulatory Hypothesis

This section assesses the impact of the bank capital on the risk level. This relationship is examined using two risk-based indicators: the non-performing loans (NPLs) ratio, and risk-weighted asset (RWA) ratio. The former indicator focuses on the quality of lending activities, while the latter is a more comprehensive risk indicator that captures both allocation of assets across different risk categories and the quality of loans. These ratios are expected to provide useful information on banking exposures in both lending and non-lending activities. According to the moral hazard hypothesis; a negative relationship exists between the capital level and risk level. The regulatory requirements require banks to assess their asset risk and subsequently impose more capital. Managers are demotivated to involve excessive risk until further capital levels are provided. This hypothesis is tested using the entire sample that aggregates banks with different ownership profiles during the sample period 2003 to 2014.

The panel (A) in Table 5-5 reports the baseline results of the regression analysis that assesses the impact of the capital on the risk level and determinants of risk-taking behaviour. The risk level is measured by the NPLs ratio (for models from one to four) and the RWAs ratio (for models from five to eight). As stated earlier, there are four models estimated using the same dependent variable. Each model represents the regression model that accounted for one of the adopted approaches to identify regulatory pressured banks as clarified previously in Section 5.2. Table 5-5 shows an insignificant adverse effect of the capital level (Equity/Asset ratio) on the credit risk (NPLs/Asset ratio) in all models. The quantitative effect of the capital coefficient is also relatively low. The coefficient was found to be -0.0002, implying a 1% increase in the capital level reduces the riskiness of lending assets by 0.02%. This finding is consistent with Aggarwal and Jacques (2001); Agusman (2008); Fiordelisi et al. (2011); Delis et al. (2012); and Shim (2013) who reported an insignificant negative relationship between capital level (as measured by equity ratio) and credit risk (measured by NPLs ratio). This insignificant result implies that there is a need to

Table 5-5: Relationship between the capital level and risk (all banks) over the sample (2003 to 2014)**:**
The dependent variables are proxies for risk level as measured by non-performing loans (NPLs/Asset) ratio and risk-weighted asset (RWAs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. Model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on the whole sample

	Robust clustered Random Effects Model							
	Estimated Models using NPLs/Asset as a dependent variable				**Estimated Models using RWAs/Asset as a dependent variable**			
	1 Coeff. (p- value)	**2** Coeff. (p- value)	**3** Coeff. (p- value)	**4** Coeff. (p- value)	**5** Coeff. (p- value)	**6** Coeff. (p- value)	**7** Coeff. (p- value)	**8** Coeff. (p- value)
Capital: Equity/Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	0.0060 ***	0.0060 ***	0.0061 ***	0.0061 ***
	(0.3420)	(0.3520)	(0.3500)	(0.3520)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Size: log Assets	-0.0169 ***	-0.0169 ***	-0.0168 ***	-0.0167 ***	0.0203	0.0185	0.0196	0.0207
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.3538)	(0.3982)	(0.3770)	(0.3488)
Profitability: ROA Ratio	0.3172 ***	0.3159 ***	0.3165 ***	0.3169 ***	0.2485	0.2485	0.2453	0.2602
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.6424)	(0.6422)	(0.6459)	(0.6275)
Diversification: NII Ratio	-0.0029	-0.0029	-0.0028	-0.0029	0.1035*	0.1019*	0.1025*	0.1030*
	(0.6810)	(0.0069)	(0.6860)	(0.6800)	(**0.0704**)	(**0.0732**)	(**0.0721**)	(**0.0712**)
A) Regulatory Pressure for undercapitalised banks (REGU)	0.0131 **				0.0512			
	(**0.0120**)				(0.4445)			
A) Regulatory Pressure for better-capitalised banks (REGO)	0.0112				-0.1198			
	(0.6290)				(0.3040)			
B) Regulatory Pressure for undercapitalised banks (PCAU)		0.0016 **				0.0106 **		
		(**0.0340**)				(**0.0477**)		
C) Regulatory Pressure - Edizs (REG-Ediz)			0.0004				0.0099*	
			(0.7500)				(**0.0967**)	
D) Regulatory Pressure for better-capitalised banks (REG-mcr)				-0.0008				-0.0174 **
				(0.7360)				(**0.0429**)
Constant	0.1445 ***	0.1446 ***	0.1439 ***	0.1446 ***	0.4175 ***	0.4288 ***	0.4124 **	0.4239 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0087**)	(**0.0066**)	(**0.0100**)	(**0.0073**)

Panel (B): Summary Statistics

Observations	2,860	2862	2860	2860	1865	1867	1865	1865
No. clusters (Banks)	410	410	410	410	329	329	329	329
Wald chi2 Statistic	59.0400	48.3700	65.4000	62.7300	29.8700	34.0800	34.5900	31.3000
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1995	0.2005	0.1996	0.1996	0.0430	0.0453	0.0430	0.0422
r2_between groups	0.2553	0.2560	0.2556	0.2553	0.0604	0.0631	0.0600	0.0589
r2_withing group	0.0630	0.0627	0.0622	0.0623	0.0087	0.0087	0.0088	0.0089

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

consider other heterogeneity factors in the assessment to examine the impact of the capital on the risk level.[71]

On the other hand, the second risk indicator, which reflects banking portfolio risk, shows a significant positive association between the capital level (Equity/Asset ratio) and the riskiness of asset portfolio (RWAs/Asset ratio) at a statistically significant level of 1%. The capital coefficient found to be about 0.0060, implying a 1% increase in the capital level associated with an increase in the riskiness of banking portfolio assets by 0.60%. An increase in the RWAs/Assets shows increases in the overall proportion of risky assets in the bank's portfolio. Indeed, the share of risk-weighted assets reflects banks' decisions on risk-taking. This result implies that high equity banks tend to have more risky assets as a share of their total assets. A positive association between the capital level and riskiness of banking asset portfolio is also found by Beatty and Gron (2001); Rime (2001); and Jokipii and Milne (2011).

The results also show the characteristics of banks that tend to be associated with a high-risk level as indicated by bank-level controlling variables. Small-sized banks and profitable banks were found to be associated with high risks. The coefficient of the size, which is measured by log asset, appears to be inversely significantly related to the credit risk level (as measured by NPLs ratio) at a significance level of 1%. This finding indicates that large banks tend to have proportionally less non-performing loans comparing to other banks. Large banks tend to have more competitive advantages, such as better investment opportunities, well-diversified portfolios, and easy access to finance, and hence they tend to have better management for their credit risk. However, the results provide no evidence for large-sized banks associated with less risk-weighted assets as a share of their total assets. The coefficient of the size appears to be positively related to the RWAs ratio, but this association was not statistically significant.[72]

[71] As discussed later, the relationship between the capital level and credit risk (as measured by NPLs ratio) is re-examined with the consideration for an ownership category on underlying banks in the sample. The results show that there is a significant negative relationship between the capital (as measured by Equity ratio) and the credit risk level (NPLs ratio) in case of considering for a sub-sample of listed banks as reported in Table 5-6. Refer to section 5.5.2, for further details.

[72] As will be discussed later, the results of this research chapter found there is a significant negative relationship between bank size (as measured by Log Assets) and the risk level (measured by RWAs

Furthermore, banks with a higher profitability level are found to have higher credit risk. The parameter estimates on the return on asset ratio (ROA) and NPLs/Asset are found to be statistically positive at a significant level of 1%.[73] This positive association between ROA ratio and NPLs ratio indicates that profitable banks tend to be involved in more risky strategies during the sample period 2003 to 2014. This period experienced regulatory reforms in the capital framework as per the Basel Accords amendments, while profitable banks were found to be associated with the risky lending portfolio.[74] The profitable banks might be involved in risky assets to compensate for losses and regulatory cost of increasing the capital requirements and other regulatory restrictions. This finding supports the argument of Marcus (1984) who argued that banks managers might adopt higher risk strategies by lowering asset quality or capital ratio to exploit governmental benefits in mispriced deposit insurance or the existence of too-big-to-fail policies.[75] Thus; profitable banks could be associated with higher risk as they were involved in risky investments. In term of the second risk indicator, Table 5-5 shows that profitable banks are also associated with a higher portion of risky assets. The coefficient Return on Asset (ROA) ratio found to be positively associated with RWAs/Asset ratio, but it was not statistically significant.[76] Another characteristic of risky banks found to be diversified banks.

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ratio) in case of a subsample of unlisted banks and a subsample of domestic-owned banks over the sample period 2003 to 2014. In addition, a significant negative relationship is also found in case of considering a sub-period 2009 to 2012. The negative relationship between bank size and RWAs ratio implies that small banks are riskier as they are more involved in RWAs in their asset portfolio. Refer to 5.5.2 and section 5.5.3 respectively for further details.

[73] All models are also re-estimated using Return on Equity (ROE) ratio as a profitability indicator. The results show a positive relationship between Return on Equity (ROE) ratio and NPLs/Asset (NPLs) ratio, and all other results are unchanged.

[74] As will be discussed later, this research chapter provides a robust result that this positive relationship between profitable banks (as measured by ROA ratio) and the riskiness of the lending portfolio did not change over the sub-periods that experienced different amendments in the Basel Accords framework. A significant positive relationship between profitable banks (as measured by ROA) and the risk level (measured by NPLs ratio) is also found in all sub-period samples (2005 to 2008), (2009 to 2012), and (2013 to 2014). Refer to 5.5.3 for further details.

[75] Section 5.5.3 shows evidence that profitable undercapitalized banks are involved in more risky lending activities, and section 5.5.4 shows evidence those large-sized undercapitalized banks are associated with risky lending portfolio during the same sample period.

[76] As will be discussed later, the results of this research chapter found there is a significant positive relationship between the profitable bank (as measured by ROA ratio) and the risk level (measured by RWAs ratio) in case of a subsample of unlisted banks over the sample period (2003 to 2014). In addition,

The results show that diversified banks, which are invested in non-lending activities as measured by the ratio of non-interest income to total income (NII ratio), found to be associated positively RWAs/Asset ratio. The coefficient of the non-interest income ratio (NII ratio) was found to be significant statistically at a significance level of 10% in all models. There was no evidence that diversified banks tend to be associated with high credit risk. The results show that the coefficient of non-interest income ratio (NII ratio) is found to be negative but insignificant statistically in all models that were estimated by NPLs ratio as a risk indicator.[77]

The results also show that the risk level also varies in term of the capitalisation level of banks. Banks that are already meeting the capital requirements are expected to behave differently compared to others (Jacques and Nigro 1997). Table 5-5 also reports the results of a potential impact of the regulatory pressure, which is one of the primary purposes of this research, on risk behaviour of banks with different level of capitalisation. Over the last two decades, banks have experienced remarkable regulatory reforms. Banks are required by law to meet the requirements of the Basel Accords II, Basel Accords II.5, and Basel Accords III. The impact of these reforms is expected to be reflected on banks' risk levels. As stated in the beginning, regulatory pressure is examined using four different approaches.

Table 5-5 shows that undercapitalised banks, as measured by REGU and PCAU, are associated with higher credit risk. Indeed, both coefficients REGU and PCAU found to be statistically significant at 5%. Ceteris paribus, significant positive coefficients of the undercapitalised banks, which are defined according to both Jacques and Nigro's approach (REGU) and Prompt Corrective Action Approach (PCAU) respectively, suggest that banks with a capital ratio below the risk-based capital ratio associated with higher non-performing loans compared to other banks. A similar result found in model three (3) that pays more attention to pressurised banks that are not

a significant positive relationship is also found in case of considering a sub-period (2005 to 2008). Refer to 5.5.2 and section 5.5.3 respectively for further details.

[77] Further assessment to examine the impact of diversified banks (as measured by NII ratio) on the risk level (as measured by the NPLs ratio) is conducted with consideration for other heterogeneity factors. Refer to section 5.5.3 and section 5.5.5 for further details.

meeting their target capital ratio as measured by variable (REG-Ediz).[78] However, the coefficient of these pressurised banks, which is measured by REG-Ediz, was found to be statistically insignificant positive coefficient. These results support that undercapitalised banks, which fail to meet the capital requirements, invested more in poor quality assets.

In term of portfolio risk, Table 5-5 also shows that both undercapitalised and pressurised banks were associated positively with a higher share of risk-weighted assets. Indeed, the coefficient PCAU was found to be statically significant at 5% while the coefficient REG-Ediz was found to have a statistical significance at 10% as reported in Table 5-5. These results imply that both undercapitalised banks and pressurised banks tend to have a high portion of risk-weighted assets compared to other banks. In theory, these undercapitalised banks are supposed to reduce their risk level not to breach the regulatory requirement. Their involvement in poor quality assets and high risk-weighted assets indicates that they adopted higher risk strategies by lowering asset quality as argued by Marcus (1984). The positive association between undercapitalised banks and the risk level suggests that these banks might attempt to invest in high-risk assets to generate higher than expected returns that could help them to increase the capital level during the next period as pointed out by Calem and Rob (1999).

On the other hand, there was an insignificant and inconsistent behaviour of better-capitalised banks. The better-capitalised banks are examined by REGO and REG-mcr in the model (1) and model (4) respectively. These are banks that tend to have a regulatory capital ratio above the minimum regulatory capital requirements. The coefficient of the better-capitalised banks, which is measured by REGO, was found to be insignificant positive coefficient, while the REG-mcr coefficient was found to be insignificant negative coefficient.[79] In term of portfolio risk, better-capitalised banks

[78] As defined earlier in the methodology chapter, the target ratio is computed as the minimum capital requirement ratio plus one bank-specific standard deviation of the total capital ratio.

[79] This insignificant inconsistent result implies that there is a need to conduct a further assessment to examine the risk behaviour of better-capitalised banks with consideration for other heterogeneity factors. As discussed later, better-capitalised banks were found to be associated with less credit risk during the period 2005 to 2008 compared to other periods. On the other hands, the results show that large-sized better-capitalised banks associated positively with credit risk. Further details are provided in section 5.5.3 for sub-period heterogeneity and section 5.5.4 for the heterogeneity of institutional size.

found to have a negative association with a risk-weighted asset ratio. Indeed, the coefficient REG-mcr was found to be statistically significant at 5%. Ceteris paribus, negative coefficients of the better-capitalised banks suggest that banks with a capital ratio above the risk-based capital ratio were found to have less involvement in risk-weighted assets compared to banks that are not meeting the regulatory capital requirements.

Overall, the above results, which are based on the whole sample, show that it is critical to examine the impact of the capital level on the risk behaviour via just assessing the impact of the capital level. The results show that there is no evidence that high-capital banks are associated with high credit risk. At the same time, the results show that high-capital banks are associated positively with relatively a high share of risky assets in the bank's portfolio as indicated by the second risk indicator (RWAs ratio). Indeed, the share of risk-weighted assets reflects banks' decisions on risk-taking. On the other hand, the above models distinguish the risk behaviour of banks with different level of capitalisation. This distinguishing in the capitalisation level provides a better understanding of assessing the impact of capital on the risk level. The above results show a positive association between undercapitalised banks and the risk level. This positive association highlights the moral hazard issue in which banks with less capital might attempt to invest in high-risk assets to generate higher than expected returns at the cost of their stakeholders. For better-capitalised banks, the results show that those better-capitalised banks are associated with less risk-weighted assets in their asset portfolio. Yet, there were no consistent results on their credit risk level. The negative association of the better-capitalisation with less asset portfolio risk supports the moral hazard hypothesis that expected high-capital level could demotivate banks in excessive risk. Furthermore, the above results highlight characteristics of banks that are associated with high risk in which small banks, and profitable, and diversified banks were found to be associated with high risk. In the following sections, these characteristics are re-examined with consideration of different heterogeneity factors.

All the above models re-estimated with consideration for the macroeconomic controlling variables. It is observed that these re-estimated models reported the same above results. The results of re-estimated models are reported in Appendix VIII. The above results are based on the entire sample that aggregates banks with different ownership profiles and from different countries. For the purpose of obtaining a better view on given findings, the given sample is re-examined from different perspectives including bank ownership statues, the prior- and post- announcement of the Basel Accords amendments, different institutional size of banks, and banks from countries with different economic and financial development levels. Accordingly, the sample divides into subsamples to examine the banking risk level in each subsample. The following sections summarise the results of these subsamples.

5.5.2 Ownership Perspective: The results of the impact of the capital on the risk level in different ownership perspectives: Does the ownership matter?

Further examination is conducted for the empirical effect of the capital level on the risk level in different bank ownership types. This examination aims to view the attitude of different owners, who might have different competitive advantages, to manage their risk, and capital levels. This research chapter will examine the risk-taking behaviour of the following ownership categories:

- Listed Banks
- Unlisted Banks.
- Domestic-owned Banks

Before reporting the results, note that tables in this section will follow the same structure as the previous section in which panel (A) of a table reports the empirical results. The empirical results are for two dependent variables that indicate the risk level, mainly the NPLs ratio and RWAs ratio. Also, each dependent variable is estimated in four different models according to the adopted approach to identify both undercapitalised and better-capitalised. Panel (B) of each table reports the main statistics about the number of observations, number of banks, Wald statistics, and R-squared that indicate the fitness of each model. In the following part of the chapter, there is a demonstration of the empirical results for samples that are sub-classified according to their ownership profile.

A) Empirical results on the risk level of listed banks versus unlisted banks:

The next tables report the empirical effect of the capital level on the risk level of both listed banks and unlisted banks. The analysis starts by using a full sample that combines both listed and unlisted banks to examine if the listed banks are less risky compared to unlisted banks. For this purpose, the variable ownership category is included in the regression, which was stated in Equation (4-1), and it refers to a value of unity for listed banks in stock exchange markets ($DV_{i,t}^{PLB}$), and zero otherwise. The analysis is then expanded to examine the risk determinants and the impact of the capital level on the risk level of each category of ownership profile separately. Subsampling allows examining the behaviour of each group of banks separately.

The models one to four in Table 5-6 and Table 5-7 report the empirical results that employed a full sample of banks, i.e., both listed and unlisted banks from all countries. These models are the same as in Table 5-5, but one more variable (DV_i^{PLB}) is added to compare the risk-taking behaviour of listed banks compared to unlisted banks. Table 5-6 is based on the NPLs ratio as a risk indicator, while Table 5-7 is based on the RWAs ratio as a risk indicator. Overall, the empirical results did not provide sufficient evidence on the difference in the risk level between listed and unlisted banks. No significant differences in the risk level are found between listed and unlisted banks as indicated by an insignificant coefficient ($DV_{i,t}^{PLB}$) in Table 5-6 and Table 5-7. These results imply that there is no a significant difference in risk level between listed and unlisted banks. A similar result is also found by Amadou Barry et al. (2011) who examined European listed and unlisted banks during the period 1999 to 2005. They pointed out that no significant differences in the risk level between listed and unlisted banks suggest that the influence of the market discipline is not reflected in the risk behaviour.

This research chapter conducted further analyses on the risk behaviour of listed banks and unlisted banks separately. This sub-classification aims to examine differences in the risk behaviour of each category of banks with consideration for the capitalisation level and other bank-level controlling factors. Listed banks are expected to be more influenced by market discipline compared to unlisted banks during the sample period. Models from five (5) to eight (8) are based on a subsample of listed banks only; while models nine (9) to twelve (12) are based on a subsample of unlisted banks using both risk indicators, i.e., the NPLs ratio and RWAs ratio as reported in Table 5-6 and Table 5-7 respectively. The comparison between empirical results for subsamples of listed and unlisted banks shows no significant differences.

However, the obtained results of these subsamples provide a better understanding of the baseline regressions that are presented in Table 5-5. For example, these results show that the risk behaviour of listed banks consistently

Table 5-6: Relationship between the capital level and risk (for three samples: all banks, listed banks, and unlisted banks respectively) banks during the sample period 2003 to 2014:

The dependent variable is the risk level as measured non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on three samples: a full sample of all banks, a subsample of listed only, and a subsample of unlisted

	Robust Clustered Random Effects Model Estimated Using NPLs/Asset as a Dependent Variable											
	The whole sample				**A subsample of listed banks**				**A subsample of unlisted banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	-0.0014 ***	-0.0014 ***	-0.0014 ***	-0.0014 ***	0.0002	0.0002	0.0002	0.0002
	(0.3405)	(0.3501)	(0.3483)	(0.3501)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.4920)	(0.4650)	(0.4710)	(0.4770)
Size: log Assets	-0.0169 ***	-0.0169 ***	-0.0168 ***	-0.0167 ***	-0.0170 ***	-0.0175 ***	-0.0172 ***	-0.1729 ***	-0.0170 ***	-0.0169 ***	-0.0167 ***	-0.0167 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Profitability: ROA Ratio	0.3172 ***	0.3160 ***	0.3165 ***	0.3169 ***	0.2911 ***	0.2910 ***	0.2906 ***	0.2913 ***	0.3727 ***	0.3702 ***	0.3740 ***	0.3708 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)
Diversification: NII Ratio	-0.0028	-0.0028	-0.0028	-0.0028	0.0056	0.0051	0.0054	0.0050	-0.0059	-0.0059	-0.0058	-0.0057
	(0.6857)	(0.6830)	(0.6909)	(0.6851)	(0.5900)	(0.6220)	(0.6020)	(0.6270)	0.5100	0.5080	0.5190	0.5250
A) Under-capitalised banks (REGU)	0.0131 **				0.0121				0.0152 ***			
	(**0.0125**)				(0.1460)				(**0.0030**)			
A) Better capitalised banks (REGO)	0.0111				-0.0320				0.0449			
	(0.6293)				(0.1310)				0.2330			
B) Under-capitalised banks (PCAU)		0.0016 **				0.0013				0.0023 *		
		(**0.0337**)				(0.2370)				(**0.0530**)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0004				0.0025 **				-0.0019	
			(0.7471)				(**0.0180**)				0.3110	
D) better capitalised banks (REG-mcr)				-0.0008				-0.0019				-0.0003
				(0.7306)				(0.3330)				0.9550
DV=1 for listed banks	-0.0005	-0.0006	-0.0005	-0.0006								
	(0.8656)	(0.8474)	(0.8552)	(0.7306)								
Constant	0.1447 ***	0.1448 ***	0.1441 ***	0.1449 ***	0.1579 ***	0.1590 ***	0.1559 ***	0.1598 ***	0.1388 ***	0.0139 ***	0.0139 ***	0.1388 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics												
No. Obs.	2,860	2,862	2,860	2,860	1,354	1355	1354	1354	1,506	1507	1506	1506
No. Bank	410	410	410	410	191	191	191	191	219	219	219	219
Wald chi2 Statistics	64.3600	55.2400	70.6000	68.6700	48.6100	48.9000	55.0100	50.3000	31.1400	24.2100	28.2600	35.4600
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1994	0.2004	0.1995	0.1995	0.2482	0.2459	0.2473	0.2459	0.2302	0.2338	0.2308	0.2315
r2_between groups	0.2554	0.2560	0.2556	0.2553	0.2545	0.2538	0.2561	0.2536	0.3009	0.3048	0.3016	0.3027
r2_within group	0.0631	0.0627	0.0622	0.0623	0.1281	0.1259	0.1280	0.1260	0.0579	0.0561	0.0568	0.0557

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table 5-7: **Relationship between the capital level and risk (for three samples: all banks, listed banks, and unlisted banks respectively) during the sample period 2003 to 2014:**
The dependent variable is the risk level as measured by the risk-weighted asset (RWAs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on subsamples of listed and unlisted banks

	Robust Clustered Random Effects Model Estimated Using RWAs/Asset as a Dependent Variable											
	The whole sample				**A subsample of listed banks**				**A subsample of unlisted banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0061***	0.0060***	0.0061***	0.0061***	0.0041***	0.0040***	0.0041***	0.0041***	0.0040	0.0039	0.0039	0.0040
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0004**)	(**0.0005**)	(**0.0004**)	(**0.0003**)	(0.1064)	(0.1206)	(0.1231)	(0.1149)
Size: log Assets	0.0204	0.0187	0.0197	0.0209	-0.0094	-0.0093	-0.0097	-0.0100	-0.1408**	-0.1382**	-0.1404**	-0.1405**
	(0.3498)	(0.3931)	(0.3720)	(0.3445)	(0.7147)	(0.7219)	(0.7081)	(0.7004)	(**0.0110**)	(**0.0118**)	(**0.0110**)	(**0.0109**)
Profitability: ROA	0.2414	0.2414	0.2381	0.2531	-0.6869	-0.6702	-0.6734	-0.6590	1.8795***	1.8754***	1.8783***	1.8944***
	(0.6522)	(0.6521)	(0.6558)	(0.6373)	(0.2641)	(0.2779)	(0.2735)	(0.2878)	(**0.0001**)	(**0.0001**)	(**0.0002**)	(**0.0001**)
Diversification: NII Ratio	0.1032*	0.1016*	0.1023*	0.1028*	-0.0705	-0.0766	-0.0742	-0.0738	-0.0338	-0.0291	-0.0323	-0.0334
	(**0.0703**)	(**0.0730**)	(**0.0719**)	(**0.0710**)	(0.2278)	(0.1939)	(0.2096)	(0.2128)	(0.7663)	(0.7991)	(0.7771)	(0.7693)
A) Under-capitalised banks (REGU)	0.0508				0.0320				0.1543			
	(0.4481)				(0.6449)				(0.5626)			
A) Better-capitalised banks (REGO)	-0.1160				-0.3655***				0.2040			
	(0.3120)				(**0.0054**)				(0.3405)			
B) Under-capitalised banks (PCAU)		0.0106**				-0.0036				0.0196**		
		(**0.0480**)				(0.5543)				(**0.0250**)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0099*				0.0095				0.0103	
			(**0.0961**)				(0.1759)				(0.2830)	
D) Better-capitalised banks (REG-mcr)				-0.0173**				-0.0207**				-0.0094
				(**0.0446**)				(**0.0477**)				(0.4857)
DV=1, listed banks	0.0413	0.0422	0.0422	0.0417								
	(0.4014)	(0.3932)	(0.3935)	(0.3989)								
Constant	0.3952***	0.4061***	0.0422***	0.4014***	0.7439***	0.7304***	0.7263***	0.7512***	1.6115***	1.6082***	1.6144***	1.6288***
	(**0.0062**)	(**0.0045**)	(**0.0073**)	(**0.0050**)	(**0.0003**)	(**0.0005**)	(**0.0005**)	(**0.0003**)	(**0.0004**)	(**0.0004**)	(**0.0004**)	(**0.0004**)

Panel (B): Summary Statistics

No. Obs.	1,865	1,867	1,865	1,865	1,054	1,055	1,054	1,054	902	903	902	902
No. Banks	329	329	329	329	170	170	170	170	165	165	165	165
Wald chi2 Statistics	29.8800	34.0900	34.7400	31.2300	33.52	27.5800	28.3900	32.1600	73.8000	71.3400	69.9700	74.0300
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.0374	0.0394	0.0375	0.0368	0.1303	0.1003	0.1135	0.1244	0.0353	0.0369	0.0358	0.0352
r2_between groups	0.0606	0.0632	0.0606	0.0595	0.1170	0.0902	0.0980	0.1055	0.0363	0.0378	0.0370	0.0364
r2_within groups	0.0087	0.0088	0.0089	0.0089	0.0316	0.0251	0.0263	0.0275	0.0507	0.0510	0.0506	0.0508

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

supports the obtained results that are reported in Section 5.5.1. The results for model five (5) to eight (8) show that there is a statistically significant negative relationship between the capital level of listed banks and the credit risk (as measured by the NPLs ratio) at a significance level of 1% as reported in Table 5-6. Also, the results show that those high-capital listed banks invested a higher portion of their asset portfolio in risk-weighted assets. The coefficient of the capital level of listed banks was found to have a positive coefficient of Equity/Asset ratio with a significance level of 1% as reported in Table 5-7. Such a positive association between the equity level and share of risk-weighted assets is also found by Beatty and Gron (2001); Rime (2001); and Jokipii and Milne (2011). These banks might be involved in risk-weighted assets because they are believed to have an effective risk management mechanism.

Berger (1995) argued that banks with greater net safety, i.e., they have high equity level or less leverage, might create opportunities to invest in non-lending activities to finance profitable on-balance sheet activities. Yet, the results of this chapter show no evidence that diversified listed banks are associated with less risk. The association of high-capital listed banks with low credit risk and high portfolio risk implies that those banks tend to behave differently in their risk management activities. Managers might tend to reduce their risk in specific activities, but they also tend to be involved in other activities that still keep the riskiness of their portfolio. They tend to signal positively to their stockholders via showing a low credit risk, while at the same time they tend to be involved in other activities that still keep riskiness of their portfolio as captured by a regulatory indicator RWAs ratio that is calculated by as per the Basel Accord framework. This result is also consistent with findings of Kwan and Eisenbeis (1997) who examined 352 of the U.S. banks over the period 1986 to 1995. They found a negative relationship between capital level and asset quality and at the same time banks with higher capital were found to be associated positively with interest rate risk. They pointed out that banks might choose different combinations of credit risk, interest rate risk, and financial leverage.

On the other hand, there was no evidence that managers of high-capital unlisted banks adopted the same risky behaviour like high-capital listed banks. The results in models from (9) to (12) show that the capital coefficient (as measured by Equity ratio) of unlisted banks associated insignificantly with the NPLs ratio and RWAs ratio as reported in Table 5-6 and Table 5-7 respectively. However, this does not mean that ownership perspective is irrelevant. Indeed, the results of this chapter account for both ownership profile and capitalisation level as heterogeneity factors that could provide a better understanding of the relationship between the capital level and risk behaviour. The results based on the sub-classification of the sample into listed and unlisted banks helps to recognise if there is a difference in the risk behaviour of banks with different ownership profiles. Listed and unlisted banks with different capitalisation level were found to have different risk levels. A low-risk level is found to be associated with listed better-capitalised banks, while a high-risk level is found to be associated with unlisted undercapitalised banks as elaborated below.

In the subsample of listed banks, the results show that better-capitalised listed banks are associated consistently and significantly with low-risk level. Table 5-6 shows that better-capitalised listed banks, which are measured by REGO and REG-mcr, were found to be associated with less credit risk. And Table 5-7 shows that better-capitalised listed banks, which are measured by REGO and REG-mcr, were found to have less risk-weighted assets in their portfolio. Both REGO and REG-mcr coefficients were found to be statistically significant at 1% and 5% respectively. Yet, there was no evidence that better-capitalised unlisted banks are associated with less risk during the same sample period. The adverse effect of the capital level on the risk level can be explained from an ownership perspective. The listed banks are governed by rules of the stock exchange. According to the stock exchanges' regulations, they are required to disclose their relevant financial information publicly. This disclosure, which is known as a market discipline, provides informative signals that enable stakeholders to consider a precarious position of a bank. Besides, the regulatory disclosure requirements, as a part of the external supervisory monitoring mechanism, provide informative information to regulators to assess the riskiness position of a bank. Better-capitalised listed banks, which are already meeting the regulatory capital requirements, are less regulatory pressurised. The negative association between better-capitalised listed banks and risk-based indicators suggest that these banks chose to invest in better quality assets. Increases in the capital level of publicly listed banks provided a net safety and did not make them shift their asset portfolio toward riskier assets.

In contrast, the empirical results show a consistent and significant relationship between undercapitalised unlisted banks and both risk indicators as shown in the models from (9) to (12). The coefficients of undercapitalised unlisted banks, which are measured by Jacques and Nigro's approach (REGU) in model nine, Prompt Corrective Action Approach (PCAU) in model ten, were found to be significantly positively related with credit risk level at a significant level of 1% and 10% respectively as reported in Table 5-6. The second risk indicator, which is the RWAs ratio, reported consistent results too. The undercapitalised unlisted banks were found to be positively associated with the RWAs ratio. The coefficient PCAU was significant at 5% as reported in Table 5-7. Those undercapitalised banks, which are not meeting the minimum capital requirements, are more regulatory pressurised. Marcus (1984) argued that managers might adopt higher risk strategies by lowering asset quality or capital ratio to exploit governmental benefits in mispriced deposit insurance or the existence of too-big-to-fail policies. Undercapitalised banks might be involved in more risky investments in an attempt to generate more earnings to build-up their capital level and meet the regulatory capital requirements. Taking into the consideration that unlisted banks are not obliged to disclose their financial information to the public.

However, these results do not mean that market discipline is an effective tool to prevent excessive risk-taking behaviour. The pressured listed banks, which have a capital ratio less than the target ratio as defined by the probabilistic Ediz approach, were found to be involved in low-quality lending assets, and they were associated with higher credit risk comparing to other banks. In the subsample of listed banks as reported in the model seven (7), it is observed that the pressurised listed banks, which are measured by REG-Ediz, were found to be associated with high credit risk (as measured by the NPLs ratio) at a significant level of 5%. These banks might be involved in high-risk activities in return for a higher income that could be used to build up the capital level. This association of those pressurised listed banks implies that they might be involved in high-return investments, which are associated with high-risk, in an attempt to signal positively for expected returns. From an ownership perspective, Jensen and Meckling (1976) argue that the separation of the ownership and management creates a conflict of interest, and increase information asymmetry, and hence managers might induce more risk especially in an inefficient monitoring environment. These results highlight the impact of the ownership structure on the risk behaviour of banks with different level of capitalisation.

Finally, the results of this chapter also found the main characteristics of risky banks that are identified based on the bank-level controlling variables. There was no evidence on a significant difference in the risk determinants of banks in both listed and unlisted subsamples. Similar to the results of the baseline regressions, which are based on the full sample as reported in Table 5-5, large-sized banks were found to be associated with less risk at both listed and unlisted banks. Indeed, the coefficient of bank size (as measured by log assets) found to be associated negatively with the NPLs ratio at a significance level of 1% in both subsamples of listed and unlisted banks (see Table 5-6). The coefficient of bank size is also found associated negatively with the RWAs ratio in both subsamples of listed and unlisted banks. This relationship appears to be the most significant with unlisted banks at a significance level of 5% as reported in Table 5-7.

Profitable banks were also found to be associated with a higher risk level regardless of the type of ownership of a given bank. Profitable listed and unlisted banks (as measured by ROA ratio) were found to the positively related with a higher credit risk at a significant level of 1%. In term of asset portfolio risk, profitable unlisted banks were found to be associated positively with the RWAs ratio at a significance level of 1%. This positive association indicates that profitable banks tend to be involved in more risky strategies to compensate for losses and regulatory costs of increasing the capital requirements and other regulatory restrictions. Lindquist (2004) pointed out the explanatory role of profitability level in evaluating the relationship between capital and risk. He said that banks are more profit-making business, and these banks tend to build up their capital through accumulated retained earnings. This finding perhaps, explains the risk-taking behaviour of undercapitalised banks.[80]

In term diversified banks, there is no evidence that listed or unlisted banks benefited from their diversification strategies to reduce their risk level. The results show no significant relationship between diversified banks (as measured by NII ratio) and both risk indicators in subsamples of listed and unlisted banks as showing in Table 5-6 and Table 5-7 respectively. Based on these results, small-sized banks and profitable banks were found to be risky banks regardless of whether a bank is listed or not.

B) Empirical results on the risk level of domestic-owned banks:

The second type of ownership category that is considered in this chapter is domestic-owned banks versus foreign-owned banks. The domestic banks defined as banks with more than 50% of shares are held by domestic investors. Risk literature highlights that there could be variation in the risk levels of foreign-owned banks compared to domestic-owned banks. Compared to domestic-owned banks, foreign-owned banks have superior risk management skills to assess their portfolio risk. They have better access to diversified services and funding. These competitive advantages enable foreign-owned banks to have better risk-management (Claessens et al., 2001; Detragiache et al., 2008; Claessens and Van Horen, 2013).

However, this chapter is based on a sample that includes both domestic and foreign banks. Unfortunately, the observations for the foreign-owned banks found to be relatively small.[81] Empirical results could be unreliable in comparing a relatively large sample versus a relatively small sample. Thus; in this section, there will not be the

[80] Section 5.5.3 conducted further examination on the risk behavior of profitable banks. The results show that profitable undercapitalized banks were associated with credit risk especially during the less regulatory pressure period (i.e. 2003 to 2008).

[81] The number of observations for a subsample of foreign banks is about 573 (377) annual observations for NPLs (RWAs) regressions out of 2,860 (1,865) annual observations in the whole sample that is adopted in this chapter. In other words, observations of foreign-owned banks represent almost 20% (18%) of the total sample of NPLs (RWAs) regressions.

comparison of the risk behaviour of each group of banks separately.[82] However, this section will re-examine the risk determinants and impact of the capital on the risk level using on a subsample of domestic-owned banks only to obtain more robust results.

Table 5-8 reports the findings on the effect of capital on banking risk (using both risk indicators NPLs ratio and RWAs ratio) using a subsample of domestic-owned banks only. Comparing the empirical results of Table 5-8 to Table 5-5, which is based on the baseline regression using the whole sample, it is observed that there is consistency in the empirical results. All significant statistical coefficients in the baseline regressions (as reported in Table 5-5) are also found in the subsample of domestic-owned banks. This consistency might refer to the fact that the majority of the sample size is domestic-owned banks.

The results show no evidence that undercapitalised domestic banks tend to have high credit risk as indicated by an insignificant coefficient of the Equity/Asset ratio in the first four models of the NPLs regressions (see Table 5-8). However, these high-capital domestic-owned banks invested a higher portion of their asset portfolio in risk-weighted assets. Indeed, the coefficient of the Equity/Asset ratio was found to be statistically significant at 5%. This positive association between the equity level and the RWAs ratio might be associated with undercapitalised domestic banks because better-capitalised domestic banks were found to be less risky. The same findings were found in the baseline regressions that are reported in Table 5-5. These results support the moral hazard issue that expected a potential tendency of banks to increase their risk level when their capital level is reduced to obtain benefits from high-risk assets. Undercapitalised domestic banks found to have a high-risk level. These banks were found to have a high RWAs ratio during the sample 2003 to 2014 as reported in Table 5-8. Indeed, the coefficient REGU was found to be significant at 5% for NPLs regressions and 1% for RWAs regressions. This result perhaps reflects issues of the effectiveness of a monitoring environment that could induce banks to be involved in high risky activities in return for a higher income that could be used to

[82] The empirical results on banking risk and impact of the capital level based on foreign-owned banks are provided in Appendix VIII at Table VIII-2 (for NPLs regressions) and Table VIII-3 (for RWAs regressions).

Table 5-8: **Relationship between the capital level and risk (for domestic-owned banks only) during the sample period 2003 to 2014:**

The dependent variables are the risk level indicators as measured by non-performing loans (NPLs/Asset) ratio and risk-weighted asset (RWAs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of domestic banks

	Robust Clustered Random Effects Model							
	A subsample of domestic banks using NPLs/Asset as a dependent variable				**A subsample of domestic banks using RWAs/Asset as a dependent variable**			
	1 Coeff. (p-value)	**2** Coeff. (p-value)	**3** Coeff. (p-value)	**4** Coeff. (p-value)	**5** Coeff. (p-value)	**6** Coeff. (p-value)	**7** Coeff. (p-value)	**8** Coeff. (p-value)
Capital: Equity/Asset Ratio	-0.0003	-0.0003	-0.0003	-0.0003	0.0043 **	0.0043 **	0.0043 **	0.0044 **
	(0.1280)	(0.1310)	(0.1310)	(0.1310)	(**0.0153**)	(**0.0160**)	(**0.0145**)	(**0.0129**)
Size: log Assets	-0.0157 ***	-0.0159 ***	-0.0157 ***	-0.0157 ***	-0.1103 **	-0.1093 **	-0.1104 **	-0.1099 **
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0178**)	(**0.0182**)	(**0.0177**)	(**0.0179**)
Profitability: ROA Ratio	0.2956 ***	0.2950 ***	0.2948 ***	0.2958 ***	0.3457	0.2426	0.2330	0.2714
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.6969)	(0.6999)	(0.7116)	(0.6665)
Diversification: NII Ratio	0.0000	-0.0001	0.0001	-0.0001	-0.0575	-0.0588	-0.0574	-0.0593
	(0.9970)	(0.6960)	(0.9920)	(0.9880)	(0.4191)	(0.4107)	(0.4241)	(0.4069)
A) Undercapitalised banks (REGU)	0.0096 **				0.1090 ***			
	(**0.0500**)				(**0.0077**)			
A) Better-capitalised banks (REGO)	-0.0078				-0.1206			
	(0.7740)				(0.3566)			
B) Undercapitalised banks (PCAU)		0.0015*				0.0070		
		(**0.0730**)				(0.1903)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0009				0.0129*	
			(0.4780)				(**0.0650**)	
D) Better-capitalised banks (REG-mcr)				-0.0008				-0.0254 ***
				(0.7880)				(**0.0075**)
Constant	0.1377 ***	0.1378 ***	0.1367 ***	0.1379 ***	1.4678 ***	1.4572 ***	1.4562 ***	1.4815 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0003**)	(**0.0001**)	(**0.0001**)	(**0.0001**)
No. Observations	2,287	2289	2287	2287	1,619	1,621	1,619	1,619
No. Banks	330	330	330	330	274	274	274	274
Wald chi2 Statistics	42.7200	30.4200	52.3700	40.7700	51.6500	37.1900	37.4800	46.4700
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1650	0.1658	0.1652	0.1650	0.0466	0.0466	0.0470	0.0463
r2_between groups	0.2240	0.2246	0.2243	0.2241	0.0522	0.0520	0.0525	0.0519
r2_within group	0.0546	0.0546	0.0542	0.0541	0.0233	0.0227	0.0232	0.0230

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

build up the capital level. These undercapitalised banks are involved in more risky activities at the time the sample period experienced regulatory pressures to build up their capital level and meet the regulatory requirements. In term of better-capitalised domestic banks, as measured by REGO and REG-mcr, these banks were found to be associated negatively with the NPLs ratio and the RWAs ratio during the sample period as reported in Table 5-8. Indeed, this negative association was found to be significant for the coefficient REG-mcr at 1% in the RWAs regressions.

Besides, the above results highlight the main characteristics of risky domestic-owned banks. Risky domestic-owned banks were found to be small-sized banks and profitable banks. Similarly to the results of the baseline regressions, the bank size was found to be negatively related to the risk level at a significant level of 1% for NPLs regression and at 5% for RWAs regressions as reported in Table 5-8. Profitable banks were found to be associated positively with higher credit risk. This result implies that profitable domestic-owned banks were involved in low-quality lending portfolios. They might aim to gain higher earnings.[83] In term of portfolio risk, there was no evidence that profitable banks were associated with less portfolio risk as reported in Table 5-8. The results show that the coefficient of diversification, which is measured by the NII ratio, was associated with both risk indicators. However, the results were not statistically significant.[84]

Overall, the empirical results in this section, which examined the impact of the capital on the risk level in different ownership perspectives, show that accounting for both ownership profile and capitalisation level as heterogeneity factors could provide a better understanding of the relationship between the capital level and risk behaviour. The results show that the risk level of banks with different capitalisation level was found to vary significantly among listed and unlisted banks. A low-risk level is

[83] The subsample of foreign-owned banks, which is based on 573 annual observations, shows that profitable foreign-owned banks were also associated positively with credit risk. Thus; profitable banks were found to be associated with high credit risk regardless of ownership categories.

[84] All models of the Risk regressions are re-estimated based on domestic banks and without including any stated based banks. The results show the same results that are reported in Table 5-8 for a subsample of only domestic and non-stated owned banks over the sample period 2003 to 2014. All the coefficients' signs are found to be the same. Results are available up-to request.

associated with listed better-capitalised banks, while a high-risk level is was found to be associated with unlisted undercapitalised banks. On the other side, a high-risk level was found to be associated with undercapitalised domestic banks versus a low-risk level was found to be associated with domestic better-capitalised banks during the same period. These results highlight the impact of the ownership structure on the risk behaviour of banks with different level of capitalisation. The results of this chapter also found that one of the main characteristics of risky banks is profitability. Profitable banks were found to be associated positively with the risk level regardless of ownership category. Additionally, the results show that small-sized banks were found to be associated positively with risk indicators. These small-sized banks were found to have the same relationship in all subclassified samples according to ownership perspective. These risk determinants were found to be associated with all banks regardless of their ownership profile.

5.5.3 Policy Perspective: The relationship between the capital level and the risk level: is there any impact on changes in the capital regulations?

This chapter covered a sample period (2003 to 2014) that has experienced announcement of the Basel Accords II in 2004, Basel II.5 in 2009 and Basel Accords III in 2010. These accords introduced new amendments in the capital structure to define the regulatory capital requirements. In this section, a further investigation is conducted on the empirical effect of the capital level (Equity/Asset ratio) on the risk level (as measured by the NPLs ratio and RWAs ratio). This investigation was conducted with consideration for the amendments in the regulatory capital requirements in the post-period of announcing the Basel Accords II (i.e., 2005 to 2008), and the post-period of announcing the Basel Accords II.5 (i.e., 2009 to 2012) respectively.[85] This investigation aims to view the risk attitude of banks prior and post period for the announcement of the Basel amendments. The following sections report the risk behaviour of banks in different sample periods.

A) Banking risk during the prior- and post- announcement for amendments of the Basel Accords:

In this section, there is a demonstration for the empirical results on banking risk for subsamples during the post-period of announcement for the Basel Accords II in 2004 (i.e., 2005-2008), and the post-period for the Basel Accords II.5 (i.e., 2009 to 2012). There was no evidence that high-capital banks were associated with less credit risk during the post period that experienced the accouchement the new amendment of the Basel Accords. The results show that the coefficient of the capital level (as measured by the Equity ratio) is positively, but statistically insignificant, associated with the NPLs ratio in both post-periods of the announcement for the Basel Accords II and the post-period for the Basel Accords II.5 as reported in Table 5-9.

In term of the riskiness of assets portfolio, Table 5-10 shows that high-equity banks

[85] The pre-Basel II Accords period (2003 and 2004) and the post-period of the Basel III (2013 and 2014) are excluded in the analysis due to a small number of observations. Yet, the results are reported in Table VIII-4 (for NPLs regressions) and Table VIII-5 (for RWAs regressions) in Appendix VIII.

Table 5-9: Relationship between the capital level and risk (for three subsamples: a subsample for the period (2005-2008), and a subsample for the period (2009-2012) respectively):

The dependent variable is the risk level indicator as measured by non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using NPLs/Asset as a dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0001 (0.8674)	0.0001 (0.8702)	0.0001 (0.8772)	0.0001 (0.8516)	0.0003 (0.2760)	0.0003 (0.2710)	0.0003 (0.2710)	0.0003 (0.2690)
Size: log Assets	-0.0145 *** (**0.0000**)	-0.0148 *** (**0.0000**)	-0.0146 *** (**0.0000**)	-0.0142 *** (**0.0000**)	-0.0121 *** (**0.0000**)	-0.0122 *** (**0.0000**)	-0.0122 *** (**0.0000**)	-0.0122 *** (**0.0000**)
Profitability: ROA Ratio	0.3061 ** (**0.0336**)	0.3146 ** (**0.0291**)	0.3069 ** (**0.0339**)	0.3142 ** (**0.0289**)	0.2220 *** (**0.0000**)	0.2232 *** (**0.0000**)	0.2205 *** (**0.0000**)	0.2231 *** (**0.0000**)
Diversification: NII Ratio	-0.0071 (0.5149)	-0.0073 (0.5017)	-0.0073 (0.5054)	-0.0078 (0.4725)	-0.0082 (0.1030)	-0.0083 (0.1010)	-0.0085* (**0.0900**)	-0.0083 (0.1020)
A) Under-capitalised banks (REGU)	0.0161 (0.1310)				0.0245 (0.3110)			
A) Better-capitalised banks (REGO)	-0.0151 (0.5423)				-0.0046 (0.7410)			
B) Undercapitalised banks (PCAU)		0.0036 ** (**0.0307**)				0.0003 (0.6470)		
C) Regulatory Pressure - Edizs (REG-Ediz)			0.0005 (0.6874)				0.0024 *** (**0.0030**)	
D) Better-capitalised banks (REG-mcr)				-0.0073 ** (**0.0479**)				0.0005 (0.6940)
Crisis Dummy Variable 2007	-0.0041 *** (**0.0075**)	-0.0039 *** (**0.0091**)	-0.0040 *** (**0.0086**)	-0.0039 *** (**0.0093**)				
Constant	0.1264 *** (**0.0000**)	0.1269 *** (**0.0000**)	0.1265 *** (**0.0000**)	0.1308 *** (**0.0000**)	0.1070 *** (**0.0000**)	0.1071 *** (**0.0000**)	0.1062 *** (**0.0000**)	0.1066 *** (**0.0000**)
Panel (B): Summary Statistics								
No. Observations	933	934	933	933	1031	1032	1031	1031
No. Banks	353	353	353	353	388	388	388	388
Wald chi2 Statistics	54.0800 (**0.0000**)	53.7800 (**0.0000**)	53.5500 (**0.0000**)	54.2500 (**0.0000**)	69.6800 (**0.0000**)	67.06 (**0.0000**)	75.1500 (**0.0000**)	65.8100 (**0.0000**)
r2_overall	0.1982	0.2007	0.1971	0.1979	0.2209	0.2213	0.2226	0.2211
r2_between groups	0.1866	0.1888	0.1862	0.1857	0.2117	0.2122	0.2131	0.2125
r2_within group	0.0776	0.0780	0.0740	0.0842	0.1103	0.1083	0.1180	0.1081

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table 5-10: Relationship between the capital level and risk (for three subsamples: a subsample for the period (2005-2008), and a subsample for the period (2009-2012) respectively):
The dependent variable is the risk level indicator as measured by risk-weighted assets (RWAs) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of prior- and post-period of announcement for Basel Accords Amendments

Estimated Models using RWAs/Asset as a dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p- value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0062***	0.0062***	0.0062***	0.0013***	-0.0006	-0.0007	-0.0006	-0.0007
	(**0.0012**)	(**0.0012**)	(**0.0012**)	(**0.0013**)	(0.7930)	(0.7496)	(0.7676)	(0.7402)
Size: log Assets	-0.0564***	-0.0578***	-0.0579***	-0.0548***	-0.1292***	-0.1243***	-0.1262***	-0.1256***
	(**0.0056**)	(**0.0053**)	(**0.0051**)	(0.0075)	(**0.0011**)	(**0.0002**)	(**0.0006**)	(**0.0003**)
Profitability: ROA Ratio	0.4975	0.4981	0.5008	0.5204	1.0040	0.9406	0.9660	0.9602
	(0.1290)	(0.1260)	(0.1258)	(0.1040)	(0.1652)	(0.2018)	(0.1883)	(0.1899)
Diversification: NII Ratio	0.0830	0.0795	0.0769	0.0846	0.0792*	0.0735	0.0741*	0.0734
	(0.2000)	(0.2211)	(0.2337)	(0.1895)	(**0.0707**)	(0.1012)	(**0.0973**)	(0.1009)
A) Undercapitalised banks (REGU)	0.2675*				0.0981			
	(**0.0774**)				(0.1584)			
A) Better-capitalised banks (REGO)	-0.0217				0.05663			
	(0.8755)				(0.3793)			
B) Undercapitalised banks (PCAU)		0.0038				-0.0077		
		(0.5839)				(0.4001)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0039				-0.0147	
			(0.5187)				(0.6880)	
D) Better-capitalised banks (REG-mcr)				-0.0233**				0.0097
				(**0.0276**)				(0.5770)
Crisis Dummy Variable 2007	0.0300***	0.0301***	0.0299***	0.0300***				
	(**0.0023**)	(**0.0025**)	(**0.0024**)	(**0.0023**)				
Constant	0.9513***	0.9611***	0.9656***	0.9606***	1.6412***	1.637***	1.6566***	1.6359***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics								
No. Observations	791	792	791	791	563	564	563	563
No. Banks	310	310	310	310	228	228	228	228
Wald chi2 Statistics	60.5800	57.1400	55.7300	66.1900	33.78	34.1900	34.1900	34.3900
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1917	0.1893	0.1884	0.1930	0.0499	0.0493	0.0473	0.0485
r2_between groups	0.1402	0.1377	0.1374	0.1412	0.0564	0.0555	0.0538	0.0548
r2_within group	0.0321	0.0298	0.0299	0.0362	0.0075	0.0010	0.0021	0.0010

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

tended to have a higher share of risk-weighted assets during the post-period of the announcing the Basel Accords II (i.e., 2005 to 2008). Indeed, the coefficient of Equity/Asset ratio was found to be statistically significant at 1%. This coefficient was found to be 0.0062 for RWAs regressions during the sub-period 2005-2008, implying a 1% increase in the capital level raising the portion of risk-weighted assets in banking asset portfolio by 0.62%. A positive association between the capital level, measured in equity level, and portfolio risk also was found by Beatty and Gron (2001) who examined the U.S.A holding companies banks during the post-period of implementing the Basel Accords I (i.e., 1986 to 1995). They pointed-out banks tend to re-adjust their RWAs in the same direction of the capital level to maintain their regulatory capital ratio. On the other side, there was no evidence that banks keep a high portion of risk-weighted assets in their asset portfolio during the post-period of the announcing the Basel Accords II.5 (i.e., 2009 to 2012). Thus; these results highlight that the impact of the capital level on the riskiness of banking asset portfolio was found to be more significant during the post-period of announcing the Basel Accords II.

The new amendments to the Basel Accords aim to build up more risk-sensitive based capital. Banks are expected to meet the new regulatory requirements, and their risk level is hypothesised to change during the post period of announcing the changes in the Basel Accords. However, there was no evidence on changes in the risk behaviour of high-equity banks over the subsamples that experienced different amendments of the Basel Accords. There was also no evidence on changes in the impact of the regulatory capital on banks with different capitalisation level over periods that experienced different regulatory environment. For the undercapitalised banks, the results show that there no change in the risky behaviour of undercapitalised banks in sub-periods that experienced the introduction of the new amendments in the capital framework as per the Basel Accords II and the Basel Accords II.5. There was more of an evident and consistent positive relationship between undercapitalised banks and risk level as measured by credit risk particularly in the sub-period (2005 to 2008) and the sub-period (2009 to 2012). For instance, Table 5-9 shows that the behaviour of undercapitalised banks, which are measured by REGU, and PCAU, is associated with a higher credit risk compared to others during the post-period of announcement for the Basel Accords II (2005 to 2008). Indeed, PCAU was found to be statistically significant at 5%. In addition, undercapitalised banks (as measured by REG-Ediz) were found to be associated higher risk at a significant level of 1% as reported in the subsample of (2009 to 2012) in Table 5-9. Although the risk-weighted assets ratio is a regulatory risk indicator that is computed as per the Basel Accords, this indicator was found not to be related significantly with undercapitalised banks in both subsamples that experienced the introduction of the new amendments in the Basel Accords. This chapter did not find any evidence to support the hypothesis of reduction in the risk level (both in term of credit risk and portfolio risk) of undercapitalised banks during both the post-period of announcing the Basel Accords II (2005 to 2008) and the post-period of announcing the Basel Accords II.5 (2009 to 2012). The risky behaviour of the undercapitalised banks, which were found to be associated with high risk, supports the moral hazard issue that tends to be associated with banks with low capital.

On the other hand, the risk behaviour of better-capitalised banks, which were already meeting the minimum capital requirements, behaved differently compared to undercapitalised banks during the same period. Better-capitalised banks were hypothesised not to be changed as the new amendments of the Basel Accords were introduced because they would meet the regulatory requirements easily. The results show that those better-capitalised banks were found to have less credit (as indicated by a negative coefficient of REGO and REG-mcr in Table 5-9) and less portfolio riskiness (as indicated by a negative coefficient of REGO and REG-mcr in Table 5-10) during the sub-period 2005-2008. Indeed, the coefficient REG-mcr was found to be significant at 5% in both tables. These results are consistent with findings of Jacques and Nigro (1997) who found a significant negative association between the American well-capitalised banks and the risk level during period 1990-1991 when supplementary amendments of the Basel I was introduced. The negative association during the post period of announcing the amendments of the Basel Accords II reflects the preference of the better-capitalised banks signal to both regulators and the market that they already meet the minimum capital requirements, and their portfolio is safe. In contrast, there was no evidence of changes in the risk behaviour of better-capitalised banks during the post-period of introducing the amendments in the capital of the Basel Accords II.5. In term of credit risk, the results show an insignificant and inconsistent relationship between better-capitalised banks and credit risk during the subsample period 2009 to

2012. The REGO coefficient is found to be insignificantly negative, and the REG-mcr coefficient found to be insignificantly positive. The second risk indicator shows no evidence that those better-capitalised banks maintained low-risk behaviour during the period (2009 to 2012). Table 5-10 shows that better-capitalised banks were associated positively, but insignificantly, with the RWAs ratio.

In term of other controlling variables, the results show that there were no changes in the behaviour of large-size, profitable, and diversified banks. Indeed, the coefficients of bank size (Log Assets), profitability (ROA ratio), and diversification level (NII ratio) did not change over both sub-periods as reported in Table 5-9 and Table 5-10. The signs of these coefficients are similar to the estimated coefficients that are based on the whole sample as reported in Table 5-5. In term of bank size, large banks were found to be associated negatively with both credit risk (as measured by NPLs ratio) and asset portfolio risk (as measured by RAWs ratio) in each subsample at a significance level of 1% as reported in Table 5-9 and Table 5-10 respectively.[86]

Besides, profitable banks were also found to be associated with a high-risk level. The coefficient of profitability (as measured by the ROA ratio) is found to be associated positively with both risk-indicators during both sub-periods of announcing the amendments of the Basel Accords II and II.5. This coefficient was found to be associated significantly in the NPLs regressions at a significance level of 5% and 1% for a sub-period (2005 to 2008) and a sub-period (2009 to 2012) respectively as reported in Table 5-9. However, the profitability coefficient is found to be associated insignificantly with the second risk indicator (i.e., the riskiness of asset portfolio indicator) during both a sub-period (2005 to 2008) and a sub-period (2009 to 2012) respectively as reported in Table 5-10. These results suggest that profitable banks tend to be involved in more risky strategies (as reflected by risk-based indicators) to obtain high-returns and compensate for potential losses and regulatory costs for meeting the regulatory requirements. These losses and regulatory costs are associated with the bank wary of the expected shrinkage of their balance sheets as a result of regulatory

[86] The RWAs regressions show that the coefficient of bank size was found to be statistically significant at a significance level of 1% during the period 2009 to 2012 only. The models 1 to 4 for a sub-sample (2005 to 2008), which is reported in Table 5-9, are re-estimated again with consideration for controlling variables (annual GDP growth and Inflation rate), the same results obtained, and the coefficient of bank size found to be statistically significant at 1%. The results are available up to request.

requirements especially after the financial crisis 2007/2008 as pointed out by Abdel-Baki and Shoukry (2013); and Dermine (2013).

Furthermore, the results show that diversified banks, which have high return from non-interest income, enable to enjoy advantages of diversification via reducing their credit risk over the sample period. Those diversified banks are found to be associated negatively with the NPLs ratio (i.e., the credit risk indicator) as reported in all subsamples in Table 5-9. Indeed, these results report a significant negative relationship during the sub-period 2009 to 2012 as it is shown in the model 3 as a significance level of 10%.[87] The results show that highly diversified banks during the post period of the Basel Accords II.5 were less involved in credit risk as reflected in the coefficient value. The results show that highly diversified banks, as measured by the NII ratio, were found to be associated positively with the RWAs ratio in both sub-periods. Indeed, the coefficient of the NII ratio was found to be statistically significant at 10% during the post period of announcing the Basel Accords II.5 as reported in Table 5-10.[88] Diversified banks were more involved in risk-weighted assets in their portfolio as reflected in the coefficient value. The coefficient of NII ratio during the subsample period (2009 to 2012) was found to be larger compared to the NII ratio's coefficient in the subsample period (2005 to 2008).

Finally, for the purpose of controlling for the crisis period, a crisis dummy variable is included in the models that are estimated based on the subsample (2005-2008) to capture whether there is an effect of the financial crisis in the given period. This dummy variable is indicated as a value of unity for the year 2007 (DV_{2007}^{Crisis}), and zero otherwise. This variable is expected to be associated positively with risk level to indicate banks were riskier during the crisis period. However, Table 5-9 shows that there is a significant negative relationship between the crisis dummy variable and the

[87] At a significance level of 5%, the results show a significant negative coefficient for NII ratio for all four models during the same sample period 2009 to 2012 when these models are re-estimated with consideration for the macroeconomic controlling variables (in particular inflation rate and annual growth of GDP) given that other coefficients are not changed. The results are available up to request.

[88] The model 1 to 4 for a sub-sample (2005 to 2008) are re-estimated with consideration for controlling variables (annual GDP growth and Inflation rate), the same results obtained, and the coefficient of diversification was found to be statistically significant at 10%. The results are available up to request.

credit risk level at a significance level of 1%.[89] This result implies that banks were associated with less credit risk during 2007.[90] Yet, the results show that the riskiness of asset portfolio is not reduced. Table 5-10 shows that there is a significant positive relationship between the crisis dummy variable and the portfolio risk at a significance level of 1%.[91] This result implies that banks were associated with more risky assets during the financial crisis period.[92]

Overall, the empirical results in this section focus on banking risk during the periods of prior- and post- announcement for amendments of the Basel Accords and mainly the Basel Accords II and Basel Accords II.5. The above results highlight the characteristics of risky banks in each period. The results show that small-sized, profitable banks are associated with high risk in both the post-period of announcing the Basel Accords II (i.e., 2005 to 2008) and the post-period of announcing the Basel Accords II.5 (i.e., 2009 to 2012). The results of this chapter also show that the impact of the regulatory capital differs according to the capitalisation level. The results in this section did not find any evidence to support the reduction in the risk level (both in term

[89] The effect of the financial crisis is also examined using a crisis dummy variable with a value of unity for the years 2007 and 2008. The results show a significant negative crisis dummy variable given that there was no difference in sign and significance of all other variables in the model. In addition, the effect of the financial crisis is also examined using a crisis dummy variable with a value of unity for the year 2008, and the results show an insignificant negative crisis dummy variable given that there were no changes in signs and significance of all other variables in the model. The results are available up to request.

[90] Since the crisis dummy variable was found to be significant; the subsample (2005-2008) was re-estimated without including observations of 2007. The purpose of excluding observations of 2007 is to examine the risk behaviour without effects of financial crisis 2007. The results of the re-estimated models, which are based on 698 observations for 344 banks, did not change, and the same above results were obtained. The results are available up to request.

[91] The effect of the financial crisis is also examined using a crisis dummy variable with a value of unity for the years 2007 and 2008. The results show a significant positive crisis dummy variable given that there was no difference in sign and significance of all other variables in the model. In addition, the effect of the financial crisis is also examined using a crisis dummy variable with a value of unity for the year 2008, and the results show an insignificant positive crisis dummy variable given that there were no changes in signs and significance of all other variables in the model. The results are available up to request.

[92] Since the crisis dummy variable was found to be significant; the subsample (2005-2008) was re-estimated without including observations of 2007. The purpose of excluding observations of 2007 is to examine the risk behaviour without effects of financial crisis 2007. The results of the re-estimated models, which are based on 620 observations for 310 banks, did not change, and the same above results were obtained. The results are available up to request.

of credit risk and portfolio risk) of undercapitalised banks during both the post-period of announcing the Basel Accords II (2005 to 2008) and the post-period of announcing the Basel Accords II.5 (2009 to 2012). The risky behaviour of the undercapitalised banks, which were found to be associated with high risk, supports the moral hazard issue that tends to be associated with banks with low capital. On the other hand, the results show that there was a more evident and consistent negative relationship between better-capitalised banks and risk level as measured by credit risk and portfolio risk during the post period of announcing the Basel Accords II. However, there was no evidence that better-capitalised banks were associated with a low-risk level during the post-period of announcing the Basel Accords II.5 (2009 to 2012). In term of change in the risk behaviour during the post-period of the announcement for amendments in the Basel Accords, the results did not show any evidence on changes in the characteristics of risky banks during the prior- and post-period of the amendments in the Basel Accords.

B) Banking risk during the prior- and post- period of the regulatory pressure:

The previous section focused more on specific sub-periods in the sample that experienced the announcement for the new amendments of the Basel Accords. The attention was mainly on post-periods of announcing for the new amendments of the Basel Accords II and Basel Accords II.5. As pointed out earlier, this sub-classification aimed to examine characteristics of banks that are associated with higher risk and examine how their risk behaviour is changed during the period which experienced the announcement of amendments in the Basel Accords. The results show the characteristics of risky banks in both subsamples. However, the results did not show any evidence of changes in the characteristics of risky banks during the prior- and post-period to the amendments in the Basel Accords.

One of the limitations of the results in the previous section is the focus on a period that followed the announcement of specific regulatory reform. Some sub-periods are not considered in the analysis of the previous section due to the small size of observations, for example, a sub-period 2003/2004 and a sub-period 2013/2014.

However, these sub-periods experienced the implementation of regulatory reforms in combination with other sub-periods, and hence ignoring these periods might lead to losing some information. These limitations overcome in this section by considering sub-classifying the sample period into two sub-samples to account for the prior- and post- period of the regulatory pressure. Banks experienced more regulatory pressure particularly after the financial crisis 2007/2008. During the post-period of the financial crisis, regulatory authorities asked banks to impose more capital and meet additional regulatory requirements. Basel Accords II.5 was introduced in 2009 and Basel III in 2010, and more banks started implementing the Basel Accords III in 2013/2014. The new amendments in Basel Accords in Basel II.5 and III are more restrictive compared to the Basel Accords I and II that were implemented before 2009. Thus; the post period after 2009 experienced more regulatory restrictions than before. Hypothetically, the risk level is expected to reduce during the regulatory pressure period due to expecting a sensitive risk-based capital requirement during the restrictive regulatory periods. Banks are required to meet their regulatory capital requirements and avoid any additional regulatory costs. Thus; banks are expected to change their risk behaviour and banking portfolios in response to the regulatory pressure.

In this section, a further investigation is conducted on the risk behaviour of capitalised banks during the regulatory pressure period (2009 to 2014) versus less regulatory pressure period (2003 to 2008). This investigation aims to view the impact of the regulatory pressure on the risk level for both undercapitalised banks and better-capitalised banks. For this propose the sample is divided into two sample periods (2003 to 2008) versus (2009 to 2014). The analysis starts by using a time dummy ($DV_t^{2009/12}$) is used to test whether there is a significant difference in the risk level during the prior- and post- period of the regulatory pressure. This dummy variable ($DV_t^{2009/12}$) donates the value of unity for the period 2009 to 2014, and zero otherwise. It has a subscript of (t) since it does not change across banks in the sample. The coefficient of this dummy variable is expected to be negative, i.e., the period 2009 to 2014 had experienced more regulatory requirements and asked banks to increase their capital level, disclose more relevant information, and meets other regulatory requirements. This variable is added in the models that are estimated in the baseline regressions that are based on the whole sample as reported in Section 5.5.1. In addition, a crisis dummy variable is included in the models for the purpose of controlling the crisis year (2007).

Table 5-11 show that there is no evidence that credit risk (i.e., NPLs ratio) reduced during the post- period of the regulatory pressure. The coefficient ($DV_t^{2009/12}$) was found to be statistically insignificant. However, Table 5-12 shows that the riskiness of the asset portfolio is not reduced during the same period. It is observed that a time dummy ($DV_t^{2009/12}$) has a positive coefficient in the RWAs regressions, and it is significant at 5% as reported in Table 5-12. This positive coefficient of a dummy variable ($DV_t^{2009/12}$) implies that banking asset portfolio risk did not reduce during the pressurised regulatory period (i.e., 2009 to 2014). These results support the findings that are obtained in the baseline regressions, which are reported in Table 5-5, in which the results support that bank manager might tend to reduce their risk in specific activities, but they tend to be involved in other activities that still keep the riskiness of their portfolio risk.

In order to understand why there is an indicator of low credit risk and high asset portfolio risk during the period 2009 to 2014, further analysis is required to examine the risk behaviour during 2003 to 2008 compared to the risk level from 2009 to 2014. The overall view of the empirical results of both samples, it is observed that there are no differences in the characteristics of banks that are associated with high-risk level between both subsamples. The following part of the section focuses on the main characteristics of banks that are associated with high-risk in periods that experienced a different degree of regulatory restrictions. Both Table 5-11 and Table 5-12 report both subsamples: a subsample for period 2003 to 2008 versus a subsample for period 2009 to 2014.

Based on these results, this chapter expands the analysis to conduct further examination of bank characteristics that are associated with a higher risk level according to their capital level. For this purpose, the following interaction term ($Inter_{it}$) is used:

$$Inter_{it} = REG_{it}^{k} * X_{it} \qquad \text{Equation (5-1)}$$

Table 5-11: Relationship between the capital level and risk (for a subsample for the period (2003-2008), a subsample for the period (2009-2014):

The dependent variable is the risk level indicator as measured by non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample for prior and post period of the regulatory restrictions												
Estimated Models using NPLs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample for the period 2003 to 2014				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008)**				**A subsample for banks during the period of the regulatory pressure (2009 to 2014)**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	0.0007	0.0007	0.0007	0.0007	0.0001	0.0001	0.0001	0.0001
	(0.4034)	(0.4152)	(0.4133)	(0.4158)	(0.3495)	(0.3543)	(0.3536)	(0.3543)	(0.3710)	(0.3718)	(0.3741)	(0.3770)
Size: log Assets	-0.0162 ***	-0.0161 ***	-0.0160 ***	-0.0160 ***	-0.0195 ***	-0.0194 ***	-0.0194 ***	-0.0195 ***	-0.0120 ***	-0.0121 ***	-0.0120 ***	-0.0119 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Profitability: ROA Ratio	0.3175 ***	0.3163 ***	0.3168 ***	0.3172 ***	0.0867	0.0882	0.0903	0.0884	0.01228	0.0121	0.0118	0.0119
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.2673)	(0.2616)	(0.2534)	(0.2596)	(0.7948)	(0.7982)	(0.8019)	(0.8030)
Diversification: NII Ratio	-0.0029	-0.0029	-0.0028	-0.0029	-0.0030	-0.0033	-0.0033	-0.0033	0.0063	0.0064	0.0063	0.0063
	(0.6798)	(0.6761)	(0.6847)	(0.6786)	(6917)	(0.6704)	(0.6684)	(0.6695)	(0.1755)	(0.1682)	(0.1766)	(0.1778)
A) Under capitalised banks (REGU)	0.0133 **				-0.0120				0.0055			
	(**0.0153**)				(0.1441)				(0.3457)			
A) Better capitalised banks (REGO)	0.0102				-0.0010				-0.0021			
	(0.6546)				(0.9717)				(0.8972)			
B) Under capitalised banks (PCAU)		0.0017 **				0.0001				0.0013		
		(**0.0306**)				(0.9413)				(0.1156)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0004				-0.0020				0.0003	
			(0.7045)				(0.2279)				(0.6937)	
D) Better capitalised banks (REG-mcr)				-0.0009				0.0008				-0.0020
				(0.6909)				(0.8282)				(0.24)
DV for Crisis 2007	-0.0034 ***	-0.0034 ***	-0.0034 ***	-0.0034 ***	-0.0032	-0.0032	-0.0032	-0.0032				
	(**0.0060**)	(**0.0057**)	(**0.0017**)	(**0.0064**)	(0.1301)	(0.1381)	(0.1327)	(0.1336)				
DV for period after 2009	0.0017	0.0017	0.0017	0.0018								
	(0.3566)	(0.3526)	(0.3495)	(0.3419)								
Constant	0.1385 ***	0.1384 ***	0.1377 ***	0.1385 ***	0.1592 ***	0.1589 ***	0.1597 ***	0.1584 ***	0.1081 ***	0.1080 ***	0.1077 ***	0.1093 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics												
Observations	2,860	2,862	2,860	2,860	1,324	1,325	1,324	1,324	1,400	1,400	1,400	1,400
No. Banks	410	410	410	410	364	364	364	364	391	391	391	391
Wald chi2 Statistics	107.81	107.64	110.49	107.58	49.4200	48.2000	51.6100	50.2900	53.4400	53.9400	52.5700	56.0100
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.2015	0.2026	0.2017	0.2016	0.2193	0.2186	0.2182	0.2184	0.1750	0.1746	0.1747	0.1734
r2_between groups	0.2569	0.2577	0.2573	0.2569	0.2282	0.2278	0.2273	0.2277	0.1652	0.1653	0.1652	0.1625
r2_within group	0.0643	0.0641	0.0635	0.0636	0.0616	0.0606	0.0620	0.0608	0.0406	0.0412	0.0403	0.0441

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table 5-12: Relationship between the capital level and risk (for a subsample for the period (2003-2008), a subsample for the period (2009-2014):

The dependent variable is the risk level as measured by risk-weighted assets/Assets (RWAs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample for prior and post period of the regulatory restrictions												
Estimated Models using RWAs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample for the period 2003 to 2014				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008)**				**A subsample for banks during the period of the regulatory pressure (2009 to 2014)**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0058***	0.0058***	0.0058***	0.0058***	0.0077***	0.0077***	0.0077***	0.0077***	-0.0009	-0.0008	-0.0009	-0.0008
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0002**)	(**0.0002**)	(**0.0002**)	(**0.0002**)	(0.6971)	(0.7105)	(0.6993)	(0.7294)
Size: log Assets	-0.0193	-0.0208	-0.0204	-0.0190	-0.0165	-0.0167	-0.0168	-0.0168	-0.1160***	-0.1168***	-0.1184***	-0.1156***
	(0.1804)	(0.1521)	(0.1592)	(0.1903)	(0.2025)	(0.2013)	(0.1975)	(0.1956)	(**0.0009**)	(**0.0004**)	(**0.0006**)	(**0.0004**)
Profitability: ROA Ratio	0.3554	0.3555	0.3529	0.3698	0.2055	0.2032	0.2035	0.2030	1.0772	1.0523	1.0354	1.0697
	(0.5189)	(0.5183)	(0.5204)	(0.5032)	(0.6936)	(0.6948)	(0.6959)	(6974)	(0.1378)	(0.1491)	(0.1599)	(0.1415)
Diversification: NII Ratio	0.1050*	0.1041*	0.1041*	0.1048*	0.1337	0.1298	0.1315	0.1314	0.0649	0.0628	0.0619	0.0622
	(**0.0602**)	(**0.0608**)	(**0.0613**)	(**0.0603**)	(0.1010)	(0.1064)	(0.1045)	(0.1027)	(0.1370)	(0.1513)	(0.1601)	(0.1543)
A) Under capitalised banks (REGU)	0.0345				0.1199*				0.1095			
	(0.6319)				(**0.0699**)				(0.1758)			
A) Better capitalised banks (REGO)	-0.1212				0.0088				0.2274			
	(0.2899)				(0.9330)				(0.5818)			
B) Under capitalised banks (PCAU)		-0.0079				-0.0085				0.0018		
		(0.1181)				(0.1290)				(0.8161)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0121*				-0.0001				-0.0088	
			(**0.0531**)				(0.9984)				(0.6443)	
D) Better capitalised banks (REG-mcr)				-0.0196**				0.00002				-0.0125
				(0.0294)				(0.9984)				(0.5198)
DV for Crisis 2007	-0.0052	-0.0052	-0.0052	-0.0052	0.0299**	0.0301**	0.0299**	0.0300**				
	(0.8161)	(0.6443)	(0.9984)	(0.2899)	(**0.0230**)	(**0.0270**)	(**0.0231**)	(**0.0273**)				
DV for period after 2009	0.0548**	0.0547**	0.0555**	0.0553**								
	(**0.0142**)	(**0.0140**)	(**0.0133**)	(**0.0134**)								
Constant	0.6918****	0.6992****	0.6878****	0.7004****	0.6425****	0.6475****	0.6460****	0.6456****	1.5577****	1.5762****	1.5939****	1.5783****
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics												
Observations	1,865	1,867	1,865	1,865	1,143	1,144	1,143	1,143	722	723	722	722
No. Banks	329	329	329	329	327	327	327	327	232	232	232	232
Wald chi2 Statistics	76.1300	79.4300	77.700	76.5500	37.0500	35.2800	33.3100	33.2000	21.0300	19.71	19.8500	19.8000
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.018**)	(**0.014**)	(**0.0013**)	(**0.0000**)
r2_overall	0.0729	0.0742	0.0733	0.0724	0.1340	0.1337	0.1329	0.1328	0.0449	0.0444	0.0433	0.0441
r2_between groups	0.0925	0.0931	0.0926	0.0918	0.1385	0.1385	0.1375	0.1375	0.0563	0.0554	0.0544	0.0555
r2_within group	0.0202	0.0202	0.0206	0.0206	0.0262	0.0270	0.0258	0.0258	0.0081	0.0040	0.0048	0.0043

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Where, (REG_{it}^{k}) is the capital level that is defined by k regulatory pressure approach. As stated earlier, this chapter uses four approaches to measure the regulatory capital pressure, i.e., Jacques and Nigro's approach (as measured by REGU and REGO), the prompt corrective action approach (as measured by PCAU), the Ediz approach (as measured by REG-Ediz), and the standard approach (as measured by REG-mcr). (X_{it}) is one of three bank-level controlling variables: profitability level (as measured by the ROA ratio), diversification level (as measured by the NII ratio), and ownership level ($\mathrm{DV}_{\mathrm{i}}^{\mathrm{PLB}}$).[93] The first two variables are considered because they are found to be risk determinants that are reported in the baseline regressions (Table 5-5). The ownership variable is also considered to identify which type of ownership profile is associated with a higher risk level.[94] These interaction terms are added separately to each model in both subsamples: a subsample for the period (2003 to 2008) and a subsample (2009 to 2014).

The empirical results of these regressions with the interaction terms are reported in four tables that are attached in Appendix VIII to save space. Table VIII-6 and Table VIII-7 report empirical results, which accounts for the interaction term, for a sub-period (2003 to 2008) for each indicator that reflects the risk level (i.e., the NPLs ratio and RWAs ratio respectively). Besides, Table VIII-8 and Table VIII-9 report empirical results of the same exercise but for a sub-period (2009 to 2014) for the same indicators. Comparing the results of the regressions that account the above interaction term in both subsamples, i.e., subsample for less regulatory pressure period (i.e., 2003 to 2008) versus a subsample for a pressurised regulatory period (i.e., 2009 to 2014), the following points are observed:

- Undercapitalised profitable banks (as measured by $REG_{it}^{k} * ROA_{it}$) tend to be associated with less credit risk during the less regulatory pressure period (i.e., 2003 to 2008) as reported in Table VIII-6. Indeed,

[93] The bank size is not considered in this section. There is a further investigation conducted in the next section (5.5.4) on the risk behaviour of both undercapitalized and better-capitalised banks at a different institutional size of the bank.

[94] In this analysis, only publicly listed banks versus unlisted banks are accounted because they have relatively the same number of observations, while the number of observations for foreign banks is relatively small comparing to the number of observations of a subsample for domestic banks.

the coefficient of the interaction term ($REG_{it}^{REGU} * ROA_{it}$) was found to be negative at a significance level of 1% in the first model. However, there is no evidence that those undercapitalised profitable banks were able to reduce their credit risk during the period that experienced more regulatory restrictions (i.e., 2009 to 2014). The coefficient of the interaction term ($REG_{it}^{k} * ROA_{it}$) was found to be positive, but statistically insignificant, in all NPLs regressions during the period 2009 to 2014 as reported in Table VIII-8.

On the other hand, the portfolio riskiness of those undercapitalised profitable banks was found to be higher compared to other banks in both sub-periods that experienced different regulatory restrictions. Those banks were found to be associated positively with the asset portfolio risk, as indicated by the coefficient $REG_{it}^{REGU} * ROA_{it}$ in the first model, during the period that experienced less regulatory pressure (i.e., 2003 to 2008). Indeed, the coefficient of the interaction term ($REG_{it}^{REGU} * ROA_{it}$) was found to be positive at a significance level of 5% as reported in Table VIII-7. They were also found to be associated positively with the asset portfolio risk, as indicated by the coefficient $REG_{it}^{PCAU} * ROA_{it}$ in the second model, during the period that experienced more regulatory pressure (i.e., 2009 to 2014). Indeed, the coefficient of the interaction term ($REG_{it}^{PCAU} * ROA_{it}$) was found to be positive at a significance level of 5% as reported in Table VIII-9. Association of the undercapitalised profitable banks with a risky asset indicates that those banks worked to invest in risky assets in an attempt to generate high earnings that could be benefited to signal positively to the public that they are performing well. Beatty and Gron (2001), who examined the American holding companies' banks during the post-period of implementing the Basel Accords I (i.e., 1986 to 1995), argued that profit-maximizing banks choose to change their equity, risk-adjusted assets, and total assets to minimise costs of being away from their target capital ratio. The results of this chapter show that undercapitalised profitable banks might choose to readjust riskiness of their portfolio. They were found to be associated with less credit risk credit risk (as reflected in low nonperforming loans), and at the same time their assets portfolio was associated with high RWAs. This behaviour was more apparent during the less restrictive regulatory pressure period (i.e., 2003 to 2008).

In term of the risk behaviour of better-capitalised banks, there is no sufficient evidence on the risk behaviour of better-capitalised profitable banks. The coefficient of the better-capitalised profitable banks was found to have inconsistent signs and statistically insignificant values except for the coefficient ($REG_{it}^{REGO} * ROA_{it}$) in model one found to be positive at a significance level of 5% as reported in Table VIII-7. This positive coefficient implies that better-capitalised banks are associated with a high proportion of risk-weighted assets during the period of less regulatory pressure (i.e., 2003-2008).

- Undercapitalised diversified banks (as measured by $REG_{it}^{k} * NII_{it}$) are found to be associated with less credit risk during the less regulatory pressure period (i.e., 2003 to 2008) as reported in Table VIII-6. Indeed, the coefficient of the interaction term ($REG_{it}^{REGU} * NII_{it}$) was found to be negative at a significance level of 5% in the first model as reported in Table VIII-6. Those undercapitalised banks were also found to be associated with less risk-weighted assets in their asset portfolio during the same period. The coefficient of the interaction term ($REG_{it}^{PCAU} * NII_{it}$) was found to be negative at a significance level of 10% in the second model as reported in Table VIII-7. These results imply that undercapitalised diversified banks get benefit from their investment in non-interest activities, and they were able to reduce their risk level during the period that experienced less regulatory restrictions. However, there is no evidence on the risk behaviour of these banks is reduced during the period that experienced more regulatory pressure (i.e., 2009 to 2014). The coefficient of the undercapitalised diversified banks was found to have inconsistent signs and statistically insignificant values for the sub-period (2009 to 2014) in all models as reported in Table VIII-8 and Table VIII-9.

In term of the risk behaviour of better-capitalised banks, there is no sufficient evidence on the risk behaviour of better-capitalised diversified banks. The coefficient of the better-capitalised diversified banks was found to have inconsistent signs and statistically insignificant values except the coefficient ($REG_{it}^{REGO} * NII_{it}$) in the first model was found to be negative at a significance level of 10% as reported in Table VIII-7. This negative coefficient implies that better-capitalised banks tend to have less risk-weighted assets in their asset portfolio during the period of less regulatory pressure (i.e., 2003-2008).

- The results show that both undercapitalised and better-capitalised listed banks (as measured by $REG_{it}^{k}\mathrm{DV}_{\mathrm{i}}^{\mathrm{PLB}}$) change their risk behaviour differently during the prior- and the post period of the regulatory pressure. On the one hand, there was no sufficient evidence that undercapitalised listed banks were associated with less risk during an unrestrictive regulatory period (i.e., 2003 to 2008). The coefficient of undercapitalised listed was banks found to be inconsistent and statistically insignificant except the coefficient ($REG_{it}^{k}\mathrm{DV}_{\mathrm{i}}^{\mathrm{PLB}}$) in the first model of the RWAs regressions that was found to be positive at a significance level of 5% as reported in Table VIII-7. This positive coefficient suggests that even undercapitalised listed banks, which are supposed to follow regulations and disclose their relevant information, were found to be associated with risky asset portfolio during less regulatory pressure. On another hand, there was no evidence that those undercapitalised listed banks were associated with less risk during the post-period of the regulatory pressure (i.e., 2009 to 2014).

  On the other hand, there was no evidence that better-capitalised listed banks, which are already meeting the minimum capital requirements, change their risk behaviour over the sample periods that experienced different regulatory pressure. However, the results show that better-capitalised banks become less risky during the period that experienced more regulatory pressure (i.e., 2009 to 2014). The coefficient ($REG_{it}^{REGO}\mathrm{DV}_{\mathrm{i}}^{\mathrm{PLB}}$) was found to be associated negatively with the RWAs ratio during the period (2009 to 2014) at a significance level of 10%. This result is consistent with findings of Aggarwal and Jacques (2001). They found that adequately capitalised banks a significant positive relationship between capital level and portfolio risk, as measured by the RWAs ratio, during the prior-period of implementing the prompt corrective action plan that used penalties for undercapitalised banks for breaching the minimum capital requirements. Also, they found that adequately capitalised banks show a significant negative relationship between capital level and portfolio risk during the post-period of implementing the prompt corrective action plan.

Overall, the above results highlight the main characteristics of banks that are associated with high-risk banks, especially during the period that experienced more regulatory changes. The results show that the capitalisation level and restrictiveness of the regulatory pressure environment are heterogeneity factors that should be accounted for to obtain a better understanding of the banking risk behaviour. For instance, undercapitalised profitable banks are able to reduce their credit risk during the period that experienced less regulatory pressure. However, those undercapitalised profitable banks were found to be associated with high asset portfolio risk at the same time. After the introduction of the new regulatory requirements, as per the Basel Accords, there was no evidence that those banks were able to reduce their riskiness.

Furthermore, diversified banks were able to reduce the riskiness of their portfolio only during the less regulatory pressure period regardless of their capitalisation level. However, there was no evidence that those diversified banks were able to reduce their risk level during the period that experienced more regulatory pressure. These results highlight a potential attempt of these profitable and diversified banks to invest in high-risk activities to obtain higher returns, especially during the period that experienced less regulatory restrictions.

The results show that there were observable differences in the risk behaviour of the undercapitalised banks versus better-capitalised banks according to the ownership profile. The results show that listed undercapitalised banks were associated with high-risk compared to other unlisted undercapitalised banks. Thus, these results support the existence of moral hazard issues even during the period of more regulatory pressure. Whereas, better-capitalised listed banks did change their risk behaviour from high-risk banks during less regulatory pressure period to less-risk banks during the high regulatory pressure period. Indeed, the coefficient REGU was found to be statistically significant at 10%. They were found to respond to regulatory requirements and change their behaviour accordingly. This result suggests that better-capitalised listed banks worked to send a positive signal to both regulatory authorities and public that they can meet the regulatory requirements, and they reduce their risk level during the period more regulatory instructions were introduced.

C) Risk behaviour r during the prior- and post- period of the effective implementation for the amendments of the Basel Accords:

The results in the previous sections should be considered with caution to recognise the impact of the amendments in the regulatory capital framework as per the Basel Accords. The analysis, in section 5.5.3.A, is based on the announcement period for the amendments of the Basel Accords. On the other hand, the analysis, in section 5.5.2.B, is based on sub-periods that experienced introduction and implementation of some amendments as per the Basel Accords. However, there was a time lag between the announcement a given framework of the Basel Accords and its implementation, and this time lag varies among countries that are included in the sample. The above results are based on the whole sample that aggregates all banks in which some banks implemented the Basel Accords I, while others applied the Basel Accords II over the sample period.[95] They might not reflect the direct impact of the changes in the capital regulatory framework. Therefore, evaluating the impact of the changes in the regulatory capital framework is more critical. For the purpose of dealing with this

[95] Refer to Appendix (II) for further details on the number of banks in the sample that implemented Basel Accords I, II, and III per year.

limitation and in order to provide a robust result on the impact of changes in the capital framework on the risk level, the sample was split into subsamples according to the effective implementation of the Basel Accords in each country. Two main subsamples are considered as follow:

1. ***The impact of the implementation of the Basel Accords II on the risk behaviour:***

A subsample is extracted from the whole sample to examine the risk-taking behaviour of banks after the effective implementation of the Basel Accords II. This subsample includes banks from countries that were adopting the Basel Accords I, and then some of them started implementing the Basel Accords II in 2006. The banks in the countries that started implementing the Basel II are hypothesised to be the most affected banks by the Basel regulatory reforms. Hence, the risk level in these banks is expected to be affected negatively by the new regulatory requirements. The new amendments of the Basel Accords II aim to improve the sensitivity of risk-based capital requirements and additional disclosure requirements were imposed.[96] Table 5-13 lists countries that are included in the subsample: For the purpose of capturing the effects of the implementation of the Basel Accords II on risk level, banks that started

Table 5-13: The subsample that is used to examine the prior- and post-period of implementing the framework of the Basel Accords II

Subsample	Countries
A subsample of banks that were implementing Basel Accords I during period 2003 to 2005	Algeria, Djibouti, European Union's Countries*, Iraq, Japan, Libya, Qatar, Sudan, Switzerland, Syrian Arab Republic, Mauritania, and Yemen.
A subsample of banks that started implementing Basel Accords II during period 2006 to 2012	Qatar, Japan, Sudan, Switzerland, and European Union's Countries*
A subsample of banks that kept using Basel Accords I during period 2006 to 2012	Algeria, Djibouti, Iraq, Libya, Syrian Arab Republic, Mauritania, and Yemen

Note:

- European Unions' countries that are included in the sample are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, and United Kingdom.

[96] Chapter Two of the thesis provides further details on developments of the Basel regulatory capital framework over the last three decades.

implementing Basel Accords II since 2006 are indicated by the following interaction term (DV^{BII}) in which:

$$DV^{BII} = DV^{dB} * DV_t^y \qquad \text{Equation (5-2)}$$

Where, (DV^{dB}) is a dummy variable that donates the value of unity for banks that were implementing the Basel Accords I and, then they started implementing Basel Accords II after 2006, zero otherwise. (DV_t^y) is a dummy variable that donates the value of unity for years when banks implemented the II Basel Accords (i.e., period 2006 to 2012), and zero otherwise. It has a subscript of (t) since it does not change across banks in the sample. The coefficient of this interaction term is expected to be negative.

Empirical Results on the impact of the implementation of the Basel Accords II on the risk behaviour:

Panel (A) in Table 5-14 reports the empirical results of the regression analysis that aims to examine the risk behaviour using a subsample of banks that were adopting the Basel Accords I during the sample period (2003 to 2005), and then some of these banks started implementing the new amendments of Basel Accords II during the period (2006 to 2012). The dependent variable represents the risk level and is measured using two indicators: the non-performing loans (NPLs) ratio and risk-weighted assets (RWAs) ratio. Each risk indicator is measured in four different models according to the adopted approach to identify regulatory pressured banks as stated previously. There are 737 annual observations for 152 banks for the NPLs regressions, and 644 annual observations for 130 banks for the RWAs regressions over the period (2003 to 2012) as reported in panel (B) at Table 5-14. The result shows a negative coefficient for the variable (DV^{BII}) in the NPLs regressions at a significant level of 1% in all four models. This result implies that the risk level of these banks, which started executing the new amendments of the Basel II after 2006, tend to have a lower risk level compared to banks that keep adopting the Basel Accords I during the sample period (i.e., 2006 to 2012). This result implies that banks, which started executing the new

Table 5-14: Relationship between the capital level and risk (for a subsample of banks that applied the Basel Accords II): The dependent variables are the risk level as measured by the non-performing loans (NPLs/Asset) ratio and the risk-weighted assets (RWAs/Assets) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks that applied the Basel Accords I during 2003 to 2005, and then some of them applied Basel Accords II during the period 2006 to 2012.

	Robust Clustered Random Effects Model							
	A subsample for banks during the period (2003 to 2012) using the NPLs/Asset as a dependent variable				**A subsample for banks during the period (2003 to 2012) using the RWAs/Asset as a dependent variable**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0002	0.0002	0.0002	0.0002	0.0158 ***	0.0156 ***	0.0158 ***	0.0159 ***
	(0.6380)	(0.6420)	(0.6380)	(0.6460)	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)
Size: log Assets	-0.0098 **	-0.0098 **	-0.0099 **	-0.0099 **	0.0613 ***	0.0582 **	0.0573 **	0.0609 ***
	(**0.0380**)	(**0.0390**)	(**0.0390**)	(**0.0410**)	(**0.0073**)	(**0.0157**)	(**0.0168**)	(**0.0094**)
Profitability: ROA Ratio	0.2954 ***	0.2962 ***	0.2948 ***	0.2969 ***	1.6183 ***	1.6019 ***	1.6226 ***	1.6391 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Diversification: NII Ratio	-0.0064	-0.0064	-0.0062	-0.0065	0.0037	-0.0057	0.0012	0.0020
	(0.3270)	(0.3250)	(0.3430)	(0.3190)	(0.9328)	(0.8941)	(0.9783)	(0.9646)
A) Under-capitalised banks (REGU)	-0.0016				0.1494			
	(0.9130)				(0.1655)			
A) Better-capitalised banks (REGO)	-0.0179				-0.1677			
	(0.4860)				(0.2730)			
B) Under-capitalised banks (PCAU)		-0.0008				-0.0128*		
		(0.1520)				(**0.0607**)		
C) Regulatory Pressure -Edizs (REG-Ediz)			0.0010				0.0029	
			(0.3050)				(0.7134)	
D) Better-capitalised banks (REG-mcr)				0.0005				-0.0215
				(0.8140)				(0.3182)
DV for banks implemented Basel II since 2006	-0.0045 ***	-0.0045 ***	-0.0045 ***	-0.0045 ***	0.0670	0.0604	0.0583	0.0658
	(**0.0070**)	(**0.0070**)	(**0.0070**)	(**0.0070**)	(0.5545)	(0.6008)	(0.6119)	(0.5640)
Constant	0.0928 **	0.0925 **	0.0919 **	0.0924 **	-0.1240	-0.1004	-0.1010	-0.1088
	(**0.0170**)	(**0.0170**)	(**0.0180**)	(**0.0160**)	(0.5306)	(0.6282)	(0.6259)	(0.5967)
Panel (B): Summary Statistics								
No. Observation	737	797	737	737	644	646	644	644
No. Banks	152	152	152	152	130	130	130	130
Wald chi2 Statistics	49.6900	31.7100	32.4800	57.3300	26.3500	23.0000	20.6400	21.9500
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0004**)	(**0.0008**)	(**0.0021**)	(**0.0012**)
r2_overall	0.2081	0.2083	0.2083	0.2080	0.2298	0.2391	0.2406	0.2308
r2_between groups	0.2055	0.2057	0.2055	0.2052	0.2388	0.2449	0.2478	0.2403
r2_within group	0.1091	0.1085	0.1094	0.1085	0.0654	0.0654	0.0588	0.0614

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

amendments of the Basel II in 2006, assessed their lending portfolio more effectively, and hence they tend to have less credit risk. They were aware that the new risk assessment guidelines would be more reflective for their risk level, and they were asked to disclose relevant information according. They do not want to signal the regulators and the market for having a low-quality portfolio otherwise they will be asked to account for a higher capital level. However, there was no evidence that the riskiness of their asset portfolio was reduced too. The results for the second risk-based indicator, which are represented in models 5 to 8 in Table 5-14, show an insignificant positive coefficient for the variable (DV^{BII}) in the RWAs regressions.

In term of other controlling variables, Table 5-14 reports the same findings in Table 5-5 which are the baseline results of the regression that are based on the whole sample.[97]A further investigation of the risk level was conducted using a subsample that includes only banks that implemented the Basel Accords II during the period (2006 to 2012).[98] The results were found to be consistent with results that are based on the baseline regressions reported that are reposted in Section 5.5.1.[99]

[97] All the findings are the same except the risk behaviour of undercapitalised banks in both NPLs regressions and RWAs regressions. The results of both NPLs regressions and RWAs regressions provide no evidence that undercapitalised banks are associated with a high-risk level. The coefficients of the undercapitalized banks in the NPLs regressions were found to be insignificant and inconsistent as reported in Table 5-14. Unlike to the baseline regressions, which are reported in Table 5-5, the results of the RWAs regressions found that undercapitalised banks (as measured by PCAU in the model 6) are associated with less risk-weighted assets in their asset portfolio at a significance of 10% during the sample period 2003 to 2012. All other empirical results are the same as the baseline regressions in Table 5-5. In term of statistical significance, the baseline regressions reported the same significant coefficients for the NPLs regressions. Thus; it is observed that the coefficient of model fitness, which is R-square as reported in panel (B) of each table, is close each other (about 20%) as reported at Table 5-5 (for the baseline regressions) and Table 5-14 (for the subsample regressions). However, the RWAs regressions in Table 5-14 reported more significant coefficient. Thus; it is observed that the coefficient of model fitness, which is R-square as reported in panel (B) of each table, of the subsample regressions in Table 5-14 is higher than the coefficient of model fitness of a baseline regressions that are reported in Table 5-5 (4% versus above +20% respectively).

[98] The subsample for banks that implemented Basel Accords II is based on 558 (468) annual observations for 135 (118) banks for the NPLs (RWAs) regression as reported in Table VIII-10 (Table VIII-11).

[99] The empirical results for a subsample of that include only banks that implemented the Basel Accords II during the period (2006 to 2012) are reported in Appendix (VIII).

2. ***The impact of the implementation of the Basel Accords III on the risk behaviour:***

Due to the variation of the time lag between the announcement for the amendments of the Basel Accords III and its effective implementation, it was hard to extract a subsample that includes banks which adopted the Basel Accords II versus banks which started adopting the Basel Accords III at the same period. Therefore, the adopted interaction term in the previous section cannot be used to assess the impact of the implementation of the Basel Accords III. Thus; a different approach is used in this section to examine the impact of the implementation of the Basel Accords III.

A subsample is extracted from the whole sample to examine the risk-taking behaviour of banks after the effective implementation of the Basel Accords III. This subsample includes banks from countries that were adopting the Basel Accords II, and then started implementing the Basel Accords III in 2013 and 2014. The period between 2013 and 2014 is expecting to be the most affected period that reflects the implications for the new amendments of the Basel Accords III on the risk level. Table 5-15 lists countries that are included in the subsample:

Table 5-15: The subsample that is used to examine the prior- and post-period of implementing the framework of the Basel Accords III

Subsample	Countries
A subsample of banks that were implementing Basel Accords II during the period 2007 to 2012	Japan, Switzerland, European Union's Countries*, Canada, Mexico, Republic of Korea, and the United States of America
A subsample of banks that started implementing Basel Accords III during the period 2013-2014	Japan, Switzerland, European Union's Countries*, Canada, Mexico, Republic of Korea, and the United States of America

Note:

- European Unions' countries that are included in the sample are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, and United Kingdom.

For the purpose of capturing the immediate effects of the implementation of the Basel Accords III on risk level during the period 2013/2014, a time dummy variable ($DV_t^{2013/14}$) that donates the value of unity for years 2013 and 2014 when banks were implementing the III Basel Accords, and zero otherwise. It has a subscript of (t) since it does not change across banks in the sample. The coefficient of this dummy variable is expected to be negative, i.e., the period when banks start implementing the Basel Accords III are more likely to reduce their risk level more than other years in order to signal to regulatory authorities and the market that they can meet the new regulatory requirements.

Empirical Results on the impact of the implementation of the Basel Accords III on the risk behaviour:

Table 5-16 reports the empirical results of the regression analysis that aims to examine the risk behaviour of banks that were adopting the Basel Accords II during the sample period (2007 to 2012), and then they started implementing the new amendments of Basel Accords III during the period (2013 to 2014). As stated earlier, the risk level is measured using credit risk indicator (as measured by NPLs ratio) and portfolio risk indicator (as measured by RWAs ratio). Each risk indicator is measured in four different models according to the adopted approach to identify regulatory pressured banks.

In term of credit risk regressions, there are 1,083 annual observations for 216 banks from 26 countries that were implementing the Basel Accords II during the period (2007 to 2012) as reported in panel (B) in Table 5-16. In term of portfolio risk regressions, there are 933 annual observations for 195 banks from 26 countries that were implementing the Basel Accords II during the same as reported in Table 5-16. The result shows a significant positive coefficient for the variable ($DV_t^{2013/14}$) in all four models of the NPLs regressions at a significance level of 1% as reported in Table 5-16. This result does not support the null hypothesis that expected a negative relationship.[100] The positive coefficient of ($DV_t^{2013/14}$) implies that the risk level increased during the period 2013-2014 compared to other years. This period is the same period when all banks in the underlying subsample started implementing the new

[100] All models were re-estimated using the time dummy variable 2013 and time dummy variable 2014 separately. The results of the re-estimated models did not change, and the same above results were obtained. Both coefficients time dummy variable 2013 and time dummy variable 2014 found to be positive with a significance level of 1%.

Table 5-16: Relationship between the capital level and risk (for a subsample of banks that were implementing the Basel Accords II and then they shift to apply the Basel Accords III in 2013 and 2014):

The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio and the Risk-weighted Assets (RWAs) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in (Table 4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords II during the period (2007 to 2012), and then they started implementing Basel III during the period (2013-2014)

Estimated Models	Robust Clustered Random Effects Model							
	A subsample for banks that start implementing Basel II during the period (2007 to 2012) and then Basel III during the period (2013-2014) using NPLs/Asset as a dependent variable				A subsample for banks that start implementing Basel II during the period (2007 to 2012) and then Basel III during the period (2013-2014) using RWAs/Asset as a dependent variable			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Coefficient (p- value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p- value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0001 (0.3254)	0.0001 (0.3438)	0.0001 (0.3624)	0.0001 (0.3560)	0.0143 *** (**0.0000**)	0.0140 *** (**0.0000**)	0.0143 *** (**0.0000**)	0.0143 *** (**0.0000**)
Size: log Assets	-0.0006 (0.4701)	-0.0007 (0.3732)	-0.0008 (0.4257)	-0.0007 (0.4322)	-0.1629 *** (**0.0000**)	-0.1609 *** (**0.0000**)	-0.1625 *** (**0.0000**)	-0.1629 *** (**0.0000**)
Profitability: ROA Ratio	0.3526 *** (**0.0000**)	0.3532 *** (**0.0000**)	0.3526 *** (**0.0000**)	0.3532 *** (**0.0000**)	1.1685 *** (**0.0000**)	1.1632 *** (**0.0000**)	1.1737 *** (**0.0000**)	1.1690 *** (**0.0000**)
Diversification: NII Ratio	-0.0074** (**0.0350**)	-0.0074** (**0.0355**)	-0.0074** (**0.0342**)	-0.0074** (**0.0359**)	-0.0943** (**0.0328**)	-0.0927** (**0.0357**)	-0.0948** (**0.0334**)	-0.0941** (**0.0331**)
A) Under-capitalised banks (REGU)	-0.0027* (**0.0503**)				-0.0060 0.9604			
A) Better capitalised banks (REGO)	-0.0068 (0.4263)				0.0255 (0.0254)			
B) Under-capitalised banks (PCAU)		0.0005 (0.4204)				-0.0208 *** (0.0019)		
C) Regulatory Pressure - Edizs (REG-Ediz)			0.0004 (0.4566)				-0.0021 (0.7211)	
D)Better capitalised banks (REG-mcr)				0.00001 (0.9897)				0.0010 (0.9140)
DV for period 2013-2014	0.0039 *** (**0.0014**)	0.0039 *** (**0.0014**)	0.0039 *** (**0.0013**)	0.0039 *** (**0.0014**)	-0.0261 *** (**0.0025**)	-0.0253 *** (**0.0031**)	-0.0262 *** (**0.0025**)	-0.0260 *** (**0.0025**)
Constant	0.0109 (0.1269)	0.0116 (0.1034)	0.0110 (0.1216)	0.0111 (0.1233)	1.7924 ***	1.7852 ***	1.7917 ***	1.7927 ***

Panel (B): Summary Statistics

No. Obs.	1,083	1,085	1,083	1,083	933	935	933	933
No. Banks	216	216	216	216	195	195	195	195
Wald chi2 Statistics	143.33 (**0.0000**)	125.94 (**0.0000**)	186.39 (**0.0000**)	126.04 (**0.0000**)	188.27 (**0.0000**)	196.01 (**0.0000**)	189.56 (**0.0000**)	192.18 (**0.0000**)
r2_overall	0.4313	0.4308	0.4321	0.4313	0.4068	0.4059	0.4073	0.4070
r2_between groups	0.4968	0.4970	0.4979	0.4970	0.4057	0.4044	0.4061	0.4059
r2_within group	0.2465	0.2463	0.2459	0.2458	0.1702	0.1840	0.1701	0.1701

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

amendments of the Basel III. This result implies that banks started implementing the Basel III, while they had a risky lending portfolio. In this regard, Sutorova and Teply (2014) found that the market did not appreciate positively for a higher capital level and less risky balance sheet of banks under the proposal of the Basel III. They found that the Basel Accords III could cause a drop in the market value of banks. Thus; banks might seek for high-risk high-return strategies in an attempt to obtain higher returns that could be used to show a better position and compensate for the additional requirements. The Basel III expanded its standards to include additional capital, liquidity, and disclosure requirements. This result reflects one of the costs of implementing the new regulatory requirements during the short term. These banks might seek for high-risk high-return strategies in an attempt to obtain higher returns that could be used to show a better position and compensate for the additional requirements.

On the other hand, the empirical results support the null hypothesis that expected a negative relationship between the implementation of the new amendments of Basel Accords and the risk behaviour. The coefficient of the time dummy variable ($DV_t^{2013/14}$) was found to be negative at a significance level of 1% in all RWAs regressions. The negative coefficient of ($DV_t^{2013/14}$) implies that regulatory restrictions play a role in discouraging banks to induce in more risky assets. This result suggests that these banks, which started implementing the Basel Accords, respond to the regulatory requirements, and they tended to be involved in less risk-weighted assets in their portfolio compared to other years. They might reduce their share in risk-weighted assets to signal to regulatory authorities and the market that they can meet the new regulatory requirements.

For the purpose of obtaining a robust result, another subsample is extracted from the whole sample to examine the risk-taking behaviour of banks after the effective implementation of the Basel Accords III. This subsample includes banks from countries that were adopting the Basel Accords II during period 2006 to 2012 and then started implementing the Basel Accords III in 2013 and 2014. The results of this subsample reported the same above findings which reflect consistency in the reported results. Refer to Appendix VIII for further details and mainly Table VIII-12 and Table VIII-13.

Nevertheless, these results should be taken with caution because it is observed that this subsample include banks from developed countries and mainly Canada, European Union's Countries, Japan, Mexico, Republic of Korea, Switzerland, and United States of America. The previous empirical results of this chapter, which are reported in Table 5-5, show that undercapitalised banks were found to be associated with high risk. While, Table 5-16 show that undercapitalised banks are associated negatively with the risk level. One of the possible reasons for variations in the behaviour of risky banks is that the sample included banks from both developed and developing countries that experienced different regulatory and supervisory environment. Further analysis of the impact of the capital level on the risk behaviour of banks from countries with different economic and financial development level is conducted in Section 5.6.4.

5.5.4 Bank-size perspective: The relationship between the capital level and risk level: Does bank-size matter?

All previous results show that larger banks, in term of asset size, associated with a lower risk level as measured by coefficient log asset. However, the literature shows that large-sized banks behave differently from small-sized banks (for example, Demsetz and Strahan, 1997; Hughes and Mester, 2013; Moutsianas and Kosmidou, 2016). Larger banks tend to have more competitive advantages. These banks claim to have better investment opportunities, well-diversified portfolios, and easy access to finance. The literature also highlights the existence of large-sized banks flag concerns over the issue of too-big-to-fail especially if they are associated with less capitalisation.

For the purpose of examining variation in the risk behaviour of different sized banks, the sample is divided into different size-based categories using Ward's method. The latter is characterised to be a simple systematic approach that is used as a classification tool to categorise the banks in the sample into different sized-based categories. The sub-classification is based on the concept of grouping a given dataset according to an underlying quantitative variable.[101] In this research chapter, the sample is sub-grouped into three sized based categories, and they are identified using the variable logarithm of total assets in the USD for each year of the sample periods according to Ward's method.[102] The categories are: small-sized banks (less than USD 8 million), medium-sized banks (between USD 8 million to USD 143.8 million), and large-sized banks (more than USD 134.8 million). This size-based segregation is used to examine if there is any difference in the behaviour of undercapitalised banks versus better-capitalised banks at different bank size. To capture the effects of the bank size

[101] Ward's method is a simple systematic approach that is based on the concept of grouping a given dataset according to an underlying quantitative variable. It starts forming a cluster of two observations that have the closest squared distance between them. Then every two clusters, which have the closest squared distance of its mean, are joined together. This process continues as more clusters are joined in a move up the hierarchy until the predetermined number of groups is formed. Each cluster is expected to include observations with the closet squared distance, and hence each cluster is expected to have the most similar characteristics of the variable that is used to categorize a given dataset.

[102] Further details on the results of the Ward's method of cluster analysis are provided in Appendix III.

on the behaviour of the capitalised banks, an interaction term (DV_K^{iS}=) is used in four different models in which:

$$DV_K^{iS} = DV_K^{REGp} * DV_t^{iS} \qquad \text{Equation (5-3)}$$

Where, (DV_k^{REGp}) is a dummy variable that indicates for pressurised banks in term of the capital as it is measured by (k) approach. As it was stated previously, the following four approaches are used to identify pressurised banks:

> Model 1: examines the undercapitalised banks (REGU) and better-capitalised banks (REGO) according to Jacques and Nigro's approach.
>
> Model 2: examines the undercapitalised banks (PCAU) according to the Prompt Corrective Action Approach.
>
> Model 3: examines the pressurised banks (REG-Ediz) as defined by the according to a probabilistic approach.
>
> Model 4: examines the better-capitalised banks as captured by the variable (REG-mcr).

(DV^{iS}) is a dummy variable that indicates the size of banks. Only small-sized banks ((DV^{SS})) and large-sized banks (DV^{LS}) are accounted. The medium size banks are not included in the regression to avoid collinearity issues.

Empirical Results on the impact of the capital on the risk level in different bank size levels:

Table 5-17 reports the empirical results of the risk behaviour of undercapitalised banks and better-capitalised banks according to the bank size. There are four models, and each one of them is based on one of the above stated four approaches. The results show evidence on different risk behaviour for small-sized banks compared to large-sized banks especially in terms of credit risk. With regard to the risk behaviour of small-sized banks, which are defined as banks with less than USD 8 million of assets value, the results show no evidence that small-sized undercapitalised banks are

Table 5-17: Relationship between the capital level and banking risk (for the whole sample with consideration for capitalised banks at different bank-size):

The dependent variables are the risk level as measured by the non-performing loans (NPLs/Asset) ratio and the risk-weighted assets (RWAs/Assets) ratio. A short name abbreviates each variable, and list of abbreviation and a list definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on the whole sample to examine capitalised banks at different bank-size during the sample period 2003 to 2013

	Robust Clustered Random Effects Model Estimated using NPLs/Asset as a dependent variable				**Robust Clustered Random Effects Model Estimated using RWAs/Asset as a dependent variable**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)
Capital: Equity/Asset Ratio	0.0006	0.0006	0.0006	0.0006	0.0059***	0.0060***	0.0060***	0.0059***
	(0.2513)	(0.2541)	(0.2502)	(0.2484)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Size: log Assets	-0.0181***	-0.0167***	-0.0169***	-0.0191***	0.0254	0.0201	0.0060	0.0330
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.2674)	(0.3671)	(0.3823)	(0.1838)
Profitability: ROA Ratio	-0.0700	-0.0693	-0.0685	-0.0644	0.2424	0.2539	0.2531	0.2109
	(0.2418)	(0.2346)	(0.2439)	(0.2717)	(0.6500)	(0.6356)	(0.6352)	(0.6925)
Diversification: NII Ratio	0.0008	0.0014	0.0012	-0.0003	0.1057*	0.1014*	0.1040*	0.1144**
	(0.8891)	(0.8131)	(0.8397)	(0.9617)	(**0.0620**)	(**0.0753**)	(**0.0668**)	(**0.0407**)
A) Regulatory Pressure for undercapitalised small banks (DV^{SS}_{REGU})	-0.0004				-0.0980***			
	(0.9811)				(**0.0000**)			
A) Regulatory Pressure for undercapitalised large banks (DV^{LS}_{REGU})	0.0703				-0.7134**			
	(0.1102)				(**0.0135**)			
A) Regulatory Pressure for better-capitalised small banks (DV^{SS}_{REGO})	-0.0449				-0.1620			
	(0.6152)				(0.4485)			
A) Regulatory Pressure for better-capitalised large banks (DV^{LS}_{REGO})	0.1147**				-0.8978***			
	(**0.0179**)				(**0.0003**)			
B) Regulatory Pressure for undercapitalised small banks (DV^{SS}_{PCAU})		-0.0029				0.0002		
		(0.5632)				(0.9907)		
B) Regulatory Pressure for undercapitalised large banks (DV^{LS}_{PCAU})		0.0027**				-0.0253**		
		(**0.0455**)				(**0.0102**)		
C) Regulatory Pressure - Edizs Regulatory Pressure – small banks ($DV^{SS}_{REG-Ediz}$)			-0.0028				0.0057	
			(0.4129)				(0.0645)	
C) Regulatory Pressure - Edizs Regulatory Pressure – large banks ($DV^{LS}_{REG-Ediz}$)			0.0021				-0.0012	
			(0.1753)				(0.9002)	
D) Regulatory Pressure for better-capitalised small banks (DV^{SS}_{REGmcr})				-0.0017				-0.0016
				(0.6120)				(0.9151)
D) Regulatory Pressure for better-capitalised large banks (DV^{LS}_{REGmcr})				0.0133**				-0.1255***
				(**0.0128**)				(**0.0048**)
Constant	0.1503***	0.1408***	0.1427***	0.1569***	0.3858**	0.4163***	0.4170***	0.3454**
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0177**)	(**0.0095**)	(**0.0095**)	(**0.0420**)
Panel (B): Summary Statistics								
No. Observations	2,724	2,726	2,724	2,724	1,865	1,867	1,865	1,865
No. Banks	400	400	400	400	329	329	329	329
Wald chi2 Statistics	91.5000	64.6200	75.1100	89.5200	79.8700	37.5800	30.1400	49.3100
(p-value)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1821	0.1785	0.1781	0.1848	0.0630	0.0472	0.0432	0.0769
r2_between groups	0.2381	0.2346	0.2312	0.2403	0.0837	0.0652	0.0603	0.0949
r2_within groups	0.0611	0.0622	0.0625	0.0611	0.0097	0.0089	0.0083	0.0082

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

associated with high risk. The small-sized undercapitalised banks, as which are measured by (DV^{SS}_{REGU}), (DV^{SS}_{PCAU}), and ($DV^{SS}_{REG-Ediz}$), according to an adopted approach of identifying undercapitalised banks, were found to be associated negatively with both risk indicators: credit risk (as measured by the NPLs ratio) and portfolio risk (as measured by the RWAs ratio). Although the results show no a statistically significant coefficient in the NPLs regressions, the coefficient (DV^{SS}_{REGU}) was found to be negative and statistically significant at 1% in the RWAs regressions. These results suggest that small-sized banks are risk-averse, and they do not get involved in risky asset portfolio to avoid extra regulatory costs.

On the other hand, large undercapitalised banks, which are not meeting the regulatory minimum capital requirements and their asset size are more than USD 134.8 million, were found to have higher credit risk compared to others. The coefficient of those large-sized undercapitalised banks, which are measured by (DV^{LS}_{REGU}) and (DV^{LS}_{PCAU}), was found to be positive and the coefficient (DV^{LS}_{PCAU}), in particular, was found to be statistically significant at 5%. The existence of risky large-sized banks flags concerns on the issue of too-big-to-fail especially if they associate with a lower capitalisation level. These banks are claimed to be associated with excessive risk at the cost of government assistance. This result is also consistent with Laeven et al. (2016) who found that banks with a larger size tend to have a higher systemic risk, and they tend to be less capitalised. In term of the portfolio risk, those large-sized undercapitalised banks were found to be less involved in risk-weighted assets in their portfolio. Both coefficients (DV^{LS}_{REGU}) and (DV^{LS}_{PCAU}) were found to be statistically significant at 5% in all RWAs regressions.

For better-capitalised banks, the results show that small-sized better-capitalised banks are less risky compared to large-sized better-capitalised banks. The results show no evidence that small-sized better-capitalised banks, which are measured by (DV^{SS}_{REGO}) and (DV^{SS}_{REGmcr}), are associated with high risk. However, the results show evidence that large-sized better-capitalised banks, which are measured by (DV^{LS}_{REGO}) and (DV^{LS}_{REGmcr}), are associated with high credit risk as measured by the NPLs ratio. Indeed, both coefficients (DV^{LS}_{REGO}) and (DV^{LS}_{REGmcr}) were found to be positive and statistically significant at 5% as reported in Table 5-17. These results imply that those large-sized better-capitalised banks are riskier in their lending activities compared to others. In term of the portfolio risk, better-capitalised banks, were found to be associated with less asset portfolio risk regardless of their institutional size from the asset perspective. There were no evidence that small-sized better-capitalised banks, which are measured by (DV^{SS}_{REGO}) and (DV^{SS}_{REGmcr}), are associated with high risk-weighted assets in their asset portfolio. But, large-sized better-capitalised banks, which are measured by (DV^{LS}_{REGO}) and (DV^{LS}_{REGmcr}), were found to have a significant negative coefficient in the RWAs regressions at a significant level of 1%. These results suggest that large-sized better-capitalised banks have a lower risky portfolio. Those large-sized better-capitalised banks tend to have less risk-weighted assets in their portfolio to signal to both regulators and the market that they already meet the minimum capital requirements, and they have a net safety to meet portfolio risk according to the regulatory requirements. However, as stated earlier, those large-sized better-capitalised banks were found to be more involved in low-quality lending assets compared to the others.

Overall, the above results show that there are differences in the risk behaviour of capitalised banks at a different institutional size of banks. The small-sized banks were found to be less risky compared to the large-sized banks. This result implies that small-sized banks are risk-averse, and they tend to build up a high quality of lending portfolio to reduce their non-performing loans. However, large-sized banks were found to be associated with high credit risk and had a high association with non-performing loans. In term of portfolio risk, which is measured using the regulatory risk-based indicator, banks show they are less involved in risk-weighted assets in their asset portfolio regardless of their asset-based institutional size.

5.5.5 Economic and Financial Development Perspective: The relationship between the capital level and the risk level: Does financial development matter?

The sample of this chapter includes banks from different countries mainly banks from the Middle East and North Africa (MENA) countries and banks from the Organisation for Economic Co-operation and Development (OECD) countries. However, these countries have different financial structure, and they are at different stages of economic and financial development as discussed in Chapter Three. Compared to the OECD countries, a banking sector in the MENA region is not only characterised to be a bank-based system, but it is also operating in a less developed financial structure with low institutional quality. This part of the chapter examines empirically if the capital-risk nexus differs across countries according to their economic and financial development.

From an empirical perspective, there are limited empirical studies that examine the banking risk behaviour with consideration for the differences in the quality of a legal environment and variation in stages of economic and financial development. Unlike to the previous studies, this chapter will examine the capital-risk nexus empirically with consideration for the regulatory capital pressure (via accounting the risk behaviour for both undercapitalised banks and better-capitalised banks) in countries with different level of economic and financial development. This analysis contributes to assessing the influence of the capital on the bank risk behaviour in both developed (represented by banks from the OECD countries) and less developed economic and financial markets (represented by banks from the MENA countries).

The capitalisation level is hypothesised to have a greater influence on bank risk in developed countries. High-capital banks in developed countries are hypothesised to be less risky due to effective legal and governance environment and developed financial markets. In contracts, the impact of the capital regulatory in developing countries might be less effective due to low institutional quality and ineffective governance. Thus; a positive relationship is expected between capital and risk level for banks in developing countries.

Empirical Results on the impact of the capital on the risk level in the OECD countries and the MENA countries:

The next tables report the empirical effect of the capital level on the riskiness of banks in both the OECD countries the MENA countries. The analysis starts by using a full sample that contains all banks in the sample to examine if banks from the MENA countries are riskier than banks from the OECD countries. For this purpose, a dummy variable is included in the regression, which stated in equation 4-1, and refers to a value of unity for banks from the MENA countries ($DV_{i,t}^{MENA}$), and zero otherwise. Then, the analysis is expanded to examine determinants of the risk and the impact of the capital level in each subsample of banks from countries with different economic and financial development. Subsampling allows examining the risk behaviour of banks in each group separately.

Table 5-18 and Table 5-19 reports the empirical results of the regression analysis that assesses the impact of the capital on the riskiness of banks using two risk-based indicators, mainly the dependent variable NPLs ratio (for credit risk) and the RWAs ratio (for portfolio risk) respectively. The models one to four in Table 5-18 and Table 5-19 reports the empirical results of a full sample of banks, i.e., banks from both the MENA and the OECD countries, are employed. These models are the same as in Table 5-5, but one more variable ($DV_{i,t}^{MENA}$) is added to compare the risk level of banks from a different group of countries.

In term of credit risk, the results show no evidence that the MENA banks are associated with high credit risk. Table 5-18 shows that the coefficient of the ($DV_{i,t}^{MENA}$), in the first four models, is negatively associated with the NPLs ratio and it is statistically insignificant. On the other side, the results show that the coefficient of the ($DV_{i,t}^{MENA}$) is associated positively with the RWAs ratio at a significant level of 1% in all RWAs regressions. This significant positive coefficient reflects the current risky assets in the asset portfolio of the MENA banks. Their portfolio assets contain a higher portion of risk-weighted assets that might potentially cause losses. This result indicates that banks from the less developed countries (i.e., the MENA countries) are riskier than others.

Table 5-18: Relationship between the capital level and the risk level (for subsamples of banks during the sample period 2003 to 2014 according to region):

The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and a list of abbreviation and a list definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks during the sample period 2003 to 2014 according to region

Estimated Models using NPLs ratio as a dependent variable	Robust Clustered Random Effects Model											
	The whole sample				A subsample for banks from the OECD's countries during the period (2003 to 2014)				A subsample for banks from the MENA's countries during the period (2003 to 2014)			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Capital: Equity/ Asset Ratio	0.0006	0.0006	0.0006	0.0006	0.0001	0.0001	0.0001	0.0001	0.0008	0.0008	0.0008	0.0008
	(0.2565)	(0.2555)	(0.2409)	(0.2559)	(0.5238)	(0.5161)	(0.5071)	(0.5245)	(0.2500)	(0.2503)	(0.22499)	(0.2503)
Size: log Assets	-0.0181***	-0.0180***	-0.0179***	-0.0180***	-0.0028**	-0.0026**	-0.0026**	-0.0028**	-0.0302***	-0.0301***	-0.0299***	-0.0301***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0212**)	(**0.0478**)	(**0.0496**)	(**0.0327**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Profitability: ROA Ratio	-0.0691	-0.0690	-0.0680	-0.0687	-0.0202	-0.0191	-0.0190	-0.0195	-0.0984	-0.0887	-0.0875	-0.0894
	(0.2318)	(0.2300)	(0.2381)	(0.2326)	(0.5199)	(0.5421)	(0.5454)	(0.5331)	(0.3655)	(0.361)	(0.3736)	(0.3625)
Diversification: NII Ratio	0.0012	0.0011	0.0012	0.0011	0.0040	0.0038	0.0038	0.0039	-0.0032	-0.0032	-0.0033	-0.0033
	(0.8348)	(0.8460)	(0.8349)	(0.8470)	(0.2758)	(0.3143)	(0.3140)	(0.2955)	(0.7644)	(0.7639)	(0.7574)	(0.7613)
REGU	-0.0072				-0.0108***				0.0060			
	(0.3821)				(**0.0000**)				(0.4689)			
REGO	0.0058				0.0039				-0.0136			
	(0.8263)				(0.7423)				(0.8161)			
PCAU		-0.0002				-0.0004				-0.0002		
		(0.8843)				(0.4639)				(0.9576)		
REG-Ediz			-0.0013				-0.0004				-0.0015	
			(0.3071)				(0.5796)				0.5570	
REGmcr				0.0004				0.0026*				-0.0007
				(0.8293)				(**0.0742**)				(0.7812)
DV=1, for MENA banks	-0.0058	-0.0060	-0.0056	-0.0058								
	(0.8263)	(0.4897)	(0.5066)	(0.4913)								
Constant	0.1534***	0.1533***	0.1531***	0.1528***	0.0333***	0.0160***	0.0316***	0.0299***	0.2234***	0.2223***	0.2216***	0.2229***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0015**)	(**0.0041**)	(**0.0042**)	(**0.0066**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics												
No Observation	2,724	2,726	2,726	2,726	1,439	1,441	1,439	1,439	1,285	1,285	1,285	1,285
No. Banks	400	400	400	400	217	217	217	217	183	183	183	183
Wald chi2 Statistics (p-value)	97.1100	97.6200	96.7100	96.9600	151.84	8.5400	11.1300	10.6000	23.7000	24.6000	24.2600	23.6800
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.1287)	(**0.0488**)	(0.0599)	(**0.0006**)	(**0.0002**)	(**0.0002**)	(**0.0003**)
r2_overall	0.1756	0.1757	0.1757	0.1758	0.0488	0.0493	0.0473	0.0480	0.1105	0.1103	0.1101	0.1104
r2_between groups	0.2271	0.2273	0.2261	0.2274	0.0713	0.0750	0.0700	0.0739	0.0901	0.0900	0.0890	0.0899
r2_within groups	0.0631	0.0628	0.1757	0.0628	0.0085	0.0043	0.0048	0.0065	0.1124	0.1123	0.1128	0.1122

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table 5-19: **Relationship between the capital level and the risk level (for subsamples of banks during the sample period 2003 to 2014 according to region):**

The dependent variable is the risk level as measured by the risk-weighted assets (RWAs/Asset) ratio. A short name abbreviates each variable, and a list of abbreviation and a list definition is presented in Table (4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks during the sample period 2003 to 2014 according to region

Estimated Models using RWAs ratio as a dependent variable	Robust Clustered Random Effects Model											
	The whole sample				A subsample for banks from the OECD's countries during the period (2003 to 2014)				A subsample for banks from the MENA's countries during the period (2003 to 2014)			
	1	2	3	4	5	6	7	8	9	10	11	12
Capital: Equity/ Asset Ratio	0.0056***	0.0056***	0.0056***	0.0057***	0.0107***	0.0107***	0.0107***	0.0107***	0.0051***	0.0051***	0.0051***	0.0051***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Size: log Assets	0.0392*	0.0378*	0.0387*	0.0400*	0.1023***	0.1010***	0.1019***	0.1022***	-0.0463*	-0.0471*	-0.0476*	-0.0462*
	(0.0757)	**(0.0846)**	**(0.0804)**	**(0.0712)**	**(0.0026)**	**(0.0026)**	**(0.0026)**	**(0.0026)**	**(0.0692)**	**(0.0614)**	**(0.0580)**	**(0.0669)**
Profitability: ROA Ratio	0.2171	0.2160	0.2132	0.2273	1.5580***	1.5847***	1.5784***	1.5815***	-1.1801	-1.1825	-1.1723	-1.1734
	(0.6847)	(0.6860)	(0.6893)	(0.6714)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	(0.1162)	(0.1165)	(0.1168)	(0.1205)
Diversification: NII Ratio	0.1103*	0.1085*	0.1093*	0.1098*	0.0529	0.0494	0.0530	0.0530	0.1395*	0.1368*	0.1372*	0.1367*
	(0.0538)	**(0.0568)**	**(0.0555)**	**(0.0548)**	(0.3347)	(0.3655)	(0.3389)	(0.3367)	**(0.0675)**	**(0.0711)**	**(0.0678)**	**(0.0718)**
REGU	0.0534				-0.0531				0.0551			
	(0.4238)				(0.6751)				(0.4050)			
REGO	-0.0916				0.0066				-0.1959			
	(0.4220)				(0.9650)				(0.3150)			
PCAU		-0.0100*				-0.0228***				0.0075		
		(0.0628)				**(0.0003)**				(0.4076)		
REG-Ediz			0.0093				-0.0030				0.0147	
			(0.1216)				(0.6817)				(0.1299)	
REGmcr				-0.0168*				0.0020				-0.0115
				(0.0530)				(0.8612)				(0.2817)
DV=1, for MENA banks	0.1187***	0.1186***	0.1190***	0.1196***								
	(0.0028)	**(0.0031)**	**(0.0033)**	**(0.0030)**								
Constant	0.2324	0.2424	0.2269	0.2368	-0.3265	-0.3084	-0.3248	-0.3244	0.9410***	0.9392***	0.9345***	0.9443***
	(0.1576)	(0.1349)	(0.1686)	(0.1465)	(0.2005)	(0.2159)	(0.2019)	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Panel (B): Summary Statistics												
No. Observations	1,865	1,867	1,865	1,865	1,182	1,184	1,182	1,182	683	683	683	683
No. Banks	329	329	329	329	196	196	196	196	133	133	133	133
Wald chi2 Statistics (p-value)	35.3700	38.4900	41.0100	37.4100	70.4400	70.0300	60.7200	61.9700	36.1100	35.3500	36.8000	35.3600
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.0285	0.0299	0.0287	0.0282	0.0003	0.0010	0.004	0.0003	0.1082	0.1082	0.1042	0.1067
r2_between groups	0.0451	0.0465	0.0451	0.0446	0.0033	0.0052	0.0035	0.0033	0.0439	0.0410	0.0399	0.0421
r2_within groups	0.0113	0.0113	0.0114	0.0115	0.0374	0.0386	0.0373	0.0374	0.0791	0.0774	0.0802	0.0777

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

This chapter conducted further analyses on the risk behaviour of the OECD banks and the MENA banks separately. This sub-classification aims to examine differences in the risk behaviour of each category of banks with consideration for the capitalisation level and other bank-level controlling factors. Table 5-18 and Table 5-19 demonstrate the empirical results for a subsample of banks from the OECD countries in the models five (5) to eight (8), and a subsample of banks from the MENA countries in the models from nine (9) to twelve (12). In term of the capital-risk nexus, the results show no evidence of the variation in the risk behaviour of banks with high-capital in both subsamples. The coefficient of the capital level is found to be insignificant in all NPLs regressions and RWAs regressions in both subsamples as reported in Table 5-18 and Table 5-19 respectively.

However, the results show evidence of the variation in the risk behaviour of banks with different capitalisation levels. Indeed, this variation was found to be different in the subsample of the OECD countries versus the subsample of the MENA countries. In term of undercapitalised banks, the OECD undercapitalised banks were found to have different risk behaviour compared to the MENA banks during the same sample period. The results show that the OECD undercapitalised banks, which are measured by Jacques and Nigro's approach (REGU), the Prompt Corrective Action Approach (PCAU), and Edidz's probabilistic approach (REG-Ediz), are found to be associated with less risk as indicated by both risk indicators. The coefficient REGU in the NPLs regression was found to be negatively associated with the NPLs ratio at a significant level of 1% in the OECD subsample as reported in Table 5-18.[103] Also, the coefficient PCAU in the RWAs regression was found to be negatively associated with the RWAs ratio at a significant level of 1% as reported in Table 5-19. These results imply that undercapitalised banks in developed countries (which are represented in this research by a subsample of the OECD banks) kept high-quality lending assets and their asset portfolios were less risky during the sample period that experienced regulatory reforms as per the Basel Accords. Developed countries are associated with better governance and legal environment (from the perspective of protection rights, public trust in policies, transparency, and less information asymmetric, etc.); thus, undercapitalised

[103] All models of the NPLs regressions are re-estimated with consideration for macroeconomic controlling variables, and mainly Inflation Rate and annual GDP Growth. The results show the same results that are reported in Table 5-18 for a subsample of OECD countries. The re-estimated results show that the undercapitalized banks, as measured by the PCAU coefficient, are associated negatively with the NPLs ratio at a significance level of 5%. All the other coefficients' signs are found to be the same. Results are available up-to request.

banks in these countries are more averse to be involved in a risky portfolio.[104] On the other side, there was no sufficient evidence that the MENA undercapitalised banks were associated with low-risk during the same period. The coefficient of undercapitalised banks in all regressions (i.e., model nine (9) to twelve (12)) was found to be positive and statistically insignificant as reported in Table 5-18 and Table 5-19.[105]

In term of the risk behaviour of better-capitalised banks, the results show that the OECD better-capitalised banks have different risk behaviour compared to banks in the MENA countries. The results show that the OECD better-capitalised banks, which are measured by Jacques and Nigro's approach (REGO) and the standard approach (REG-mcr), are found to be associated positively with both risk indicators. Indeed, the coefficient REG-mcr in the NPLs regression was found to be positively associated with the NPLs ratio at a significant level of 10% in the OECD subsample as reported in Table 5-18.[106] These results imply that better-capitalised banks in developed countries (which are represented in this research by a subsample of the OECD banks) were involved in a risky lending portfolio. On the other hand, the results show no evidence that the MENA better-capitalised banks were associated with high-risk activities. All the coefficients of better-capitalised banks in both NPLs and RWAs regressions were found to be associated negative and statistically insignificant as

[104] In view of this result, the empirical results of Chapter Six, *empirical results and discussion on the impact of the capital on banking performance*, found that the OECD undercapitalised banks are associated with low earning during the same sample period (i.e. 2003 to 2014). Low earnings could be due to the nature of invested activities that characterised to be less risky.

[105] All models of the RWAs regressions are re-estimated with consideration for macroeconomic controlling variables, and mainly Inflation Rate and annual GDP Growth. The results show the same results that are reported in Table 5-19 for a subsample of MENA countries. The re-estimated results show that the undercapitalized banks, as measured by the PCAU coefficient, are associated positively with the RWAs ratio at a significance level of 5%. All the other coefficients' signs are found to be the same. Results are available up-to request.

[106] All models of the NPLs regressions are re-estimated with consideration for macroeconomic controlling variables, and mainly Inflation Rate and annual GDP Growth. The results show the same results that are reported in Table 5-19 for a subsample of OECD countries. The re-estimated results show that the better-capitalised banks, as measured by the REG-mcr coefficient, are associated positively with the NPLs ratio at a significance level of 5%. All the other coefficients' signs are found to be the same. Results are available up-to request.

reported in model nine (9) and twelve (12) in Table 5-18 (for NPLs regressions) and Table 5-19 (for RWAs regressions).

It is observed that better-capitalised banks were found to be associated with high risk in developed countries, while they were found to be associated with low risk in countries where financial markets are less developed. Although developed countries are associated with better governance and legal environment (from the perspective of protection rights, public trust in policies, transparency, and less information asymmetric, etc.), better-capitalised banks in these countries are more into risky assets. This risky behaviour reflects the nature of asset composition in these countries' banks. Haselmann and Wachtel (2010) argued that banks that operate in a well-functioning legal environment are more open to enterprise lending and other mortgages due to quality and enforceability of legal system. The results of this chapter found that it is better-capitalised banks rather than undercapitalised banks who are more willing to accept involvement in high-risk activities in countries where there are better governance and legal environment.

On the other hand, better-capitalised banks in developing countries, where there are a low-quality legal system and high information asymmetry, are more involved in high-quality assets.[107] Besides, the MENA banking system is highly concentrated and relies on banks as a primary source of funding. Involvement of better-capitalised banks in risky activities is a threat to the financial system in countries where governance and legal environment is still developing. Regulatory authorities are more concerned to maintain the stability of these banks. Compared to developed countries, the results of this chapter show that it is undercapitalised banks rather than better-capitalised banks who are more involved in high-risk activities in countries where governance and legal environment is still not well developed.[108]

[107] Haselmann and Wachtel (2010) argued that banks are more willing to accept collateral in countries where is an effective legal system to protects the right of each party. Thus banks in developing countries are more into high-quality lendings to minimise their default probability.

[108] The variation in the risk level of the OECD better-capitalised versus the MENA better-capitalised banks is also reflected in their profit-based efficiency level. The empirical results of Chapter Six, *empirical results and discussion on the impact of the capital on banking porformance*, found that the

These results highlight the importance of considering both the capitalisation level and stages of economic and financial development to assess the risk behaviour of banks. Both undercapitalised banks and better-capitalised banks found to have a different level of risk, and this risk level also varies among countries with different stages in economic and financial development. Accordingly, it is observed that the results of this section provide better results for the baseline regressions in Section 5.5.1 (Table 5-5) that is based on the whole sample combining banks from both the OECD and the MENA countries. Table 5-5 shows that all undercapitalised banks are positively associated with high-risk while better-capitalised capitalised banks are associated with less risk. However, with consideration for a sub-classification for banks according to their economic and financial development level, the results of this section show that the COED undercapitalised banks are associated with lower risk, while it is the MENA undercapitalised banks that are associated with high-risk. In term of the better-capitalised banks, it is the OECD better-capitalised banks which are associated with high risk, while the MENA better-capitalised banks are associated with less risk.

In term of other characteristics that are associated with high-risk banks, which are reflective in the form of bank-level controlling variables, the results show that this country-wise sub-classification also provides a robust check and a better understanding of the baseline regressions that are reported in Table 5-5 and discussed in section 5.5.1. For instance, not all large-sized banks are found to be associated with less risk. In the sub-sample of the OECD countries, the results show that large-sized banks were associated with less credit risk (as measured by the NPLs ratio). Table 5-18 shows that the coefficient of the asset size (as measured by log asset) was negative and it is statistically significant at 5% in all NPLs regressions. However, those large-sized banks were found to have a high portion of risk-weighted assets in their asset portfolios. The coefficient of the asset size was found to be positive in all RWAs regressions, and it is statistically significant at 1% as reported in Table 5-19.

OECD better-capitalised banks were associatedwith high earning, while the MENA better-capitalised banks were associated with low earning during the same sample period (i.e. 2003 to 2014).

On the other hand, the MENA large banks were found to have less credit risk and less portfolio risk. The coefficient of the log asset was found to be associated negatively at a significant level of 1% for NPLs regressions and 10% for RWAs regressions as reported in Table 5-18 and Table 5-19 respectively. This result implies that the MENA small-sized banks were riskier than others. Small-sized banks are more likely to deal with low-quality creditors. The literature highlighted that large-sized banks tend to be more diversified, and enjoy economies of scale. Hence; they tend to take high-quality assets (see, e.g., Demsetz and Strahan, 1997; Hughes and Mester, 2013). Small-sized banks left with less available credit and they are likely to be low-quality credit as argued by Berger et al. (2005b). Indeed, most of the banks in the MENA countries are characterised to be small-sized banks, even though their share decreased over time.[109]

Another characteristic of risky banks was found to be profitability. The results show that the OECD profitable banks were characterised to have a high portion of their asset portfolio in risk-weighted assets as reported in Table 5-19. The coefficient of the profitable banks (as measured by the ROA ratio) was found to be positive at a significant level of 1% in RWAs regressions. For the MENA profitable banks, the results show no evidence that those MENA profitable banks were associated with high risk. The coefficient ROA was found to be negative and statistically insignificant in both NPLs regressions and RWAs regressions. In term of diversified banks, the results show no evidence that diversified banks, which are invested in non-lending activities as measured by the ratio of non-interest income to total income (NII ratio), were able to reduce their risk. Indeed, the MENA diversified banks were found to be involved more in the RWAs in their asset portfolio. The coefficient of non-interest income ratio (NII ratio) was found to be positive and statistically significant at 10%. Based on these results, the risky banks in the OECD countries were found to be characterised to be large and profitable banks, while the risky banks in the MENA countries were characterised to be small-sized and diversified banks.

[109] Further details on the size distribution on for the OECD banks and the MENA banks are provided in Appendix III.

5.6Summary: The results of the impact of capital on the banking risk:

The following table presents a summary of the main empirical results in this research chapter:

Table 5-20: Summary of the empirical results on the impact of the capital on the banking risk		
Null Hypotheses	**Empirical Results**	**Support the hypothesis?**
Hypothesis 1: There is a negative relationship between the capital and the risk level.	A significant positive relationship between high-capital listed banks and portfolio risk as measured by the RWAs/Assets ratio during the period 2003 to 2014 (the same relationship is also found in a sub-period 2003 to 2008) A significant negative relationship between high-capital listed banks and credit risk as measured by the NPLs/Assets ratio during the sample period 2003 to 2014. A significant positive relationship between high-capital domestic banks and portfolio risk as measured by the RWAs/Assets ratio during the sample period 2003 to 2014. A significant positive relationship between high-capital unlisted banks and portfolio risk as measured by the RWAs/Assets ratio during the sample period 2003 to 2014 (for both the OECD banks and the MENA banks)	No; Banks found to have less risk in certain activities while at the same time they are involved in other risky activities
Hypothesis 2: There is a negative association between listed banks and risk level.	An insignificant negative relationship between the dummy for listed banks and credit risk as measured by the NPLs/Assets ratio during the period 2003 to 2014. An insignificant positive relationship between the dummy for listed banks and portfolio risk as measured by the RWAs/Assets ratio during the period 2003 to 2014.	No
Hypothesis 3: There is a positive relationship between domestic ownership and risk level.	An insignificant negative relationship between the dummy for domestic banks and credit risk as measured by NPLs/Assets. A significant positive relationship between the dummy for domestic banks and portfolio risk as measured by RWAs/Assets.	Yes

Null Hypotheses		Empirical Results			Support the hypothesis?
	Ownership Profile	Capital level	Undercapitalised banks	Better-capitalised banks	
Hypothesis 4: The relationship between the capital and risk level does not vary among banks with different ownership profile	**Listed banks**	A significant negative relationship between high-capital listed banks and credit risk. A significant positive relationship between high-capital listed banks and portfolio risk.	A significant positive relationship between undercapitalised listed banks and credit risk. An insignificant relationship between undercapitalised listed banks and portfolio risk.	An insignificant negative relationship between better-capitalised listed banks and credit risk. A significant negative relationship between better-capitalised listed banks and portfolio risk.	Yes; There is no consistent variation between the capital level and risk for banks with different ownership profiles (at different capitalization level)
	Unlisted Banks	An insignificant relationship between high-capital unlisted banks and credit risk. An insignificant positive relationship between high-capital unlisted banks and portfolio risk.	A significant positive relationship between undercapitalised unlisted banks and credit risk. A significant positive relationship between undercapitalised unlisted banks and portfolio risk.	An insignificant relationship between better-capitalised unlisted banks and credit risk. An insignificant relationship between better-capitalised unlisted banks and portfolio risk.	
	Domestic Banks	An insignificant relationship between high-capital domestic banks and credit risk. A significant positive relationship between high-capital domestic banks and portfolio risk.	A significant positive relationship between undercapitalised domestic banks and credit risk. A significant positive relationship between undercapitalised domestic banks and portfolio risk.	An insignificant relationship between better-capitalised domestic banks and credit risk. A significant negative relationship between better-capitalised domestic banks and portfolio risk.	

Null Hypotheses		Empirical Results	Support the hypothesis?
Hypothesis 5: The relationship between the capital and risk level is expected to be negative after the introduction of the Basel Accords II, Basel II.5, and Basel III	All banks during the subsample period 2003 to 2008	An insignificant positive relationship between the capital and credit risk during the prior-period of imposing the regulatory changes. A significant positive relationship between the capital and portfolio risk during the prior-period of imposing the regulatory changes.	No
	All banks during the subsample period 2009 to 2014	An insignificant positive relationship between the capital and credit risk during the post-period of imposing the regulatory changes (i.e., 2009 to 2014). An insignificant negative relationship between the capital and portfolio risk during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).	
Hypothesis 6a: There is a negative relationship between undercapitalised banks and risk level during the post-period of introducing the regulatory reforms.	Undercapitalised banks during the subsample period 2003 to 2008	A significant positive relationship between undercapitalised banks and credit risk during the prior-period of imposing regulatory changes. A significant positive relationship between the undercapitalised banks and portfolio risk during the prior-period of imposing the regulatory changes.	No; Undercapitalised banks found to be associated positively with credit risk even during the post-period of introducing the regulatory reforms.
	Undercapitalised banks during the subsample period 2009 to 2014	A significant positive relationship between undercapitalised banks and credit risk during the post-period of imposing regulatory changes. An insignificant inconsistent relationship between the undercapitalised banks and portfolio risk during the post-period of imposing the regulatory changes.	
Hypothesis 6b: There is a positive relationship between better-capitalised banks and risk level during the post-period of introducing the regulatory reforms	Better-capitalised banks during the subsample period 2003 to 2008	An insignificant inconsistent relationship between better-capitalised banks and credit risk during the prior -period of imposing the regulatory changes (i.e., 2003 to 2008). An insignificant positive relationship between better-capitalised banks and portfolio risk during the prior -period of imposing the regulatory changes (i.e., 2003 to 2008).	No
	Better-capitalised banks during the subsample period 2009 to 2014	An insignificant inconsistent relationship between better-capitalised banks and credit risk as measured by the NPLs/Assets ratio during the post-period of imposing the regulatory changes (i.e., 2009 to 2014). An insignificant inconsistent relationship between better-capitalised banks and portfolio risk during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).	

Null Hypotheses	Empirical Results	Support the hypothesis?
Hypothesis 7: The relationship between the capital and risk level does not vary among countries with different economic and financial development level	A significant negative relationship between the OECD undercapitalised banks and credit risk during the period 2003 to 2014. A significant positive relationship between the OECD better-capitalised banks and credit risk during the period 2003 to 2014. An insignificant relationship between the MENA undercapitalised banks and credit risk during the period 2003 to 2014. An insignificant negative relationship between the MENA better-capitalised banks and credit risk during the period 2003 to 2014.	No; The relationship between undercapitalised banks and portfolio risk does vary among countries with different economic and financial development level.
	A significant negative relationship between the OECD undercapitalised banks and portfolio risk during the period 2003 to 2014. An insignificant positive relationship between the OECD better-capitalised banks and portfolio risk during the period 2003 to 2014. A significant positive relationship between the MENA undercapitalised banks and portfolio risk during the period 2003 to 2014. An insignificant negative relationship between the MENA better-capitalised banks and portfolio risk ratio during the period 2003 to 2014.	

Chapter Six: Empirical Results and Discussions on the Impact of Capital on Bank Performance

A. Does Ownership Matter?

B. Impact of Changes in the Basel Accords?

C. Does Economic and Financial Development Level of Countries Matter?

6 Chapter 6: Empirical Results and Discussions on the Impact of Capital on Bank Performance

6.1. Introduction

This chapter presents empirical evidence on the banking performance over the period that experienced the recent reforms in the capital regulations. Banks were asked to meet the reforms in the capital regulations, and they worked to hold more capital for their risk level. As stated earlier, these regulatory requirements were changed and improved notably in the capital framework. From a theoretical perspective, these regulations aim to promote more financial stability, and the outcomes of well-functioning regulations are expected to contribute to improving economic performance (Jalilian et al. 2007). However, some pointed out a negative impact of building up a capital level. They argued that high capital level might limit lending growth, increase lending cost, limit economic growth, and create competitive obstacles (e.g., Cosimano and Hakura, 2011; Vassiliadis et al., 2012; Sutorova and Teply, 2013; and Angelini et al.,2015). In view of these divergent sights, the consequences of imposing more capital and its impact on banking performance are still questioned. These questions are the primary focus of this chapter.

The chapter aims to assess and examine the impact of capital regulations and its amendments on banking performance. The assessment of the performance level is also conducted with consideration for the variation of the regulatory pressure across banks. As stated earlier in Chapter Four, this research adopts four different approaches to measure the regulatory pressure: Jacques and Nigro's approach, the Prompt Corrective Action (PCA) Approach, Ediz's probabilistic approach, and the standard approach. Each of these approaches is examined in a separate model. These models are also used to examine the capital-efficiency nexus with consideration for the differential in the ownership profile, regulatory pressure periods, and level of economic and financial development of countries. These factors are considered to add more understanding to the impact of the capital on banking performance.

This research chapter analyses a panel dataset comprising 354 banks from both developed countries, which are represented by banks from countries that are members of the Organisation for Economic Co-operation and Development (OECD), and developing countries, which are represented by banks from the Middle East and North Africa (MENA) countries, over the sample period 2003 to 2014. The relationship between the capital- performance is estimated using the Equation (4-3) in which the performance level is the dependent variable. The performance level is examined using three different indicators: return on asset ratio (ROA), net interest margin (NIM), and total costs to assets (TCA). As for explanatory variables, a set of four variables are used to examine variation in bank performance: bank size, the riskiness of banks, diversification level, and regulatory pressure. Table (4-1) summarises the definition of each variable that is used in this chapter. The analysis is based on the random effects model with error terms clustered at the firm level to accounts for the heterogeneity effects that derive from different ownership profile and different regulatory pressurised period. The clustered random effects model is also corrected to account both within-cluster correlations and heteroskedasticity in the error terms.

The remainder of the chapter is organised as follows. Section 6.2 compares data from different subsamples and test for significant differences in the means of the subsamples. Section 6.3 presents descriptive statistics for the variables that are used in the data analysis, and section 6.4 shows results of the bivariate analysis that aims to explore the degree of correlation that could be existent between any two independent variables in a regression model to assess multicollinearity issues. The empirical results of regression analysis and discussion are presented in section 6.5. The chapter ends with a summary of the empirical results in section 6.6.

6.2 Comparison Data of Different Groups

One of the aims of this chapter is to assess if there is also variation in the capital-performance nexus from different perspectives including ownership profile and countries with different economic and financial development levels. From the ownership perspective, this chapter considers examining the capital-performance nexus in listed banks versus unlisted banks, while from the economic and financial development levels, the chapter examines the variation in the capital-performance nexus in banks operating in the OECD countries versus banks in the MENA countries.[110] Similarly to Chapter Five, a parametric t-statistic and non-parametric Wilcoxon rank-sum (WRS) test are used to assess if there are any significant differences in means of two subsamples to obtain the robust result.[111] Table 6-1 and report the results of t-statistic and the WRS test respectively.

Table 6-1 reports results of t-statistics for all underlying variables, while Table 6-2 shows the results of the WRS. As regards to subsamples of listed banks versus unlisted banks, the t-statistic test shows that there is a significant difference in means of a subsample of listed banks versus unlisted banks in all underlying variables except for two dependent variables and mainly for net interest margin (NIM) and total cost to assets (TCA) ratio (see panel A at Table 6-1). On the other hand, the WRS test shows that the mean value of net interest margin in the subsamples is statistically different. The WRS test shows instead that the TCA ratio, NPLs ratio, and interest rate spread (IRS) have insignificant differences in means of listed banks versus unlisted banks

Table 6-1: Test of differences in means using t-statistics:
This table presents the results of t-statistics test that is used to test statistical differences between the underlying subsamples. The null hypothesis of t-statistics is $H_0: \mu_i - \mu_j = 0$, i.e., there is no difference in means between two subsamples. This test is conducted for each variable. The variables are: total return to total assets (ROA), net interest margin (NIM), total cost to assets (TCA), total equity to total assets ratio (EA Ratio), logarithm of total assets (log Assets), total non-performing loans to total assets ratio (NPLs/Assets), total non-interest income to total income ratio (NII Ratio), and interest rate spread (IRS). The definition of each variable is presented in Table (4-1).

Univariate Statistics	ROA Ratio	NIM Ratio	TCA Ratio	EA Ratio	Log Assets	NPLs Ratio	NII Ratio	Interest Rate Spread
Panel (A): Difference in Mean between the listed banks and unlisted banks (t-test) +								
Diff. Mean	0.0029 ***	0.0012	0.0004	1.9192 ***	0.2617 ***	0.0050 ***	0.0295 ***	0.2349 ***
p-value	(**0.0001**)	(0.1773)	(0.6419)	(**0.0000**)	(**0.0000**)	(**0.0024**)	(**0.0000**)	(**0.0017**)
Panel (B): Difference in Mean between the OECD banks and the MENA banks (t-test) +								
Diff. Mean	0.0147 ***	0.0144 ***	0.0110 ***	10.5318 ***	1.8391 ***	0.0272 ***	0.0544 ***	2.3845 ***
p-value	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)

Data source: Bankscope version 56th, 2015; World Banks Database as on December 2015
+ t-test for difference in means is conducted on the confidence level of 90%, 95%, and 99% using two-tailed tests. (*), (**), (***) indicates rejection of the null hypothesis at the 10, 5, 1% significance levels, respectively.

[110] Another aspect of ownership profile is comparing subsample of domestic-owned banks versus foreign-owned banks. However, this chapter does not consider this sub-classification due to a relatively small sample size of foreign-owned.

[111] Further details about t-test statistics and the Wilcoxon Rank-Sum test is provided in Appendix IV. In case there is a difference between results for these two tests, this research will depend on the results of the non-parametric test, i.e., the WRS test. The WRS is valid for any form of distribution, and it is less sensitive to outliers (Wild Chris, 1997).

Table 6-2: **Test of differences in means using Wilcoxon Rank Sum test:**
This table presents the results of the non-parametric Wilcoxon rank-sum test that is used to test statistical differences between the underlying subsamples. The null hypothesis of the Wilcoxon rank-sum test is $H_0: \mu_i = \mu_j$, i.e., the means of both samples are the same. This test is conducted for each variable. The variables are: total return to total assets (ROA), net interest margin (NIM), total cost to assets (TCA), total equity to total assets ratio (EA Ratio), logarithm of total assets (log Assets), total non-performing loans to total assets ratio (NPLs/Assets), total non-interest income to total income ratio (NII Ratio), and interest rate spread (IRS). The definition of each variable is presented in Table (4-1).

Wilcoxon Rank-Sum test	ROA Ratio	NIM Ratio	TCA Ratio	EA Ratio	Log Assets	NPLs Ratio	NII Ratio	Interest Rate Spread
Panel (A): Difference in Mean between the listed banks and unlisted banks								
rank sum (1): listed banks	4290966	4083408	2225537	4090311	4217021	2970904	4087312	4215589
rank sum (2): unlisted banks	3969114	4111768	2281966	4161643	4161350	2475746	3894698	4792301
n1	1928	1918	1479	1921	1935	1782	1902	2012
n2	2136	2130	1523	2141	2158	1518	2093	2232
z-score	-9.968	-5.398	-0.203	-5.033	-6.785	-1.089	-7.886	1.377
p-value	(**0.0000**)	(**0.0000**)	(0.8392)	(**0.0035**)	(**0.0000**)	(0.2760)	(**0.0072**)	(0.1685)
Panel (B): Difference in Mean between the OECD banks and the MENA banks								
rank sum (1): domestic banks	6020001	5990913	3213321	6385307	3084213	3853386	5032550	6670636
rank sum (2): foreign banks	2240075	2204263	1294182	1866647	5294158	1593264	2949461	2337254
n1	2427	2412	1951	2437	2446	1909	2367	2492
n2	1637	1636	1051	1625	1647	1391	1628	1752
z-score	-29.633	-30.360	-12.533	-39.177	51.864	-25.995	-8.466	-35.151
p-value	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)

Data source: Bankscope version 56th, 2015; World Banks Database as on December 2015

as reported in panel (A) of Table 6-2. In respects to subsamples of banks operating in the OECD countries versus banks in the MENA countries, the results of t-test statistic report a significant difference in mean values for all variables between banks operating in the OECD countries and Banks in the MENA countries at a significant level of 1% (panel B in Table 6-1). The WRS test has supported the same results (see panel B in Table 6-2). Overall, the above results report the statistical difference in means of the banking performance indicators among banks that have different ownership profiles and banks that are operating in countries with different economic and financial development levels.

6.3 Descriptive Statistics

This chapter analyses a panel dataset comprising 354 banks from 43 countries over 12 annual periods (2003 to 2014). These banks are from both the Organisation for Economic Co-operation and Development (OECD) countries and the Middle East and North Africa (MENA) countries. Table 6-3 reports the descriptive statistics of both dependent and independent variables that are adopted from the given panel dataset. This section focuses more on discussing the dependent variables that have not been discussed in Chapter Five.[112]

Table 6-3: **Descriptive Statistics:**
This table presents the descriptive statistics of both dependent and independent variables. These variables are measured based on an unbalanced dataset that contains annual observations of 354 banks over the period 2003 to 2014. The variables are: total return to total assets (ROA), net interest margin (NIM), total cost to assets (TCA), total equity to total assets ratio (EA Ratio), logarithm of total assets (log Assets), total non-performing loans to total assets ratio (NPLs/Assets), total non-interest income to total income ratio (NII Ratio), and interest rate spread (IRS). The definition of each variable is presented in Table (4-1). Appendix III presents descriptive statistics for each variable per year.

Univariate Statistics	ROA	NIM	Total Cost / Asset	EA Ratio	Log Assets	NPLs /Assets	NII Ratio	Spread Rate
Panel (A): All Banks								
Obs.	5,155	5,138	4,031	5,150	5,184	4,248	5,080	5,348
Mean	0.0215	0.0273	0.0560	11.4965	7.1774	0.0256	0.2452	3.8121
Median	0.0161	0.0241	0.0505	8.6900	7.4889	0.0139	0.2101	3.2000
Std. Div.	0.0253	0.0324	0.0367	11.9226	1.1205	0.0425	0.1873	2.3030
Max	0.4904	0.9024	0.7151	99.4400	9.5807	0.8707	0.9982	16.0000
Min	-0.1224	-0.8166	0.0010	-15.6900	3.7867	0.00005	-0.7043	-8.4400
Panel (B): OECD Banks								
Obs.	2,696	2,694	2,048	2,681	2,706	2,607	2,681	2,620
Mean	0.0163	0.0231	0.0542	7.3238	8.0173	0.0128	0.2364	2.8337
Median	0.0103	0.0159	0.0489	6.1400	7.9022	0.0095	0.2109	3.0000
Std. Div.	0.0224	0.0330	0.0438	5.4516	0.5797	0.0136	0.1873	1.3769
Max	0.3212	0.9024	0.7151	80.5500	9.5807	0.1507	0.9721	8.8000
Min	-0.0771	-0.3135	0.0010	-10.9600	3.8108	0.00005	-0.7043	-1.1000
Panel (C): MENA Banks								
Obs.	2,459	2,444	1,983	2,469	2,478	1,941	2,399	2,528
Mean	0.272	0.0319	0.0578	16.0275	6.2602	0.0407	0.2550	4.9034
Median	0.0235	0.0286	0.0527	12.0900	6.2612	0.0242	0.2086	4.6900
Std. Div.	0.0269	0.0310	0.0273	14.9946	0.8050	0.0575	0.1867	2.6169
Max	0.4904	0.4093	0.2240	99.4400	8.0858	0.8707	0.9982	16.0000
Min	-0.1224	-0.8166	0.0014	-15.6900	3.7867	0.00009	-0.5517	-8.4400

Data source: Bankscope version 56th, 2015; World Banks Database as on December 2015

[112] The sample in this chapter is the same sample that is used in Chapter Five. Thus; it is observed that statistics of all controlling variable, which are also adopted in Chapter Five, are the same values. Hence, refer to Chapter Five for discussion on the values of these controlling variables.

On average, the banks were found to have a ROA of 2.15% and a NIM of 2.73% over the whole sample from 2003 to 2014. From the cost perspective, banks were found to have total costs of 5.6% out of their total assets. There is a slight difference between values of mean and median of both profit-based and cost-based indicators. This difference reflects the existences of differences in the level of both profitability and operating cost, and as indicated by the maximum and minimum values in Table 6-3. On average, banks in the MENA were found to be more profitable and they were associated with higher operating costs compared to banks in the OECD countries over the sample period 2003 to 2014. There are a number of bank-level and country level controlling variables. However, the discussion on the remaining variables is already elaborated in Section 5.4. of Chapter Five.

6.4Bivariate Analysis

The univariate analysis aims to examine if there are any multicollinearity issues for a group of the variables that are adopted to examine the research hypothesis. Table 6-4 reports correlation coefficients for the set of the underlying variables, and these coefficients are measured according to the Pearson Correlation Method using the whole sample dataset over the period 2003 to 2014. The relationship between dependent variables and independent variables was found to be statistically significant at either 1% or 5%. The highest correlation coefficients between the dependent variables (i.e., ROA ratio, NIM ratio, and TCA ratio) and other independent variables were found to be less than 35%. However, most of the coefficients are below 23.95 except for six coefficients.[113] These coefficients are still not considered to be a strong correlation that could be an indicator of the potential multicollinearity issues between the dependent variables and all other independent variables.

The literature has not defined a specific level of this coefficient that could be referred

[113] The six coefficients are association between (Equity-to-Asset and ROA at 32.68%), (log Assets and ROA at 28.28%), (log Assets and NIM at 34.66%), (Interest Rate Spread and ROA at 24.71%), (Interest Rate Spread and NIM at 27.27%), and (Interest Rate Spread and TCA at 29.12%). However, all these coefficients were found to be less if the subsamples of the OECD banks and the MENA banks are considered. Appendix III reported the correlation matrix separately for both subsamples.

Table 6-4: Pearson Correlation Matrix:
This table reports correlation coefficients for the variables that are based on the sample of 354 banks over the period of 2003 to 2014 using the Pearson Method. The variables are: total return to total assets (ROA), net interest margin (NIM), total cost to assets (TCA), total equity to total assets ratio (EA Ratio), logarithm of total assets (log Assets), total non-performing loans to total assets ratio (NPLs/Assets), total non-interest income to total income ratio (NII Ratio), under-capitalised capitalised banks according to Jacques and Nigro's approach (REGU), better-capitalised banks according to Jacques and Nigro's approach (REGO), under-capitalised banks according to PCA approach (PCAU), pressurised banks according to Ediz approach (REG-Ediz), better-Capitalised banks according to standard approach (REG-mcr), and interest rate spread (IRS). The definition of each variable is presented in Table (4-1). Appendix III presents correlation matrix for two subsamples: banks at the OECD countries and the MENA countries.

	ROA Ratio	NIM Ratio	Total Cost / Asset	Equity / Assets	Log Assets	NPLs / Assets	NII Ratio	REGU	REGO
ROA Ratio	1								
NIM Ratio	0.2175***	1							
Total Cost / Asset	0.0802***	0.1526***	1						
Equity / Assets	0.3268***	0.1798***	0.0208	1					
Log Assets	-0.2828***	-0.3466***	-0.04199***	-0.4069***	1				
NPLs to Assets	0.1667***	0.2395***	0.2296***	0.2603***	-0.3708***	1			
NII Ratio	0.1332***	-0.0956***	0.1089***	0.1808***	-0.1630***	0.0357**	1		
REGU	0.0332	0.0193	-0.0150	0.0140	-0.0343	0.0237	0.0215	1	
REGO	-0.1402***	-0.0327	-0.0561**	-0.2110***	0.2874***	-0.1154***	-0.0821***	-0.2291***	1
PCAU	-0.0355	-0.0831***	-0.0422	-0.0560**	0.1776***	-0.0494**	0.0376	0.2635***	-0.1593***
REG-Ediz	0.0691***	0.0079	-0.0578**	0.0961***	-0.0333	0.0179	0.0203	0.1403***	-0.6429***
REG-mcr	-0.1101***	-0.0338	-0.0731**	-0.1215***	0.1416***	-0.0484**	-0.0829***	-0.4491***	0.5101***
Interest Rate Spread	0.2471***	0.2727***	0.2912***	0.1805***	-0.5462***	0.1150***	0.2710***	0.0046	-0.1604***

Notes: (*), (**), and (***) indicates for a statistically significant level at 1, 5, and 10 % respectively.

Continued (Table 6-4)

	PCAU	REG-Ediz	REG-mcr	Interest Rate Spread
PCAU	1			
REG-Ediz	0.1181***	1		
REG-mcr	-0.5866***	0.3123***	1	
Interest Rate Spread	-0.1240***	-0.0089	-0.0629***	1

Notes: (*), (**), and (***) indicates for a statistically significant level at 1, 5, and 10 % respectively.

to conclude the existences of the multicollinearity issue (Wooldridge, 2003, p.98). Yet, some authors suggested that 0.90 - 0.80 as a cut-off to indicate a high degree of correlation (e.g. Mason and Perreault, 1991; and Kennedy, 1992), while others consider 0.70 to be an indicator of high correlation (e.g. Tabachnick and Fidell, 2013). Given these indicators, the coefficients in Table 6-4 are not reflecting critical issues in multicollinearity.

In short, the t-statistic test and the Wilcoxon rank-sum, which are discussed in section (6.2), show that there is a significant difference in means of key variables, both dependent and independent variables, between banks with different ownership profiles and banks from countries with different economic and financial development levels. On the other hand, the results of the univariate analysis provide evidence of a significant association between the performance level and each of the independent variables. This relationship is found to be significant in subsamples too. In the next section, all the above variables are used to conduct the multivariate analysis in the form of regression models to assess the research hypotheses.

6.5Empirical Analysis

This section will discuss the empirical results of the multivariate analysis that aims to examine the impact of the capital on banking performance. This capital-performance nexus is examined using a multiple regression analysis that considers a number of variables to provide a better understanding of the capital-performance nexus. This analysis is based on a sample that contains banks from both the OECD countries and the MENA countries over the sample period 2003 to 2014. This sample is used to assess the research hypotheses, which were discussed in Chapter Three, and answer the research questions. The summary of research hypotheses is given in Table (3-2). The following sections will present the empirical results for each hypothesis.

Before reporting the empirical results, note that Appendix VII presents the details on procedures and results of statistical tests that are carried out to identify the most appropriate panel-based model. The statistical tests show that firm-level clustered-based random effects model is the most appropriate. This model is tested using the following dependent variables: total return to total assets (ROA) ratio, net interest margin (NIM) ratio, and total costs to total assets (TCA) ratio. There are two indicators used to assess the goodness of a model; Wald statistics and R-squared. The goodness of the model refers to the fitness of a given statistical model to summarise how well the regression line fits a given set of observations in a sample as pointed out by Wooldridge (2002). The fitness requires to account for non-zero variables. The descriptive statistics and trend of the key variables show that all variables are non-zero variables. Besides, the Wald chi-square statistic test provides as an indicator of whether a given set of dependent and independent variables are significantly different from zeros. It is based on the null hypothesis that all the coefficients in the model are zero.[114] R-squared, which is a primary tool to measure the fitness of a model, is a percentage of sample variations in the dependent variable that is explained by independent variables (Wooldridge, 2002, p.40). The following parts present the empirical results of firm-level clustered-based random effects model. The Wald chi-square statistic and R-square are reported in panel (B) of each table.

6.5.1 The relationship between the capital level and bank performance: Expected Bankruptcy Cost Hypothesis:

This section assesses the relationship between the bank capital and the bank performance using the entire sample that aggregates banks with different ownership profiles during the sample period 2003 to 2014. The banking performance is measured using three different estimators: total return to total assets (ROA) ratio, net interest margin (NIM) ratio, and total costs to total assets (TCA) ratio. The first two are a primary proxy for profit-based indicators. The ROA and NIM are accounting-based ratios that reflect the performance of the bank's management in utilising its given assets to generate more net income. These ratios are expected to provide more useful information because they account for both the cost and revenues of a given bank. While, the TCA ratio is a proxy for cost management that is more focus on intermediation cost in banking activities. The relationship between the capital level

[114] If the p-value is less than the significance level (i.e., 0.0500), then there is no evidence to accept the null hypothesis, and the coefficients in the model are non-zero values.

and performance hypothesised to be positive relationship according to the expected bankruptcy cost hypothesis.

The panel (A) in Table 6-5 reports the baseline results of the regression analysis that assesses the impact of the capital on the bank performance (using both profit and cost indicator). As stated earlier, there are four models estimated using the same dependent variable. The models from one to four represent the regression results according to the adopted approach to identify regulatory pressured banks as clarified previously in Section 6.2. The results show that there is a significant positive relationship between the capital level (Equity/Asset ratio) and the bank profit level (ROA ratio) in all models. Although the capital coefficient is statistically significant at a significant level of 1%, the quantitative effect of this coefficient is relatively low. The capital coefficient was found to be 0.0003, implying a 1% increase in the capital level raises profitability by 0.03%. This finding is consistent with Molyneux and Thornton, 1992; Berger, 1995; Rime, 2001; Goddard et al., 2004; Lin et al., 2005; Grigorian and Manole, 2006; Semih Yildirim and Philippatos, 2007; Athanasoglou et al., 2008; García-Herrero et al., 2009; Soares et al., 2014. This positive relationship in the capital-performance relationship supports “expected bankruptcy cost hypothesis”. This hypothesis suggests that increases in the banking capital level reflect higher survival probability since the capital act as a buffer against unexpected losses. Those high-capital banks have higher creditworthiness and a better relationship with customers; hence they are more able to generate more revenues at a lower cost.

The second profitability indicator did not show enough evidence to support the expected bankruptcy hypothesis. The coefficient of the capital level was found to be insignificant in all NIM regressions. This insignificant result implies that there is a need to consider other heterogeneity factors in the assessment to examine the impact of the capital on the risk level.[115] There was also no evidence that high-capital banks associated with high costs. Table 6-5 shows that the coefficient of Total-Cost-to-

[115] As will be discussed later, the results of this chapter found there is a significant positive relationship between the capital (as measured by Equity/Asset ratio) and Net Interest Margin (NIM) in case of considering for sub-samples for period (2005 to 2008), and period (2009 to 2012) respectively as reported in Table 6-11. Refer to section 6.5.3, for further details.

Table 6-5: **Relationship between the capital level and performance (Full sample)**:

The dependent variable is bank performance: total returns to total assets ratio (ROA), net interest margin (NIM), and the total cost to total assets ratio (TCA) respectively. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ Capital, asset size, riskiness, and diversification were main determents of banking performance.
- ⇨ Banking performance varies according to the capitalisation level. Undercapitalised banks were found to be associated with high ROA and less total costs. Whereas, better-capitalised banks were found to be associated with less ROA, high NIM, and high total costs.

Panel (A): Regression Models Using Robust Clustered Random Effects Model based on the whole sample

	The dependent variable is the ratio of total returns to total assets ratio (ROA)				The dependent variable is the ratio of net interest margin (NIM)				The dependent variable is the ratio of the total cost to total assets ratio (TCA)			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Equity/ Asset Ratio	0.0003 ***	0.0003 ***	0.0003 ***	0.0003 ***	0.0001	0.0001	0.0001	0.0001	-0.0002	-0.0002	-0.0002	-0.0002
	(**0.0053**)	(**0.0054**)	(**0.0060**)	(**0.0044**)	(0.3405)	(0.3504)	(0.3540)	(0.3556)	(0.1985)	(0.2014)	(0.2129)	(0.1992)
log Assets	-0.0022 **	-0.0025 **	-0.0024 **	-0.0023 **	-0.0046 ***	-0.0044 ***	-0.0045 ***	-0.0045 ***	-0.0083 ***	-0.0082 ***	-0.0082 ***	-0.0081 ***
	(**0.0406**)	(**0.0226**)	(**0.0276**)	(**0.0328**)	(**0.0001**)	(**0.0002**)	(**0.0001**)	(**0.0001**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
NPLs/ Asset	-0.0187	-0.0190	-0.0185	-0.0181	0.0558 **	0.0559 **	0.0559 **	0.0559 **	0.0565 ***	0.0570 ***	0.0554 ***	0.0571 ***
	(0.1385)	(0.1274)	(0.1425)	(0.1483)	(**0.0470**)	(**0.0448**)	(**0.0454**)	(**0.0455**)	(**0.0009**)	(**0.0008**)	(**0.0011**)	(**0.0007**)
NII Ratio	0.0047	0.0047	0.0047	0.0045	-0.0311 ***	-0.0310 ***	-0.0310 ***	-0.0310 ***	-0.0112 **	-0.0112 **	-0.0113 **	-0.0112 **
	(0.2006)	(0.1933)	(0.1959)	(0.2160)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0243**)	(**0.0251**)	(**0.0233**)	(**0.0257**)
A) Under-capitalised banks (REGU)	0.0032				0.0006				-0.0031			
	(0.4947)				(0.8187)				(0.4528)			
A) Better capitalised banks (REGO)	-0.0319 **				0.0170 *				0.0283 **			
	(**0.0248**)				(**0.0955**)				(**0.0347**)			
B) under-capitalised banks (PCAU)		0.0012				-0.0006				0.0007		
		(0.1988)				(0.3242)				(0.3986)		
C) Edizs Regulatory Pressure			0.0017 *				0.0001				-0.0017 **	
			(**0.0558**)				(0.9295)				(**0.0155**)	
D) Better capitalised banks (REG-mcr)				-0.0030 **				-0.0001				-0.0112
				(**0.0475**)				(0.9008)				(0.3832)
DV =1, for period after 2009	0.0007	0.0009	0.0009	0.0009	0.0012	0.0011	0.0012	0.0012	-0.0038 ***	-0.0040 ***	-0.0040 ***	-0.0040 ***
	(0.4663)	(0.3617)	(0.3926)	(0.3842)	(0.1354)	(0.1655)	(0.1585)	(0.1571)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Interest rate Spread	0.0004	0.0004	0.0004	0.0005	0.0006	0.0006	0.0006	0.0006	0.0010 **	0.0010 *	0.0010 **	0.0010 **
	(0.2771)	(0.2792)	(0.2716)	(0.2430)	(0.2783)	(0.2919)	(0.2993)	(0.2971)	(**0.0446**)	(**0.0512**)	(**0.0448**)	(**0.0495**)
Constant	0.0315 ***	0.0320 ***	0.0307 ***	0.0335 ***	0.0576 ***	0.0576 ***	0.0578 ***	0.0580 ***	0.1127 ***	0.1130 ***	0.1138 ***	0.1136 ***
	(**0.0005**)	(**0.0004**)	(**0.0007**)	(**0.0002**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)

Panel (B): Summary Statistics

Observation	2,066	2,068	2,066	2,066	2,077	2,079	2,077	2,077	1,534	1,536	1,534	1,534
On. Banks	310	310	310	310	311	311	311	311	262	262	262	262
Wald chi2 Statistic	65.6800	60.4000	64.3000	62.6100	145.15	143.38	142.65	143.79	122.14	113.35	117.43	113.49
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_ overall	0.1310	0.1287	0.1314	0.1342	0.1443	0.1429	0.1426	0.1426	0.2018	0.1979	0.2022	0.1977
r2_between groups	0.2377	0.2330	0.2381	0.2451	0.1983	0.1956	0.1946	0.1946	0.2293	0.2281	0.2311	0.2291
r2_within group	0.0020	0.0018	0.0023	0.0020	0.0296	0.0297	0.0297	0.0297	0.1439	0.1415	0.1442	0.1416

Assets (TCA ratio) is statistically insignificant in all TCA regressions [116] The result shows that the coefficient of the bank capital, as measured by the Equity-to-Assets (E/A) ratio, is statistically insignificant in all TCA regressions.[117]

In term of other bank-level controlling variables, Table 6-5 shows that the coefficient of the size, which is measured by log asset, is appeared to be inversely related to the performance indicators at a significance level of 5% (in case of ROA) and 1% (in case of NIM). This finding indicates that large banks tend to have proportionally less managerial efficiency compared to other banks. Large-size banks were found to be associated with less profit (as measured by the ROA ratio and NIM ratio). Goddard et al. (2004) pointed out that large banks might face diseconomies of scale due to the complexity and bureaucracy of administrative works at large banks. The negative profit-size relationship implies that smaller banks are more profitable than larger banks. These finding matches with results of Nikiel and Opiela, 2002; Demirguc-Kunt et al., 2003; Micco et al., 2007; Pasiouras and Kosmidou, 2007; Ariff and Luc, 2008; Athanasoglou et al., 2008; and Beltratti and Stulz, 2012 who found that large banks were associated negatively with profitability.

In term of banking cost, the empirical results show that the coefficient of size is also negatively related to the cost level (as measured the TCA ratio) at a significance level of 1%. This finding implies that large banks have better management in their operational costs. This finding matches with findings Nikiel and Opiela, 2002; Demirguc-Kunt et al., 2003; Micco et al., 2007; Bonin et al., 2005a; and Ariff and Luc, 2008. This negative association between performance indicators and Asset size was also found in this chapter at all other regressions. The results show that there is a significant negative association between performance indicators and asset size at the

[116] Note that the regression of total cost to assets is based on a smaller sample compared to other regressions. The sample is smaller due to missing values of bank-level data for the variable total cost-to-assets, given that total costs comprise total interest expenses, total non-interest expenses, and personnel expenses.

[117] As will be discussed later, the results of this chapter found there is a significant negative relationship between the capital (as measured by the Equity/Asset ratio) and Total Costs-to-Assets (TCA) in case of subsamples for the period (2003 to 2008) and period (2009 to 2014) respectively. In addition, a significant negative relationship was also found in case of considering for capitalised banks at different bank size. Refer to Table 6-15 and Table 6-20 in section 6.5.3 and section 6.5.4 respectively for further details.

different sub-periods in all regressions in both developed and developing countries.[118] These results emphasise that small banks were associated with higher earning than their larger counterparts. Goddard et al. (2013) justified high earning of small banks due to their low-quality lending portfolio, and hence they charge a higher risk premium, reflected in a higher interest margin, and higher revenues and profits. On the other hand, large banks were found to be associated with less cost compared to others because they are utilising their scale advantages.

Among the other controlling variables, different profit-based indicators were found to have different results in term on the impact of the non-preforming loan (NPLs) ratio on the banking performance. For example, the coefficient of the NPLs ratio was found to be associated negatively with the ROA ratio. At the same time, the coefficient of the NPLs ratio was found to be associated positively with NIM ratio. Such conflicting results were also found by Lee and Hsieh (2013) who examined Asian banks from 42 countries during the sample period 1994 to 2004. The result exhibited in Table 6-5 shows there is no statistical significance evidence on the impact of the NPLs ratio in all ROA regressions.[119] Yet, the impact of the NIM ratio was found to be statistically significant at 5%. This result implies that risky banks, which are associated with a low-quality lending portfolio as indicated by having high NPLs, tended to charge a higher interest margin, and hence associated with high net interest margin (NIM). This result is consistent with findings of Brock and Suarez, 2000; Drakos, 2002; Dietrich and Wanzenried, 2011; and Lee and Hsieh, 2013.

While in term of banking cost, non-performing loans (NPLs) ratio was found to be associated positively with the Total Cost to Asset (TCA) ratio at a significant level of 1%. This result matches with the hypothetical expectation that risky banks are less

[118] Further details are provided in the section 6.5.3 which discuss the impact of the capital on banking performance at different regulatory pressure period and section 6.5.5 for the impact of the capital on banking performance at subsamples of developed and developing countries respectively.

[119] This insignificant result implies that there is a need to conduct a further assessment to examine the impact of risky (as measured by the NPLs ratio) on banking performance (as measured by the ROA) with consideration for other heterogeneity factors. This relationship is examined in the following sections with consideration for the different ownership categories. As will be discussed later, the obtained results of this chapter were found there is a significant negative relationship between the NPLs ratio and banking profitability (as measured by the ROA) in a subsample of unlisted banks during the same sample period 2003 to 2014. Refer to Table 6-6 in section 6.5.2 for further details.

cost-efficient. These results support Berger et al. (1997) who pointed out that profitable banks are more effective in assessments of their credit risk. Some studies also find a similar result (e.g., Carvallo and Kasman, 2005; Fries and Taci, 2005; and Ariff and Luc, 2008) who found high-risk banks have less banking cost.

As for the impact of diversified banks on banking performance, there was no sufficient evidence on diversification advantages. Table 6-5 shows that those diversified banks, which have high return from non-interest income (NII), are less profitable. The coefficient of the NII ratio was found to be associated negatively with the NIM ratio at a significant level of 1%. This result implies that diversified banks, as indicated by the NII ratio, tended to earn low net interest margins. This result matches with findings of Demirguc-Kunt et al. (2003). They argued that loan pricing is affected by differences in banking activities. Banks might tend to charge low interests for customers who also use their fee-based activities. A negative relationship between the NII ratio and the NIM is also found by Carvallo and Kasman, 2005; Micco et al., 2007; and Beltratti and Stulz, 2012. On the other hand, the obtained results exhibited that banks benefited from revenue diversification by reducing total costs. The coefficient NII ratio was found to be associated with the TCA ratio negatively at a significant level of 5% as reported in Table 6-5.

Besides the above bank-level controlling variables, Table 6-5 reports the results of a potential impact of the regulatory pressure, which is one of the primary purposes of this research, on banking performance. As stated in the beginning, regulatory pressure is examined using four different approaches. Each approach is examined in a separate model. Table 6-5 shows that undercapitalised banks, as measured by the REGU approach and the PCAU approach, were associated with higher profitability level as measured by the ROA ratio in model one and two respectively. Indeed, the coefficient PCAU was found to be statistically significant at 10%. Ceteris paribus, positive coefficients of the undercapitalised banks suggest that banks with the capital ratio below the risk-based capital ratio tended to have a high return on assets (ROA) compared to other banks. This result could be matched with results of Ariff and Luc, 2008; Shim, 2010; and Goddard et al., 2013 who found that low-capital banks are associated with higher earnings. Banks could use profitability as an indicator for a low probability of failure (Hai-Chin 2000). Thus; undercapitalised banks might work on their resources to make high earnings that could be used to offset the regulatory capital requirements and relevant regulatory costs.

The findings show insignificant results in case examining the behaviour of undercapitalised banks in relation to the Net Interest Margin (NIM) as a second profit-based indicator. Furthermore, the behaviour of undercapitalised banks is also examined in relation to cost-based indicator. Table 6-5 shows that undercapitalised banks, as measured by REG-Ediz, are negatively associated with the Total Cost to Assets (TCA) ratio. The coefficient of REG-Ediz was found to be negative at a significance level of 5%. This result implies that those pressurised banks tended to either maintain their low-capital level, which is below an internal target capital ratio, but just above the regulatory capital requirements, or restructuring their lending portfolio to a lower risk-based portfolio to benefit from low banking operating costs.

Table 6-5 also reports the performance level of better-capitalised banks that are already meeting the minimum regulatory capital requirements. The better-capitalised banks, which are examined by REGO and REG-mcr, were found to be associated negatively with the ROA ratio. Both REGO and REG-mcr were negative and significant at 5% as reported in Table 6-5 in the model (1) and model (4) respectively. This result implies that those better-capitalised banks are operating inefficiently in managing their earnings, and hence they are associated with less profit compared to undercapitalised banks. This result supports the argument those who pointed out a potential opportunity cost of holding high capital levels rather than involved in more profitable investment opportunities (Goddard et al. 2013). However, the findings of the NIM regressions, which represent a second profit-based indicator, show that the coefficient of REGO, which is in the first model, is positive at a significant level of 10% as reported in Table 6-5. In term of cost-based indicator, the TCA regressions show that better-capitalised banks as associated with high costs as indicated by a positive coefficient of REGO with a significance level of 5%. This result matches with Demirguc-Kunt et al. (2003) who find that high-equity banks associated with high overhead costs.

Furthermore, the impact of the capital regulatory reforms that experienced especially after 2009 is also examined by a dummy variable ($DV_{\underset{2009}{post}}$) that refers to a unity value for the period (2009 to 2014), and zero otherwise. However, the results do not provide sufficient evidence on changes in the profit-based indicators as measured by the ROA ratio and NIM ratio. Table 6-5 shows that the coefficient ($DV_{\underset{2009}{post}}$) is positively associated, but statistically insignificant, with ROA ratio and NIM ratio in all regressions. In term of cost-based indicator, the coefficient ($DV_{\underset{2009}{post}}$) was found to be associated negatively with the Total Cost to Asset (TCA) ratio at a significant level of 1%. This result implies that banking operating costs reduced during the period that experienced imposing of more regulatory requirements (2009 to 2014). In other words, there were less operating expenses (both interest-based and non-interest-based expenses) during the period (2009 to 2014) compared to the period (2003 to 2008). Further discussion on changes in both profit-based and cost-based indicators is discussed in section 6.5.3.

In summary, for the full sample, the above results show that the capital level does matter, and the performance level varies according to the capital level. The above results are based on the entire sample that aggregates different banks from all sample countries, i.e., banks from both the OECD countries and MENA countries during the sample period (2003 to 2014). For the purpose of obtaining a better view on given findings, this whole sample is examined in different perspectives including bank ownership profiles, prior and posts the announcement for the Basel Accords amendments, different regulatory pressurised period, bank size, and banks from countries with different economic and financial development levels, i.e., the OECD countries versus the MENA countries. Accordingly, the sample divides into subsamples to examine the behaviour banks in each group. The following sections summarise the results of these subsamples.

6.5.2 Ownership Perspective: The results of the impact of the capital on the banking performance in different ownership perspectives: Does the ownership matter?

Further examination is conducted for the empirical effect of the capital level on the performance in different bank ownership types. This examination aims to view the attitude of different owners, who might have different competitive advantages, to improve their performance and capital levels. Before reporting the results, note that tables in this section will follow the same structure as the previous section in which panel (A) of a table reports the empirical results. Panel (B) of each table reports the main statistics about the number of observations, number of banks, Wald statistics, and R-squared that indicate the fitness of each model. In the following part of the chapter, there is a demonstration of the empirical results for samples that are sub-classified according to their ownership profile mainly: listed banks, unlisted privately-owned banks, and domestic-owned banks.

A) Empirical results on the performance of listed banks versus unlisted banks:

The next tables report the empirical effect of the capital level on the performance of both listed banks and unlisted banks. The analysis starts by using a full sample that combines both listed and unlisted banks to examine if the listed banks have better performance than unlisted banks. For this purpose, the variable ownership category is included in the regression, which was stated in equation 4-1, and it refers to a value of unity for listed banks in stock exchange markets ($DV_{i,t}^{PLB}$), and zero otherwise. The analysis is then expanded to examine the performance determinants and the impact of the capital level in each category of ownership profile separately. Subsampling allows examining the behaviour of each group of banks separately. Table 6-6, Table 6-7, and Table 6-8 reports the empirical results of the regression analysis that assesses the impact of the capital on banking performance using three different indicators, mainly the dependent variable Return on Assets (ROA) ratio, Net Interest Margin (NIM ratio), Total Cost to Assets (TCA) ratio respectively.

Table 6-6: Relationship between the capital level and performance (for three samples: all banks, listed banks, and unlisted banks respectively):

The dependent variable is bank performance: total returns to total assets (ROA) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ Listed banks are performing better in utilising their resources and generating higher earnings than unlisted banks.
- ⇨ There is no evidence of statistical differences between listed banks and unlisted banks in their capital and profit based indicator as measured by ROA ratio.

Panel (A): Regression Models based on subsamples of listed and unlisted banks during the sample period 2003 to 2014

Estimated Models using ROA as the dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample				**A subsample of listed banks**				**A subsample of unlisted banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0003***	0.0003***	0.0003***	0.0003***	0.0009***	0.0009***	0.0009***	0.0009***	0.0001	0.0001	0.0001	0.0001
	(**0.0039**)	(**0.0039**)	(**0.0044**)	(**0.0032**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.2136)	(0.2141)	(0.2358)	(0.1826)
Size: log Assets	-0.0024**	0.0027**	-0.0026**	-0.0025**	0.0020	0.0016	0.0018	0.0019	-0.0047***	-0.0050***	-0.0050***	-0.0048***
	(**0.0246**)	(**0.0134**)	(**0.0168**)	(**0.0201**)	(0.1983)	(0.2908)	(0.2371)	(0.2304)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Risk: NPLs/Asset	-0.0184	-0.0186	-0.0182	-0.0178	0.0342	0.0332	0.0351	0.0336	-0.0377***	-0.0371***	-0.0377***	-0.0360***
	(0.1355)	(0.1268)	(0.1407)	(0.1445)	(0.1370)	(0.1484)	(0.1227)	(0.1436)	(**0.0051**)	(**0.0074**)	(**0.0054**)	(**0.0071**)
Diversification: NII Ratio	0.0041	0.0041	0.0041	0.0040	-0.0010	-0.0010	-0.0010	-0.0011	0.0056	0.0056	0.0054	0.0055
	(0.2603)	(0.2554)	(0.2564)	(0.2792)	(0.8486)	(0.8579)	(0.8471)	(0.8257)	(0.2645)	(0.2633)	(0.2794)	(0.2754)
A) Undercapitalised banks (REGU)	0.0025				0.0042				0.0035			
	(0.6002)				(0.4181)				(0.8472)			
A) Better capitalised banks (REGO)	-0.0285**				-0.0259				-0.0336			
	(**0.0377**)				(0.1172)				(0.1273)			
B) Undercapitalised banks (PCAU)		0.0012				0.0010				0.0012		
		(0.2023)				(0.4579)				(0.3142)		
C) Edizs Regulatory Pressure			0.0017*				0.0016				0.0023	
			(**0.0677**)				(0.1526)				(0.1067)	
D) Better capitalised banks (REG-mcr)				-0.0029*				-0.0031*				-0.0024
				(**0.0610**)				(**0.0938**)				(0.3244)
DV = 1 for listed banks	0.0037**	0.0040***	0.0038**	0.0038**								
	(**0.0135**)	(**0.0096**)	(**0.0121**)	(**0.0127**)								
DV =1, for period after 2009	0.0008	0.0010	0.0010	0.0010	-0.0009	-0.0008	-0.0009	-0.0008	0.0018	0.0021	0.0020	0.0021
	(0.4005)	(0.3093)	(0.3376)	(0.3304)	(0.4666)	(0.5337)	(0.4982)	(0.5094)	(0.2121)	(0.1560)	(0.1673)	(0.1626)
Interest rate Spread	0.0004	0.0004	0.0004	0.0004	0.0008	0.0007	0.0008	0.0008*	0.0001	0.0002	0.0001	0.0002
	(0.3126)	(0.3123)	(0.3046)	(0.2791)	(0.1087)	(0.1193)	(0.1055)	(**0.0997**)	(0.8051)	(0.7456)	(0.7873)	(0.6971)
Constant	0.0310***	0.0134***	0.0302***	0.0329***	-0.0035	-0.0021	-0.0042	-0.0010	0.0506***	0.0500***	0.0494***	0.0509***
	(**0.0006**)	(**0.0005**)	(**0.0008**)	(**0.0003**)	(0.7803)	(0.8638)	(0.7348)	(0.9362)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics												
Observation	2,066	2,068	2,066	2,066	1,107	1,108	1,107	1,107	959	960	959	959
Banks	310	310	310	310	160	160	160	160	150	150	150	150
Wald chi2 Statistics	78.8200	74.2300	77.2800	77.0800	72.3000	69.5100	71.2700	74.8700	48.4900	48.7600	49.3000	49.5100
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1390	0.1378	0.1396	0.1422	0.1858	0.1833	0.1876	0.1881	0.1199	0.1212	0.1193	0.1255
r2_between groups	0.2530	0.2506	0.2541	0.2601	0.3285	0.3242	0.3346	0.3328	0.2308	0.2305	0.2272	0.2404
r2_within group	0.0019	0.0017	0.0021	0.0019	0.0303	0.0303	0.0295	0.0311	0.0070	0.0057	0.0100	0.0047

The models one to four in Table 6-6 reports the empirical results of a full sample of banks, i.e., both listed and unlisted banks from all countries, is employed. These models are the same as in Table 6-5, but one more variable (DV_i^{PLB}) is added to compare the performance level of listed banks compared to unlisted banks. Table 6-6 shows that the coefficient of the ($DV_{i,t}^{PLB}$), in the first four models, is positively associated with the ROA ratio at a significance level of 5% (and 1% in the second model). This positive coefficient for the ($DV_{i,t}^{PLB}$) implies that listed banks are more profitable and they are generating more earnings from their resources compared to unlisted banks. This result matches with findings of Iannotta et al., 2007; Semih Yildirim and Philippatos, 2007; and García-Herrero et al., 2009 who found a positive relationship between listed banks and profitability. However, Table 6-7 does not report a significant ownership coefficient ($DV_{i,t}^{PLB}$) in all models of Net Interest Margin (NIM) regressions.

It is observed that the comparison between empirical results for subsamples of listed and unlisted banks shows no significant differences. Yet, the obtained results of these subsamples provide a better understanding of the baseline regressions that are presented in Table 6-5 and discussed in the previous section. For example, the relationship between the capital level (as measured the Equity/Asset ratio) and profit-based indicator (as measured by the ROA ratio) was found to be positive in both subsamples of listed banks and unlisted banks as reported in Table 6-6 and Table 6-7 respectively. Though this relationship is consistent with results in Table 6-5, the relationship appears to be the most significant for listed banks. While in term of other controlling variables, the impact of the size (as measured by log assets), and riskiness (as measured by NPLs ratio) on profit-based performance (as measured by the ROA ratio and NIM ratio) found to be most significant for unlisted banks.

In term of capitalised banks, Table 6-6 shows that the relationship between undercapitalised banks (and better-capitalised banks) and the profit-based indicator (as measured by the ROA ratio) in both listed and unlisted banks are consistent with baseline regressions that are reported in Table 6-5. The second profit-based indicator highlights a significant difference between the performance of undercapitalised listed banks versus undercapitalised unlisted banks. The previous results, which are based

Table 6-7: Relationship between the capital level and performance (for three samples: all banks, listed banks, and unlisted banks respectively):

The dependent variable is bank performance: Net Interest Margin (NIM) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ The relationship between performance determinants (size, and risk level) and profit-based indicator (NIM ratio) appears to be the most significant for unlisted banks.
- ⇨ There is a statistical difference between undercapitalised listed banks and undercapitalised unlisted banks in their relationship to profit based indicator as measured by NIM ratio.

Panel (A): Regression Models based on subsamples of listed and unlisted banks during the sample period 2003 to 2014												
Estimated Models using NIM as the dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample				**A subsample of listed banks**				**A subsample of unlisted banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	2.8e-06	2.1e-06	2.9e-06	2.2e-06
	(0.3390)	(0.3494)	(0.3528)	(0.3545)	(0.4744)	(0.4887)	(0.4933)	(0.4940)	(0.9763)	(0.9830)	(0.9759)	(0.9812)
Size: log Assets	-0.0047 ***	-0.0045 ***	-0.0046 ***	-0.0046 ***	-0.0024	-0.0023	-0.0022	-0.0022	-0.0066 ***	-0.0064 ***	-0.0064 ***	-0.0065 ***
	(0.0001)	**(0.0003)**	**(0.0002)**	**(0.0002)**	(0.3425)	(0.3582)	(0.4043)	(0.3776)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Risk: NPLs/ Asset	0.0558 ***	0.0559 **	0.0559 **	0.0559 **	0.0013	0.0016	0.0033	0.0016	0.0865 ***	0.0855 ***	0.0857	0.0856 ***
	(0.0472)	**(0.0449)**	**(0.0455)**	**(0.0456)**	(0.9607)	(0.9516)	(0.9046)	(0.9524)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Diversification: NII Ratio	-0.0311 ***	-0.0311 ***	-0.0311 ***	-0.0311 ***	-0.0395 ***	-0.0390 ***	-0.0389 ***	-0.0390 ***	-0.0288 ***	-0.0291 ***	-0.0290 ***	-0.0291 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0062)**	**(0.0058)**	**(0.0054)**	**(0.0058)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
A) Undercapitalised banks (REGU)	0.0005				0.0049 **				-0.0419 **			
	(0.8505)				**(0.0438)**				**(0.0250)**			
A) Better capitalised banks (REGO)	0.0172*				0.0085				0.0291			
	(0.0869)				(0.3785)				(0.1066)			
B) Undercapitalised banks (PCAU)		-0.0006				0.0002				-0.0009		
		(0.3245)				(0.7150)				(0.4873)		
C) Edizs Regulatory Pressure			0.0001				0.0016				-0.0015	
			(0.9368)				(0.3520)				(0.1970)	
D) Better capitalised banks (REG-MCR)				-0.0001				-0.0010				0.0010
				(0.9123)				(0.2009)				(0.6914)
DV = 1 for listed banks	0.0006	0.0005	0.0005	0.0005								
	(0.7627)	(0.3245)	(0.8060)	(0.8033)								
DV =1, for period after 2009	0.0012	0.0011	0.0012	0.0012	-0.0003	-0.0003	-0.0003	-0.0003	0.0027 ***	0.0025 **	0.0025 **	0.0025 **
	(0.1387)	(0.1692)	(0.1628)	(0.1611)	(0.8522)	(0.0496)	(0.8470)	(0.8584)	**(0.0089)**	**(0.0197)**	**(0.0171)**	**(0.0184)**
Interest rate Spread	0.0006	0.0006	0.0006	0.0006	0.0002	0.0002	0.0002	0.0002	0.0013	0.0013	0.0013	0.0013
	(0.2825)	(0.2958)	(0.3028)	(0.3008)	(0.7250)	(0.7566)	(0.7393)	(0.7438)	(0.1398)	(0.1512)	(0.1445)	(0.1530)
Constant	0.0576 ***	0.0576 ***	0.0578 ***	0.0579 ***	0.0472 ***	0.0472 ***	0.0454 **	0.0476 ***	0.0664 ***	0.0672 ***	0.0677 ***	0.0667 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0071)**	**(0.0073)**	**(0.0177)**	**(0.0063)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Panel (B): Summary Statistics												
Observations	2,077	2,079	2,077	2,077	1,109	1,110	1,109	1,109	968	969	968	968
No. Banks	311	311	311	311	160	160	160	160	151	151	151	151
Wald chi2 Statistics	156.56	153.58	153.76	155.23	61.4100	49.7500	48.4700	52.3000	104.24	107.07	95.0300	102.96
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.1447	0.1432	0.1429	0.1429	0.0866	0.0855	0.0876	0.0858	0.3274	0.3243	0.3270	0.3241
r2_between groups	0.1988	0.1960	0.1949	0.1949	0.2078	0.2033	0.2074	0.2047	0.3454	0.3435	0.3447	0.3428
r2_within group	0.0296	0.0297	0.0297	0.0297	0.0078	0.0080	0.0085	0.0081	0.1977	0.1924	0.1949	0.1921

on the baseline regressions as reported in Table 6-5 in the previous section, did not provide consistent results on the behaviour of undercapitalised banks in relation to the second profit-based indicator (i.e., NIM ratio). Table 6-7 shows that undercapitalised listed banks, as measured by REGU, PCAU, and REG-Ediz in model 5, 6, and 7 respectively, are positively associated with NIM ratio. Indeed, the coefficient REGU is statistically significant at 5%. Ceteris paribus, positive coefficients of the undercapitalised banks suggest that banks with the capital ratio below the risk-based capital ratio tend to have a higher net interest margin (NIM) compared to other better-capitalised listed banks. On the other side, undercapitalised unlisted banks, as measured by REGU, PCAU, and REG-Ediz in model 9, 10, and 11 in Table 6-7, are negatively associated with NIM ratio. And the coefficient REGU is statistically significant at 5%.

The results of undercapitalised banks could be explained in view of the signalling hypothesis. For undercapitalised banks, a direct increase in the capital level might be costly (Berger, 1995). Yet, they could use profitability as an indicator of the low probability of failure (Hai-Chin, 2000). Thus, undercapitalised banks might work on utilising their resources to make high earnings, and hence they will able to signal about expected future stability especially in the absence of well-functioning equity market. In view of the signalling hypothesis, listed banks are governed internally via market discipline and externally via regulatory capital requirements. Market discipline involves the disclosure of relevant information to the public, while meeting regulatory capital requirement implies being supervised by regulators. Compared to unlisted banks, listed banks are expected theoretically to be more motivated to run their business more efficiently and generate high earnings to signal good news to their stakeholders and avoid any regulatory constraints by regulators. This argument could explain the association of high net interest margin (NIM) with undercapitalised listed banks. However. unlisted banks lack market discipline, and their management might be less incentive to maintain their performance. Undercapitalised unlisted banks are found to be associated with less earning compared to others.

In term of better-capitalised banks, there was no evidence on differences on the impact of capital level on banking performance between better-capitalised listed banks and better capitalised unlisted banks during the sample period (2003 to 2014). Yet, better-capitalised listed banks were found to be associated with less earning as measured by ROA. The coefficient REG-mcr found to be negative at a significane level of 10% as reported in subsample for listed banks in Table 6-6. This result supports the empirical results in the baseline regression that have been discussed in the previous section (see Table 6-5). Those better-capitalised banks are operating inefficiently in managing their earnings, and hence they are associated with less profit compared to undercapitalised banks.

From a cost perspective, the results show no evidence on a variation on cost level between listed banks and unlisted banks. The models one to four in Table 6-8 reports the empirical results of a full sample of banks, i.e., both listed and unlisted banks from all countries, is employed. These models are the same as in Table 6-5, but one more variable (DV_i^{PLB}) is added to compare the cost inefficiency of listed banks compared to unlisted banks. The results show no evidence on the variation of cost level among banks with different ownership profile. Table 6-8 shows that the coefficient of the ($DV_{i,t}^{PLB}$), in the first four models, is insignificant all TCA regressions. This result consistent with Semih Yildirim and Philippatos (2007) who also did not yield any significant relationship between listed banks and cost level.

As per to the comparison between cost determinants for subsamples of listed and unlisted banks, Table 6-8 shows no significant differences between listed and unlisted banks especially in term of controlling variables, e.g., size (as measured by log assets), and riskiness (as measured by NPLs ratio) on profit level (as measured by ROA ratio and NIM ratio). Yet, the obtained results of these subsamples provide a better understanding of the baseline regressions that are presented in Table 6-5 and discussed in the previous section. For example, the relationship between the undercapitalised banks (measured by REGU) and cost-based indicator (as measured by TCA ratio) were found to be an insignificant negative relationship as shown in Table 6-5. Yet, this relationship found to be more significant for undercapitalised listed banks in which the coefficient REGU was found to be negative and statistically significant at 5% as reported in the fifth model at Table 6-8. In contrast, the REGU was found to be insignificant for undercapitalised unlisted banks as reported in model

Table 6-8: Relationship between the capital level and performance (for three samples: all banks, listed banks, and unlisted banks respectively):
The dependent variable is the banking cost level: Total Cost to Asset (TCA) ratio. Independent variables are defined and summarized Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ No evidence on a variation on cost level between listed banks and unlisted banks.
- ⇨ The ownership profile provides a better understanding of the relationship between capitalised banks and performance level.

Panel (A): Regression Models based on subsamples of listed and unlisted banks during the sample period 2003 to 2014

Estimated Models using TCA as the dependent variable	Robust Clustered Random Effects Model											
	The whole sample				A subsample of listed banks				A subsample of unlisted banks			
	1	2	3	4	5	6	7	8	9	10	11	12
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0001	-0.0001	-0.0001	-0.0002
	(0.1997)	(0.2023)	(0.1241)	(0.2000)	(0.3925)	(0.3943)	(0.3966)	(0.3950)	(0.1729)	(0.1913)	(0.2156)	(0.1733)
Size: log Assets	-0.0083***	-0.0082***	-0.0082***	-0.0081***	-0.0078***	-0.0077***	-0.0078***	-0.0077***	-0.0092***	-0.0091***	-0.0090***	-0.0091***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0050)**	**(0.0052)**	**(0.0048)**	**(0.0049)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Risk: NPLs/ Asset	0.0564***	0.0569***	0.0554***	0.0570***	0.0500*	0.0497*	0.0479*	0.0498*	0.0629***	0.0631***	0.0622***	0.0635***
	(0.0010)	**(0.0008)**	**(0.0011)**	**(0.0008)**	**(0.0749)**	**(0.0792)**	**(0.0891)**	**(0.0568)**	**(0.0029)**	**(0.0025)**	**(0.0028)**	**(0.0025)**
Diversification: NII Ratio	-0.0113**	-0.0112**	-0.0114**	-0.0011**	-0.0110*	-0.0111*	-0.0114**	-0.0110*	-0.0069	-0.0068	-0.0069	-0.0068
	(0.0235)	**(0.0245)**	**(0.0225)**	**(0.0251)**	**(0.0198)**	**(0.0540)**	**(0.0475)**	**(0.0568)**	(0.3913)	(0.3974)	(0.3939)	(0.3942)
A) Undercapitalised banks (REGU)	-0.0031				-0.0070**				0.0240			
	(0.4459)				**(0.0198)**				(0.4635)			
A) Better capitalised banks (REGO)	0.0284**				0.0014				0.0537**			
	(0.0338)				(0.9216)				**(0.0223)**			
B) Undercapitalised banks (PCAU)		0.0007				0.0008				0.0008		
		(0.3992)				(0.4133)				(0.5339)		
C) Edizs Regulatory Pressure			-0.0017**				-0.0012				-0.0022**	
			(0.0155)				(0.1395)				**(0.0473)**	
D) Better capitalised banks (REG-MCR)				-0.0011				-0.0003				-0.0030
				(0.3852)				(0.8107)				(0.2134)
DV = 1 for listed banks	0.0008	0.0006	0.0008	0.0006								
	(0.7571)	(0.8195)	(0.7671)	(0.8359)								
DV =1, for period after 2009	-0.0039***	-0.0040***	-0.0040***	-0.0040***	-0.0019	-0.0019	-0.0019	-0.0019	-0.0066***	-0.0070****	-0.0022***	-0.0070***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	(0.1676)	(0.4133)	(0.1597)	(0.1601)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Interest rate Spread	0.0001**	0.0010*	0.0010**	0.0010*	0.0011*	0.0011*	0.0011*	0.0011*	0.0010	0.0008	0.0009	0.0008
	(0.0468)	**(0.0533)**	**(0.0470)**	**(0.0514)**	**(0.0996)**	**(0.0996)**	**(0.0992)**	**(0.0966)**	(0.1315)	(0.1998)	(0.1554)	(0.2307)
Constant	0.1125***	0.1128***	0.1137***	0.1135***	0.1096***	0.1090***	0.1105***	0.1093***	0.1173***	0.1203***	0.1202***	0.1232***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**

Panel (B): Summary Statistics

	1	2	3	4	5	6	7	8	9	10	11	12
Observation	1,534	1,536	1,534	1,534	865	866	865	865	669	670	669	669
No. Banks	262	262	262	262	136	136	136	136	126	126	126	126
Wald chi2 Statistics	127.07	117.17	120.79	117.29	75.9000	71.9400	71.4300	69.8800	70.6700	66.9200	67.9700	65.7200
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.2015	0.1976	0.2019	0.1974	0.1606	0.1593	0.1601	0.1584	0.2367	0.2358	0.2395	0.2401
r2_between groups	0.2291	0.2279	0.2310	0.2289	0.2475	0.2465	0.2443	0.2459	0.2162	0.2171	0.2214	0.2231
r2_within group	0.1440	0.1416	0.1442	0.1416	0.1058	0.1063	0.1078	0.1054	0.2083	0.2002	0.2047	0.2016

10 at Table 6-8. Similarly, the relationship between the better-capitalised banks (measured by REGO) and cost-based indicator (measured by TCA ratio) found to be a significant positive relationship as shown in Table 6-5. Yet, this relationship was found to be more significant for better-capitalised unlisted banks in which the coefficient REGO was found to be positive and statistically significant at 5% as reported in the fifth model in Table 6-8. In contrast, REGO was found to be insignificant for better-capitalised listed banks as reported in model 10 in Table 6-8.

B) Empirical results on the performance of domestic-owned banks:

The literature highlights that there could be variation in the performance levels of foreign-owned banks comparing to domestic-owned banks. Claessens et al. (2001) argued that foreign banks differ from domestic banks in term of interest margin, overhead costs, loan loss provision, and profitability. However, this chapter is based on a sample that includes both domestic and foreign banks. Unfortunately, the observations for the foreign-owned banks found to be relatively small. [120] The performance determinants and the impact of the capital on banking performance is re-examined based on a subsample of domestic-owned banks only to obtain more robust results. [121] Table 6-9 reports the findings on the effect of capital on banking performance (using both profits- and cost-based indicators) for a subsample of domestic-owned banks only. Comparing the empirical results of Table 6-9 to Table 6-5, which is based on the baseline regression using the whole sample, it is observed that there is consistency in the empirical results. This consistency might refer to the fact that most of the sample is domestic-owned banks. [122]

[120] The number of observations for a subsample of foreign banks is about 446 annual observations for ROA regression, 446 annual observations for NIM regression, and 448 annual observations for TCA regression out of 2,066 annual observations in the whole sample in this chapter, i.e., observations of foreign-owned banks represent almost 22% of the total sample.

[121] The empirical results on banking performance and the impact of the capital level based on foreign-owned banks are provided in Appendix IX.

[122] All models of the performance regressions are re-estimated based on domestic banks and without including any stated based banks. The results show the same results that are reported in Table 6-9 for a subsample of only domestic and non-stated owned banks over the sample period 2003 to 2014. All the coefficients' signs are found to be the same. Results are available up-to request.

Table 6-9: Relationship between the capital level and performance (for a subsample of domestic-owned banks):
The dependent variables are bank Return on Assets (ROA), Net Interest Margin (NIM), Total Cost to Asset (TCA). Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

⇨ These results are consistent with results that are obtained using the whole sample as reported in Table 6-5.

Panel (A): Regression Models based on subsamples of domestic and foreign banks during the sample period 2003 to 2014

	Robust Clustered Random Effects Model											
	A subsample of domestic banks The ROA as the dependent variable				**A subsample of domestic banks The NIM as the dependent variable**				**A subsample of domestic banks The TCA as the dependent variable**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0004*** (**0.0032**)	0.0004*** (**0.0037**)	0.0004*** (**0.0039**)	0.0004*** (**0.0026**)	0.0002 (0.1269)	0.0002 (0.1248)	0.0002 (0.1360)	0.0002 (0.1362)	-0.0002 (0.2647)	-0.0002 (0.2674)	-0.0002 (0.2719)	-0.0002 (0.2618)
Size: log Assets	-0.0015 (0.2161)	-0.0019 (0.1213)	-0.0018 (0.1452)	-0.0016 (0.1693)	-0.0038** (**0.0100**)	-0.0037** (**0.0138**)	-0.0037** (**0.0152**)	-0.0037** (**0.0149**)	-0.0081*** (**0.0002**)	-0.0080*** (**0.0002**)	-0.0080*** (**0.0002**)	-0.0079*** (**0.0002**)
Risk: NPLs/Asset	-0.0173 (0.2243)	-0.0176 (0.2068)	-0.0169 (0.2360)	-0.0168 (0.2313)	0.0341** (**0.0424**)	0.0588** (0.0417)	0.0590** (**0.0407**)	0.0587** (**0.0424**)	0.0585*** (**0.0022**)	0.0585*** (**0.0022**)	0.0576*** (**0.0027**)	0.0587*** (**0.0021**)
Diversification: NII Ratio	0.0033 (0.4155)	0.0033 (0.4159)	0.0033 (0.4204)	0.0031 (0.4499)	-0.0341*** (**0.0001**)	0.0339*** (**0.0000**)	-0.339*** (**0.0000**)	-0.0339*** (**0.0000**)	-0.0107* (**0.0617**)	-0.0106* (**0.0652**)	-0.0107* (**0.0619**)	-0.0105* (**0.0669**)
A) Undercapitalised banks (REGU)	-0.0010 (0.9103)				0.0004 (0.9351)				-0.0027 (0.7383)			
A) Better capitalised banks (REGO)	-0.0402** (**0.0103**)				0.0141 (0.2244)				0.0160 (0.2654)			
B) Undercapitalised banks (PCAU)		0.0010 (0.3520)				-0.0002 (0.7395)				0.0010 (0.2397)		
C) Edizs Regulatory Pressure			0.0020* (**0.0617**)				0.0007 (0.5631)				-0.0011 (0.1350)	
D) Better capitalised banks (REG-MCR)				-0.0034** (**0.0467**)				-0.0008 (0.5598)				-0.0020 (0.1549)
DV =1, for period after 2009	0.0008 (0.5084)	0.0010 (0.3811)	0.0009 (0.4206)	0.0009 (0.4075)	-0.0003 (0.7499)	-0.0004 (0.6904)	-0.0004 (0.6878)	-0.0004 (0.6942)	-0.0038*** (**0.0005**)	-0.0039*** (**0.0005**)	-0.0039*** (**0.0005**)	-0.0039*** (**0.0005**)
Interest rate Spread	0.0007* (**0.0666**)	0.0007* (**0.0778**)	0.0007* (**0.0681**)	0.0008* (**0.0595**)	0.0011* (**0.938**)	0.0010 (0.1026)	0.0010 (0.1011)	0.0010 (0.1037)	0.0012** (**0.0331**)	0.0012** (**0.0376**)	0.0012** (**0.0326**)	0.0012** (**0.0350**)
Constant	0.0245** (**0.0124**)	0.0256** (**0.0124**)	0.0238** (**0.0153**)	0.0269*** (**0.0057**)	0.0505*** (**0.0000**)	0.0505*** (**0.0000**)	0.0500*** (**0.0000**)	0.0510*** (**0.0000**)	0.1120*** (**0.0000**)	0.1117*** (**0.0000**)	0.1126*** (**0.0000**)	0.1128*** (**0.0000**)
Panel (B): Summary Statistics												
Observations	1,620	1,622	1,620	1,620	1,629	1,631	1,629	1,629	1,190	1,192	1,190	1,190
No. Banks	245	245	245	245	246	246	246	246	201	201	201	201
Wald chi2 Statistics	63.5100 (**0.0000**)	56.7400 (**0.0000**)	58.7400 (**0.0000**)	59.6000 (**0.0000**)	115.11 (**0.0000**)	111.96 (**0.0000**)	111.79 (**0.0000**)	113.73 (**0.0000**)	89.0300 (**0.0000**)	85.8200 (**0.0000**)	87.1400 (**0.0000**)	86.4400 (**0.0000**)
r2_overall	0.1764	0.1717	0.1764	0.1793	0.1677	0.1660	0.1659	0.1660	0.2201	0.2180	0.2203	0.2172
r2_between groups	0.3228	0.3149	0.3223	0.3305	0.2302	0.2268	0.2264	0.2263	0.2580	0.2570	0.2585	0.2584
r2_within group	0.0013	0.0008	0.0014	0.0011	0.0288	0.0291	0.0294	0.0293	0.1367	0.1372	0.1372	0.1382

Overall, the empirical results in this section, which examined the impact of the capital on the banking performance in different ownership perspectives, do not provide sufficient evidence on the variation on capital-performance nexus among banks with different ownership profile. There was no evidence of differences in the relationship between capital (as measured by the equity-asset ratio) performance. The results show that undercapitalised listed banks, as measured by a dummy variable REGU, found to differ significantly in their profit level (as measured by NIM ratio) compared to undercapitalised unlisted banks. On the other hand, the results show that subclassification of the sample based on the ownership perspective provides a better understanding of the banking performance and its determinants. This subclassification helps to identify the most significant results compared to results that are obtained using a dataset combing bank from different categories of ownership. For example, some performance determinants were not statistically significant in the baseline regressions, which are based on a dataset of the whole sample, but these determinants found to be significant in subclassified samples according to ownership perspective.

6.5.3 Policy Perspective: The relationship between the capital level and banking performance: is there any impact on changes in the capital regulations?

This chapter covered a sample period 2003 to 2014 that has experienced announcement for the Basel Accords II in 2004, Basel II.5 in 2009 and Basel Accords III in 2010. These accords introduced new amendments in the regulatory capital requirements, and banks were asked to meet these amendments accordingly. In this section, a further investigation is conducted on the empirical effect of the capital level (as measured by the Equity/Asset ratio) on the banking performance level (from both profit- and cost-based perspectives). This investigation is conducted with consideration for the amendments in the regulatory capital requirements in the post-period of announcing the Basel Accords II (i.e., 2005 to 2008), and the post-period of announcing the Basel Accords 2.5 (i.e., 2009 to 2012) respectively. [123] This investigation aims to examine banking performance during the period that experienced regulatory changes as per amendments of the Basel Accords and to examine the characteristics of banks that are associated with high performance.

A) Banking performance during the prior- and post- announcement for amendments of the Basel Accords:

In this section, there is a demonstration for the empirical results on banking performance for subsamples during the post-period of announcement for the Basel Accords II in 2004 (i.e., 2005-2008), and the post-period for the Basel Accords II.5 (i.e., 2009 to 2012). The results show that high-equity banks associated positively with profitability level (as measured by the ROA ratio and NIM ratio) in both subsamples of post-period of announcement for the Basel Accords II in 2004, and the post-period for the Basel Accords II.5 as reported in Table 6-10 and Table 6-11 respectively. Although the capital coefficient was found to be statistically significant in all models, the quantitative effect of this coefficient found to be relatively low.

[123] The pre-Basel II Accords period (2003 and 2004) and the post-period of the Basel III (2013 and 2014) are excluded in the analysis due to a small number of observations. Yet, the results are reported in Appendix (IX).

Table 6-10: Relationship between the capital level and performance (for three subsamples: a subsample for the period (2005-2008), and a subsample for the period (2009-2012)):

The dependent variable is profit-based performance as measured by total returns to total assets (ROA) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the sub-period samples (2005 to 2008) and (2009 to 2012) respectively. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ High profit-based banks (as measured by the ROA ratio) during the sub-period (2005 to 2008) are found characterised to be high-equity banks and diversified banks.
- ⇨ High profit-based banks (as measured by the ROA ratio) during the sub-period (2009 to 2012) are found characterised to be high-equity banks, and diversified banks, and banks with the risky lending portfolio.

Panel (A): Regression Models based on a subsample of prior- and post-period of announcement for Basel Accords Amendments

Estimated Models using ROA as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0003*	0.0003*	0.0003*	0.0003*	0.0006***	0.0006***	0.0006***	0.0006***
	(**0.0869**)	(**0.0900**)	(**0.0958**)	(**0.0857**)	(**0.0005**)	(**0.0005**)	(**0.0005**)	(**0.0004**)
Size: log Assets	0.0010	0.0007	0.0007	0.0008	-0.0013	-0.0015	-0.0015	-0.0015
	(0.3662)	(0.5363)	(0.5051)	(0.4492)	(0.2832)	(0.2110)	(0.1866)	0.2120
Risk: 5 NPLs/Assets	0.0094	0.0096	0.0100	0.0094	0.0896*	0.0880*	0.0887*	0.0887*
	(0.6822)	(0.6814)	(0.6688)	(0.6850)	(**0.0541**)	(**0.0565**)	(**0.0545**)	(**0.0539**)
Diversification: NII Ratio	0.0274***	0.0274***	0.0273***	0.0274***	0.0073*	0.0074*	0.0073*	0.0073*
	(**0.0048**)	(**0.0051**)	(**0.0054**)	(**0.0051**)	(**0.0818**)	(**0.0817**)	(**0.0804**)	(**0.0846**)
A) Regulatory Pressure for undercapitalised banks (REGU)	0.0570				-0.0008			
	(0.1439)				(0.6762)			
A) Regulatory Pressure for better-capitalised banks (REGO	-0.0184				-0.0332**			
	(0.3902)				(**0.0430**)			
B) Regulatory Pressure for undercapitalised banks (PCAU)		0.0012				-0.0006		
		(0.4397)				(0.5630)		
C) Regulatory Pressure -Edizs Regulatory Pressure (REG-Ediz)			0.0021				0.0016*	
			(0.1001)				(**0.0806**)	
D) Regulatory Pressure (REG-mcr)				-0.0007				-0.0017
				(0.6649)				(0.3349)
DV=2007 for crisis period	0.0030***	0.0029***	0.0029***	0.0028***				
	(**0.0051**)	(**0.0051**)	(**0.0069**)	(**0.0065**)				
Interest rate Spread	0.0022***	0.0022***	0.0022***	0.0022***	-0.0001	-0.0001	-0.0001	-0.0001
	(**0.0014**)	(**0.0016**)	(**0.0017**)	(**0.0015**)	(0.9175)	(0.9099)	(0.9186)	(0.9114)
Constant	-0.0013	-0.0004	-0.0013	-0.0004	0.0209**	0.0211**	0.0207**	0.0225**
	(0.8931)	(0.9697)	(0.8911)	(0.9671)	(**0.0455**)	(**0.0428**)	(**0.0461**)	(**0.0304**)
Panel (B): Summary Statistics								
Observations	954	955	954	954	993	994	993	993
No. Banks	354	354	354	354	376	376	376	376
Wald chi2 Statistics	72.6600	59.5100	68.7000	56.1800	40.5000	36.9100	39.2300	38.3400
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1457	0.1399	0.1406	0.1392	0.1818	0.1798	0.1823	0.1832
r2_between groups	0.1859	0.1779	0.1806	0.1786	0.2521	0.2505	0.2513	0.2562
r2_within groups	0.0194	0.0183	0.0202	0.0174	0.0236	0.0206	0.0236	0.0188

Nevertheless, the coefficient value found to be larger during the post-period for the Basel Accords 2.5 (i.e., 2009-2012), and statistically more significant. The capital coefficient was found to be 0.0003 (0.0004) for the ROA (NIM) regressions during the period 2005-2008, implying a 1% increase in the capital level raise profitability by 0.03% (0.04%). While the capital coefficient was found to be 0.0006 (0.0005) for ROA (NIM) regressions during the period 2009-2012, implying a 1% increase in the capital level raises profitability by 0.06% (0.05%). The positive relationship in the capital-performance relationship supports the "expected bankruptcy cost hypothesis".[124] Based on this hypothesis, high-capital banks are able to utilise their creditworthiness and a better relationship with customers to generate more revenues at a lower cost. This relationship was found to be more significant during the post-period of announcing the Basel Accords II.5. The capital coefficient was found to be significant at 10% (5%) for the ROA (NIM) regressions during the period 2005-2008, while the same coefficient was found to be significant at 1% (1%) for the ROA (NIM) regressions during the period 2009-2012. Banks during the post period of the Basel Accords II.5 worked to build up their capital level and enhance their governance as per to the regulatory and supervisory requirements to improve their creditworthiness. From the cost-based perspective, there was no evidence that high-equity banks are associated with less cost as shown in Table 6-12.[125]

The above results highlight that high equity banks have better performance in which they are able to generate higher earnings. Indeed, the capital-performance nexus is found to be more statistically significant during the post-period of introducing the Basel Accords 2.5. High-equity banks do not imply that they are already meeting the regulatory capital requirements. Thus, in the next part, the performance level of both undercapitalised and better-capitalised banks is examined separately. The new amendments to the Basel Accords aim to build up more risk-sensitive based capital. Thus; undercapitalised banks, which are not meeting the

[124] As a reminder, this positive relationship between the capital and performance is consistent with results that were found in baseline regressions, which are based on the whole sample period (i.e., 2003 to 2014), and reported a positive capital-performance nexus as shown in Table 6-5.

[125] As a reminder, this insignificant negative relationship is also consistent with the obtained results from the baseline regressions that are based on the whole sample, as reported in Table 6-5.

Table 6-11: Relationship between the capital level and performance (for three subsamples: a subsample for the period (2005-2008), and a subsample for the period (2009-2012)):

The dependent variable is cost indicator as measured by net interest margin (NIM) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the sub-period samples (2005 to 2008) and (2009 to 2012) respectively. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ High profit-based banks (as measured by the NIM ratio) during the sub-period (2005 to 2008) are found characterised to be high-equity banks and small size.
- ⇨ High profit-based banks (as measured by the ROA ratio) during the sub-period (2009 to 2012) are found characterised to be high-equity banks and have a risky lending portfolio.

Panel (A): Regression Models based on a subsample of prior- and post-period of announcement for Basel Accords Amendments

Estimated Models using NIM as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**			
	1 Coeff. (p-value)	**2** Coeff. (p-value)	**3** Coeff. (p-value)	**4** Coeff. (p-value)	**1** Coeff. (p-value)	**2** Coeff. (p-value)	**3** Coeff. (p-value)	**4** Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0004**	0.0004**	0.0004**	0.0004**	0.0005***	0.0005***	0.0005***	0.0005***
	(**0.0175**)	(**0.0142**)	(**0.0174**)	(**0.0146**)	(**0.0025**)	(**0.0027**)	(**0.0017**)	(**0.0025**)
Size: log Assets	-0.0035**	-0.0035*	-0.0037*	-0.0037*	-0.0014	-0.0007	-0.0009	-0.0009
	(**0.0490**)	(**0.0688**)	(**0.0725**)	(**0.0679**)	(0.5107)	(0.7446)	(0.6686)	(0.6949)
Risk: 5 NPLs/Assets	0.0441	0.0449	0.0450	0.0449	0.1361**	0.1396**	0.1391**	0.1393**
	(0.3361)	(0.3200)	(0.3229)	(0.3198)	(**0.0367**)	(**0.0353**)	(**0.0350**)	(**0.0352**)
Diversification: NII Ratio	0.0025	0.0027	0.0025	0.0026	-0.0237	-0.0238	-0.0240	-0.0239
	(0.8664)	(0.8594)	(0.8668)	(0.8639)	(0.1486)	(0.1516)	(0.1513)	(0.1504)
A) Regulatory Pressure for undercapitalised banks (REGU)	-0.0433				0.0054*			
	(0.0327)				(**0.0890**)			
A) Regulatory Pressure for better-capitalised banks (REGO	-0.0410				0.0622*			
	(0.5171)				(**0.0584**)			
B) Regulatory Pressure for undercapitalised banks (PCAU)		-0.0022				0.0022		
		(0.1944)				(0.1087)		
C) Regulatory Pressure -Edizs Regulatory Pressure (REG-Ediz)			0.0014				0.0010	
			(0.4391)				(0.6663)	
D) Regulatory Pressure (REG-mcr)				0.0016				-0.0006
				(0.2867)				(0.8410)
DV=2007 for crisis period	-0.0009	-0.0010	-0.0009	-0.0009				
	(0.3793)	(0.3665)	(0.3894)	(0.3886)				
Interest rate Spread	0.0007	0.0007	0.0007	0.0007	-0.0003	-0.0003	-0.0003	-0.0003
	(0.4536)	(0.4233)	(0.4379)	(0.4270)	(0.7043)	(0.7127)	(0.7134)	(0.7126)
Constant	0.0469***	0.0451***	0.0456***	0.0448***	0.0314**	0.0298*	0.0305*	0.0311**
	(**0.0053**)	(**0.0035**)	(**0.0034**)	(**0.0038**)	(**0.0454**)	(**0.0605**)	(**0.0620**)	(**0.0371**)
Panel (B): Summary Statistics								
Observations	955	956	955	955	1,001	1,002	1,001	1,001
No. Banks	354	354	354	354	378	378	378	378
Wald chi2 Statistics	52.16	51.8500	50.8600	51.6000	103.44	81.7600	79.0900	78.6300
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.0826	0.0859	0.0853	0.0859	0.0745	0.0726	0.0719	0.0716
r2_between groups	0.1031	0.1108	0.1105	0.1116	0.1223	0.1190	0./1145	0.1154
r2_within groups	0.0200	0.0121	0.0114	0.0099	0.0065	0.0072	0.0081	0.0076

regulatory capital requirements, are expected to be associated with risky activities that might impact their performance level negatively. However, the performance of those undercapitalised banks is expected to be improved especially during the period that experienced imposing additional regulatory requirements to avoid any additional regulatory costs. The performance of undercapitalised banks is examined in two sub-periods 2005 to 2008 and the sub-period 2009 to 2012 too.

For undercapitalised banks, the results show no significant evidence on the association between undercapitalised banks and the performance level during the sub-period (2005 to 2008) as reported in Table 6-10, Table 6-11, and Table 6-12 for regressions of ROA, NIM, and TCA respectively. On the other hand, undercapitalised banks, as measured by REG-Ediz, were found to be associated positively with the ROA ratio at a significance level of 1% during the period 2009 to 2012 (refer to Table 6-10). In addition, a significant association is found with regard to the second profit-based indicator (i.e., the NIM ratio), and cost-based indicator (the TCA ratio). The results show that undercapitalised banks, as measured by REGU and PCAU, are associated positively with the NIM ratio during the sub-period (i.e., 2009 to 2012). Indeed, the coefficient REGU was found to be statistically significant at 10% as reported in Table 6-11. This positive association implies that those undercapitalised banks tended to earn high margin during the post-period of Basel Accords II.5. However, this interpretation should be taken with caution. Banks might charge a higher margin to cover their high costs. It is observed that undercapitalised banks, and mainly the coefficient REGU, were associated positively with cost-based indicator (TCA) ratio as reported in Table 6-12. The coefficient REGU was found to be statistically significant at 5%. This positive association implies that undercapitalised banks are also associated with high operating costs during the period (2009 to 2012). After the announcement of additional amendments in the capital requirements in the form of Basel II.5, the results show that undercapitalised respond to these regulatory reforms after 2009 via charging high margin and their operating cost found to be high.

For better-capitalised banks, which are already meeting the minimum capital requirements, it is hypothesised that they keep their performance level even with the introduction of new amendments to the Basel Accords. Better-capitalised banks are

Table 6-12: Relationship between the capital level and performance (for three subsamples: a subsample for the period (2005-2008), and a subsample for the period (2009-2012)):

The dependent variable is cost level as measured by total costs to assets (TCA) ratio. Independent variables are defined and summarised in Table (4-1). The estimation method is robust clustered random effects model based on the sub-period samples (2005 to 2008) and (2009 to 2012) respectively. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ High cost-based banks, which are associated with high TCA ratio, during the sub-period (2005 to 2008) are found characterised to be small banks and risky banks
- ⇨ High cost-based banks, which are associated with high TCA ratio, during the sub-period (2009 to 2012) are found characterised to be small banks.

Panel (A): Regression Models based on a subsample of prior- and post-period of announcement for Basel Accords Amendments

Estimated Models using TCA as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p- value)	Coeff. (p- value)	Coeff. (p- value)	Coeff. (p- value)
Capital: Equity/Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	-0.00004	-0.00004	-0.00003	-0.00005
	(0.3488)	(0.3555)	(0.3590)	(0.3517)	(0.7029)	(0.7139)	(0.7357)	(0.6432)
Size: log Assets	-0.0034**	-0.0033*	-0.0034**	-0.0035**	-0.0100***	-0.0099***	-0.0099***	-0.0099***
	(**0.0449**)	(**0.0502**)	(**0.0461**)	(**0.0398**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Risk: NPLs/Assets	0.0485*	0.0492*	0.0486*	0.0493*	0.0631	0.0658	0.0654	0.0681
	(**0.0881**)	(**0.0797**)	(**0.0875**)	(**0.0787**)	(0.2957)	(0.2745)	(0.2804)	(0.2563)
Diversification: NII Ratio	0.0074	0.0074	0.0074	0.0075	-0.0108	-0.0112	-0.0111	-0.0109
	(0.3787)	(0.3836)	(0.3813)	(0.3760)	(0.1229)	(0.1120)	(0.1163)	(0.1213)
A) Regulatory Pressure for undercapitalised banks (REGU)	-0.0137				0.0190**			
	(0.5859)				(**0.0447**)			
A) Regulatory Pressure for better-capitalised banks (REGO	-0.0042				0.0478**			
	(0.8628)				(**0.0233**)			
B) Regulatory Pressure for undercapitalised banks (PCAU)		-0.0011				0.0013		
		(0.3089)				(0.2350)		
C) Regulatory Pressure -Edizs Regulatory Pressure (REG-Ediz)			-0.0007				-0.0012	
			(0.5600)				(0.2313)	
D) Regulatory Pressure (REG-mcr)				0.0012				0.0010
				(0.3979)				(0.5571)
DV=2007 for crisis period	0.0043***	0.0043***	0.0044***	0.0043***				
	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)				
Interest rate Spread	-0.0008	-0.0008	-0.0007	-0.0008	0.0005	0.0005	0.0004	0.0004
	(0.2812)	(0.2819)	(0.2900)	(0.2794)	(0.3668)	(0.4595)	(0.4776)	(0.4792)
Constant	0.0847***	0.0841***	0.0844***	0.0837***	0.1244***	0.1263***	0.1263***	0.1248***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0304**)

Panel (B): Summary Statistics

Observations	742	743	742	742	882	823	822	822
No. Banks	227	227	277	277	321	321	321	321
Wald chi2 Statistics	25.4700	27.2700	24.5400	26.0100	64.79	55.2500	55.4300	56.0100
	(**0.0013**)	(**0.0003**)	(**0.0009**)	(**0.0005**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.0801	0.0840	0.0830	0.0844	0.0425	0.0386	0.386	0.0387
r2_between groups	0.1076	0.1119	0.1104	0.1132	0.0184	0.0161	0.0162	0.0166
r2_within groups	0.0064	0.0062	0.0062	0.0057	0.0974	0.0983	0.0981	0.0971

more capable of meeting the new amendments, and hence their performance level should not be affected negatively after the introduction of new amendments to the Basel Accords. In view of empirical results for the sub-period 2005 to 2008, no significant results were found on the relationship between better-capitalised banks, which are measured by REGO and REG-mcr, and performance level as reported in Table 6-10 for the ROA ratio, Table 6-11 for the NIM ratio, and Table 6-12 for the TCA ratio. However, more significant consistent results were found during the post-period of introducing the Basel 2.5. Unlike undercapitalised banks, Table 6-10 shows that better-capitalised banks, as measured by REGO, were associated with less earning (as measured by ROA ratio) compared to other banks during the post-period 2009 to 2012 at a significance level of 5%. This result implies that better-capitalised banks do not utilise their resources to generate high earnings. This finding supports the view of the potential negative impact of holding high capital level. At the same time, better-capitalised banks, as measured by REGO, were found to be associated with high net interest margin (NIM) at a significance level of 10% as shown in Table 6-11. It is observed that both undercapitalised and better-capitalised charge a high margin to increase their earnings during the sub-period 2009 to 2012.

Similarly, both undercapitalised and better-capitalised banks were found to be associated with high costs. The coefficient of better-capitalised banks, as measured by REGO, was found to be associated positively by operating costs (as a measured by the TCA) at a significance level of 5% as shown in Table 6-12. This result suggests that better-capitalised banks, which are already meeting the minimum regulatory capital requirements, were still associated with high operating costs to run their banking activities during a period there are more regulatory and supervisory requirements. As a whole, it is observed that during the period that imposed more regulatory requirements as per the Basel Accords II.5 (i.e., 2009 to 2012), better-capitalised banks were found to be associated with less earning, charge high margin and associated with high operating costs.

The above results highlight the performance of high capital banks, and banks with different capitalised levels during both sub-periods. The results were found to be more statistically significant during the post-period of introducing the Basel Accords II.5

(i.e., 2009 to 2012). The empirical results also reported other characteristics of banks during both periods. These characteristics are reflective in the form of bank level controlling variables. The results show that there are no a statistical differences in the coefficients of bank size (measured by Log Assets), riskiness (measured by NPLs ratio), and diversification level (measured by NII ratio) between the subsamples periods that experienced different regulatory reforms as reported in Table 6-10, Table 6-11, and Table 6-12.

However, period-wise subsamples classification provides a better understanding of the baseline regressions that are reported in Table 6-5 and discussed in section 6.7.1. For example, the relationship between the riskiness level (as measured NPLs ratio) and profitability level (as measured by ROA ratio) were found to be negative, but statistically insignificant, in the baseline regressions that are based on the whole sample as reported in Table 6-5. This relationship was found to be positive during both subperiods post-period of the announcement Basel Accords II (i.e., 2005 to 2008) and the post-period of the announcement Basel Accords II.5 (i.e., 2009 to 2012) as reported in Table 6-10. Indeed, the relationship appears to be the most significant during the period (2009-2012) at a significance level of 10%. The same finding is found when the second profit-based indicator is accounted (i.e., NIM ratio) as reported in Table 6-11. The relationship between the NPLs ratio and NIM ratio was found to be positive, and it is the most significant during the post-period of announcement for the Basel Accords II.5 (i.e., 2009 to 2012).

The positive association between the risk level (as measured by the NPLs ratio) and profit-based indicators (both ROA and NIM ratios) is hypothetically not expected. The post-period of announcement for the Basel Accords II.5 is regulatory a more pressurised period in which banks are asked to build up an additional capital charge for market risk in securitisation and re-securitisation and disclose their risk exposure, especially in off-balance sheet activities. Yet, it seems that banking lending portfolios were still risky during the same period. This positive relationship between riskiness of banks and profit-based indicators implies that banks were involved in a risky lending portfolio to generate high earnings, and banks might charge a high premium to cover the regulatory cost of increasing the capital requirements and other regulatory restrictions. This finding supports the argument of Marcus (1984) who argued that banks managers might adopt higher risk strategies by lowering asset quality or capital ratio to exploit governmental benefits.

Similarly, the period-wise subsamples classification provides a better understanding of the relationship between the diversification levels (as measured by the NII ratio) and the performance. The relationship between the NII ratio and ROA was reported as a positive relationship but statistically insignificant based on the whole sample as shown in Table 6-5. The same relationship was found to be positive and statistically significant during the sub-period (2005-2008) with a significance level of 1% and sub-period (2009 to 2012) with a significance level of 10%. This positive association implies that banks benefited from their diversification strategy to generate higher earnings especially during the period (2005-2008). As reported in Table 6-10, the coefficient on diversification level (as measured by the NII ratio) during the post-period of the Basel Accords II (i.e., 2005 to 2008) was about 0.0274 verses 0.0073 during the post-period of the Basel Accords II.5 (i.e., 2009 to 2012).

In term of bank size, the results show no evidence of the variation in banking performance over the sample sub-periods that experienced different regulatory requirements as per the Basel Accords structure. The relationship between log assets (as an indicator of bank size) and the NIM ratio (as an indicator for profit-based indicator) was reported as a significant negative relationship based on the whole sample as shown in Table 6-5. The same negative relationship was found to be in both sub-periods (2005 to 2008) and (2009 to 2012) as reported in Table 6-11. However, the coefficient of bank size was found to be statistically significant only during the post-period of announcing the Basel Accords II (i.e., 2005 to 2008) as a significance level of 10%.[126] Indeed, the quantified size of the coefficient for the sub-period (2005 to 2008) is higher than the coefficient for the sub-period (2009 to 2012). As reported in Table 6-11, the coefficient on banks size (Log Asset) during the post-period of the Basel Accords II (i.e., 2005 to 2008) is about -0.0035 verses -0.0009 during the post-period of the Basel Accords II.5 (i.e., 2009 to 2012). This result implies that large

[126] The size coefficient found to be significant at 5% in the first model that is estimated with consideration for regulatory capitalised banks as defined by Jacques and Nigro's approach.

banks were found to be associated proportionally with less net interest margin (NIM) during the sub-period (2005 to 2008). Yet there is no statistical evidence that those large banks associate with low premium during the period that experienced imposing additional regulatory requirements as per the Basel Accords II.5. On the other hand, large banks were found to have better management for their cost level in which they associate with less cost as measured by the TCA ratio. The coefficient of bank size was found to be negative and statistically significant during both sub-periods. This negative association was found to be more significant during the post-period of the Basel Accords II.5 (i.e., 2009 to 2012). As reported in Table 6-12, the coefficient on bank size (as measured by log asset) during the post-period of the Basel Accords II (i.e., 2005 to 2008) is about -0.0034 (at a significance level of 5%) versus -0.0099 (at a significance level of 1%).

For the purpose of controlling for the crisis period, a crisis dummy variable (DV_{2007}^{Crisis}) is included into the models that are estimated based on the subsample (2005-2008) to capture whether there is an effect of the financial crisis in the given period. This variable is expected to be associated negatively with performance level to indicate losses of banks during the crisis period. However, Table 6-10 shows that there is a significant positive relationship between the crisis dummy variable and ROA ratio at a significance level of 1%.[127] This result implies that banks were still associated with high earnings during 2007.[128] In terms of banking operating cost, the crisis dummy variable was found to have a significant positive coefficient at a significance level of

[127] The effect of the financial crisis is also examined using a crisis dummy variable with a value of unity for years 2008. The results show an insignificant negative coefficient for crisis dummy variable in case of considering for additional macroeconomic controlling variables and mainly annual growth of the gross domestic products and annual inflation rate. The results show no changes in signs and significance of all other variables in the estimated models. This result implies that the negative impact of the crisis on the banking earnings was not reflected in the year 2007, but its impact might be reflected during the year 2008.

[128] Since the crisis dummy variable was found to be significant; the subsample (2005-2008) was re-estimated without including observations of 2007. The purpose of excluding observations of 2007 is to examine the risk behavior without effects of financial crisis 2007. The results of the re-estimated models, which are based on 600 observations for 354 banks, did not show a change in the value of coefficients, and the same above results were obtained.

1% as reported in Table 6-12. This result meets the hypothetical expectations that banks would have a high operating cost during the crisis period.[129]

Overall, the empirical results in this section focus on banking performance the prior- and post- announcement for amendments of the Basel Accords and mainly the Basel Accords II and Basel Accords II.5. The above results found a positive relationship is found in capital-performance nexus as per "expected bankruptcy cost" hypothesis in both post-periods of announcing regulatory requirements as per Basel Accords II and Basel Accords II.5. This hypothesis supports that high-capital banks have higher creditworthiness and a better relationship with customers; hence they are more able to improve their performance. However, there was no evidence that high-capital banks are associated negatively with the cost level.

There was no evidence on differences in the impact of the regulatory changes on banking performance. The above results highlight the characteristics of better-performed banks in each period. In term of the post-period of announcing the Basel Accords II (i.e., 2005 to 2008), the most profit-based banks (as measured by both ROA ratio and NIM ratio) were found to be high-equity banks. In term of capitalised banks according to the regulatory requirements, pressurised banks were found to be associated with high ROA ratio. In, addition, small banks were found to be associated with high net interest margins during the same period, but those small banks were found to be associated with high operating costs (as measured by TCA ratio).

On the other hand, the most profit-based banks (as measured by both ROA ratio and NIM ratio) during the post-period of announcing the Basel accords II.5 (i.e., 2009 to 2012) were found to be high equity banks. In term of capitalised banks, both undercapitalised and better-capitalised banks were found to be associated with high margins, and they were found to be associated with high operating costs (as measured by TCA ratio). In addition, the results show evidence on the association of risky banks with high earnings during the sub-period (2009 to 2012).

[129] The effect of the financial crisis is also re-examined using a crisis dummy variable with a value of unity for the year 2008 and a period (2007 to 2008). The results show a significant positive coefficient for crisis dummy variable given that there were no changes in signs and significance of all other variables in the estimated models.

B) Banking performance during the prior- and post- period of the regulatory pressure:

The previous section focused more on specific sub-periods in the sample that experienced main amendments to the Basel Accords. The attention was mainly on post-periods of announcing for the new amendments of the Basel Accords II and Basel Accords II.5. This sub-classification is found to be useful to recognise respond of banks to the regulatory reforms. The results show the characteristics of banks with the best performance banks. As discussed in the previous section, the results show that high-equity banks were associated significantly with high profit-based indicators, but there was no evidence that those high-equity banks associate with high costs. Yet these results were found to be statistically significant during the sub-period (2009 to 2012).

One of the limitations of the results in the previous section is the focus on a period that followed the announcement of specific regulatory reform. There are sub-periods that are not considered in the analysis of the previous section due to the small size of observations, for example, a sub-period 2003/2004 and a sub-period 2013/2014. However, these sub-periods experienced the implementation of regulatory reforms in combination with other sub-periods, and hence ignoring these periods might lead to losing some information. These limitations overcome in this section by considering sub-classifying the sample period into two sub-samples to account for the prior- and post- period of the regulatory pressure.

As elaborated in Chapter Two, banks have experienced more regulatory pressure particularly after the financial crisis 2007/2008. During the post-period of the financial crisis, regulatory authorities asked banks to impose more capital and meet additional regulatory requirements. Basel Accords II.5 introduced in 2009 and Basel III introduced in 2010, and then after more banks started implementing the Basel Accords III in 2013/2014. The new amendments in Basel Accords in Basel II.5 and III are more restrictive compared to the Basel Accords I and II that were implemented before 2009. Thus; the post period after 2009 experienced more regulatory restrictions than before. Hypothetically, the performance level is expected to reduce during the regulatory pressure period due to increase in operating costs of banks to meet their regulatory capital requirements and avoid any additional regulatory costs. Thus; banks are expected to change their risk behaviour and banking portfolios in response to the regulatory pressure.

In this section, a further investigation is conducted on the banking performance of capitalised banks during the regulatory pressure period (2009 to 2014) versus less regulatory pressure period (2003 to 2008). This investigation aims to view the impact of the regulatory pressure on the banking performance of both undercapitalised banks and better-capitalised banks. For this propose the sample is divided into two sample periods (2003 to 2008) versus (2009 to 2014).

The analysis starts by using a time dummy ($DV_t^{2009/12}$) is used to test whether there is a significant difference in banking performance during the prior- and post- period of the regulatory pressure. This dummy variable ($DV_t^{2009/12}$) donates the value of unity for the period 2009 to 2014, and zero otherwise. It has a subscript of (t) since it does not change across banks in the sample. The coefficient of this dummy variable is expected to be negative, i.e., the period 2009 to 2014 had experienced more regulatory requirements and asked banks to increase their capital level, disclosure more relevant information, and meet other regulatory requirements. This variable is added to the models that are estimated based on the whole sample. In addition, a crisis dummy variable is included in the models for the purpose of controlling the crisis year (2007).

The empirical results show that the profit-based indicators were found to be higher during the post- period of the regulatory pressure as reflected by a positive coefficient of time dummy variable ($DV_t^{2009/12}$). This coefficient was found to be a significant positive value in term of NIM ratio at a significance level of 10% as reported in Table 6-14. The positive coefficient of a dummy variable ($DV_t^{2009/12}$) implies that the profitability level did not reduce during the pressurised regulatory period (i.e., 2009 to 2014). In term of the cost-based indicator, the coefficient ($DV_t^{2009/12}$) was found to be significantly negative at a significance level of 1% as reported in Table 6-15. This negative coefficient suggests that banking operating costs reduced during the period that experienced regulatory reforms. In order to to the banking performance from 2009 to 2014. Compared to reported results in the previous section (6.6.3.A), the results of

Table 6-13: Relationship between the capital level and performance (for a subsample for the period (2003-2008), a subsample for the period (2009-2014):

The dependent variable is profit performance as measured by total returns to total assets (ROA) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ High profit-based banks during the sub-period (2005 to 2008) are found characterised to be high-equity banks.
- ⇨ High profit-based banks during the sub-period (2009 to 2012) are found characterised to be high-equity banks and small-sized banks.

Panel (A): Regression Models based on a subsample for prior and post period of the regulatory restrictions

Estimated Models using ROA as the dependent variable	Robust Clustered Random Effects Model											
	The whole sample for the period 2003 to 2014				A subsample for banks during the period of less regulatory restrictions (2003 to 2008)				A subsample for banks during the period of the regulatory pressure (2009 to 2014)			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0003 ***	0.0003 ***	0.0003 ***	0.0003 ***	0.0002 **	0.0002 *	0.0002 *	0.0002 **	0.0004 **	0.0004 **	0.0004 **	0.0004 **
	(0.0056)	**(0.0057)**	**(0.0063)**	**(0.0046)**	**(0.0488)**	**(0.0517)**	**(0.0565)**	**(0.0456)**	**(0.0156)**	**(0.0155)**	**(0.0170)**	**(0.0141)**
Size: log Assets	-0.0022 **	-0.0025 **	-0.0024 **	-0.0023 **	-0.0006	-0.0008	-0.0007	-0.0006	-0.0024 *	-0.0028 **	-0.0028 *	-0.0027 *
	(0.0411)	**(0.0226)**	**(0.0279)**	**(0.0332)**	(0.4661)	(0.3465)	(0.3865)	(0.4560)	**(0.0762)**	**(0.0426)**	**(0.0467)**	**(0.0538)**
Risk level: NPLs/Assets	-0.0181	-0.0184	-0.0179	-0.0175	0.0144	0.0147	0.0151	0.0144	0.0525	0.0514	0.0514	0.0529
	(0.1564)	(0.1445)	(0.1609)	0.1667	(0.2638)	(0.2640)	(0.2525)	(0.2657)	(0.1850)	(0.1937)	(0.1940)	(0.1738)
Diversification : NII Ratio	0.0046	0.0047	0.0047	0.0045	0.0078	0.0077	0.0077	0.0076	0.0029	0.0028	0.0029	0.0025
	(2096)	(0.2022)	(0.2048)	(0.2251)	(0.1197)	(0.1212)	(0.1251)	(0.1244)	(0.5738)	(0.5764)	(0.5624)	(0.6220)
A) Under capitalised banks (REGU)	0.0034				0.0127				0.0008			
	(0.4551)				(0.5026)				(0.8308)			
A) Better capitalised banks (REGO)	-0.0307 **				-0.0170				-0.0425 **			
	(0.0445)				(0.2657)				**(0.0423)**			
B) Under capitalised banks (PCAU)		0.0012				0.0010				0.0006		
		(0.1795)				(0.4711)				(0.6512)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0017*				0.0009				0.0023*	
			(0.0551)				(0.3219)				(0.0679)	
D) Better capitalised banks (REG-mcr)				-0.0030 **				-0.0020				-0.0034
				(0.0473)				(0.2660)				(0.1692)
DV for Crisis 2007	0.0022 **	0.0022 **	0.0022 **	0.0022 **	0.0031 ***	0.0031 ***	0.0030 ***	0.0031 ***				
	(0.0310)	**(0.0288)**	**(0.0313)**	**(0.0332)**	**(0.0027)**	**(0.0025)**	**(0.0026)**	**(0.0028)**				
DV for period after 2009	0.0012	0.0014	0.0013	0.0013								
	(0.2666)	(0.1957)	(0.2178)	(0.2127)								
Interest rate Spread	0.0005	0.0005	0.0005	0.0005	0.0019 ***	0.0019 ***	0.0019 ***	0.0019 ***	0.0005	0.0005	0.0005	0.0005
	(0.2348)	(0.2360)	(0.2298)	(0.2064)	**(0.0034)**	**(0.0033)**	**(0.0034)**	**(0.0034)**	(0.4477)	(0.4512)	(0.4399)	(0.4510)
Constant	0.0310 ***	0.0314 ***	0.0301 ***	0.0329 ***	0.0135 *	0.0138 *	0.0132 *	0.0146 *	0.0318 **	0.0328 ***	0.0312 **	0.0350 ***
	(0.0007)	**(0.0005)**	**(0.0008)**	**(0.0003)**	**(0.0765)**	**(0.0678)**	**(0.0818)**	**(0.0593)**	**(0.0101)**	**(0.0083)**	**(0.0107)**	**(0.0054)**

Continued Table (6-13) - Panel (B): Summary Statistics

	1	2	3	4	1	2	3	4	1	2	3	4
Observations	2,066	2,068	2,066	2,066	1,007	1,008	1,007	1,007	1,059	1,060	1,059	1,059
No. Banks	310	310	310	310	285	285	285	285	301	301	301	301
Wald chi2 Statistics	67.6200	62.3700	66.3200	64.2000	87.7200	83.6500	89.5200	85.1500	44.8200	38.1300	44.8100	41.2000
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.1325	0.1302	0.1328	0.1356	0.1386	0.1374	0.1374	0.1398	0.1844	0.1808	0.1849	0.1876
r2_between groups	0.2372	0.2325	0.2375	0.2444	0.2322	0.2293	0.2289	0.2360	0.2861	0.2845	0.2843	0.2919
r2_within group	0.0029	0.0028	0.0032	0.0029	0.0025	0.0029	0.0028	0.0023	0.0001	0.0001	0.0003	0.00001

this section confirmed the same results. In addition, it is observed that both sections reported the same characteristics of banks that are associated with better performance during sub-periods that experienced a different level of regulatory pressure. For instance, both Table 6-13 and Table 6-14 shows that the most profitable banks (as reflected by ROA ratio and NIM ratio respectively) during the period 2009-2014 found to be:

- Banks with higher equity level as indicated by a significant positive coefficient for E/A ratio,
- Banks of small size as indicated by a significant negative coefficient for log assets, and
- Risky banks, which are associated with high credit risk, as indicated by a positive coefficient for NPLs ratio.[130]

It is observed that undercapitalised banks, as measured by REGU, PCAU, and REG-Ediz, were associated positively with profit-based indicators (as measured by ROA ratio and NIM ratio) during the period 2009 to 2014. Indeed, the coefficient REG-Ediz was found to have a positive relationship with ROA ratio at a significance level of 10% as reported in Table 6-13, and the coefficient REGU had a significant positive relationship with NIM ratio at a significance level 10% as reported in Table 6-14. This result is consistent with the results in section (6.6.3.A).

Whereas, better-capitalised banks, which are already meeting the minimum capital requirements as indicated by the coefficient REGO and REG-mcr, were found to be less earning as measured by ROA during the period 2009 to 2014 (Table 6-13). The coefficient REGO was found to be associated positively with the ROA ratio at a significance level of 5%. In view of these results, it is observed that undercapitalised banks were associated with higher earning, while better-capitalised banks were associated with less earning. These results imply that undercapitalised banks, which are not meeting the minimum capital regulatory requirements, utilise their assets to generate higher earnings (as measured by ROA), and charge high margins (as

[130] Risky banks were found to be associated positively, but statistically insignificant, with the ROA ratio as reported in Table 6-13, while they were found to be associated positively with the NIM ratio at a significance level of 10% as reported in Table 6-14.

Table 6-14: Relationship between the capital level and performance (for a subsample for the period (2003-2008), a subsample for the period (2009-2014):

The dependent variable is a profit-based indicator as measured by net interest margin (NIM) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ High profit-based banks (as measured by the NIM ratio) during the sub-period (2005 to 2008) are found characterised to be small banks and risky lending banks.
- ⇨ High profit-based banks (as measured by the NIM ratio) during the sub-period (2009 to 2012) are found characterised to be high-equity banks, and small-sized banks, and banks with risky lending portfolio, and diversified banks.

Panel (A): Regression Models based on a subsample for prior and post period of the regulatory restrictions

Estimated Models using NIM as the dependent variable	Robust Clustered Random Effects Model											
	The whole sample for the period 2003 to 2014				A subsample for banks during the period of less regulatory restrictions (2003 to 2008)				A subsample for banks during the period of the regulatory pressure (2009 to 2014)			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002*	0.0002*	0.0002*	0.0002*
	(0.3476)	(0.3577)	(0.3612)	(0.3629)	(0.2580)	(0.2630)	(0.2603)	(0.2622)	(**0.0752**)	(**0.0756**)	(**0.0680**)	(**0.0749**)
Size: log Assets	-0.0046***	-0.0045***	-0.0045***	-0.0045***	-0.0046***	-0.0047***	-0.0047***	-0.0046***	-0.0044***	-0.0041***	-0.0041***	-0.0041**
	(**0.0001**)	(**0.0002**)	(**0.0001**)	(**0.0001**)	(**0.0000**)	(**0.0001**)	(**0.0001**)	(**0.0000**)	(**0.0037**)	(**0.0082**)	(**0.0090**)	(**0.0105**)
Risk level: NPLs/Assets	0.0563**	0.0564**	0.0564**	0.0564**	0.0421*	0.0422*	0.0425*	0.0423*	0.0804*	0.0820*	0.0818*	0.0821*
	(**0.0445**)	(**0.0424**)	(**0.0429**)	(**0.0430**)	(**0.0822**)	(**0.0795**)	(**0.0766**)	(**0.0797**)	(**0.0549**)	(**0.0538**)	(**0.0538**)	(**0.0551**)
Diversification: NII Ratio	-0.0311***	-0.0311***	-0.0311***	-0.0311***	-0.0089	-0.0090	-0.0090	-0.0088	-0.0430***	-0.0430***	-0.0432***	-0.0432***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.1506)	(0.1478)	(0.1454)	(0.1503)	(**0.0032**)	(**0.0035**)	(**0.0034**)	(**0.0035**)
A) Under capitalised banks (REGU)	0.0008				0.0096				0.0078*			
	(0.7533)				(0.2106)				(**0.0979**)			
A) Better capitalised banks (REGO)	0.0169*				0.0022				0.0327			
	(**0.0975**)				(0.8302)				(0.1596)			
B) Under capitalised banks (PCAU)		-0.0005				0.0005				-0.0006		
		(0.3645)				(0.6221)				(0.5432)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0001				0.0003				0.0007	
			(0.0142)				(0.6428)				(0.7404)	
D) Better capitalised banks (REG-mcr)				-0.0001				-0.0021				-0.0006
				(0.8962)				(0.2965)				(0.7422)
DV for Crisis 2007	0.0020**	0.0019**	0.0020**	0.0020**	0.0013**	0.0013**	0.0013**	0.0013**				
	(**0.0144**)	(**0.0156**)	(**0.0142**)	(**0.0142**)	(**0.0366**)	(**0.0378**)	(**0.0409**)	(**0.0385**)				
DV for period after 2009	0.0016*	0.0015*	0.0015*	0.0015*								
	(**0.0581**)	(**0.0730**)	(**0.0692**)	(**0.0685**)								
Interest rate Spread	0.0007	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0011*	0.0011*	0.0011*	0.0011*
	(0.2462)	(0.2591)	(0.2653)	(0.2631)	(0.2024)	(0.2184)	(0.2154)	(0.2231)	(**0.0777**)	(**0.0788**)	(**0.0758**)	(**0.0789**)
Constant	0.0572***	0.0572***	0.0574***	0.0575***	0.0535***	0.0540***	0.0537***	0.0551***	0.0558***	0.0551***	0.0551***	0.0559***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)

Continued Table (6-14) - Panel (B): Summary Statistics

	1	2	3	4	1	2	3	4	1	2	3	4
Observations	2,077	2,079	2,077	2,077	1,008	1,009	1,008	1,008	1,069	1,070	1,069	1,069
No. Banks	311	311	311	311	285	285	285	285	303	303	303	303
Wald chi2 Statistics	149.35	148.70	146.74	146.94	82.6200	81.4700	83.1500	79.7100	170.75	171.89	162.99	160.34
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1449	0.1435	0.1432	0.1432	0.2588	0.2568	0.2569	0.2547	0.1121	0.1109	0.1110	0.1110
r2_between groups	0.1990	0.1964	0.1954	0.1954	0.2727	0.2695	0.2704	0.2678	0.2180	0.2158	0.2149	0.2153
r2_within group	0.0303	0.0303	0.0304	0.0304	0.0375	0.0386	0.0378	0.0440	0.0127	0.0128	0.0130	0.0128

indicated by NIM). While better-capitalised banks, which are meeting the regulatory requirements, were found to be less profitable. They are associated with less earning.

In term of the cost level, Table 6-15 supports the results of Table 6-12, and they show that banks with better performance in term of operating cost management during the period 2009-2014 are found to be:

- Banks with higher equity level as indicated by a significant negative coefficient for the E/A ratio,
- Banks of big size as indicated by a significant negative coefficient for log assets, and
- Diversified banks as indicated by a significant negative coefficient for the NII ratio.

In view of the capitalisation level, it is observed that undercapitalised banks were associated negatively with a cost-based indicator (as measured by TCA ratio) during the period 2009 to 2014. Indeed, the coefficient REG-Ediz was found to have a significant negative relationship with the TCA ratio at a significance level of 5% as reported in Table 6-15. Whereas, better- capitalised banks were found to be higher banking operating costs as reported in the same table. The coefficient REGO was found to be associated positively with the TCA ratio at a significance level of 5% (Table 6-15). These results show variation in banking cost level according to the capitalisation level.

In an attempt to understand the variation in the banking performance according to the capital level, this chapter expands the previous analysis via conducting the further examination on characteristics of banks that associated with better performance with consideration for their capital level. For this purpose, the following interaction term ($Inter_{it}$) is used:

$$Inter_{it} = REG_{it}^{k} * X_{it} \qquad \text{Equation (6-1)}$$

Where, (REG_{it}^{k}) is the capital level that is defined by k regulatory pressure approach. As stated in Chapter Four, this chapter uses four approaches to

Table 6-15: Relationship between the capital level and performance (for a subsample for the period (2003-2008), a subsample for the period (2009-2014):

The dependent variable is cost level as measured by total cost to total assets (TCA) ratio. Independent variables are defined and summarised in Table (4-1). The estimation method is robust clustered random effects model based on the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ Low cost-based banks (as measured by the TCA ratio) during the sub-period (2005 to 2008) are found characterised to have low equity banks, large banks, and low risky lending banks.
- ⇨ Low cost-based banks (as measured by the TCA ratio) during the sub-period (2009 to 2012) are found characterised to be low-equity banks, and large-sized banks, and diversified banks.

Panel (A): Regression Models based on a subsample for prior and post period of the regulatory restrictions

Estimated Models using TCA as the dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample for the period 2003 to 2014				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008)**				**A subsample for banks during the period of the regulatory pressure (2009 to 2014)**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	-0.0003 **	-0.0003 **	-0.0003 **	-0.0003 **	-0.0002 ***	-0.0002 ***	-0.0002 **	-0.0002 ***
	(0.1953)	(0.1978)	(0.2090)	(0.1959)	**(0.0147)**	**(0.0151)**	**(0.0155)**	**(0.0147)**	**(0.0091)**	**(0.0076)**	**(0.0109)**	**(0.0088)**
Size: log Assets	-0.0084 ***	-0.0083 ***	-0.0083 ***	-0.0083 ***	-0.0050 ***	-0.0050 ***	-0.0050 ***	-0.0050 ***	-0.0124 ***	-0.0122 ***	-0.0122 ***	-0.0121 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0028)**	**(0.0028)**	**(0.0025)**	**(0.0031)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Risk level: NPLs/Assets	0.0578 ***	0.0583 ***	0.0568 ***	0.0584 ***	0.0688 ***	0.0686 ***	0.0682 ***	0.0688 ***	0.0168	0.0151	0.0162	0.0171
	(0.0008)	**(0.0007)**	**(0.0010)**	**(0.0007)**	**(0.0069)**	**(0.0074)**	**(0.0075)**	**(0.0076)**	(0.6505)	(0.6850)	(0.6612)	(0.6485)
Diversification: NII Ratio	-0.0116 **	-0.0115 **	-0.0117 **	-0.0115 **	-0.0045	-0.0045	-0.0045	-0.0044	-0.0148 **	-0.0146 **	-0.0149 **	-0.0144 **
	(0.0199)	**(0.0206)**	**(0.0190)**	**(0.0210)**	(0.4536)	(0.4547)	(0.4541)	(0.4625)	**(0.0296)**	**(0.0310)**	**(0.0284)**	**(0.0354)**
A) Under capitalised banks (REGU)	-0.0029				-0.0052				-0.0048			
	(0.4874)				(0.6327)				(0.1284)			
A) Better capitalised banks (REGO)	0.0266 **				-0.0072				0.0370 **			
	(0.0452)				(0.6950)				**(0.0157)**			
B) Under capitalised banks (PCAU)		0.0007				0.0005				-0.0010		
		(0.3559)				(0.6246)				(0.2801)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0016 **				-0.0008				-0.0016 **	
			(0.0187)				(0.4192)				**(0.0264)**	
D) Better capitalised banks (REG-mcr)				-0.0011				-0.0010				0.0006
				(0.3846)				(0.4595)				(0.6750)
DV for Crisis 2007	0.0050 ***	0.0050 ***	0.0050 ***	0.0050 ***	0.0047 ***	0.0048 ***	0.0048 ***	0.0047 ***				
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**				
DV for period after 2009	-0.0029 ***	-0.0030 ***	-0.0030 ***	-0.0030 ***								
	(0.0016)	**(0.0014)**	**(0.0011)**	**(0.0013)**								
Interest rate Spread	0.0012 **	0.0012 **	0.0012 **	0.0012 **	0.0006	0.0006	0.0006	0.0006	0.0013 **	0.0013 **	0.0013 **	0.0013 **
	(0.0152)	**(0.0175)**	**(0.0152)**	**(0.0168)**	(0.3028)	(0.2953)	(0.2684)	(0.2905)	**(0.0109)**	**(0.0090)**	**(0.0107)**	**(0.0104)**
Constant	0.1119 ***	0.1122 ***	0.1130 ***	0.1128 ***	0.0908 ***	0.0905 ***	0.0908 ***	0.0909 ***	0.1386 ***	0.1381 ***	0.1391 ***	0.1370 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Panel (B): Summary Statistics												
Observations	1,534	1,536	1,534	1,534	695	696	695	695	839	840	839	839
No. Banks	262	262	262	262	206	206	206	206	254	254	254	254
Wald chi2 Statistics	135.36	123.65	126.93	123.73	40.9600	39.8600	40.3000	40.1600	126.31	108.29	123.29	110.34
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.2054	0.2020	0.2059	0.2017	0.1643	0.1652	0.1691	0.1647	0.2349	0.2338	0.2351	0.2331
r2_between groups	0.2305	0.2296	0.2322	0.2304	0.1755	0.1756	0.1805	0.1753	0.2392	0.2460	0.2422	0.2422
r2_within group	0.1566	0.1546	0.1570	0.1545	0.0654	0.0655	0.0648	0.0662	0.1081	0.0969	0.1034	0.0978

measure the regulatory capital pressure. (X_{it}) is one of three bank-level controlling variables: riskiness level (as measured by NPLs ratio), diversification level (as measured by NII ratio), and ownership level (DV_i^{PLB}).[131] These interaction terms are added sepreatly to each model in both subsamples: subsample for the period (2003 to 2008) and subsample (2009 to 2014).

The empirical results of these regressions are reported in six tables that are attached in Appendix (IX) to save space. Three tables report empirical results, which accounts for the interaction term, for a sub-period (2003 to 2008) for each indicator that reflects the performance level (i.e., the ROA ratio, NIM ratio, and TCA ratio respectively). Besides, there are another three tables that report empirical results of the same exercise but for a sub-period (2009 to 2014) for the same indicators. Comparing the results of the regressions that account the above interaction term in both subsamples, i.e., subsample for less regulatory pressure period (i.e., 2003 to 2008) versus a subsample for a pressurised regulatory period (i.e., 2009 to 2014), the following points are observed:

- The results show that undercapitalised risky banks (as measured by $REG_{it}^{k} * NPLs_{it}$) were associated significantly with high earnings during the less regulatory pressure period (i.e., 2003 to 2008) only (refer to Appendix IX in Table IX-9 for the NIM regression). While better-capitalised risky banks were associated significantly with less earning only during the less regulatory pressure period (refer to Appendix IX in Table IX-9 for the NIM regression). From the cost perspective, both undercapitalised and better-capitalised risky banks were found to be associated significantly with less banking operating costs during the period (2003 to 2008) as reported in Table IX-10.

[131] In this analysis, the Chapter accounts for only listed versus unlisted banks to compare the performance level according to the ownership profile. The comparison between domestic versus foreign banks is avoided due to a relatively small number of foreign-owned banks in the sample compared to the number of domestic banks in the sample.

There was no evidence that capitalised risky banks (whether undercapitalised or better-capitalised) were associated significantly with performance level during the period that experienced more regulatory pressure (i.e., 2009 to 2012). Besides, there was no evidence of change in the performance level between banks from different regulatory pressure periods.

- Undercapitalised diversified banks (as measured by $REG_{it}^{k} * NII_{it}$) were found to be associated significantly with high earnings during a period that experienced more regulatory pressure (i.e., 2009 to 2014).The coefficient ($REG_{it}^{REG-Ediz} * NII_{it}$) was found to be positive at a significance level of 1% for a subsample of a restrictive regulatory period as reported at Table IX-11. On the other hand, there was no evidence of the performance of better-capitalised diversified banks during the less regulatory pressure. Yet, those better-capitalised diversified banks were found to be associated with high net interest margin during the restrictive regulatory period. The coefficient ($REG_{it}^{REGO} * NII_{it}$) was found to be associated positively with net interest margin (NIM) at a significance level of 1% for a subsample of a restrictive regulatory period (i.e., 2009 to 2014) as shown in Table IX-12.

  From the cost perspective, the results show evidence that undercapitalised diversified banks were associated significantly with a less operating cost during the less regulatory pressure (refer to Table IX-10), but they could not able to maintain low costs during the period of the more restrictive regulatory period. The coefficient ($REG_{it}^{PCAU} * NII_{it}$) and ($REG_{it}^{REG-Ediz.} * NII_{it}$) were found to be positive at a significance level of 10% and 5% respectively as shown in Table IX-13.

- In term of the ownership, the results show that undercapitalised listed banks utilise their resources to generate higher earnings than unlisted banks. Undercapitalised listed banks (as measured by $REG_{it}^{k}\mathrm{DV}_{\mathrm{i}}^{\mathrm{PLB}}$) were found to be associated significantly with high earning during both the less regulatory pressure period (i.e., 2003 to 2008), and the more regulatory pressure period (i.e., 2009 to 2014) as reported at IX in Table IX-8 for the less regulatory pressure period, and Table IX-11 for the more regulatory pressure period respectively. On the other side, there is no evidence that better-capitalised were associated with less earning in both sub-periods.

From the cost perspective, the results show no evidence on the cost-based level for both undercapitalised and better-capitalised listed banks during the period (2003 to 2008). Yet, those banks were found to be associated with high operating costs during the period (2009 to 2014). Indeed, the coefficient ($REG_{it}^{PCAU} * \mathrm{DV}_{\mathrm{i}}^{\mathrm{PLB}}$) was found to be associated positively with the TCA ratio at a significance level of 10% in a sub-period (2009 to 2014) as reported in Table IX-13. A positive coefficient for better-capitalised listed banks was sound to be significant during sub-period of (2009 to 2014) as reported in Table IX-13.

The above results highlight the characteristics of the capitalised banks that are associated with better performance level during periods that experienced both less restrictive regulatory and more restrictive regulatory pressure. The results show that undercapitalised risky banks and undercapitalised diversified banks tended to be associated positively with profit-based indicators. Undercapitalised banks tend to utilise their resources to generate high earnings that could be used to build-up their capital level and avoid any additional regulatory costs. Even undercapitalised listed banks tended to be associated with high earnings to signal positively to the public that they are doing well.

However, there was no evidence that those undercapitalised banks associated with less banking operating costs. For example, undercapitalised diversified banks were found to be associated with high operating costs (both interest-based expenses and non-interest-based expenses) during the period that experienced more regulatory pressure. Undercapitalised listed banks were also found to be associated with more operating costs compared to other banks during the same period. These results give indications that imposing more regulatory pressures, which are reflected in the form of additional capital requirements and disclosure requirements, induced undercapitalised banks to form their own strategies to generate high earnings though they associated with high operating costs.

On the other hand, there was no evidence that better-capitalised banks were performing well. Only better-capitalised diversified banks were found to be associated with high net interest margin compared to others during the period when more regulatory requirements are imposed. Though high margins are an indication of high earning from a bank perspective, increases in net interest margin imply an increase in banking intermediation cost. Indeed, there was no evidence that better-capitalised banks were associated with less operating costs in a period when additional regulatory capital requirements were imposed. Better-capitalised listed banks were found to be associated with high banking costs during the restrictive regulatory period.

The above results show no evidence that profit-based banking performance is changed after the introduction of additional regulatory requirements. However, there is evidence that banking operating cost is changed for undercapitalised diversified banks. Undercapitalised diversified banks were found to be associated with less operating costs during the less regulatory restrictions (i.e., 2003 to 2008). However, those undercapitalised banks were found to be associated with high operating cost during the period that experienced additional regulatory requirements (2009 to 2014). After 2009, additional regulators become more restrictive in off-balance sheet activities, and banks were required to disclose their activities and boost their capital level as per to the Basel Accords II.5 and Basel Accords III.

C) Banking performance during the prior- and post- period of the effective implementation for the amendments of the Basel Accords:

The results in the previous sections should be considered with caution to recognise the impact of the amendments in the regulatory capital framework as per the Basel Accords. As pointed out earlier in Chapter five, there is a time gap between the announcement a given framework of the Basel Accords and its implementation, and this time gap varies among countries that are included in the sample. The above results are based on the whole sample that aggregates all banks in which some banks implemented the Basel Accords I, while others applied the Basel Accords II over the sample period.[132] Therefore, this chapter adopts the same approach of Chapter Five, and the main sample split into subsamples according to the effective implementation of the Basel Accords in each country as elaborated below.

1. The impact of the implementation of the Basel Accords II on the banking performance:

For the purpose of examining the banking performance after the effective implementation of the Basel Accords II, a subsample is extracted from the whole sample. This subsample includes banks from countries that were adopting the Basel Accords I, and then some of them started implementing the Basel Accords II in 2006. The banks in the countries that started implementing the Basel II are hypothesised to be the most affected banks by the Basel regulatory reforms. Hence, the performance level in these banks is expected to be affected positively by the new regulatory requirements. The new amendments of the Basel Accords II aim to improve the sensitivity of risk-based capital requirements, and additional disclosure requirements were imposed.[133]

The same subsample that was used in Chapter Five is adopted here in this section. Table 5-13 lists countries that are included in the subsample. For the purpose of

[132] Refer to Appendix II for further details on the number of banks in the sample that implemented the Basel Accords I, II, and III per year.

[133] Chapter Two of the thesis provides further details on developments of the Basel regulatory capital framework over the last two decades.

capturing the effects of the implementation of the Basel Accords II on the banking performance, the same approach of Chapter Five is adopted, i.e. the interaction term (DV^{BII}).[134] The coefficient of this interaction term is expected to be positive.

Empirical Results on the impact of the implementation of the Basel Accords II on the banking performance:

The panel (A) in Table 6-16 reports the empirical results of the regression analysis that aims to examine banking performance using the above-stated subsample. The dependent variable represents banking performance and is measured using three indicators: total return to total assets (ROA) ratio, net interest margin (NIM) ratio, and total costs to total assets (TCA) ratio. There are 764 annual observations for 148 banks for the ROA regressions, 773 annual observations for 149 banks for the NIM regressions, and 502 annual observations for 109 banks for the TCA regressions over the period (2003 to 2012) as reported in panel (B) at Table 6-16.

The result shows a significant positive coefficient for the variable (DV^{BII}) in the NIM regressions at a significance level of 1% as reported in in models 5 to 8 in Table 6-16. This result implies that those banks, which started implementing the new amendments of the Basel II since 2006, tend to generate higher net interest margin comparing to banks that kept adopting the Basel Accords I during the sample period (i.e., 2006 to 2012). In term of cost-based indicator, there is no evidence that banking operating costs, as measured by the TCA ratio, is lower for banks that started implementing the new amendments of the Basel II since 2006 compared to banks that kept adopting the Basel Accords I during the sample period (i.e., 2006 to 2012). In terms of other controlling variables, Table 6-16 reports the same findings that were found in Table 6-5, which are the baseline results of the regression that are based on

[134] The definition of the interaction term is given in the equation (5-2) in Section 5.6.3.C at Chapter Five.

Table 6-16: Relationship between the capital level and performance (for a subsample of banks that applied the Basel Accords II):
The dependent variable is bank performance: total returns to total assets ratio (ROA), net interest margin (NIM), and the total cost to total assets ratio (TCA) respectively. Independent variables are defined and summarised in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.
Key results:

- ⇨ No evidence on a positive relationship between banks that started implementing the Basel Accords II since 2006 and (ROA) ratio.
- ⇨ A significant positive relationship between banks that started implementing the Basel Accords II since 2006 and (NIM) ratio.
- ⇨ No evidence on a negative relationship between banks that started implementing the Basel Accords II since 2006 and (TCA) ratio.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords I from 2003 to 2005, and then some of them applied Basel Accords II during the period 2006 to 2012

	Robust Clustered Random Effects Model											
	A subsample for banks during the period (2003 to 2012) using the dependent variable total returns to total assets ratio (ROA) ratio				**A subsample for banks during the period (2003 to 2012) using the dependent variable net interest margin (NIM) ratio**				**A subsample for banks during the period (2003 to 2012) using the dependent variable total costs to total assets (TCA) ratio**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.2e-04	6.8e-08	6.8e-06	1.7e-06	0.0004	0.0004	0.0004	0.0004	-0.0004 ***	-0.0004 ***	-0.0004 ***	-0.0004 ***
	(0.9892)	(0.9996)	(0.9699)	(0.9923)	(0.1028)	(0.1058)	(0.1039)	(0.1049)	(**0.0002**)	(**0.0002**)	(**0.0002**)	(**0.0001**)
Size: log Assets	-0.0032 *	-0.0033 *	-0.0034 *	-0.0032 *	-0.0032	-0.0030	-0.0031	-0.0031	-0.0130 ***	-0.0130 ***	-0.0128 ***	-0.0129 ***
	(**0.0620**)	(**0.0638**)	(**0.0585**)	(**0.0670**)	(0.1525)	(0.2011)	(0.1818)	(0.1955)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Risk: NPLs/Asset ratio	-0.0405 *	-0.0394 *	-0.0396 *	-0.0399 *	0.0559	0.0509	0.0503	0.0512	0.0196	0.0171	0.0147	0.0156
	(**0.0819**)	(**0.0957**)	(**0.0986**)	(**0.0872**)	(0.4587)	(0.4838)	(0.4876)	(0.4828)	(0.6419)	(0.6806)	(0.7238)	(0.7037)
Diversification: NII Ratio	0.0058	0.0057	0.0059	0.0057	-0.0318 *	-0.0316 *	-0.0315 *	-0.0316 *	-0.0163 **	-0.0163 **	-0.0163 **	-0.0162 **
	(0.2010)	(0.2015)	(0.1894)	(0.2099)	(**0.0956**)	(**0.0913**)	(**0.0918**)	(**0.0938**)	(**0.0170**)	(**0.0161**)	(**0.0151**)	(**0.0170**)
A) Regulatory Pressure for undercapitalised banks (REGU)	-0.0199 **				0.0095				-0.0146			
	(**0.0400**)				(0.4132)				(0.2289)			
A) Regulatory Pressure for better-capitalised banks (REGO)	-0.0335				0.0412				0.0087			
	(0.2084)				(0.2314)				(0.6794)			
B) Regulatory Pressure for undercapitalised banks (PCAU)		-0.0004				-0.0006				0.0001		
		(0.7488)				(0.2984)				(0.9490)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0021				0.0014				-0.0022 **	
			(0.1727)				(0.4807)				(**0.0197**)	
D) Regulatory Pressure (REG-mcr)				-0.0025				0.0006				-0.0032
				(0.5275)				(0.8601)				(0.4969)
DV for banks implemented Basel II	-0.0032	-0.0031	-0.0032	-0.0031	0.0003	0.00002	0.0001	0.0001	0.0024	0.0025	0.0024	0.0026
	(0.1483)	(0.1549)	(0.1566)	(0.1606)	(0.8675)	(0.9880)	(0.9720)	(0.9553)	(0.2695)	(0.2597)	(0.2914)	(0.2471)
Interest Rate Spread	0.0005	0.0005	0.0005	0.0005	0.0023 ***	0.0022 ***	0.0023 ***	0.0022 ***	-0.0001	-0.0001	-0.0001	-0.0001
	(0.3963)	(0.3773)	(0.3671)	(0.3762)	(**0.0015**)	(**0.0019**)	(**0.0019**)	(**0.0016**)	(0.9559)	(0.9100)	(0.9771)	(0.9300)
Constant	0.0414 ***	0.0400 ***	0.0394 ***	0.0418 ***	0.0367 *	0.0380 **	0.0379 **	0.0378 **	0.1540 ***	0.1550 ***	0.1537 ***	0.1572 ***
	(**0.0084**)	(**0.0091**)	(**0.0085**)	(**0.0070**)	(**0.0553**)	(**0.0553**)	(**0.0438**)	(**0.0362**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)

Panel (B): Summary Statistics

	1	2	3	4	5	6	7	8	9	10	11	12
Observation	764	766	764	764	773	775	773	773	502	504	502	502
No. Banks	148	148	148	148	149	149	149	149	109	109	109	109
Wald chi2	45.4800	44.0200	42.5400	45.3300	118.46	67.5000	59.0400	82.5900	48.6600	49.5100	56.2000	49.6300
Statistics	(**0.0000**)	(**0.000**)	(**0.000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1162	0.1137	0.1206	0.1187	0.1129	0.1095	0.1102	0.1096	0.1621	0.1580	0.1694	0.1588
r2_between groups	0.1728	0.1736	0.1793	0.1769	0.1677	0.1590	0.1606	0.1588	0.2431	0.2406	0.2504	0.2428
r2_within group	0.0114	0.0083	0.0118	0.0082	0.0071	0.0077	0.0079	0.0077	0.0968	0.0965	0.0965	0.0978

the whole sample.[135] A further investigation of the banking performance is conducted using a subsample that includes only banks that implemented the Basel Accords II during the period (2006 to 2012).[136] The results were found to be consistent with results that are based on the baseline regressions reported that are reposted in Section 6.5.1.[137]

2. *The impact of the implementation of the Basel Accords III on the banking performance:*

Another subsample is extracted from the whole sample to examine the banking performance after the implementation of the Basel Accords III. This Chapter adopts the same subsample of Chapter Five that includes banks from countries that adopted the Basel Accords II, and they started implementing the Basel Accords III in 2013. The banks at the countries that started implementing the Basel III are expecting to be the most affected banks by the Basel regulatory reforms. Table 5-15 lists countries that are included in the subsample.

For the purpose of capturing the immediate effects of the implementation of the Basel Accords III on the banking performance during the period 2013/2014, a time dummy variable ($DV_t^{2013/14}$) that donates the value of unity for years 2013 and 2014 when banks were implementing the III Basel Accords, and zero otherwise. The coefficient of this dummy variable is expected to be positive, i.e., the period when banks start implementing the Basel Accords III are more likely to reduce their risk

135 Except for the behavior of undercapitalised banks in the ROA regressions, Table 6-16 shows that undercapitalised banks were associated with less ROA as reported in models one (1) to three (3). Indeed, the coefficient REGU, in model one (1), was found to be a significant negative relationship at a significant level of 5%. This negative relationship suggests that undercapitalised banks could not be able to utilise their resources to be involved in low-risk low-return activities; hence they tended to be associated with low earnings during the period that experienced the implementation of new risk assessment guidelines. All other empirical results were the same as the baseline regressions in Table 6-5.

136 The subsample for banks that implemented Basel Accords II is based on (502 to 551) annual observations for (109 to 132) banks according to adopted dependent variable.

137 The empirical results for a subsample of that include only banks that implemented the Basel Accords II during the period (2006 to 2012) are reported in Appendix IX.

level more than other years and disclose their risky activities too. Hence; they could induce to improve their performance to signal to regulatory authorities and the market that they have a better solvency position, and they can meet the new regulatory requirements.

Empirical results on the impact of the implementation of the Basel Accords III on the banking performance:

The panel (A) in Table 6-17 reports the empirical results of the regression analysis that aims to examine the banking performance after the implementation of the Basel Accords III during the period (2013 to 2014). As stated earlier, both profit- and cost-based indicators are considered using to measure the performance level. There are 1,083 annual observations for 216 banks for the ROA regressions, 1,083 annual observations for 216 banks for the NIM regressions, and 842 annual observations for 173 banks for the TCA regressions over the period (2006 to 2014) as reported in panel (B) at Table 6-17.

In term of effects of the Basel Accords III, the result shows a significant negative coefficient for the variable ($DV_t^{2013/14}$) in all four models of the ROA regressions at a significance level of 1% as reported in Table 6-17. This negative coefficient implies that the profit level, which is measured by the ROA, reduced during the period 2013-2014 when banks that started implementing the new amendments of the Basel III. Reduction in the ROA could be due to bad management for its resources or due to the bank's involvement in low-risk activities that were associated with low earnings.[138] During 2013/2014, banks started implementing the Basel Accords III requirements which are more restrictive than the Basel Accords II. Banks were required to boost both the quantity and quality of their capital level in responding to their exposure to risky activities. Banks were also required to disclose their both on- and off-balance

[138] The empirical results in Chapter Five "*Empirical results and discussion on the impact of the capital on banking risk*" reported that banks during the period (2003-2014) were associated with high credit risk, which reflects bad management for lending portfolio, and they were also associated with low risk-weighted assets.

Table 6-17: Relationship between the capital level and performance (for a subsample of banks that shift to apply the Basel Accords III): The dependent variable is performance level: total returns to total assets ratio (ROA), net interest margin (NIM), and the total cost to total assets ratio (TCA) respectively. Independent variables are defined and summarised in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ Banks that started implementing the Basel Accords III during 2013-2014 are significantly associated with less ROA.
- ⇨ Banks that started implementing the Basel Accords III during 2013-2014 are significantly associated with less NIM.
- ⇨ Banks that started implementing the Basel Accords III during 2013-2014 are significantly associated with less TCA.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords II from 2006 to 2012 (2007-2012), and then they applied Basel Accords III during the period 2013 to 2014

	Robust Clustered Random Effects Model											
	A subsample for banks start implementing Basel II during the period (2007 to 2012) and then Basel III during the period (2013-2014) using the dependent variable ROA ratio				**A subsample for banks start implementing Basel II during the period (2007 to 2012) and then Basel III during the period the (2013-2014) using the dependent variable NIM ratio**				**A subsample for banks start implementing Basel II during the period (2007 to 2012) and then Basel III during the period (2013-2014) using the dependent variable TCA ratio**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0003	0.0002	0.0002	0.0002	0.0010 ***	0.0010 ***	0.0010 ***	0.0010 ***	0.0008	0.0006	0.0006	0.0006
	(0.4437)	(0.4611)	(0.4747)	(0.4658)	**(0.0010)**	**(0.0007)**	**(0.0006)**	**(0.0007)**	(0.1740)	(0.2968)	(0.2942)	(0.2920)
Size: log Assets	-0.0041 **	-0.0042 **	-0.0043 **	-0.0042 **	-0.0056 **	-0.0056 **	-0.0056 **	-0.0056 **	-0.0323 ***	-0.0337 ***	-0.0335 ***	-0.0334 ***
	(0.0178)	**(0.0155)**	**(0.0150)**	**(0.0160)**	**(0.0138)**	**(0.0130)**	**(0.0130)**	**(0.0126)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Riskiness: NPLs/Asset	0.8201 ***	0.8295 ***	0.8274 ***	0.8301 ***	0.2062 ***	0.2050 ***	0.2054 ***	0.2055 ***	-0.1501 **	-0.1470 **	-0.1457 **	-0.1455 **
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0092)**	**(0.0092)**	**(0.0096)**	**(0.0091)**	**(0.0214)**	**(0.0230)**	**(0.0251)**	**(0.0254)**
Diversification: NII Ratio	0.0186 ***	0.0187 ***	0.0186 ***	0.0187 ***	-0.0185 **	-0.0185 **	-0.0185 **	-0.0184 **	0.0409 **	0.0419 **	0.0419 **	0.0418 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	(0.0203)	(0.0204)	(0.0202)	(0.0206)	**(0.0114)**	**(0.0101)**	**(0.0102)**	**(0.0095)**
A) Regulatory Pressure for undercapitalised banks (REGU)	-0.0017				-0.0004				-0.0235 ***			
	(0.5151)				(0.8770)				**(0.0000)**			
A) Regulatory Pressure for better-capitalised banks (REGO)	-0.0161				0.0080				-0.0175			
	(0.3030)				(0.5226)				(0.4795)			
B) Regulatory Pressure for undercapitalised banks (PCAU)		-0.0002				-0.0003				-0.0004		
		(0.8614)				(0.4189)				(0.6678)		
C) Regulatory Pressure - Edizs (REG-Ediz)			0.0011				0.0002				0.0002	
			(0.2539)				(0.7945)				(0.8507)	
D) Regulatory Pressure for better-capitalised banks (REG-mcr)				-0.0011				-0.0019*				0.0019
				(0.6108)				**(0.0970)**				(0.5756)
DV for period 2013-2014	-0.0068 ***	-0.0069 ***	-0.0068 ***	-0.0069 ***	-0.0011 *	-0.0011 *	-0.0011 *	-0.0011 *	-0.0117 ***	-0.0118 ***	-0.0118 ***	-0.0118 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0876)**	**(0.0925)**	**(0.0841)**	**(0.0826)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Interest Rate Spread	-0.0006	-0.0006	-0.0006	-0.0006	0.0011 ***	0.0011 ***	0.0011 ***	0.0011 ***	0.0025 ***	0.0024 ***	0.0025 ***	0.0118 ***
	(0.1172)	(0.1023)	(0.1017)	(0.1150)	**(0.0066)**	**(0.0074)**	**(0.0062)**	**(0.0059)**	**(0.0007)**	**(0.0009)**	**(0.0008)**	**(0.0008)**
Constant	0.0399 **	0.0398 **	0.0397 **	0.0409 **	0.0596 ***	0.0600 ***	0.0600 ***	0.0621 ***	0.2922 ***	0.3036 ***	0.3014 ***	0.2990 ***
	(0.0120)	**(0.0107)**	**(0.0111)**	**(0.0116)**	**(0.0018)**	**(0.0015)**	**(0.0015)**	**(0.0011)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**

Panel (B): Summary Statistics												
Observation	1,083	1,085	1,083	1,083	1,083	1,085	1,083	1,083	842	844	842	842
No. Banks	216	216	216	216	216	216	216	216	173	173	173	173
Wald chi2 Statistics	160.39 **(0.0000)**	147.65 **(0.0000)**	148.26 **(0.0000)**	147.43 **(0.0000)**	45.8400 **(0.0000)**	38.0000 **(0.0000)**	39.9700 **(0.0000)**	41.4900 **(0.0000)**	248.78 **(0.0000)**	114.30 **(0.0000)**	115.35 **(0.0000)**	114.85 **(0.0000)**
r2_overall	0.4945	0.4925	0.4916	0.4934	0.3684	0.3673	0.3686	0.3704	0.1196	0.1181	0.1195	0.1193
r2_between groups	0.5685	0.5661	0.5651	0.5669	0.3870	0.3859	0.3879	0.3896	0.0935	0.0911	0.0927	0.0924
r2_within group	0.2482	0.2480	0.2502	0.2482	0.0697	0.0691	0.0691	0.0697	0.2774	0.2711	0.2701	0.2705

sheet activities. Thus; banks induced to reduce their risky activities that were eventually associated with less earning.[139]

On the other hand, Table 6-17 show banks that started implementing the new amendments of the Basel III during the period 2013-2014 were also associated with less net interest margin (NIM) compared to other previous years when banks were implementing the Basel Accords II. The coefficient for the variable ($DV_t^{2013/14}$) in all four models of the NIM regressions was found to be negative at a significance level of 10% as reported in Table 6-17. The negative coefficient of ($DV_t^{2013/14}$) in both ROA and NIM regressions support that banks during the period 2013-2014 were associated with low earnings.

From the cost perspective, the banking operating costs, as measured by the TCA ratio, were found to be lower for banks that started implementing the new amendments of the Basel III during the period 2013-2014 compared to previous years. The empirical results show a significant negative coefficient for the variable ($DV_t^{2013/14}$) in the TCA regressions at a significance level of 1% as reported in Table 6-17. Low operating costs during 2013-2014 reflects banking efforts to minimise their both interest and non-interest-based expenses during a period that banks were required to build up their capital level.

In terms of other controlling variables, it is observed that the statistical significant empirical results of profit-based regressions, which are represented by ROA ratio and

[139] The empirical results in Chapter Five "*Empirical results and discussion on the impact of the capital on banking risk*" also reported that banks during the period (2003-2014) associated with high credit risk. Thus, low earnings could be due to this risky lending portfolio especially if a bank already has a high-equity level. Indeed, Chapter Five found evidence that high equity banks are associated with high risk.

NIM ratio, are the same findings that found in Table 6-5 which are the baseline results of the regression that are estimated based on the whole sample.[140] However, the empirical results on a cost-based indicator were found to be different from the baseline regressions that are reported in Table 6-5 and mainly the coefficient of risky banks (indicated by the NPLs ratio) and coefficient of diversified banks (indicated by the NII ratio). Unlike the results in baseline regressions, Table 6-17 shows that risky banks, as measured by the NPLs ratio, are associated with less banking cost. Indeed, the coefficient NPLs ratio was found to be a significant negative coefficient in all TCA regressions at a significance level of 5%. Kwan and Eisenbeis (1997) argued that not all risky banks be associated with inefficiency. He pointed out that there are active risk-taking banks that are able to achieve higher expected returns with proper risk management. Thus; active risk-raking banks might able to utilise their earnings to cover their operating costs.

Aligned with the previous finding, Table 6-17 found that undercapitalised banks are associated with less operating costs. The coefficient REGU, which represents undercapitalised banks as per to Jacques and Nigro's approach, was found to be negative at a significance level of 5% in the first model of the TCA regression. The undercapitalised banks could be associated with less operating costs due to active risk-taking strategies as argued by Kwan and Eisenbeis (1997) or due to safe investment in low risk-weighted assets. However, based on the empirical results of Chapter Five, *empirical results and discussion on the impact of the capital on banking risk*,

[140] Except for the behavior of risky banks, which ware measured by the NPLs ratio, in the ROA regressions. Table 6-5 does not provide any evidence on a significant association of risky bank with less earning. While, Table 6-17, which is based on a subsample for banks that implemented the Basel Accords II during the period 2006 to 2012 and then started implementing the Basel Accords III during 2013-2014, reported a significant positive coefficient for the NPLs ratio at a significance level of 1%. This positive coefficient suggests that risky banks, which were involved in a risky lending portfolio, tended to generate high earning income. However, this result should be taken with caution because Table 6-16, which is based on a subsample for banks that implemented the Basel Accords II and then some of them started implementing the Basel Accords II over the sample period 2003 to 2012, shows that risky banks were associated with less earning as reflected with a negative coefficient with a significance level of 10%. Indeed, a subsample of banks which implemented only Basel Accords II during the period 2006-2012, were also found to be associated with a significant negative NPLs coefficient as reported in Appendix IX. Thus; there might be several reasons for variations in the behavior of risky banks including, for example, the variation of a sample that include banks from both developed and developing countries. These countries experienced different regulatory and supervisory environment. Further analysis on profit-based indicator and behavior of risky banks according to subsamples of developed and developing countries is conducted in Section 6.5.5.

undercapitalised banks were found to be associated more with high-risk strategies rather than involving in safe investments during the period (2003 to 2014).[141] Thus; undercapitalised banks might restructure their banking portfolio using high-risk strategies to benefit from earnings to cover their banking operating costs.[142]

Furthermore, and unlike to results of the baseline regressions in Table 6-5, Table 6-17 shows that the coefficient of the NII is associated positively with the TCA ratio at a significance level of 5% (and 1% in the fourth model). This positive coefficient implies that diversified banks were associated with high operating costs in countries that included in this subsample over the sample period (2007 to 2014). Such a positive relationship between diversification level and banking costs was also reported by Demirgüç-Kunt and Detragiache (2000), who examined banks from 72 countries, Casu and Girardone (2004), who examined Italian banks, and Micco et al. (2007) who examined banks from 179 countries. They found that banks with high fee-based income were associated with high overhead costs. Banks involvement into diversified activities could be costly especially during a period that experienced additional imposed additional capital requirements for non-lending activities, and banks were required to disclose their exposure as per Basel Accords II and Basel Accords II.5 in 2009.[143] A further investigation for the banking performance is conducted using a subsample that includes banks implemented the Basel Accords II during the period (2006 to 2012), and then some of them started implementing the Basel Accords III

[141] The empirical results in Chapter Five "*Empirical results and discussion on the impact of the capital on banking risk*" reported that undercapitalised banks during the period (2003-2014) associated with high credit risk and high risk-weighted assets. Besides, the results of the same chapter show that undercapitalised profit banks associated with high risk too. These results imply that these undercapitalised banks were involved in highly risky assets to generate more earnings as per the moral hazard hypothesis.

[142] The previous section 6.5.3.B shows that profitable risky banks are associated positively with profit-based indicators during both less regulatory pressure (i.e., 2003 to 2008) and more restrictive regulatory period (i.e., 2009 to 2014).

[143] As a reminder, this subsample includes banks from developed countries and mainly Japan, Switzerland, the European Union's Countries, Canada, Mexico, and the Republic of Korea, and the United States of America. While, the results that are based on baseline regressions in Table 6-5 are based on a whole same that include both developed and developing countries. This variation in the results between both samples reflects the heterogeneity of the diversification results according to countries and sample period.

during the period (2013-2014).[144] The results found to be consistent with the results that are reported in this section.[145]

[144] This subsample is based on 645 annual observations for 119 banks in both ROA regressions and NIM regressions, and 431 annual observations for 84 banks for the TCA regressions. This subsample is based on banks from Japan, Switzerland, and the European Union's Countries over the sample period 2006 to 2014. Thus; the empirical results of this subsample should be taken with caution due to the small size of the sample especially for the TCA regressions (results are reported in Appendix IX).

[145] In particular, the results of profit-based indicators (i.e., ROA regressions and NIM regressions) were found to be consistent with the empirical results that are reported in this section. The empirical results for this subsample, which includes banks from Japan, Switzerland, and the European Union's Countries over the sample period (2006 to 2014), are reported in Appendix IX.

6.5.4 Bank-size perspective: The relationship between capital and banking performance: Do bank-size matter?

As pointed out in Chapter Five, the literature shows that large-sized banks behave differently from small-sized banks. Berger and Bouwman (2013) recommended examining the role of the capital should be examined with consideration for the size heterogeneity of banks. They argued that small banks benefit more from a high capital to strengthen their survival probability, while medium and large banks might benefit from their size as one of the determinants of their survival via enjoying government subsidies for too-big-to-fail. Besides, the existence of large banks is one of the concerns of policymakers due to the issue of too-big-to-fail especially if they are associated with less capitalisation level. This section aims to provide a better understanding of the capital-performance nexus with consideration for the size heterogeneity of banks.

For the purpose of examining the performance level of different institutional size of banks, the main sample is segregated according to asset size. Similar to Chapter Five, this section adopted the interaction term (DV_{K}^{iS}=), which is defined in Equation 5-3, to examine if there is any difference in the behaviour of undercapitalised banks versus better-capitalised banks at different bank size. The sample is divided into three categories: small banks (less than USD 8 million), medium-sized banks (between USD 8 million to USD 143.8 million), and large banks (more than USD 134.8 million) as per Ward's method.[146] The following section presents empirical results on the behaviour of undercapitalised banks versus better-capitalised banks at different bank size.

Empirical results on the impact of the capital on the banking performance in different bank size levels:

Table 6-18 reports the empirical results of the banking performance of undercapitalised banks and better-capitalised banks according to the bank size. There

[146] Appendix III provides an overview on about Ward's Method. Ward's Method is used to identify three clusters based on the variable logarithm of total assets for each year. This method is based on the concept of a systematic approach of grouping similar datasets according to an underlying variable.

are four models, which are based on one of the above stated four approaches, for each banking performance indicator. The results show evidence on the difference in the banking performance for small-sized banks compared to large-sized banks.

The small-sized undercapitalised banks, which are measured by (DV_{REGU}^{SS}), (DV_{PCAU}^{SS}), and ($DV_{REG-Ediz}^{SS}$) according to an adopted approach of identifying undercapitalised banks, were found to have higher earning (as measured by the ROA) compared to others. Indeed, both (DV_{REGU}^{SS}) and (DV_{PCAU}^{SS}) were found to be statistically significant at 10% and 5% respectively. While, the large-sized undercapitalised banks, which are measured by (DV_{REGU}^{LS}), (DV_{PCAU}^{LS}), and ($DV_{REG-Ediz}^{LS}$), were found to have lower earning (as measured by the ROA). Indeed, the coefficient (DV_{PCAU}^{LS}), and ($DV_{REG-Ediz}^{LS}$) were found to be statistically significant at 1% and 5% respectively. The existence of large-sized undercapitalised banks arises concerns on the issue of too-big-to-fail. These banks are claimed to be associated with excessive risk at the cost of government assistance. The results of this chapter support that large-sized undercapitalised banks also associated with low earning. This low performance of large-sized undercapitalised banks might refer to their risky portfolio.[147] This result might also concern policymakers in which those large-sized undercapitalised banks are not operating well to improve their performance.

In term of better-capitalised banks, the results found that large-sized better-capitalised banks, which are measured by (DV_{REGO}^{LS}) and (DV_{REGmcr}^{LS}), were generating less earnings from their resources. Indeed, coefficients of large-sized better-capitalised banks are found to be statistically significant at 1% in ROA regression, and statistically significant at 5% in NIM regressions as reported in Table 6-18. This low earning could be due to involvement in a less risky portfolio (Goddard et al., 2013). For small-sized better-capitalised banks, there were no evidence that those small-sized better-capitalised banks were performing better.

[147] The empirical results in Chapter Five "*Empirical results and discussion on the impact of the capital on banking risk*" supported this claimed and the results reported that large banks during the period (2003-2014) associated with high credit risk.

Table 6-18: Relationship between the capital level and banking performance (for the whole sample with consideration for capitalised banks at different bank-size):

The dependent variable is bank performance: total returns to total assets ratio (ROA), net interest margin (NIM), and total cost to total assets ratio (TCA) respectively. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key result:

- ⇨ Banking performance of capitalised banks varies according to the institutional size of a bank.

Panel (A): Regression Models based on the whole sample to examine capitalised banks at different bank-size during the sample period 2003 to 2014

	Robust Clustered Random Effects Model using ROA ratio as dependent variable				**Robust Clustered Random Effects Model using NIM ratio as dependent variable**				**Robust Clustered Random Effects Model using TCA ratio as dependent variable**			
	1 Coeff. (p-value)	**2** Coeff. (p-value)	**3** Coeff. (p-value)	**4** Coeff. (p-value)	**1** Coeff. (p-value)	**2** Coeff. (p-value)	**3** Coeff. (p-value)	**4** Coeff. (p-value)	**1** Coeff. (p-value)	**2** Coeff. (p-value)	**3** Coeff. (p-value)	**4** Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0003 *** (**0.0043**)	0.0003 *** (**0.0044**)	0.0003 *** (**0.0053**)	0.0003 *** (**0.0039**)	0.0001 (0.3183)	0.0001 (0.2985)	0.0001 (0.3026)	0.0001 (0.3243)	-0.0002 * (**0.0906**)	-0.0002 * (**0.0836**)	-0.0002 (0.1128)	-0.0002 (0.1078)
Size: log Assets	-0.0016 (0.2492)	-0.0019 * (0.0746)	-0.0017 * (0.0839)	-0.0009 (0.5236)	-0.0035 *** (**0.0070**)	-0.0041 *** (**0.0002**)	-0.0040 *** (**0.0009**)	-0.0033 ** (**0.0252**)	-0.0104 *** (**0.0000**)	-0.0106 *** (**0.0000**)	-0.0109 *** (**0.0000**)	-0.0125 *** (**0.0000**)
Riskiness: NPLs/Asset	-0.0182 (0.1596)	-0.0186 (0.1358)	-0.0191 (0.1326)	-0.0168 (0.1959)	0.0553 ** (**0.0484**)	0.0545 * (**0.0515**)	0.0546 * (**0.0512**)	0.0558 ** (**0.0443**)	0.0590 *** (**0.0006**)	0.0592 *** (**0.0006**)	0.0574 *** (**0.0008**)	0.0567 *** (**0.0010**)
Diversification: NII Ratio	0.0055 (0.1356)	0.0047 (0.1978)	0.0048 (0.1943)	0.0060 (0.1030)	-0.0307 *** (**0.0000**)	-0.0309 *** (**0.0000**)	-0.0309 *** (**0.0000**)	-0.0304 *** (**0.0000**)	-0.0115 ** (**0.0198**)	-0.0114 ** (**0.0226**)	-0.0116 ** (**0.0207**)	-0.0118 ** (**0.0185**)
A) Under-capitalised small banks (DV^{SS}_{REGU})	0.0095 * (**0.0821**)				0.0017 (0.5838)				-0.0031 (0.5916)			
A) Under-capitalised large banks (DV^{LS}_{REGU})	-0.0390 (0.1902)				-0.0905 (0.1273)				-0.0336 (0.7730)			
A) Better-capitalised small banks (DV^{SS}_{REGO})	-0.0298 (0.3159)				0.0214 (0.3446)				0.0502 ** (**0.0372**)			
A) Better-capitalised large banks (DV^{LS}_{REGO})	-0.0874 *** (**0.0001**)				-0.0388 ** (**0.0439**)				0.0218 (0.3634)			
B) Under-capitalised small banks (DV^{SS}_{PCAU})		0.0043 ** (**0.0409**)				-0.0007 (0.6795)				0.0028 * (**0.0787**)		
B) Under-capitalised large banks (DV^{LS}_{PCAU})		-0.0025 *** (0.0017)				-0.0017 ** (**0.0101**)				-0.0006 (0.6503)		
C) Edizs Regulatory Pressure – small banks ($DV^{SS}_{REG-Ediz}$)			0.0020 (0.2426)				0.0002 (0.9290)				-0.0023 * (**0.0555**)	
C) Edizs Regulatory Pressure – large banks ($DV^{LS}_{REG-Ediz}$)			-0.0020 ** (**0.0439**)				-0.0017 ** (**0.0122**)				- 0.00004 (0.9726)	
D) Better-capitalised small banks (DV^{SS}_{REGmcr})				-0.0024 (0.2303)				-0.0006 (0.7375)				-0.0033 ** (**0.0444**)
D) Better-capitalised large banks (DV^{LS}_{REGmcr})				-0.0096 *** (**0.0000**)				-0.0055 ** (**0.0240**)				0.0080 ** (**0.0195**)
Interest Rate Spread	0.0005 (0.2212)	0.0005 (0.2474)	0.0004 (0.2548)	0.0006 (0.1624)	0.0006 (0.2875)	0.0006 (0.2867)	0.0006 (0.2922)	0.0006 (0.2648)	0.0009 * (**0.0841**)	0.0008 (0.1060)	0.0009 * (**0.0913**)	0.0008 (0.1155)
Constant	0.0266 ** (**0.0167**)	0.0277 *** (**0.0018**)	0.0269 *** (**0.0021**)	0.0230 * (**0.0540**)	0.0510 *** (**0.0000**)	0.0553 *** (**0.0000**)	0.0548 *** (**0.0000**)	0.0504* ** (**0.0000**)	0.1259 *** (**0.0000**)	0.1287 *** (**0.0000**)	0.1315 *** (**0.0000**)	0.1423 *** (**0.0000**)

Panel (B): Summary Statistics

Observations	2,066	2,068	2,066	2,066	2,077	2,079	2,077	2,077	1,534	1,536	1,534	1,534
No. Banks	310	310	310	310	311	311	311	311	262	262	262	262
Wald chi2	151.91	95.6300	74.0100	163.20	199.23	148.74	167.15	171.98	130.97	112.91	115.66	113.64
Statistics (p-value)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.1412	0.1341	0.1284	0.1462	0.1442	0.1441	0.1433	0.1461	0.1948	0.1925	0.1943	0.2059
r2_between groups	0.2587	0.2482	0.2351	0.2626	0.2008	0.1993	0.1973	0.2002	0.2246	0.2249	0.2236	0.2296
r2_within groups	0.0018	0.0033	0.0021	0.0028	0.0290	0.0291	0.0293	0.0292	0.1230	0.1215	0.1213	0.1237

In term of the cost level, which is measured by the TCA ratio, Table 6-18 shows that small-sized undercapitalised banks, which are indicated by the Prompt Corrective Action approach (DV^{SS}_{PCAU}), were associated with high banking operating costs. Indeed, the coefficient (DV^{SS}_{PCAU}) was found to be negative at a significant level of 10%. However, this result should be taken with caution. The other indicators of small-sized undercapitalised banks do not show evidence on the association of these small-sized under-capitalised banks with high operating costs. For example, the small-sized pressurised banks, which are not meeting their target capital ratio as measured by Ediz approach, were found to have low banking operating costs as indicated by a significant negative coefficient ($DV^{SS}_{REG-Ediz}$) at a significance level of 10%.[148]

In term of better-capitalised banks, results show consistent results on the cost level of large-sized better-capitalised banks only. The TCA regressions show that those large-sized better-capitalised banks, as measured by (DV^{LS}_{REGO}) and (DV^{LS}_{REGmcr}), were found to be associated with high operating costs. Indeed, the coefficient (DV^{LS}_{REGmcr}) is statistically significant at 5%. In view of small-sized better-capitalised banks, the results do not show any consistent results on the cost level of those small-sized better-capitalised banks as reported in Table 6-20.

Overall, the above results show that small-sized undercapitalised is more profitable in generating high earnings. However, there was no evidence that small-sized better-capitalised banks associate with high earnings. On the other hand, the results show that both large-sized undercapitalised banks and large-sized better-capitalised banks are associated with low performance. These banks were found to be associated with low

[148] As a reminder, pressurised banks according to the Ediz approach are banks that have an actual capital ratio less than their target capital ratio. The target capital ratio is measured as the sum of the minimum regulatory capital ratio plus one bank-specific capital ratio standard deviation. Thus; pressurised banks are more likely to preach the minimum capital requirements in case any volatility in the market.

earnings and high banking operating costs. This result is consistent with the literature (e.g., Nikiel and Opiela, 2002; Ariff and Luc, 2008; and Dietrich and Wanzenried, 2011) who found that large banks have lowest profit and cost level. Unlike to Nikiel and Opiela, 2002; Ariff and Luc, 2008; and Dietrich and Wanzenried, 2011 who focused only on the institutional size of banks without accounting for capitalisation level, the results of this chapter support the argument of the importance of considering the institutional size of capitalised banks to assess the capital-performance nexus. For example, the baseline regressions, which are reported in Table 6-5, show that undercapitalised banks associate with high earnings. However, the above results in Table 6-18 show that only those small-sized undercapitalised banks are more profitable in generating high earning, while large-sized undercapitalised banks tended to have low earnings. Furthermore, the baseline regressions, which are reported in Table 6-5, show no evidence on the performance of the undercapitalised banks in the NIM regressions. However, the above results in Table 6-18 show that only those large-sized undercapitalised banks have low earnings in term of net interest margin. Thus; institutional size should be accounted for to obtain a better understating on the behaviour of capitalised banks.

6.5.5 Economic and Financial Development Perspective: The relationship between the capital level and the banking performance: Does financial development matter?

The sample of this chapter includes banks from different countries, mainly banks from the Middle East and North Africa (MENA) countries and countries from the Organisation for Economic Co-operation and Development (OECD). As discussed earlier in Chapter Three, the financial structure in the MENA countries is a more bank-based system, and there is a lack of adequate liquidity and capital markets in these countries. On the other hand, most of the OECD countries are well-functioned banks in a financially developed market. The financial structure in the OECD considers being a market-based system in which financial markets play a major role in facilitating the funding channel and easing risk management. The next tables report the empirical effect of the capital level on the performance for both banks from developed countries (represented by banks from the OECD countries) and banks from developing countries (represented by banks from the MENA countries).

This section starts the analysis by using a full sample that contains all banks, and a dummy variable is included in the regression, which stated in Equation 4-1, to examine if banking performance in the MENA countries is lower than banking performance in the OECD countries. The dummy variable refers to a value of unity for banks from the MENA countries ($DV_{i,t}^{MENA}$), and zero otherwise. The analysis is then expanded to examine determinants of the performance and the impact of the capital level in each subsample of banks from countries with different economic and financial development. Subsampling allows examining the behaviour of each group of banks separately. Table 6-19, Table 6-20, and Table 6-21 reports the empirical results of the regression analysis that assesses the impact of the capital on performance using three different indicators, mainly the dependent variable the Return on Assets (ROA) ratio, the Net Interest Margin (NIM ratio), the Total Cost to Assets (TCA) ratio respectively.

The models one to four in Table 6-19 reports the empirical results of a full sample of banks, i.e., banks from both the MENA and the OECD countries, are employed.

Table 6-19: Relationship between the capital level and performance (for subsamples of banks during the sampler period 2003 to 2014 according to region)**:**

The dependent variable is a profit-based indicator as measured by total return on asset (ROA) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ Banks in the MENA countries are more profitable compared to banks from the OECD countries.
- ⇨ High equity banks are the most profitable banks in the MENA countries.
- ⇨ Small banks, less risky and diversified banks are the most profitable banks in the OECD countries.

Estimated Models using ROA as the dependent variable	**Robust Clustered Random Effects Model**											
	The whole Sample				**A subsample for banks from the OECD**				**A subsample for banks from the MENA**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0003 ***	0.0003 ***	0.0003 ***	0.0003 ***	-0.0001	-0.0001	-0.0001	-0.0001	0.0003 ***	0.0003 ***	0.0003 ***	0.0003 ***
	(**0.0082**)	(**0.0086**)	(**0.0091**)	(**0.0071**)	(0.8647)	(0.8073)	(0.8172)	(0.8215)	(**0.0021**)	(**0.0061**)	(**0.0069**)	(**0.0054**)
Size: log Assets	0.0003	0.0002	0.0002	0.0002	-0.0086 ***	-0.0086 ***	-0.0088 ***	-0.0087 ***	0.0021	0.0019	0.0020	0.0020
	(0.8594)	(0.8937)	(0.9113)	(0.8792)	(**0.0004**)	(**0.0005**)	(**0.0004**)	(**0.0004**)	(0.3228)	(0.3710)	(0.3470)	(0.3385)
Riskiness: NPLs Ratio	-0.0166	-0.0166	-0.0163	-0.0160	-0.0976 **	-0.1028 **	-0.1023 **	-0.1027 **	-0.0064	-0.0059	-0.0062	-0.0057
	(0.1822)	(0.1766)	(0.1890)	(0.1955)	(**0.0275**)	(**0.0229**)	(**0.0201**)	(**0.0217**)	(0.6382)	(0.6582)	(0.6459	(0.6740)
Diversification: NII Ratio	0.0046	0.0047	0.0047	0.0045	0.0177 ***	0.0177 ***	0.0177 ***	0.0177 ***	0.0035	0.0035	0.0036	0.0033
	(0.2005)	(0.1963)	(0.1975)	(0.2147)	(**0.0002**)	(**0.0002**)	(**0.0002**)	(**0.0002**)	(0.4719)	(0.4774)	(0.4640)	(0.4981)
A) Under-capitalised banks (REGU)	0.0032				-0.0106				0.0036			
	(0.4708)				(0.3456)				(0.3910)			
A) Better-capitalised banks (REGO)	-0.0214				-0.0230				-0.0161			
	(0.1373)				(0.1543)				(0.4352)			
B) Under-capitalised banks (PCAU)		0.0011				-0.0009				0.0032 **		
		(0.2090)				(0.3193)				(**0.0317**)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0015				0.0017*				0.0011	
			(0.1182)				(**0.0813**)				(0.4065)	
D) Better-capitalised banks using (REG-mcr)				-0.0026 *				0.0006				-0.0030 *
				(**0.0902**)				(0.7002)				(**0.0715**)
DV = 1 for banks from the MENA	0.0085 ***	0.0090 ***	0.0086 ***	0.0085 ***								
	(**0.0057**)	(**0.0022**)	(**0.0043**)	(**0.0039**)								
DV = 1, for period 2009-12	0.0001	0.0002	0.0002	0.0002	-0.0015 **	-0.0014 **	-0.0014 *	-0.0014 **	0.0015	0.0018	0.0016	0.0017
	(0.9243)	(0.8416)	(0.8635)	(0.8465)	(**0.0423**)	(**0.0470**)	(**0.0515**)	(**0.0479**)	(0.3411)	(0.2671)	(0.3286)	(0.2899)
Interest Rate Spread	0.0003	0.0003	0.0003	0.0003	0.0027 ***	0.0027 ***	0.0027 ***	0.0027 ***	-0.0004	-0.0004	-0.0004	-0.0003
	(0.4349)	(0.4492)	(0.4335)	(0.4016)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.5145)	(0.5280)	(0.5121)	(0.5566)
Constant	0.0093	0.0083	0.0082	0.0109	0.0767 ***	0.0765 ***	0.0769 ***	0.0764 ***	0.0083	0.0084	0.0076	0.0109
	0.4872	0.5269	0.5309	0.4058	(**0.0004**)	(**0.0004**)	(**0.0003**)	(**0.0003**)	(0.5793)	(0.5674)	(0.6047)	(0.4641)
Panel (B): Summary Statistics												
Observations	2,066	2,068	2,066	2,066	801	803	801	801	1,265	1,265	1,265	1,265
No. Banks	310	310	310	310	130	130	130	130	180	180	180	180
Wald chi2 Statistics	99.9500	96.7600	100.78	97.0600	43.2500	41.7900	45.5400	42.3300	16.1700	14.8600	14.0300	13.5600
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0399**)	(**0.0378**)	(**0.0000**)	(**0.0596**)
r2_overall	0.1317	0.1312	0.1325	0.1350	0.1926	0.1864	0.1906	0.1887	0.0632	0.0674	0.0629	0.0684
r2_between groups	0.2395	0.2379	0.2405	0.2464	0.2075	0.2009	0.2058	0.2025	0.1108	0.1204	0.1092	0.1238
r2_within groups	0.0043	0.0043	0.0047	0.0043	0.0731	0.0741	0.0771	0.0727	0.0162	0.0191	0.0167	0.0172

These models are the same as in Table 6-5, but one more variable ($DV_{i,t}^{MENA}$) is added to compare the performance level of banks from a different group of countries. Table 6-19 shows that the coefficient of the ($DV_{i,t}^{MENA}$), in the first four models, is positively associated with the ROA ratio at a significance level of 1%. This positive coefficient for the ($DV_{i,t}^{MENA}$) implies that banks from the MENA were better in generating high earnings from their resources compared to banks from the OECD countries. This result supports the argument that banks in concentrated markets (in developing countries) are more empowered to boost their rates, and supervisors can monitor them more easily due to a small number of banks (e.g., Maria Soledad Martinez and Mody, 2004; Boyd and De NicolÓ, 2005; Beck et al., 2006a; and Wolfe et al., 2006). Hence banks tend to be associated with high earnings. Indeed, the MENA banks are operating in a highly concentrated market.[149] In view of the second profit-based indicator, Table 6-20 show that there was no evidence that the MENA coefficient ($DV_{i,t}^{MENA}$), in the first four models, is significantly associated with the Net Interest Margin (NIM) ratio.

Further analysis is carried out to examine determinants of the performance and the impact of the capital level for the MENA banks and the OECD banks separately. For the ROA regressions and NIM regressions respectively, Table 6-19 and Table 6-20 demonstrate the empirical results from the models five (5) to eight (8) for a subsample of banks from the OECD countries, and the models from nine (9) to twelve (12) for a subsample of banks from the MENA countries. The overall view of the empirical results of both subsamples, it is observed that the performance of banks varies according to capitalisation level. Undercapitalised banks were found to have a different performance level compared to better-capitalised banks, as discussed below. In term of the performance determinants, there are no statistically significant differences in the characteristics of banks that were associated with better profit-based indicator between both subsamples. Yet, some of the determinants were found to be more statistically significant in a subsample rather than another. The following part of the section focuses on the main characteristics of banks that are associated with better performance in each group of countries.

[149] Refer to Chapter Three for further details on average concertation ratios at the MENA over the period 2000 to 2014.

Table 6-20: Relationship between the capital level and performance (for subsamples of banks during the sampler period 2003 to 2014 according to region):
The dependent variable is a profit-based indicator as measured by total net interest margin (NIM) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. Key results:

- ⇨ Banks from the MENA countries charge higher margins compared to banks from the OECD countries.
- ⇨ Small banks, risky banks, and less diversified banks are associated with high margin in both the OECD banks and the MENA banks.

Estimated Models using NIM as the dependent variable	Robust Clustered Random Effects Model											
	The whole Sample				A subsample for banks from the OECD				A subsample for banks from the MENA			
	1	2	3	4	5	6	7	8	9	10	11	12
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0001	0.0001	0.0001	0.0001	-8.7e-06	-0.00001	-7.8e-06	-0.0001	0.0001	0.0001	0.0001	0.0001
	(0.3636)	(0.3679)	(0.3718)	(0.3727)	(0.9506)	(0.9315)	(0.9569)	(0.9153)	(0.3926)	(0.4005)	(0.4024)	(0.4060)
Size: log Assets	-0.0041 **	-0.0041 **	-0.0042 **	-0.0042 **	-0.0062 ***	-0.0062 ***	-0.0061 ***	-0.0062 ***	-0.0040 **	-0.0041 **	-0.0041 **	-0.0041 **
	(0.0128)	**(0.0138)**	**(0.0110)**	**(0.0126)**	**(0.0032)**	**(0.0039)**	**(0.0043)**	**(0.0033)**	**(0.0461)**	**(0.0450**	**(0.0362)**	**(0.0422)**
Riskiness: NPLs Ratio	0.0562 **	0.0562 **	0.0562 **	0.0562 **	0.1145 ***	0.1155 ***	0.1144 ***	0.1140 ***	0.0557 *	0.0556 *	0.0557 *	0.0557 *
	(0.0453)	**(0.0433)**	**(0.0440)**	**(0.0439)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0699)**	**(0.0677)**	**(0.0676)**	**(0.0679)**
Diversification: NII Ratio	-0.0311 ***	-0.0310 ***	-0.0310 ***	-0.0310 ***	-0.0069 **	-0.0069 **	-0.0069 **	-0.0069 **	-0.0420 ***	-0.0419 ***	-0.0419 ***	-0.0420 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0183)**	**(0.0217)**	**(0.0211)**	**(0.0171)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
A) Under-capitalised capitalised banks (REGU)	0.0006				-0.0200				0.0021			
	(0.8099)				(0.2192)				(0.4644)			
A) Better-capitalised banks (REGO)	0.0182*				0.0077				0.0243			
	(0.0732)				(0.3280)				(0.1383)			
B) Under-capitalised banks (PCAU)		-0.0006				-0.0005*				0.0039		
		(0.3248)				**(0.0686)**				(0.7224)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0001				-0.0003				0.0002	
			(0.9511)				(0.4573)				(0.9153)	
D) Better-capitalised banks (REG-mcr)				-0.0001				0.0027 **				-0.0001
				(0.9295)				**(0.0200)**				(0.6760)
DV = 1 for banks from the MENA	0.0017	0.0013	0.0013	0.0013								
	(0.6001)	(0.6859)	(0.6852)	(0.6904)								
DV = 1, for period 2009-12	0.0011	0.0013	0.0011	0.0011	-0.0003	-0.0004	-0.0004	-0.0003	0.0022	0.0022	0.0022	0.0022
	(0.2015)	(0.2290)	(0.2137)	(0.2171)	(0.4235)	(0.3626)	(0.3406)	(0.4210)	(0.1014)	(0.1111)	(0.1054)	(0.1041)
Interest Rate Spread	0.0006	0.0006	0.0006	0.0006	0.0008 **	0.0008 **	0.0008 **	0.0008 **	0.0005	0.0005	0.0005	0.0005
	(0.3030)	(0.3141)	(0.3198)	(0.3187)	**(0.0203)**	**(0.0207)**	**(0.0232)**	**(0.0200)**	(0.5431)	(0.5600)	(0.5633)	(0.5598)
Constant	0.0533 ***	0.0543 ***	0.0546 ***	0.0547 ***	0.0661 ***	0.0661 ***	0.0657 ***	0.0638 ***	0.0568 ***	0.0580 ***	0.0582 ***	0.0587 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0002)**	**(0.0002)**	**(0.0002)**	**(0.0002)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Panel (B): Summary Statistics												
Observations	2,077	2,079	2,077	2,077	807	809	807	807	1,270	1,270	1,270	1,270
No. Banks	311	311	311	311	131	131	131	131	180	180	180	180
Wald chi2 Statistics	157.07	156.03	155.59	156.16	49.2800	44.4300	48.7600	46.1200	66.5300	66.9700	71.7900	66.2700
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.1425	0.1414	0.1411	0.1411	0.2964	0.2967	0.2978	0.2918	0.1163	0.1145	0.1145	0.1146
r2_between groups	0.1964	0.1939	0.1929	0.1929	0.2879	0.2893	0.2887	0.2832	0.1920	0.1864	0.1861	0.1865
r2_within groups	0.0299	0.0299	0.0299	0.0299	0.1232	0.1190	0.1183	0.1244	0.0338	0.0340	0.0340	0.0340

In term of the capital level, the results show that high-capital banks from the MENA countries were associated positively with profit-based indicator. The capital coefficient was found to be statistically significant at a significant level of 1% in all models of the ROA regressions (i.e., model nine to twelve) as reported in Table 6-19. On the other hand, there is no evidence that high-capital banks in the OECD countries were associated positively with both profit-based indicators. Indeed, the capital coefficient value is relatively low compared to the coefficient value in the MENA subsample. This result reflects the importance of the capital level in the MENA countries where the banking system is concentrated highly and relies on banks as a primary source of funding. This positive association in the MENA subsample supports expectations of Berger et al. (1995) who expected a positive association between the capital and earning for banks in the concentrated markets where banks use a high-capital level to signal higher survival probability since the capital act as a buffer against unexpected losses. Imposing high capital level is a tool to enhance and improve banking stabilities in countries where banks are the main source of funding.

Besides, the results show that undercapitalised banks, which are measured by Jacques and Nigro's approach (REGU) and the Prompt Corrective Action Approach (PCAU), in the MENA countries tended to be associated with high earning during the sample period 2003 to 2014. Both profit-based indicators were found to be associated positively with coefficients that indicate undercapitalised banks. Indeed, the coefficient PCAU was found to be a significant positive coefficient at a significance level of 5% in the ROA regression, as reported in Table 6-19. Whereas, undercapitalised banks in the OECD countries were found to be associated with less earning. The coefficient PCAU was found to be a significant negative coefficient at a significance level of 5% in the NIM regression, as reported in Table 6-20. These results highlight potential variation in the performance level of undercapitalised banks in countries with different economic and financial development levels. In developing countries, undercapitalised banks were found to have a high return on assets (ROA), and a high net margin (NIM) compared to other banks. This result implies that undercapitalised banks might work on their resources to make high earning that could be used to offset the regulatory capital requirements in countries where financial markets are less developed. On the other hand, in developed countries, undercapitalised banks were found to have less earning, and that might be due to their low risk-weighted assets. However, not all undercapitalised banks in the OECD countries associate with low earnings. The model three (3), which pays more attention to pressurised banks that are not meeting their target capital ratio as measured by variable (REG-Ediz), was found to be associated with high earrings as reported in the ROA regressions in Table 6-19. Indeed, the coefficient REG-Ediz was found to be positive a significance level of 10%.

In term of better-capitalised banks, the results show no evidence that better-capitalised banks in the MENA associate with high earnings. These banks were found operating inefficiently in the MENA during the sample period (i.e., 2003 to 2014). They were found to be associated with less earning as indicated by a significant negative coefficient of REG-mcr at a significance level of 10% as reported in the 12th model of the ROA regressions at Table 6-19. Whereas, there is no evidence that better-capitalised banks in the OECD countries were associated with less earning. The coefficient REG-mcr was found to be associated positively with NIM at a significance level of 5% as shown in the eighth model in Table 6-19.[150] These results also highlight that even performance of better-capitalised banks could vary in countries with different economic and financial development levels. In developing countries, the result supports the argument of those who pointed out a potential opportunity cost of holding high capital levels rather than involved in more profitable investment opportunities (see, e.g., Goddard et al. 2013). Small better-capitalised banks possible have less chance to expand their activities. Gorton and Claessens (1998) pointed out that higher capital requirements could make banks less risky, and hence less earning, at the cost of reducing their activities size especially at countries where the banking system is inefficiently small. Whereas, better-capitalised banks in developed countries have a wider range of activities to expand their business. Hence, they were found to be associated with high margins compared to others especially they are possibly wholesales and investment banks.[151]

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[150] The second indicator of better-capitalised banks, i.e., REGO show inconsistent and statistically insignificant results as shown in Table 6-19 and Table 6-20.

[151] The descriptive statistics show that most of the banks in the MENA countries are small-sized banks, while banks in the OECD countries were found to be large and medium-sized banks.

The above results highlight that the performance of capitalised banks varies in countries with different economic and financial development. Aligned with these results, the results show that the impact of the capital regulatory reforms, which experienced especially after 2009, on the profit-based indicators was found to be in the OECD countries rather than in the MENA countries. The OECD countries are more developed from a legal perspective in which they associate with high institutional quality and better corporate governance. Unlike the results in Table 6-5 which do not provide any evidence on changes in the performance as measured by the ROA ratio and the NIM ratio during the post period of 2009, Table 6-19 and Table 6-20 show that profit-based performance was reduced in banks of the OECD countries during the sub-period (2009-2014). The coefficient of the dummy variable ($\underset{2009}{DV_{post}}$), which indicated the period that experienced more regulatory reforms, was found to be negative in the subsample of OECD countries. Indeed, the coefficient was found to be associated negatively with ROA at a significant level of 5% as reported in models five to eight at Table 6-19. This result implies that regulatory capital requirements and disclosure requirements impact negatively on the profitability of banks in developed countries. In view of this result, the above results show that undercapitalised banks, which are expected to be more affected by the regulatory requirements, were found to be associated with less earning in the OECD countries. On the other hand, the results do not provide any sufficient evidence that profit-based performance was reduced for banks in the MENA countries during the period that experienced more regulatory pressure. The above results also show that undercapitalised banks, which are expected to be more affected by the regulatory requirements, were found to be associated with high earning in the MENA countries.

In term of other characteristics that are associated with better profit-based performance, the results show no statistically significant differences in the coefficients of bank size (measured by Log Assets), riskiness (measured by NPLs ratio), and diversification level (measured by NII ratio) between the subsamples of banks that are from different group of countries as reported in Table 6-19 and Table 6-20. However, this sub-classification provides a robust check and a better understanding of the baseline regressions that are reported in Table 6-5 and discussed in section 6.7.1. For example, the relationship between the bank's size (as measured log assets) and profit-based performance (as measured by the ROA ratio) was found to be statistically negative in the baseline regressions that are based on the whole sample as reported in Table 6-5. However, this relationship was found to be statistically significant only for banks in the OECD countries only as reported in models five to eight at Table 6-19. Unlike Micco et al. (2007), who found that large banks tended to have less profit (as measured by the ROA) in both developing and developed countries, the above results show that large banks from developed countries associate with less profitability.

Besides, the country-wise subsamples classification provides a better understanding of the results that were obtained from the baseline regressions and mainly in Table 6-5. The relationship between the riskiness levels (as measured by the NPLs ratio) and the profit-based performance (as measured by the ROA ratio) was reported to be a negative relationship but statistically insignificant based on the whole sample as shown in Table 6-5. This a statistically insignificant relationship was found to be associated with banks from a subsample of the MENA countries. While, the same relationship was found to be negative and statistically significant for banks from the OECD countries with a significance level of 5% as reported in Table 6-19. Similarly, Table 6-5 shows that the relationship between the diversification levels (as measured by the NII ratio) and the profit-based performance (as measured by the ROA ratio) reported being a positive relationship but statistically insignificant based on the whole sample as shown in Table 6-5. This a statistically insignificant relationship was found to be associated with banks from a subsample of the MENA countries. While, the same relationship was found to be positive and statistically significant for banks from the OECD countries with a significance level of 1% in all models (i.e., model five to eight in Table 6-19).

Furthermore, the sub-classification of the sample into country-wise subsamples according to the economic and development provided a better understanding of the impact of macroeconomic variable interest rate spread. Table 6-5 shows that the relationship between the interest rate spread (IRS) and the profit-based performance (as measured by ROA ratio) was reported being a positive relationship but statistically insignificant based on the whole sample. This a statistically insignificant relationship was found to be associated with banks from a subsample of the MENA countries.

Table 6-21: Relationship between the capital level and performance (for subsamples of banks during the sample period 2003 to 2014 according to region):
The dependent variable is cost-based performance as measured by total cost on asset ratio (TCA) ratio. Independent variables are defined and summarized in Table (4-1). The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using TCA as the dependent variable	Robust Clustered Random Effects Model											
	The whole Sample				A subsample for banks from the OECD				A subsample for banks from the MENA			
	1	2	3	4	5	6	7	8	9	10	11	12
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	-0.0002 (0.2211)	-0.0002 (0.2280)	-0.0001 (0.2297)	-0.0002 (0.2244)	0.0005 (0.3002)	0.0005 (0.2821)	0.0005 (0.2810)	0.0005 (0.3087)	-0.0002 (0.1568)	-0.0002 (0.1587)	-0.0002 (0.1724)	-0.0002 (0.1564)
Size: log Assets	-0.0097 *** (0.0000)	-0.0097 *** (0.0000)	-0.0096 *** (0.0000)	-0.0097 *** (0.0000)	-0.0081 *** (0.0034)	-0.0080 *** (0.0039)	-0.0080 *** (0.00332	-0.0081 *** (0.0033)	-0.0102 *** (0.0000)	-0.0103 *** (0.0000)	-0.0101 *** (0.0000)	-0.0103 *** (0.0000)
Riskiness: NPLs Ratio	0.0551 *** (0.0012)	0.0554 *** (0.0011)	0.0540 *** (0.0014)	0.0555 *** (0.0010)	0.2326 *** (0.0000)	0.2333 *** (0.0000)	0.2316 *** (0.0000)	0.2321 *** (0.0000)	0.0522 *** (0.0042)	0.0524 *** (0.0040)	0.0512 *** (0.0048)	0.0525 *** (0.0038)
Diversification: NII Ratio	-0.0112 ** (0.0260)	-0.0111 ** (0.0270)	-0.0113 ** (0.0248)	-0.0111 ** (0.0279)	-0.0150 ** (0.0372)	-0.0148 ** (0.0432)	-0.0146 ** (0.0421)	-0.0152 ** (0.0335)	-0.0102 * (0.0907)	-0.0101 * (0.0935)	-0.0103 * (0.0872)	-0.0101 * (0.0926)
A) Under-capitalised banks (REGU)	-0.0033 (0.4276)				-0.0590 (0.4409)				-0.0027 (0.5492)			
A) Better-capitalised banks (REGO)	0.0266 ** (0.0481)				0.0106 (0.6071)				0.0304 * (0.0790)			
B) Under-capitalised banks (PCAU)		0.0006 (0.4186)				0.00004 (0.9684)				0.0012 (0.2822)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0016 ** (0.0184)				-0.0015 (0.1369)				-0.0016 * (0.0872)	
D) Better capitalised banks (REG-mcr)				-0.0012 (0.3574)				0.0050 (0.1912)				-0.0015 (0.2370)
DV = 1 for banks from the MENA	-0.0057 (0.1522)	-0.0063 (0.1149)	-0.0060 (0.1318)	-0.0066 (0.1024)								
DV = 1, for period 2009-12	-0.0035 *** (0.0003)	-0.0036 *** (0.0002)	-0.0036 *** (0.0002)	-0.0036 *** (0.0003)	-0.0059 *** (0.0000)	-0.0059 *** (0.0000)	-0.0059 *** (0.0000)	-0.0059 *** (0.0000)	-0.0030 ** (0.0111)	-0.0031 ** (0.0135)	-0.0031 *** (0.0094)	-0.0031 ** (0.0118)
Interest Rate Spread	0.0010 ** (0.0453)	0.0010 * (0.0519)	0.0010 ** (0.0458)	0.0010 ** (0.0500)	0.0020 * (0.0852)	0.0019 * (0.0901)	0.0020 * (0.0852)	0.0020 * (0.0866)	0.0007 (0.1630)	0.0006 (0.1862)	0.0007 (0.1580)	0.0006 (0.1789)
Constant	0.1261 *** (0.0000)	0.1276 *** (0.0000)	0.1278 *** (0.0000)	0.1290 *** (0.0000)	0.1074 *** (0.0000)	0.1072 *** (0.0000)	0.1075 *** (0.0000)	0.1030 *** (0.0000)	0.1247 *** (0.0000)	0.1263 *** (0.0000)	0.1263 *** (0.0000)	0.1277 *** (0.0000)
Panel (B): Summary Statistics												
Observations	1,534	1,536	1,534	1,534	459	461	459	459	1,075	1,075	1,075	1,075
No. Banks	262	262	262	262	89	89	89	89	173	173	173	173
Wald chi2 Statistics	121.89 (0.0000)	113.38 (0.0000)	117.50 (0.0000)	113.64 (0.0000)	93.9500 (0.0000)	83.8900 (0.0000)	88.1800 (0.0000)	96.2400 (0.0000)	74.0900 (0.0000)	70.0200 (0.0000)	71.3900 (0.0000)	70.5800 (0.0000)
r2_overall	0.2263	0.2257	0.2281	0.2270	0.3289	0.3274	0.3338	0.3282	0.2374	0.2396	0.2396	0.2405
r2_between groups	0.2463	0.2480	0.2491	0.2503	0.3429	0.3406	0.3485	0.3413	0.2041	0.2119	0.2091	0.2138
r2_within groups	0.1425	0.1400	0.1428	0.1399	0.1284	0.1266	0.1294	0.1295	0.1529	0.1499	0.1517	0.1501

While, the same relationship was found to be positive and statistically significant for banks from the OECD countries with a significance level of 1% in all models (i.e., model five to eight in Table 6-19). This result implies that the level of the interest rate spread in the OECD macroeconomic environment contributes to enhancing the profitability of banks in these countries.[152]

The above bank-level controlling variables (i.e., bank size, riskiness level, diversification level, and spread of interest rate) were found to have the same relationship in the NIM regressions in both subsamples of the OECD countries and the MENA countries as reported in Table 6-20. Table 6-21 reports determinants of the cost-based performance and the impact of the capital level for the MENA banks and the OECD banks separately. However, it is observed that most of the observations of cost-based performance regressions are from the MENA banks. The number of observations in the whole sample is about 1,534 annual observations in which 1,075 of them are observations from the MENA banks as reported in the panel (B) in Table 6-21. The relatively small sample size the OECD subsample is due to missing values of TCA ratio.

Overall, the above results show that distinguishing countries according to their economic and financial development levels does matter to examine the capital and performance nexus. The results show a variation in the performance level of banks with different capitalisation level. Indeed, this capital and performance nexus also differs in countries with different economic and financial development level.

From one side, banks in the MENA countries are more concentrated, and they are operating in less developed economic and financial markets. The better-capitalised banks, which are already meeting the minimum capital requirements, found not operating well in the MENA during the sample period. Financial structure in the MENA is a more bank-based system in which banks play a crucial role in funding; hence the stability of these banks is critical. Holding high capital level would have a

[152] The descriptive statistics show that the average of the interest rate spread in the OECD countries is relatively low compared to the average interest rate spread in the MENA countries (Refer to Table 6-3).

potential opportunity cost rather than involved in more profitable investment opportunities as argued by Gorton and Claessens, 1998; and Goddard et al., 2013. Most of the banks in the MENA countries are small-sized banks, and they could have less chance to expand their activities.

While, undercapitalised banks in the MENA countries were found to be associated with high earnings. The results do not show that the banking profit-based performance is reduced in the MENA countries during the sub-period (2009-2014). This sub-period experienced reforms of additional regulatory capital requirements and disclosure requirements. Yet, the results show that undercapitalised banks, which are expected to be more affected by the regulatory requirements, were found are still associated with high earning in the MENA countries. These banks seem working to utilise their resources to make high earning that could be used to offset the regulatory capital requirements in countries where financial markets are less developed. These results could raise a question of the effectiveness of the disclosure system in the developing countries.

Compared to the MENA countries, the OECD countries are more developed from a legal perspective in which they associate with high institutional quality and better corporate governance. The better-capitalised banks, which are already meeting the minimum capital requirements, were found to be more profitable banks compared to others. These banks have more investment opportunities in a developed economic and financial environment. On the other hand, there was no sufficient evidence on the performance of the undercapitalised banks in the OECD countries. Yet, the results show that the profit-based performance is reduced in banks from the OECD countries during the sub-period that experienced reforms of additional regulatory capital requirements and disclosure requirements (i.e., 2009-2014).

6.6 Summary: The results of the impact of the capital on banking performance:

The following table presents a summary of the main empirical results in this chapter:

Table 6-22: Summary of the empirical results on the impact of the capital on banking performance		
Null Hypotheses	**Empirical Results**	**Support the hypothesis?**
Hypothesis 8: There is a positive relationship between the capital and the performance level.	A significant positive relationship between high-capital banks and profit-based performance over the sample period as measured by the ROA ratio over the sample period. A significant positive relationship found between high-capital banks and profit-based performance as measured by the NIM ratio in sub-period (2004 to 2008) and a sub-period (2009 to 2012). A significant negative relationship found between high-capital banks and cost level as measured by the TCA ratio in sub-period (2003 to 2008) and a sub-period (2009 to 2014). A significant positive relationship between high-capital domestic banks and profit-based performance. A significant positive relationship between high-capital for MENA banks and profit-based performance.	Yes
Hypothesis 9: There is a positive association between listed banks and performance level.	A significant positive relationship between the dummy for listed banks and profit-based performance as measured by the ROA.	Yes (only from the profit-based perspective
Hypothesis 10: There is a negative relationship between domestic ownership and banking profit, and it is a positive relationship with the cost level.	An insignificant positive relationship between the dummy for domestic banks and profit-based performance as measured by the ROA. An insignificant negative relationship between the dummy for domestic banks and profit-based performance as measured by the NIM. An insignificant negative relationship between the dummy for domestic banks and cost-based performance as measured by the TCA.	No

Null Hypotheses		Empirical Results			Support the hypothesis?
	Ownership Profile	Capital level	Undercapitalised banks	Better-capitalised banks	
Hypothesis 11: The relationship between the capital and performance level does not vary among banks with different ownership profile**.**	Listed banks	A significant positive relationship between high-capital listed banks and profit-based performance as measured by the ROA during the sample period.	A significant positive relationship between undercapitalised listed banks and profit-based performance as measured by the NIM during the sample period. A significant negative relationship between undercapitalised listed banks and cost-based performance during the sample period.	A significant negative relationship between better-capitalised listed banks and profit-based performance as measured by the ROA during the sample period. A significant negative relationship between better-capitalised listed banks and cost-based performance during the sample period.	No
	Unlisted Banks	An insignificant positive relationship between high-capital unlisted banks and banking performance during the sample period.	A significant negative relationship between undercapitalised unlisted banks and profit-based performance during the sample period. A significant negative relationship between undercapitalised unlisted banks and cost-based performance during the sample period.	An insignificant relationship between better-capitalised unlisted banks and profit-based performance. A significant positive relationship between better-capitalised unlisted banks and cost during the sample period.	

<table>
<tr><th colspan="2">Null Hypotheses</th><th colspan="3">Empirical Results</th><th>Support the hypothesis?</th></tr>
<tr><td>Hypothesis 11</td><td>Domestic Banks</td><td>A significant positive relationship between high-capital domestic banks and profit-based performance as measured by the ROA during the sample period.</td><td>A significant positive relationship between undercapitalised domestic banks and profit-based performance as measured by the ROA during the sample period.</td><td>A significant negative relationship between better-capitalised domestic banks and profit-based performance as measured by the ROA during the sample period.</td><td>No</td></tr>
<tr><td rowspan="2">Hypothesis 12: The relationship between the capital and performance level is expected to be positive after the introduction of the Basel Accords II, Basel II.5, and Basel III.</td><td>All banks during the subsample period 2003 to 2008</td><td colspan="3">A significant positive relationship between the capital and profit-based performance as measured by the ROA during the prior-period of imposing the regulatory changes (i.e., 2003 to 2008).

A significant negative relationship between the capital and cost performance as measured by the TCA during the prior-period of imposing the regulatory changes (i.e., 2003 to 2008).</td><td rowspan="2">Yes,

(but there is no change in performance level before and after the introduction of the Basel Accords)</td></tr>
<tr><td>All banks during the subsample period 2009 to 2014</td><td colspan="3">A significant positive relationship between the capital and profit-based performance during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).

A significant negative relationship between the capital and cost performance as measured by the TCA during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).</td></tr>
<tr><td rowspan="2">Hypothesis 13a: There is a negative relationship between undercapitalised banks and performance level during the post-period of introducing the regulatory reforms.</td><td>Undercapitalised banks during the subsample period 2003 to 2008</td><td colspan="3">An insignificant relationship between undercapitalised banks and performance during the prior-period of imposing the regulatory changes (i.e., 2003 to 2008).</td><td rowspan="2">No</td></tr>
<tr><td>Undercapitalised banks during the subsample period 2009 to 2014</td><td colspan="3">A significant positive relationship between undercapitalised banks and profit-based performance during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).

A significant negative relationship between undercapitalised banks and cost performance during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).</td></tr>
</table>

<table>
<tr><th colspan="2">Null Hypotheses</th><th>Empirical Results</th><th>Support the hypothesis?</th></tr>
<tr><td rowspan="2">Hypothesis 13b: There is a positive relationship between better-capitalised banks and performance level during the post-period of introducing the regulatory reforms.</td><td>Better-capitalised banks during the subsample period 2003 to 2008</td><td>An insignificant relationship between better-capitalised banks and performance during the prior-period of imposing the regulatory changes (i.e., 2003 to 2008).</td><td rowspan="2">No</td></tr>
<tr><td>Better-capitalised banks during the subsample period 2009 to 2014</td><td>A significant negative relationship between better-capitalised banks and profit-based performance as measured by the ROA during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).

A significant positive relationship between better-capitalised banks and cost performance as measured by the TCA during the post-period of imposing the regulatory changes (i.e., 2009 to 2014).</td></tr>
<tr><td colspan="2" rowspan="2">Hypothesis 14: The relationship between the capital and performance level does not vary among countries with different economic and financial development level.</td><td>A significant positive relationship between undercapitalised banks in the MENA countries and profit based performance as measured by the ROA.

A significant negative relationship between better-capitalised banks in the MENA countries and profit based performance as measured by the ROA.</td><td rowspan="2">No</td></tr>
<tr><td>A significant negative relationship between undercapitalised banks in the OECD countries and profit based performance as measured by the ROA
A significant positive relationship between better-capitalised banks in the OECD countries and profit based performance as measured by the ROA</td></tr>
</table>

Chapter Seven: Conclusions, Implications, and Recommendation for Future Studies

A. Conclusions for empirical results

B. Contributions and Implications of empirical results

C. Limitations and Recommendations

7 Chapter 7: Conclusions, Implications, and Recommendation for Future Studies

7.2 Introduction:

This chapter presents the overall summary of the main findings of this research. It highlights the main findings and their implications. Besides, it outlines the main limitations of this research and suggests some recommendations for future studies in the scope of the banking capital regulations, financial stability, and performance. This chapter starts with section 7.2 that reviews the main research questions and the adopted methodology to answer the research questions. Section 7.3 summarises the main findings on the impact of the capital on the banking risks, while section 7.4 summarises the main findings on the impact of the capital on the banking performance. The contribution and implications of the research results are presented in section 7.5. This chapter ends with section 7.6 that highlights the main limitations and recommendations for future studies.

7.3 Research Questions and Methodology:

Over the past couple of decades, bank capital regulations have been changed significantly especially after the introduction of the Basel Accords II in 2004, the Basel Accords II.5 in 2009, and the Basel Accords III in 2010. Banks have been asked to build up their capital level to meet the new regulatory capital requirements. This research examined the impact of the capital on banking risk and performance over the sample period 2003 to 2014. This research aims to answer the following main questions:

Q1. What is the impact of the capital on banking risk? This research question aims to assess whether a higher capital level implies less riskiness in the banking business.

Q2. What is the impact of the capital on banking performance? This research question aims to assess whether a higher capital level implies promoting better banking performance.

Q3. Is the capital-risk nexus (and capital-performance nexus) homogenous? This research question aims to assess if the effectiveness of the capital and its regulations are affected by other factors. This research focuses on three factors: ownership nature, the restrictiveness of the regulatory environment, and the level of economic and financial development in a country.

These questions are answered empirically by formulating several hypotheses based on the theoretical framework and previous studies. These hypotheses are tested using panel-based regression analysis. The research uses a panel-based random effects model with error terms clustered at the firm level as a statistical method. The research examined the relationship between the capital, risk, and performance based on a panel of 446 commercial banks from both the OECD countries and the MENA countries. The following sections summarise the main findings.

7.4 Conclusion on the impact of the capital on the banking risk:

In this section, there is a summary of the main findings in Chapter Five of the thesis. The purpose of Chapter Five is to analyse the impact of the capital on the banking risk over the sample period 2003 to 2014. This sample period experienced regulatory reforms in the capital requirements framework. The regulatory reforms were designed to be more reflective of banks' idiosyncratic risks. The interest of Chapter Five is based on these regulatory changes to provide more recent empirical evidence on the impact of capital regulations on banking risk behaviour. The chapter examined the capital and risk nexus with a consideration of the differential in the ownership profile, regulatory pressure periods, and level of economic and financial development of countries. These three aspects were accounted for in the evaluation of the capital and risk nexus to account for factors that reflect the heterogeneity of banking institutions. The heterogeneity factors contribute to explaining the variation in the capital-risk nexus. The empirical results of Chapter Five have documented the following main evidence:

- The results showed that capital-risk nexus is a significant association. This association found to be varied according to the heterogeneity of the level of economic and financial development of countries.
- Heterogeneity in the risk behaviour of banks according to their capital level: the results showed that the impact of the capital level on the banking risk varies according to the capitalisation level. Undercapitalised banks found to be associated with high risk, while better-capitalised banks found to be associated with low risk.
- The results did not provide sufficient evidence on the role of the ownership nature in explaining the heterogeneity in the capital and risk nexus. For instance, both listed and unlisted undercapitalised banks were found to be associated with high credit risk over the sample period 2003 to 2014
- The results showed that the regulatory reforms did not influence all the riskiness of banks in the same manner. The results showed that not all undercapitalised banks found to be associated with high-risk. Profitable-undercapitalised banks and diversified banks found to be associated with less risk only during the period of less regulatory pressure. While, listed undercapitalised banks associated with high-risk compared to other unlisted undercapitalised banks even during the period of more regulatory pressure. Whereas, better-capitalised listed banks did change their risk behaviour from high-risk banks during less regulatory pressure period to less-risk banks during the high regulatory pressure period.
- The results demonstrated that the credit risk of banks, which started executing the new amendments of the Basel II since 2006, found to have a lower risk level compared to banks that kept implementing the Basel Accords I during the sample period (i.e., 2006 to 2012). On the other hand, banks implemented the Basel Accords III found to be associated with high credit risk.
- Heterogeneity in the risk behaviour of undercapitalised banks versus better-capitalised banks across countries with different economic and financial development levels: The results showed that the capital and risk nexus for capitalised banks differs in countries with different economic and financial development levels.

Chapter Five has provided the above recent evidence on the impact of the capital level on the riskiness of the banks over the sample period 2003 to 2014. The results showed evidence that not all high-capital banks associated with low risk during the sample period. Bank managers were found reducing their riskiness in a specific type of banking activities, while they were involved in other activities that keep their portfolio risk. The results also showed that the capital-risk nexus varied according to the capitalisation level. Undercapitalised banks, which failed to meet the minimum regulatory capital requirements, found to be associated with a different level of riskiness compared to better-capitalised that met the minimum regulatory capital requirements. However, the results showed that not all banks adopted the same risky behaviour. The capital-risk nexus should be assessed with consideration for other heterogeneity factors that could provide a better understanding of the variation in the banking riskiness. The Chapter found that the ownership profile, the regulatory pressure periods, and the level of economic and financial development of countries are critical heterogeneity factors that should be considered in the assessment of the capital-risk nexus.

From an ownership perspective, the results did not find evidence that listed banks were associated with less risk compared to unlisted banks during the sample period. In addition, there was no evidence that the capital-risk nexus vary among banks with different ownership profile. There was no sufficient evidence that the risk behaviour of banks' managers of the high-capital listed banks differed from the behaviour of banks' managers of high-capital unlisted banks. However, the results of the Chapter showed that accounting for both ownership profile and capitalisation level as heterogeneity factors could provide a better understanding of the relationship between the capital level and the risk behaviour. The risk level of banks with different capitalisation level found to be varied significantly among listed and unlisted banks. A low-risk level found to be associated with listed better-capitalised banks during the sample period (2003 to 2014), while a high-risk level found to be associated with unlisted undercapitalised banks during the same period. These results reflect the variation in monitoring incentives according to the nature of the ownership profile and capitalisation level. The listed better-capitalised were found to be more affected by the market discipline, which is required by law, compared to others. These banks found to have the preference signalling to both regulators and the market that they already meet the minimum capital requirements, and their portfolio was safe. They did not want to signal bad indicators to their stakeholders, and they choose to reduce their risk level. Besides, the capital level in these banks provided a net safety for them, and it did not make them shift their lending portfolio toward riskier assets.

On the other hand, undercapitalised banks were found to be associated with the moral hazard issue in which they found to be associated with high risk even though their regulatory capital level is low. The results showed evidence that undercapitalised banks were involved in high-risk compared to other banks. The same positive association documented in all banks regardless of their ownership profile. All undercapitalised listed and unlisted banks found to be associated with high-risk. This positive association supports the existence of the moral hazard issue during the sample period. Undercapitalised banks, regardless of their ownership profile, were found to be associated with high credit risk and high asset portfolio risk. These undercapitalised banks, which are supposed to reduce their risk level to not breach the regulatory requirement, might attempt to invest in high-risk assets to generate higher expected returns that could help them to increase the capital level during the next period. Not only undercapitalised banks found to be associated with high risk, but even pressurised banks that were not meeting their target capital ratio. The results showed that the pressurised banks were associated with high credit risk and asset portfolio risk too, although they were supposed to reduce their risk level because they were more likely to breach the minimum capital requirements due to any probability of downturn pressure.

From the perspective of the impact of the regulatory pressure, the results showed that not all undercapitalised banks were associated with high risk. Chapter Five conducted further examination for the capital-risk nexus during both prior and post-period of the regulatory changes to provide insights on the characteristics of banks that were associated with high risk. The results showed that the capitalisation level and restrictiveness of the regulatory pressure environment were critical to recognise the characteristics of banks that tended to be associated with high risk. For instance, undercapitalised-profitable banks found to be associated with less credit risk during the period that experienced less regulatory pressure. However, these banks found to be associated with high asset portfolio risk at the same time. After the introduction of the new regulatory requirements, as per the Basel Accords, there was no evidence that those undercapitalised-profitable banks reduced their riskiness.

Furthermore, diversified banks were able to reduce the riskiness of their portfolio only during the less regulatory pressure period regardless of their capitalisation level. However, there was no evidence that these diversified banks were able to reduce their risk level during the period that experienced more regulatory pressure. These results highlight the potential attempt of these profitable and diversified banks to invest in high-risk activities to obtain higher returns, especially during the period that experienced less regulatory restrictions. Moreover, the results showed that there were observable differences in the risk behaviour of the undercapitalised banks versus better-capitalised banks according to the ownership profile. The results showed that the listed undercapitalised banks were associated with high-risk compared to other unlisted undercapitalised banks during the period of less regulatory pressure. Association of the listed undercapitalised banks with higher risk level compared to other banks supported the existence of moral hazard issues during the period of less regulatory pressure. This result questioned the effectiveness of a monitoring environment and the impact of the regulatory changes in the regulatory capital framework on the risk level during the period of less regulatory pressure (2003 to 2008). On the other hand, better-capitalised listed banks did change their risk behaviour from high-risk banks during less regulatory pressure period to less-risk banks during the high regulatory pressure period. This result supports the previous result that better-capitalised listed banks worked to send a positive signal to both regulatory authorities and public that they can meet the regulatory requirements, and they reduced their risk level during the period more regulatory instructions were introduced.

The Chapter also examined the direct effect of the implementation of both the Basel Accords II and Basel Accords III on the risk level, respectively. In term of the Basel Accords II, the results showed that the risk level of banks, which started implementing the new amendments of the Basel II after 2006, had less credit risk and more risk-weighted assets compared to other banks that kept using the Basel Accords I. low credit risk implies that the banks assess their lending portfolio more effectively, and hence they tend to have less credit risk. However, there was no evidence that riskiness of their asset portfolio is reduced too. In addition, there were no evident results supported the association of undercapitalised and better-capitalised banks, which were implementing the Basel Accords II, associated with less risk. In term of the impact of the implementation of the Basel Accords III during 2013/2014, the results proved that banks responded to the regulatory requirements, and they tended to be involved in less risk-weighted assets in their portfolio compared to other years. However, these banks found to be associated with higher credit risk during the same period. Banks started implementing the Basel III, while they had a risky lending portfolio. There were no sufficient data to assess whether this high credit risk is associated with undercapitalised banks or better-capitalised capitalised banks.

The last aspect that was examined in the capital-risk nexus is the consideration of the heterogeneity of economic and financial development across countries that were included in the sample. As stated above, the results showed that the existence of the risky undercapitalised banks questioned the effectiveness of a monitoring environment and the impact of the regulatory changes in the regulatory capital framework on the risk level over the sample period (2003 to 2014). The results supported the importance of considering both the capitalisation level and stages of economic and financial development to assess the risk behaviour of banks. The results showed that the capital and risk nexus for capitalised banks differed in countries with different economic and financial development levels. From one side, the results showed that the COED undercapitalised banks were associated with less risk, while it is the MENA undercapitalised banks that were associated with high-risk. On the other side, the results demonstrated that the OECD better-capitalised banks were associated with high risk, while the MENA better-capitalised banks were associated with less risk.

7.5 Conclusion on the impact of the capital regulations on banking performance:

In this section, there is a summary of the main findings in Chapter Six of the thesis. The purpose of Chapter Six is to analyse the cost of adopting the capital regulations, and its amendments over the sample period 2003 to 2014. This analysis was conducted by examining the capital-performance nexus to provide more recent empirical evidence on the impact of capital regulations on both profits- and cost-based performance during the sample period. The nexus was examined with consideration of the differential in the ownership profile, regulatory pressure periods, and the level of economic and financial development of countries. These three aspects were accounted for in the evaluation of the capital and performance nexus to account for factors that reflect the heterogeneity of banking institutions. The heterogeneity factors contribute to explaining the variation in the capital-performance nexus. The empirical results of Chapter Six have documented the following evidence:

- The capital level of banks found to have a positive impact on bank performance. However, the results showed that the impact of the capital level on banking performance varies according to the capitalisation level. Undercapitalised banks found to enjoy higher banking performance compared to better-capitalised banks.
- The performance level found to vary according to the ownership profile. Listed banks found to be more profitable in generating higher income from their resources compared to unlisted banks. However, there was no evidence of the heterogeneity in the capital and performance nexus according to the ownership profile.
- The results showed that regulatory restrictions did not influence the performance of all banks. The cost level of undercapitalised banks changed after the post-period of the regulatory pressure. Unlike the period of less regulatory pressure, undercapitalised banks found to be associated with high operating costs during the post-period of the regulatory pressure. Profit level of undercapitalised banks did not change over the period that experienced imposing additional regulatory restrictions. Better-capitalised found to be associated with less earning

and high operating cost during both periods of less and more regulatory pressure.

- There was no sufficient evidence that Basel Accords II improved the performance level. The impact of the Basel Accords III was significantly reflected in the banking performance level. Banks implemented the Basel Accords III found to be associated with less earning and less operating costs.
- The results showed that the economic and financial development level does influence on both the banking performance level and the capital-performance nexus. The results showed that the MENA banks found to be associated with better performance in generating high earnings from their resources, and they were associated with less operating costs compared to the OECD banks. The impact of the capital level on banking performance found to be varying across countries with different level of economic and financial development.

The empirical results of the research chapter found that the capital level was associated positively with the profit-based performance, and negatively with the cost-based performance as expected by the "bankruptcy costs hypothesis". This hypothesis suggests that increases in the banking capital level reflect higher survival probability since the capital acts as a buffer against unexpected losses. Those high-capital banks are expected to have higher creditworthiness, and a better relationship with customers compared to others. Hence, they are more able to generate more revenues at a lower cost. However, the results showed that this capital- performance nexus varies according to the capitalisation level. Undercapitalised banks found to be associated with high earnings and low costs, while better-capitalised banks found to be associated with low earnings and high costs. These results imply that undercapitalised banks, which are not meeting the regulatory minimum capital requirements, were able to utilise their resources to generate high earnings and operate at lower costs. The results showed that those undercapitalised banks were associated positively with earnings (as measured by returns assets (ROA) ratio and net interest margin (NIM) ratio) and negatively with operating costs (as measured by the total costs ratio) during the sample period 2003 to 2014. Those undercapitalised banks might work on utilising their resources to make high earnings and reduce their operating costs to offset the regulatory capital requirements and the relevant regulatory costs. However, this result does not mean that undercapitalised banks are safely operating as it is highlighted below. On the other side, holding the capital ratio above the minimum capital banks found to have an adverse impact on banking performance. Better-capitalised banks, which are already having a capital ratio above the regulatory minimum capital requirements, found to be associated negatively with the earnings and positively with the operating costs during the same sample period (i.e., 2003 to 2014). This result supports the argument those who pointed out a potential opportunity cost of holding high capital levels rather than involved in more profitable investment opportunities (see, e.g., Demirguc-Kunt et al., 2003; Altunbas et al., 2007; and Goddard et al., 2013).

The capital-performance nexus was also examined with consideration of the differential in the ownership profile, regulatory pressure periods, and level of economic and financial development of countries. From the ownership perspective, the results found evidence that the performance level varies among banks with different ownership profiles. Listed banks found to be better in utilising their resources to generate high earnings. However, there was no evidence of the variation in the relationship between capital level and banking performance across banks with different ownership profile. All listed banks, unlisted banks, and domestic-owned banks found to be the same capital-performance nexus over the sample period 2003 to 2014. Similar findings were also reported in the literature, e.g., Lin et al., 2005; Altunbas et al., 2007; Micco et al., 2007; and Pasiouras et al., 2009 who found no major differences in the relationship between capital and performance according to ownership profile. Even the above-stated capital- performance nexus of capitalised banks (both undercapitalised and better-capitalised banks) did not change among banks with different ownership profile.

From the perspective of the impact of the regulatory pressure, the banking performance of capitalised banks was examined during both less regulatory pressure period (i.e., 2003 to 2008) versus more regulatory pressure period (i.e., 2009 to 2014). The results showed that undercapitalised banks were associated with high earnings, and this association found to be more significant during the period that experienced more regulatory restrictions (i.e., 2009 to 2014) when the new amendments of the Basel Accords II.5 and Basel Accords III were started to be implemented in 2009 and 2013 respectively. The results showed characteristics of undercapitalised banks that tended to be associated with high earnings. Particularly, undercapitalised-risky banks and undercapitalised-diversified banks were found to be associated with high earnings. Even undercapitalised-listed banks found to be associated with high earnings to signal positively to the public that they are doing well. The association of the undercapitalised-risky banks, which tend to be associated with low-quality lending assets, with high earnings implies that they were involved in high-risk high- return strategies. In term of cost performance, the results showed that undercapitalised banks found to be associated with less operating costs only during the period of less regulatory pressure (i.e., 2003 to 2008). There was no sufficient evidence that these undercapitalised banks were associated with less banking operating costs during the period of more regulatory pressure (i.e., 2009 to 2014). For example, undercapitalised-diversified banks found to be associated with high operating costs during the period that experienced more regulatory pressure. Besides, undercapitalised-listed banks found to be associated with more operating costs compared to other banks during the same period. These results give indications that imposing more regulatory pressures, which are reflected in the form of additional capital requirements and disclosure requirements as per the Basel Accords II.5 and Basel III, found to have an adverse impact of the operating cost of undercapitalised banks. Undercapitalised banks found their own strategies to generate high-earnings but they associated with high operating costs at the same time.

On the other hand, the results showed no evidence that better-capitalised banks were performing better after the introduction of the amendments to the Basel Accords during the restrictive regulatory period (i.e., 2009 to 2014). Only better-capitalised diversified banks found to be associated with high net interest margin compared to others during the period when more regulatory requirements are imposed. Though high margin is an indication of high earning from a bank perspective, increases in net interest margin imply increases in the banking intermediation cost. Indeed, there were no evidence better-capitalised banks associated with less operating costs in the period when additional regulatory capital requirements were imposed. More specifically, better- capitalised listed banks found to be associated with high banking costs during the restrictive regulatory period. Overall, the results pointed out that the banking performance influenced adversely by the regulatory restrictions. Undercapitalised banks found to be associated with high operating costs and they tend to be involved in risky activities to generate high earnings even during the period that experienced more regulatory restrictions. On the other hand, better-capitalised banks, which tended to keep holding capital ratio above the minimum capital, found to be associated with less profit-based performance and high operating costs too during the same period.

The results also showed no sufficient evidence that the performance level was improved for banks that start implementing the Basel Accords II during the whole period of (2006 to 2012). The results showed evidence that these banks, which started implementing the new amendments of the Basel II after 2006, were found to be associated with high net interest margin (NIM) compared to banks that kept adopting the Basel Accords I during the same sample period (i.e., 2006 to 2012). However, charging a high net interest margin implies an increase in the banking intermediation costs. In this regard, Chapter Five has documented evidence that these banks, which started implementing the Basel Accords II during the whole period of (2006 to 2012), were associated with low credit risk. Hence, banks might charge a high margin to compensate the shrink in their lending portfolio as they tend to be less involved in low-quality lending assets. Besides, Chapter Five has documented evidence that those banks, which started implementing the Basel Accords II during the whole period of (2006 to 2012), associated with high assets portfolio risk. This result implies that banks involved more in other activities to compensate for regulatory costs and improve their earnings level. There was no evidence that banking operating cost reduced during the same sample period.

In terms of the impact of the implementation of the Basel Accords III, the results showed that it had an adverse impact on the profit performance. Banks, which started implementing the Basel Accords III requirements during 2013/2014, were found to be associated negatively with profit-based indicators (as measured by the ROA ratio and NIM ratio). During 2013/2014, banks were asked to boost both the quantity and quality of their capital level in responding to their exposure to risky activities. Banks were also required to disclose their both on- and off-balance sheet activities. The association of low earning with these banks, which started implementing the Basel Accords III, implies that banks worked to reduce their risky activities that are eventually lead- to having low earnings. Chapter Five has also documented evidence that these banks, which started implementing the Basel Accords III, were associated with a low portion of risk-weighted assets in their asset portfolio. Banks tended to be involved in more safe assets. This result supports the results of Chapter Five in which those banks that implemented the Basel Accords III during 2013/2014 found to be associated with less risk-weighted assets. The results showed that the banking operating costs, as measured by the TCA ratio, found to be lower for banks that started implementing the new amendments of the Basel III during the period 2013-2014 compared to previous years. Low operating costs during 2013-2014 reflects banking efforts to minimise their both interest and non-interest-based expenses during a period that banks are required to build up their capital level. There were no sufficient data to assess the influence of the new amendments in the Basel Accords III on banks with different capitalisation level.

The last aspect that was examined in the capital-performance nexus is the consideration for the heterogeneity of economic and financial development across countries that were included in the sample. The results showed that the country's economic and financial development level is an important factor to be considered when examining the capital and performance nexus. The results showed that capital and performance nexus differ in countries with different economic and financial development. On the one hand, banks in the MENA countries are more concentrated, and they are operating in less developed economic and financial markets. The better-capitalised banks, which were already meeting the minimum capital requirements, found operating with low performance in the MENA during the sample period (2003 to 2014). The results showed that holding high-capital level associated with a potential opportunity cost rather than involved in more profitable investment opportunities as argued by Gorton and Claessens, 1998; and Goddard et al., 2013. Better-capitalised MENA banks found to be associated with less earning and high operating costs. On the other hand, undercapitalised banks in the MENA countries found to be associated with high earnings and low operating costs. These banks seemed working to utilise their resources to make high earning that could be used to offset the regulatory capital requirements in countries where financial markets are less developed. Notably, most of the banks in the MENA countries are small-sized banks, and they could have less chance to expand their activities. Compared to the MENA banks, the better-capitalised OECD banks, which are already meeting the minimum capital requirements, found to be more profitable banks compared to others. The results showed no sufficient evidence that the OECD undercapitalised banks were performing well.

7.6 Contribution and Implications:

The results of this research have contributed to the banking literature via clarifying and analysing the relationship between banking capital, risk, and performance using the most recent dataset (2003 to 2014). This analysis aimed to comprehensively examine the impact of the capital and its recent regulatory changes on both banking risk behaviour and banking performance. The results of the research have several important implications from both theoretical and practical aspects, as discussed below:

From a theoretical perspective, the results of this research provide important insights on the impact of the capital on the banking risk and its effects on banking performance during the period the experienced the most recent changes in the capital regulations as per the Basel Accords II, II.5, and III. As indicated in Chapter Three, there is a lack of recent studies that have examined the impact of the capital on the banking risk and performance with consideration for the factors that account for the heterogeneity of financial institutions. This research fills this gap by clarifying and analysing the relationship between banking capital, risk, and performance with consideration of the following different perspectives: heterogeneity of ownership profiles, heterogeneity of the regulatory pressure period, and heterogeneity of economic and financial developments of countries where banks operate. This research provides evidence that these heterogeneity factors explain variation in the risk behaviour and performance level of banks in both capital-risk nexus and capital-performance nexus. In view of these heterogeneity factors, the main conclusions of this research are as follow:

- From a regulatory pressure perspective: this research concluded that the risk level and banking performance varied significantly according to the capitalisation level Undercapitalised banks, which are not meeting the minimum regulatory capital requirements, was found to be associated with high-risk and better performance level (high-profit level and low-cost level). On the other hand, better-capitalised banks, which are already meeting the minimum regulatory capital requirements, were associated with low-risk, less performance level (low-profit level and high-cost level). Studies should account for the regulatory capitalisation level in their assessment for the impact of the capital on banking risk and performance.

- An ownership perspective reflects the attitude of the managers to manage their capital-risk relationship and account for a potential cost that is associated with the implication of the capital regulations. From this perspective, this research concluded that high-capital listed banks associated with less risk and they are better in generating higher income from their resources compared to unlisted banks over the sample period (i.e., 2003 to 2014). This result gives an indication that the capital regulations should be applied in alignment with other market discipline regulations. Studies should account for market discipline in their assessment for the impact of the capital on banking risk and performance.

- From the perspective of a regulatory pressure period: this research concluded that not all banks responded to the regulatory reforms as expected by the regulators. There are listed undercapitalised banks were found to be associated with high-risk and high operating costs even during the period when more regulatory pressures were imposed (i.e., 2009 to 2014). Whereas, better-capitalised listed banks did change their risk behaviour from high-risk banks during less regulatory pressure period to less-risk banks during the high regulatory pressure period. They were also found to be associated with less earning and high operating cost during the period of more regulatory pressures (i.e., 2009 to 2014).

- From the perspective of economic and financial development level: this research concluded that the economic and financial development level of a country influences both capital-risk nexus and capital-performance nexus. From one side, the results showed that the COED undercapitalised banks were associated with less risk, but there was no sufficient evidence that the OECD undercapitalised banks were performing well. At the same time, the MENA undercapitalised banks found to be associated with high-risk and better performance level (high-profit level and low-cost level). On the other side, the results demonstrated that the OECD better-capitalised banks are associated with high risk and high profit. While the MENA better-capitalised banks were associated with less risk and they were less profitable. These results indicate that the effectiveness of the capital regulations is affected by the effectiveness and quality of the overall economic and financial development of a country. Studies should account for the quality and the stage of economic and financial development in their assessment of the impact of the capital regulations on banking risk and performance.

In view of these conclusions, the results of this research highlight the importance of considering heterogeneity factors to understand the contradictory findings in both the capital-risk nexus and capital-performance nexus. These nexuses should not be assumed to be homogenous. The results of the research support the argument of Morrison and White (2005) who argued that the impact of the capital requirements requires consideration for heterogeneous banks. The results of this research and the heterogeneity factors that are accounted in this research could be used as a benchmark for future studies that examine the impact of the capital regulations, financial stability, and its cost.

From a practical perspective, the results of this research highlight very important implications that are relevant to different stakeholders (e.g., policymakers, regulatory, supervisory parties, regulatory authorities' parties, and banks). For instance:

Policymakers: the results of this research suggest that capital regulations alone will not be effective to influence the risk behaviour and performance level. The finding that high-capital listed banks were associated with less risk and better performance compared to unlisted banks implies that the capital regulations should be applied in align with other market discipline regulations. This result supports the argument that the capital requirements should be supplemented with other regulations (see, e.g., VanHoose, 2007; and Pasiouras et al., 2009). Policymakers should account both capital regulations and market discipline to obtain the more effective impact of capital regulations.

Supervisory parties: the results of this research chapter also suggest that the effectiveness of monitoring mechanisms is critical to assess the effectiveness of regulatory requirements to maintain financial stability. Banks might show the willingness to meet the regulatory requirements, but they are motivated to invest in risky activities that maximise their benefits. The results of this research showed that undercapitalised banks, which are supposed to reduce their risk level and work to meet the regulatory capital requirements, found to be associated with high credit risk and high risk-weighted assets even during the period when there were additional regulatory pressures. They were also associated with the high-profit level and less operating costs. These undercapitalised banks might work on utilising their resources to seek for high earnings and reduce their operating costs in order to offset the regulatory capital requirements and relevant regulatory costs. Furthermore, the results showed that high-capital listed banks were found to be associated with less risk, while high-capital unlisted banks related to high risk. These results imply that further attention should be paid to the effectiveness of monitoring and disciplining banks. These results support the views that highlighted the importance of effective screening and monitoring banks to obtain an effective implementation of the capital requirements (see, e.g., Furfine, 2001; Morrison and White, 2005; Kopecky and VanHoose, 2006; and Kopecky and

VanHoose, 2012). Supervisory parties should account for enhancing the monitoring mechanisms aligned with the implementation of the regulatory capital requirements.

Regulatory authorities: another implication of the results of this research is the importance of improving the overall legal environment and the level of economic and financial development. The results showed that undercapitalised banks in developing countries were associated with a risk while undercapitalised banks in developed countries were found to be associated with low risk. This result implies that undercapitalised banks behave differently in countries with different level of development. Similarly, better-capitalised banks in developed countries were associated with higher risk due to the availability of wider investment opportunities, while better-capitalised banks in developing countries were associated with lower risk and they were associated with low performance. Regulatory authorities should account to improve the effectiveness and quality of the overall economic and financial development of a country. This result supports the view of those who highlighted the quality of institutional, legal environment affects bank behaviour (see, e.g., Dincer and Neyapti, 2008; Evrensel, 2009; Haselmann and Wachtel, 2010; and Terblanche, 2012). The effort of the regulatory authorities should not be limited to improve the capital regulations alone without the consideration of the legal system and development of the financial markets.

Supervisory parties and Banks: the results of this research provide insights on the effects of the Basel Accords II, which is scheduled to be applied over phases from 2013 to 2018. This research found that even though the impact of the amendments for the Basel Accords III was reflected by a reduction in the share of the risk-weighted assets during the period 2013-2014, but banks were still associated with high credit risk and less earning during the same period. The actual impact of the current amendments in the Basel Accords III on the credit risk and profit-based performance needs further examination especially that the Basel III will be implemented fully in 2018. These banks, which started implementing the Basel Accords III and they were associated with credit risk, might seek for high-risk high-return strategies in an attempt to obtain higher returns that could be used to show a better position and compensate for the additional regulatory requirements. Based on the results of this research, there were no evident results to support the association of both undercapitalised banks and better-capitalised banks, which were implementing the Basel Accords II, with low credit risk. The results also showed that profitable undercapitalised were associated with high credit risk. From the regulatory perspective, the Basel Accords III might not be able to absorb credit risk at least in the short term, and banks were found to be associated with low performance. The effectiveness of the capital regulatory requirements requires coordinating with other financial regulations and legal environment to be more effective in promoting the stability of the banking system as stated above.

7.7 Limitation of the Research and Recommendation for the Future Studies:

The above conclusions and implications should be accounted with the consideration that this research has some limitations. The main limitations are the following:

- **Measurement Indicators**: the current research uses accounting-based variables to measure the risk level and banking performance. Two variables are used as a proxy for the risk level; mainly nonperforming loan (NPLs) ratio and risk-weighted assets (RWAs) ratio. Besides, there are three variables that are used as indicators for the performance level: Retune on Assets (ROA) ratio, Net Interest Margin (NIM) ratio, and Total Costs (TCA) ratio. In terms of the risk indicators, the given risk indicators are more related to the riskiness of an individual financial institution. The recent financial crisis has shown that the impact of a single institution had extended to influence the whole financial system. This perspective of interconnected risk should be considered in the future studies especially that the Basel Accords III has introduced additional capital for Global Systemic Financial Institutions (GSFIs). The latter are institutions which are interconnected via various complex financial instruments. Thus; questions on the role of the capital to limit transmitted exposures across the financial system and economy should be accounted in future studies. In terms of banking performance, the adopted banking performance indicators are based on a single element to assess the performance of a bank. The banking performance can be measured using benchmarking techniques that adopt multiple elements to identify the efficient banks, e.g. data envelopment techniques and stochastic frontier models. Future studies could include different type of measurements for banking risk and banking performance to obtain robust results on the impact of banking capital and its regulations.

- **Long-term effects of the Basel Accords III**: this research assessed the effects of the Basel Accords III based on a short-term period (mainly during the period 2013 to 2014). Long-term effects of the Basel Accords III could be examined by expanding the sample period to cover a longer period. Expanding the sample period could enrich the reliability of the results that are related to the effects of the Basel Accords III. The results of this research showed that the effect of the Basel Accords II differed from the effects of the Basel Accords III. Future studies could expand the sample period and examine the effects of the Basel Accords III on both risk level and performance level.

- **Estimation Method**: the adopted estimation method in this research is a robust cluster random effects model. However, there is no one particular method that could be considered as the best method to estimate a regression to obtain efficient and consistent estimators (Fuller and Battese, 1973). For instance, the risk-capital nexus and performance-capital nexus are potentially associated with an endogeneity issue. In this research, the capital level is used as one of the independent variables that impact on the risk level and performance level too. Theoretically, some argue that the opposite direction of risk-capital nexus (and performance-capital nexus) is possible too. In other words, high capitalized banks might associate with a less restrictive monitoring environment; thereby they may have more incentive to increase their risk level (and potentially to gain high returns). Thus; there are variables are influencing each other. Econometrics literature refers to this case as endogeneity issue in which there is a correlation between dependent and independent variable. This issue has been handled by using simultaneous equation model. This model has the advantage of considering joint relationship between dependent and independent variables as suggested by Shrieves and Dahl (1992).

Moreover, the adopted estimated method in this research is based on no assumptions to control within-cluster correlation, i.e., it allows for arbitrary correlation within the cluster, and the form of this correlation could vary from cluster to cluster. This unspecified correlation implies that there is no correlation between observations ($u_{i,t}$) and ($u_{k,t}$). This limitation could be overcome in the future studies via considering the Generalized Method of Moment (GMM). This method is characterised to be based on the analogy principle in which estimation of unknown parameters is generated based on an equivalent sample that has the properties of a population with no need for assumptions about the distribution of available data. According to the central limit theorem, the mean of all samples will be closer to the mean of the population as the sample size gets large. These closer means imply that sample properties mimic population properties with increase in sample size. Hence; the expected value for a given function of an observed random variable can be predicted based on the available data in the equivalent sample. Besides, it is more suitable when there is heteroskedasticity or serial correlation issues. Indeed, it provides more ca onsistent and efficient estimators. However, the GMM method requires a large sample size (Hall, 2005).

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Appendixes

Appendixes

I. **Appendix**: Summary of Variables, Definition, and Data Source

Table I-1: Summary of variables, Definition, and Data Sources			
Classification	**Variable**	**Data Definition**	**Source**
Dependent Variables			
Risk	NPLs/Asset	NPLs-to-total assets	Bankscope (calculated)
	RWAs/Asset	Risk-weighted Assets –to- total assets	Bankscope (calculated)
Performance Level	ROA	Net Income –to-total assets	Bankscope (calculated)
	NIM	Interest income minus interest expense divided by interest-bearing assets	Bankscope (calculated)
	TCA	Total cost-to-total assets Where total costs are the sum of total interest expenses, total non-interest expenses, and personnel expenses	Bankscope (calculated)
Bank Control Variables			
Capital	Cap	Equity-to-total assets	Bankscope (calculated)
Size	Log Asset	Log of total assets	Bankscope (calculated)
Profitability*	ROA	Net Income –to-total assets	Bankscope (calculated)
Riskiness**	NPLs/Asset	NPLs-to-total assets	Bankscope (calculated)
Diversification	NII ratio	Non-interest income-to-total income	Bankscope (calculated)
Regulatory Pressure	REGU	Dummy variable with a value equal to $\text{Reg}_{i,t}^{\text{Under}} = (\frac{1}{\text{RBC}} - \frac{1}{\text{MRBC}})$ for all banks with a total risk-based capital ratio (RBC) of less than the minimum risk-based capital ratio (MRBC), otherwise zero.	Bankscope (calculated)
	REGO	Dummy variable with a value equal to $\text{Reg}_{i,t}^{\text{Over}} = (\frac{1}{\text{MRBC}} - \frac{1}{\text{RBC}})$ for all banks with a total risk-based capital ratio (RBC) of more than the minimum risk-based capital ratio (MRBC), otherwise zero	Bankscope (calculated)
	PCAU	Dummy variable with a value equal to $\text{Reg}_{i,t}^{\text{Under}}$= 1 if a bank fails to meet all or any of the three ratio requirements (i.e., above the minimum of total risk-based capital ratio, above 4% of tier 1 capital ratio, above 4% of the leverage ratio), otherwise zero.	Bankscope (calculated)
	REG-Ediz	Dummy variable with a value equal to $\text{Reg}_{i,t}$ = 1 if a bank's capital ratio less than one bank-specific standard deviation above the minimum capital requirement, otherwise zero	Bankscope (calculated)
	REGmcr	Dummy variable with a value equal to $\text{Reg}_{i,t}^{\text{Over}}$ =1for all banks with a total risk-based capital ratio (RBC) of more than the minimum risk-based capital ratio (MRBC), otherwise zero	Bankscope (calculated)

Bank Ownership	DV_i^{PLB}	A value of unity for publically listed banks in stock exchange markets, and zero otherwise.	Claessens and Van Horen database (as given)
	$DV_{i,t}^{Doms}$	a value of unity for domestic ownership, and zero otherwise. A bank is considered to be a domestic bank if more than 50% of shares are held by domestic owners.	
Macro Controlling Variables			
Inflation	INFL	Measured by consumer price index to reflect the annual percentage change in the cost of the consumers' goods and services in a country.	World Bank Database (as given)
GDP Growth %	GDPG	Annual growth rate of Gross Domestic Products	World Bank Database (as given)
Interest Rate Spread	IRS	The difference between the interest rate charged by banks on loans to private sector customers and the interest rate paid by commercial or similar banks for demand, time, or savings deposits.	World Bank Database and central banks' annual report (as given)
Notes: * It is used only in the risk level equation ** It is used only in the performance level equation			

Note that the above abbreviations will be used in the following parts of the chapter. The final column of the table gives sources of data. The dependent variables and bank-level controlling variables are obtained from the Bureau Van Dijk BankScope. The ownership controlling variables are from Claessens and Van Horen database. Moreover, macro controlling variable, in particular, interest rate spread (IRS) obtained from the World Banks Database. However, there were missing observations of interest rate spread (IRS) for a number of countries. The missing observations for a variable IRS were collected from the annual report of the central bank for a given stated country in the sample

II. Appendix: The Implementation of the Basel Accords

The implementation of the Basel Accords over the years in both the MENA countries and the OECD countries:

Table 0-2-1: The implementation of the Basel Accords over the years in both the MENA countries and the OECD countries

Year	Basel II	Basel 2.5	Basel III
2004			
2005	Kuwait		
2006	Qatar, Japan, Sudan, Switzerland, and European Union's Countries*		
2007	Canada, Malta, Morocco, Oman, Mexico, Republic of Korea, United States of America		
2008	Australia, Bahrain, Lebanon, Jordan, Saudi Arabia		
2009	Israel, UAE		
2010		Morocco	
2011		Lebanon, Japan, Switzerland, and European Union's Countries*	
2012	Egypt, Palestine, Tunisia, and Turkey	Bahrain, Egypt, Israel, Republic of Korea, UAE, United States of America	
2013	Mauritania	Kuwait, Saudi Arabia	Saudi Arabia, Tunisia, Australia, Canada, Switzerland, Mexico, Republic of Korea, United States of America, Japan, and European Union's Countries*
2014	Algeria	Qatar	Israel, Kuwait, Lebanon, Malta, Morocco, Oman, Qatar
2015			Bahrain, Palestine
2016			Turkey

Notes:

- European Unions' countries that are included in the sample are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, and United Kingdom.
- European countries apply the Capital Requirements Directives (CRD) as a banking supervisory framework that reflects rules of the Basel Accords on capital requirements. The Council and European Parliament officially enforce the first package of the CRD rules in 2006. These rules are consistent with the capital requirements rules as per the Basel II, yet the CRD had additional requirements to ensure the financial soundness of banks that are adopted in 2009 and known as the second CRD package. In 2011, the third version of the CRD package started implementing new capital requirements on trading and re-securitization that is consistent with the Basel Accords 2.5. The standards of the Basel Accords III have reflected the fourth package of the CRD that is implemented in the European banks in 2013.
- The sample includes countries that use Basel Accords I up-to 2014 are Djibouti, Iran, Iraq, Libya, Syrian Arab Republic, and Yemen.

Sources: Annual reports for different years at the website of Central Bank of each country

The number of banks applying the Basel Accords I, II, and III per year over the sample period 2003 to 2014 in both MENA countries and OECD’s countries:

Table II-2
The number of banks applying the Basel Accords I, II, and III per year over the sample period 2003 to 2014 in both MENA countries and OECD’s countries:

Year	Banks applied Basel Accords I	Banks applied Basel Accords II	Banks Applied Basel Accords III
2003	446	0	0
2004	446	0	0
2005	438	8	0
2006	291	155	0
2007	178	268	0
2008	110	336	0
2009	87	359	0
2010	87	359	0
2011	87	359	0
2012	32	414	0
2013	26	154	266
2014	14	114	318
Total Observations	2242	2526	584

Note: A stated number in each column represents the number of banks that applied a given Basel Accords in a given year.

Prepared by the author

III. Appendix: Trends in Key Variables

This section highlights some characteristics of banks in both the OECD countries and the MENA countries before and after the announcement of new reforms in the Basel Accords. These characteristics are identified via using bank-level variables that measure riskiness, performance, and bank size of banks in the current research sample.

Firstly, in term of banking risk, Figure III-1 shows the trend of risk level (as measured by the NPLs ratio and the RWAs ratio) with consideration for ownership profile, and the economic and financial development of countries. Both the NPLs ratio and the RWAs ratio are found to vary over the sample period, and they have different trends among subgroups. For example, Figure III-1 summarizes the risk trends over the sample period in which panel (A) shows the trend of the NPLs ratio, while panel (B) shows the trend of the RWAs ratio. The NPLs/Asset ratio is an indicator of banking credit risk. It is observed that there is an overall downward trend for the level of NPLs especially after the announcement of the Basel Accords II in 2004. The Basel II introduced a more sensitive risk-based capital requirement and imposed more disclosure requirements that could allow the public and the regulatory and supervisory authorities to assess the riskiness of banks. Banks became more aware that they need to meet these requirements especially more countries started their effective implementation of the Basel Accords II during 2005-2008.[153] Yet, the decline in the NPLs ratio does not necessarily mean that low-risk level. (Kiyotaki and Moore, 1997) argued that loan loss provisions could decline due to the attached value of collaterals. (Davis and Zhu, 2009), who examined banks from 15 of the OECD countries during the period 1989 to 2002, found a negative relationship between commercial property prices and bad loans ratio.

Nevertheless, it is observed that the second risk indicator, i.e., the risk-weighted assets (RWAs) ratio as shown in panel (B) in Figure III-1, shows there was an upward trend during the same period when the NPLs ratio was declining (i.e., 2004-2008). This upward trend of the RWAs ratio implies that riskiness of the banking portfolio is not reduced during the prior-crisis period.

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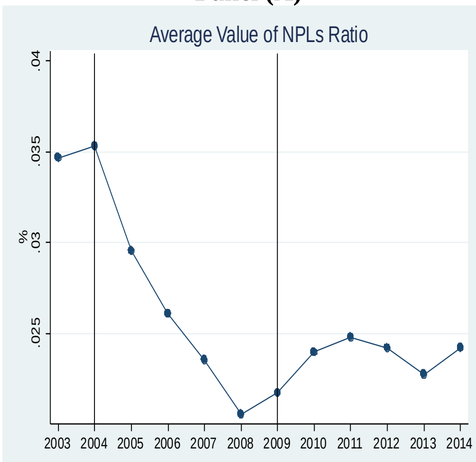
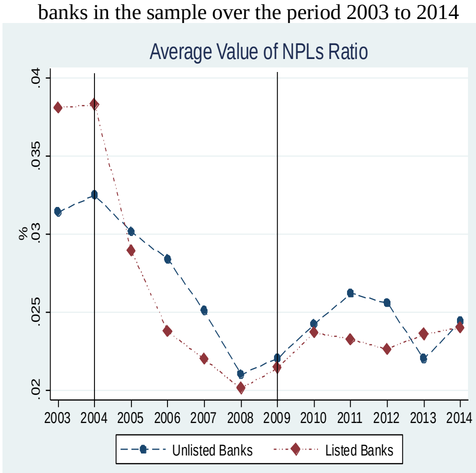
[153] Appendix II summarizes the implementation year for the Basel Accords II according to countries that are included in this research chapter.

Panel (A)	Panel (B)

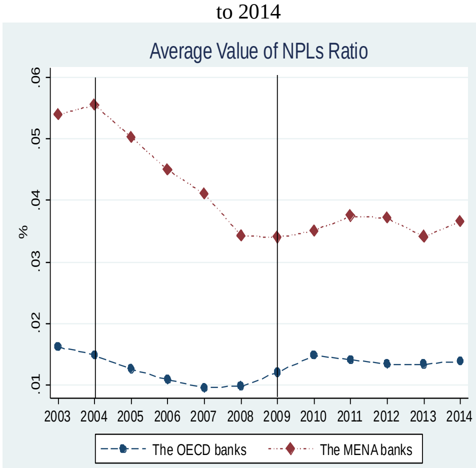
Panel (A)



Average values of the NPLs/Assets ratio for the whole banks in the sample over the period 2003 to 2014

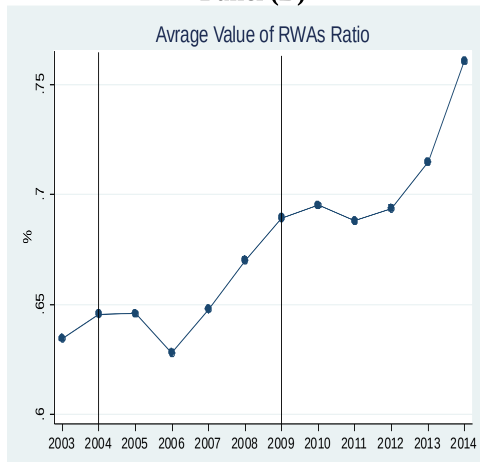


Average values of the NPLs/Assets ratio for unlisted banks (long dashed blue line line) versus listed banks (small dotted maroon line) over the sample period 2003 to 2014

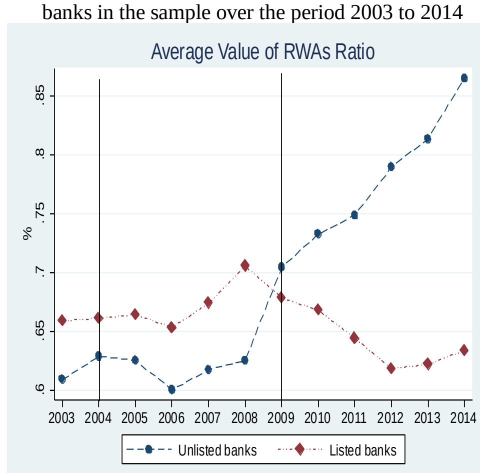


Average values of the NPLs/Assets ratio for the banks in the OECD countries (long dashed blue line line) versus banks in the MENA countries (small dotted maroon line) over the sample period 2003 to 2014

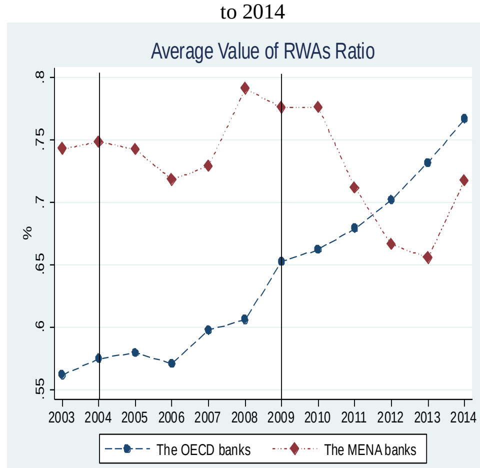
Panel (B)



Average values of the RWAs/Assets ratio for the whole banks in the sample over the period 2003 to 2014



Average values of the RWAs/Assets ratio for the unlisted banks (long dashed blue line line) versus listed banks (small dotted maroon line) over the sample period 2003 to 2014



Average values of the RWAs/Assets ratio for the banks in the OECD countries (long dashed blue line line) versus banks in the MENA countries (small dotted maroon line) over the sample period 2003 to 2014

Source: Author’s calculation based on the sample data

Figure 1II-1: Average value of banking risk level in the sample over the period 2003 to 2014

In contrast, it is observed that there was an upward trend for the level of NPLs out of the total assets since 2008. At the same time there were criticisms for the framework of Basel Accords II especially in term of valuation for collaterals and securitization (for example, (Kaplanski and Levy, 2007; Casu et al., 2011; Nijskens and Wagner, 2011; BCBS, 2013; Lutzenkirchen et al., 2013; Mayordomo et al., 2014) among others). However, a new framework of the Basel Accords, which is known as Basel II.5, was introduced in 2009 to overcome the limitations for the previous version of the Basel Accords, and more adjustments were also added in the Basel Accords III as it was announced in 2010.[154] Theoretically, the new amendments are expected to be more reflected for risk exposures. It is observed that the level of the RWAs out of the total assets kept increasing even more than the prior-crisis (i.e., 2007/2008). The risk-weighted assets ratio at the end of 2014 found to be higher than 2004. In term of subsamples, it is observed that the average trend of the NPLs ratio, which is based on the whole sample, is also found in both listed and unlisted banks (as shown in panel A in the second row). The same trend is found in banks from both the OECD countries and the MENA countries too (as shown in panel A in the third row). However, the average value of the NPLs ratio in unlisted banks was higher than listed banks over the entire sample period. While, the MENA banks found to have a higher rate of the NPLs compared to the OECD banks over the sample period (panel (A) of the second row in Figure III-1).

In contrast, the riskiness of banking asset portfolio, which is measured by the RWAs ratio, was not the same trend for banks with different ownership profile and mainly at the end 2008 (see panel (B) in the second row of Figure III-1). The riskiness of banking asset portfolio of unlisted banks increased considerably compared to listed banks during the same period. On the other side, the riskiness of the listed banks' portfolio reduced steadily. Listed banks are required by law to disclose their relevant financial information and the Basel Accords II.5 imposed also additional disclosure requirements in 2009. In term of a subsample of countries with the different economic and financial development level, it is observed that the riskiness of banking asset portfolio was growing in the MENA countries more than the OECD banks over the

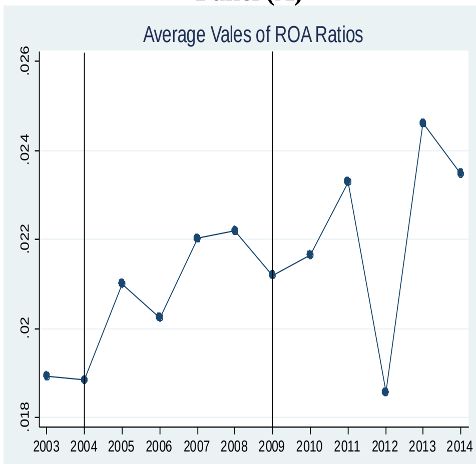
[154] Further discussion on the limitation of the Basel Accords II and new amendments of Basel Accords II.5 is elaborated in Chapter Two.

sample period except in the last two years when banks started implementing the Basel Accords III. However, there was a noticeable decline in the riskiness of asset portfolio in the MENA since 2008, while the level of the risk-weighted assets kept growing steadily after 2008 in the OECD counties (panel (B) in the last row of Figure III-1). During this post period of 2008, banks experienced more regulatory restrictions than before. Banks started implementing the new amendments of both Basel II.5 and Basel III. Yet, the effective implementation of these new amendments varied among countries.[155] The variation in trends of risk indicators highlights the importance of considering different proxies to assess the risk level. Each risk indicator has its characteristics and limitations. For instance, non-performing loans ratio focus on the risk of core banking activities which is lending activities. In addition, Rajan and Dhal (2003) pointed out the classification of loans as non-performing loans may not be consistent across countries due to different accounting approaches, and national regulatory might use different criteria to identify non-performing loans. Besides, it could be affected by the value of attached collaterals and securitization. On the other hand, the risk-weighted assets ratio is a more comprehensive risk indicator that captures both allocation of assets across different risk categories and the quality of loans as noted by Jacques and Nigro (1997). And it is computed consistently across all countries since it is based on the guidelines of the Basel Accords.

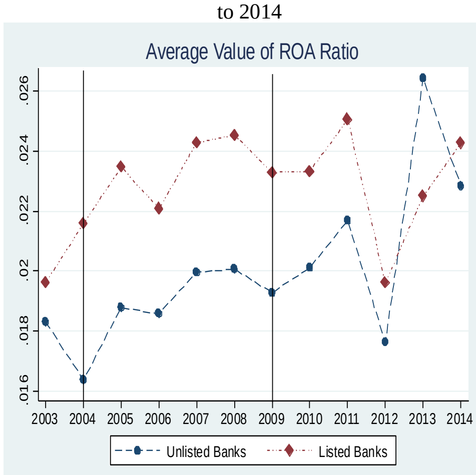
In term of banking performance, this research adopts profit-based indicators (as measured by return on assets ratio and net interest margin ratio), and cost-based indicator (as measured by total costs to assets). Figure III-2 shows the trend of profit-based indicators (both ROA ratio and NIM ratio) over the sample period. Overall, it is observed that both profit-based indicators fluctuated over the sample period. Yet, there is an upward trend experienced during the sub-period (2004 – 2008) before a sharp drop in earnings after 2008. The trend of both profit-based indicators found to more fluctuate during the sub-period (2009 – 2014). This period experienced the introduction and implementation of more regulatory reforms as per the Basel Accords II.5 in 2009 and the Basel Accords III in 2013. The same trend is observed in banks

[155] Appendix II summarizes the implementation year for the Basel Accords II.5 and Basel III according to countries that are included in this research chapter.

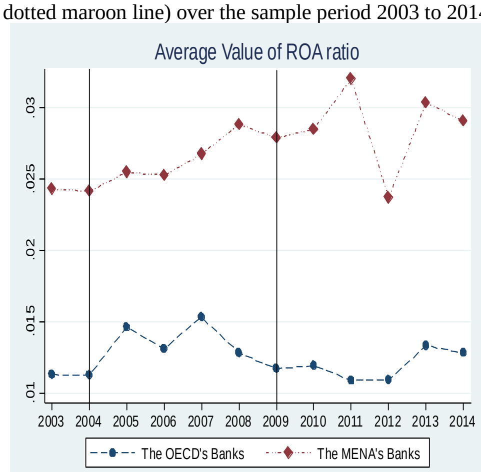
Panel (A)



Average values of Return on Assets (ROA) ratio for the whole banks in the sample over the sample period 2003 to 2014

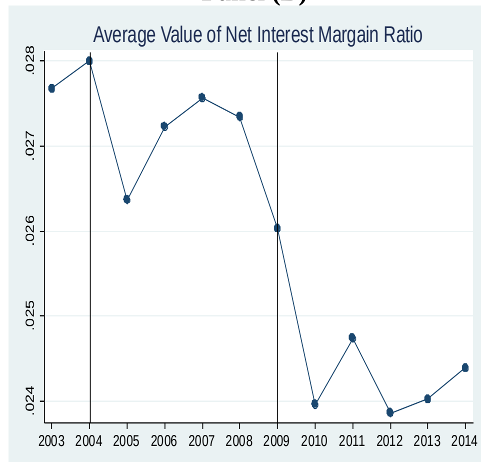


Average values of ROA ratio for the unlisted banks (long dashed blue line) versus banks in the listed bank (small dotted maroon line) over the sample period 2003 to 2014

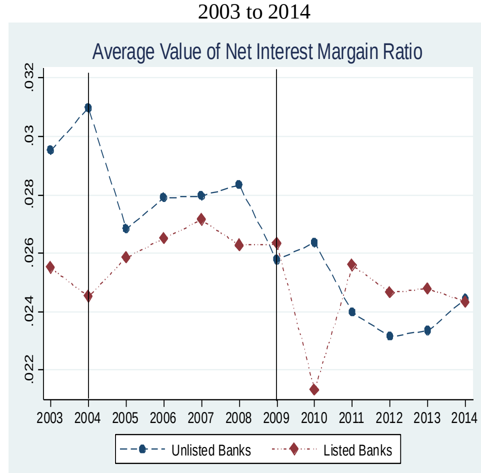


Average values of ROA ratio for the banks in the OECD countries (long dashed blue line) versus banks in the MENA countries (small dotted maroon line) over the sample period 2003 to 2014

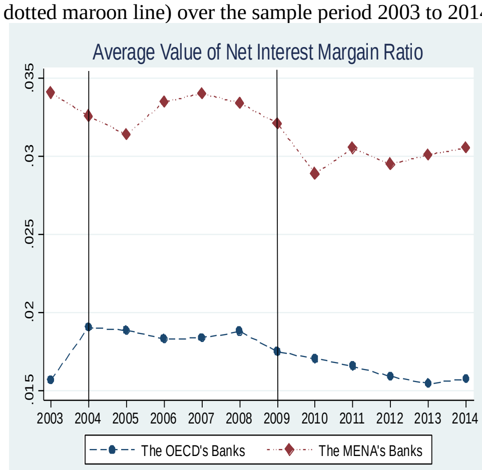
Panel (B)



Average values of Net Interest Margin (NIM) ratio for the whole banks in the sample over the sample period 2003 to 2014



Average values of NIM ratio for the unlisted banks (long dashed blue line) versus banks in the listed bank (small dotted maroon line) over the sample period 2003 to 2014



Average values of NIM ratio for the banks in the OECD countries (long dashed blue line) versus banks in the MENA countries (small dotted maroon line) over the sample period 2003 to 2014

Source: Author’s calculation based on the sample data

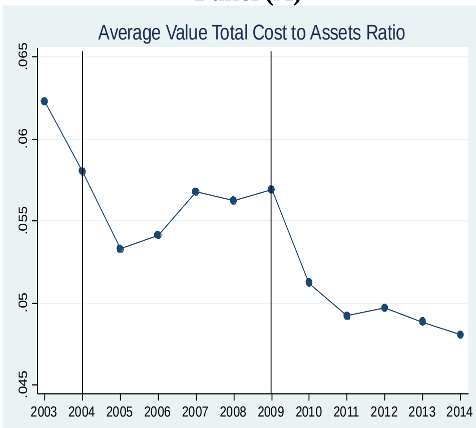
Figure III-2: Average value of profit-based indicators (ROA ratio and NIM ratio) over the period 2003 to 2014

with different ownership profile and banks from both the OECD countries and the MENA countries. Listed banks found to be associated with higher ROA level over the sample period except in the last three years (2012 – 2014) when more banks were asked to meet the regulatory reforms of the Basel Accords III. At the same time, it is observed that listed banks found to be associated with less net interest margins compared to unlisted banks except in the last three years (2012 – 2014). Listed banks found to charge higher margins after 2012 (see the second row of Figure III-2). In term of banks from countries with a different level of economic and financial development, both profit-based indicators found to be high in the MENA countries rather than in the OECD countries over the entire sample period (the last row of Figure III-2).

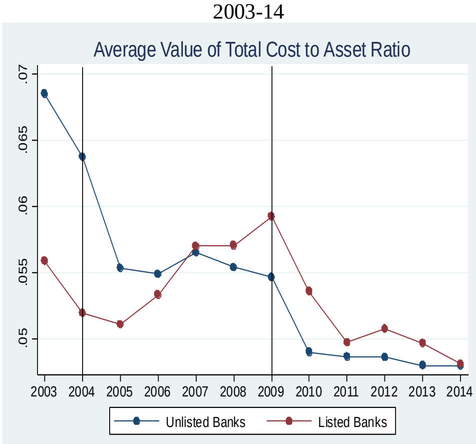
In term of cost-based indicator, the cost level found to be an upward trend during the less regulatory pressure period (i.e., 2004 – 2008), while it reduced significantly during the period that experienced more regulatory restrictions (i.e., 2009 – 2014) as shown in the first row of panel A in Figure III-3. The results show that the cost level varied according to the ownership profile. The cost level increased for listed banks during (2004 – 2008), while it decreased for unlisted banks. Unlike unlisted banks, listed banks are obligated to meet the disclosure requirements. In 2004, the Basel Accords II imposed more disclosure requirements that could allow the public and the regulatory and supervisory authorities to assess the risk behaviour of banks. Besides, more disclosure requirements were also introduced after 2009 as per the Basel Accords II.5. Though it is observed that the cost level reduced for both listed and unlisted banks during the sub-period (2009 – 2014), listed banks found to be associated witha higher level of operating costs as shown in the second row of panel A in Figure III-3. From the country-perspective, it is observed that banks in developing countries, which are represented by the MENA countries, found to be associated with higher operating costs during the entire sample period compared to banks from developed countries (i.e., the OECD countries).

In term of the bank size, the literature shows that banks with a big asset size behave differently from small banks (for example, Demsetz and Strahan, 1997; Hughes and Mester, 2013; Moutsianas and Kosmidou, 2016). Larger banks tend to have more competitive advantages. These banks are claimed to have better investment

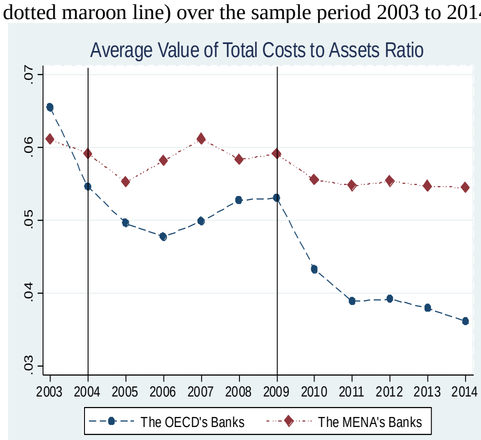
Panel (A)



Average values of Total Costs to Asset (TCA) ratio for the whole banks in the sample over the sample period 2003-14

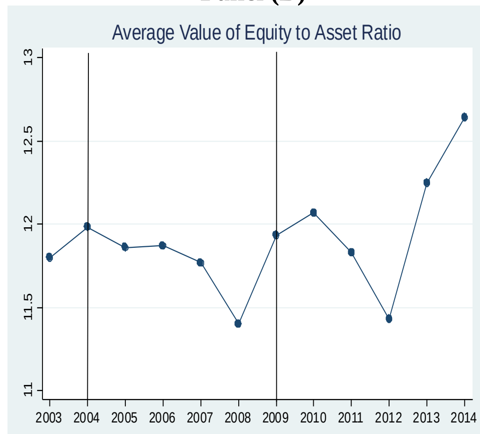


Average values of TCA ratio for the unlisted banks (long dashed blue line) versus banks in the listed bank (small dotted maroon line) over the sample period 2003 to 2014

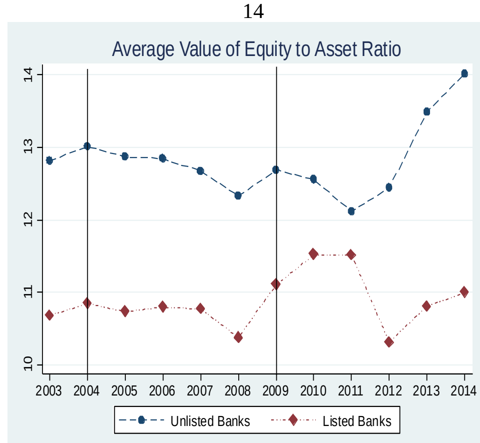


Average values of TCA ratio for the banks in the OECD countries (long dashed blue line) versus banks in the MENA countries (small dotted maroon line) over the sample period 2003 to 2014

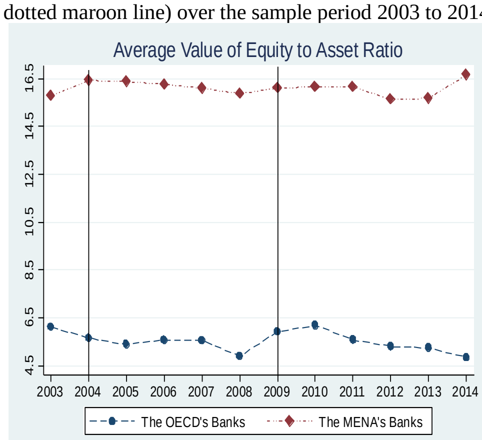
Panel (B)



Average values of Equity-to-Asset (E/A) ratio for the whole banks in the sample over the sample period 2003-14



Average values of E/A ratio for the unlisted banks (long dashed blue line) versus banks in the listed bank (small dotted maroon line) over the sample period 2003 to 2014



Average values of E/A ratio for the banks in the OECD countries (long dashed blue line) versus banks in the MENA countries (small dotted maroon line) over the sample period 2003 to 2014

Source: Author’s calculation based on the sample data

Figure III-3: Average value of the cost-based indicator (Total Cost-to-Asset ratio) and capital level (Equity-to-Asset ratio) over the period 2003 to 2014

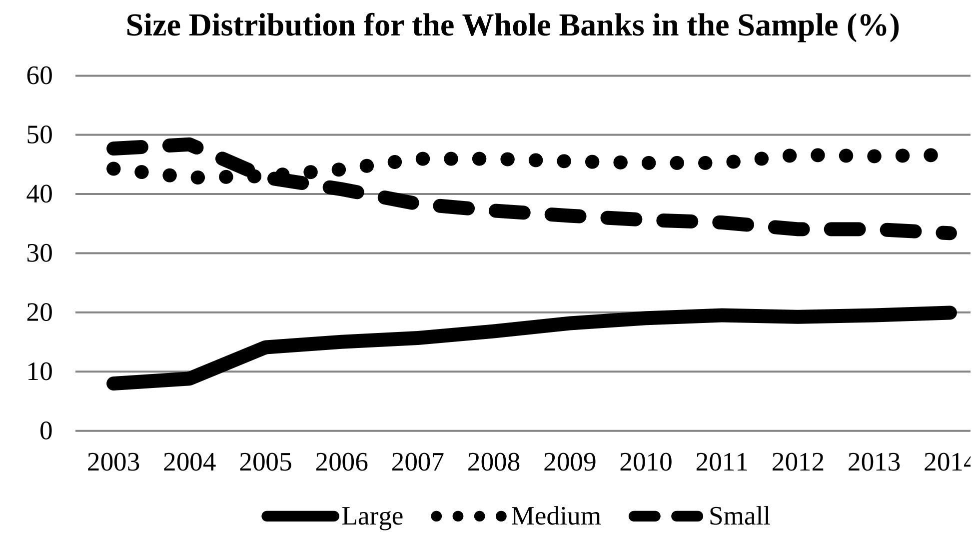
opportunities, well-diversified portfolios, and easy access to finance. In order to examine the variation in risk behavior (and performance level) of different sized banks, Ward's method of cluster analysis is used as a classification tool to categorize the banks in the sample into three different sizes: large banks, medium banks, and small banks. Ward's method is conducted using the variable logarithm of total assets in the USD for each year of the sample periods.[156] The results of the cluster analysis are reported in the Table (III-1). The sample is subdivided into three clusters: large banks, medium banks, and small banks. Based on the cluster analysis approach, the small banks are these with total assets of less than USD 8 million, medium-sized banks have total assets between USD 8 million to USD 143.8 million, and large banks have total assets more than USD 134.8 million. The overall results show that medium-sized banks form the main group of banks in the sample followed by small banks. It is observed that the number of small banks decreased over time, while the number of both medium and large banks increased over time (Figure III-4). This result implies that banks have built up their asset size in which they are shifting from small-sized banks to medium or larger size banks. The next figure shows size distribution for banks in the MENA countries versus the OECD countries (Figure III-5). Most of the banks

Table III-1
Size distribution over the sample period (2003-2014): Cluster Analysis

Size Cluster	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Large	28 (8.00)	33 (8.82)	63 (14.13)	67 (15.02)	70 (15.70)	75 (16.82)	81 (18.16)	85 (19.06)	87 (19.51)	86 (19.28)	87 (19.51)	89 (19.96)
Medium	155 (44.29)	160 (42.78)	192 (43.05)	197 (44.17)	205 (45.96)	205 (45.96)	203 (45.52)	202 (45.29)	202 (45.29)	208 (46.64)	207 (46.41)	208 (46.64)
Small	167 (47.71)	181 (48.40)	191 (42.82)	182 (40.81)	171 (38.34)	166 (37.22)	162 (36.32)	159 (35.65)	157 (35.20)	152 (34.08)	152 (34.08)	149 (33.40)
Total	350 (100)	374 (100)	446 (100)	446 (100)	446 (100)	446 (100)	446 (100)	446 (100)	446 (100)	446 (100)	446 (100)	446 (100)

Note:
() percent of the total for the year.
Total number banks in the sample are 446 banks.
There are 96 and 72 missing observations in both periods 2003 and 2004 respectively.
Source: Author's Calculation based on the sample data

[156] Ward's method is a simple systematic approach that is based on the concept of grouping a given dataset according to an underlying quantitative variable. It starts forming a cluster of two observations that have the closest squared distance between them. Then every two clusters, which have the closest squared distance of its mean, are joined together. This process continues as more clusters are joined in a move up hierarchy till the predetermined number of groups is formed. Each cluster is expected to include observations with the closet squared distance, and hence each cluster is expected to have the most similar characteristics of the variable that is used to categorize a given dataset.

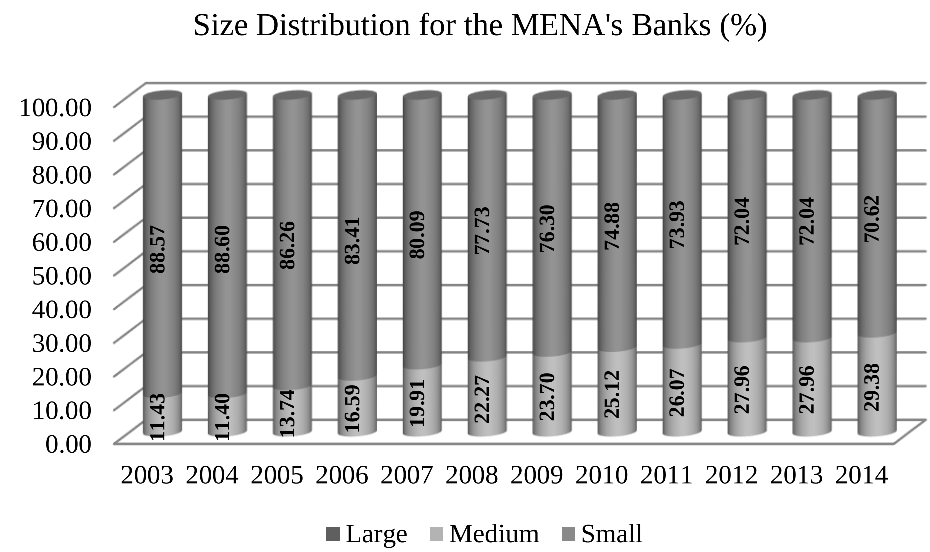


Source: Author's Calculation based on the sample data

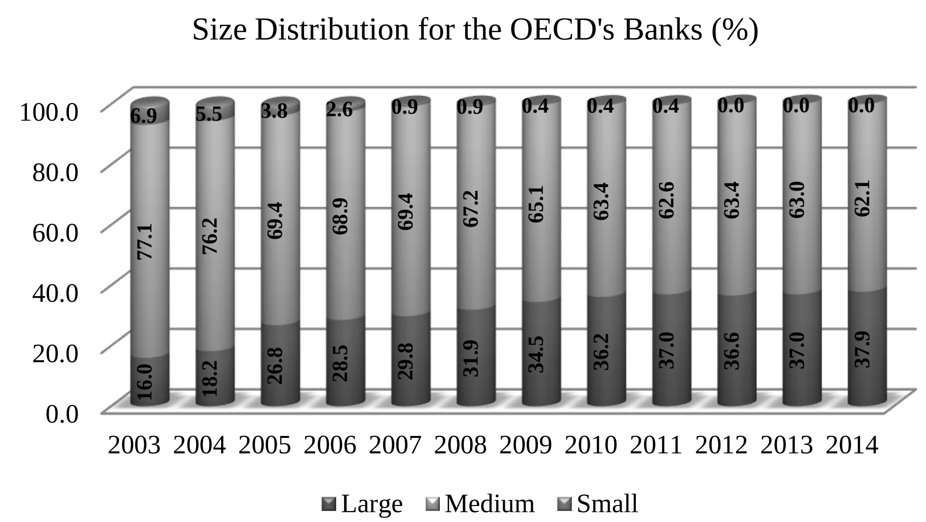
Figure (III-4) Size distribution in term of assets for the whole sample during the period 2003 to 2014

in the MENA countries are characterized to be small size banks, even though its share decreased over time. This result implies that the size of the banking asset portfolio had grown over time. On the other hand, the banks in the OECD countries are mainly medium-sized banks. Yet, there is a noticeable increase in the large size banks in the OECD countries. The results of the cluster analysis reported that the percent of large-sized banks was about 16.00 % in 2003 in the OECD countries, and this share increased to more than double, and it stood at 37.90 % in 2014.

Overall, it is noticed that size banks had increased over the decade in both groups of countries. There are small- sized banks that grew and became medium-sized banks in the MENA countries, while the asset portfolio size for medium-sized banks grew into larger sized banks in the OECD's countries (Figure III-5). These changes had occurred at the time more attention is paid to the regulatory supervision and monitoring of bank risk-taking behaviour, especially for the large financial instructions. The new amendments of Basle III, which is announced in the late of 2010, recommended a higher regulatory capital for such large institutions.



Percentage of the size distribution for banks in the MENA countries over the sample period 2003 to 2014



Percentage of the size distribution for banks in the OECD countries over the sample period 2003 to 2014

Source: Author’s Calculation based on the sample data

Figure (III-5) Size distribution in term of assets at the OECD countries versus the MENA countries

This research chapter examined in further details how do banks of different size behave differently in their risk-capital nexus as well as in their performance-capital nexus.

IV. Appendix: Comparing Two Sample Means: Independent Samples

There are a number of statistical tests that are used to test whether a given two samples have the same distribution or not. These tests are divided into a parametric test and a non-parametric test. The t-statistic is an example of a parametric test that is used to examine for a difference in means of given subsamples. Yet, this test relies mainly on the normality assumption. In contrast, the Wilcoxon rank-sum (WRS) test is an example of a non-parametric that does not rely on distribution assumptions. However, the results of both tests (i.e., t-statistic and WRS test) should be used with the caution as both tests are based on pooled data. Both tests are used in which limitations of one test is covered by others. Wilcoxon Rank Sum (WRS) test can be used as robust for t-test statistics to obtain a robust result. The following part provides further details about t-test statistics and Wilcoxon Rank-Sum test.

T-test Statistic:

The difference in means for a given variable in the sample is tested using the t-test statistic. This test is used to examine if there is a significant difference in means between two samples (e.g., the banks operating in the OECD countries and others in the MENA countries). The t-test statistic is based on the null hypothesis that the difference in means between two samples is zero i.e.

$$H_0 : \mu_i - \mu_j = 0$$

This hypothesis implies that there is no significant difference in the means of both groups. The null hypothesis is tested using the t-test statistic that is computed as follows:

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{s * \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where, $(\bar{x}_1)$, $(\bar{x}_2)$ refer to the observed sample mean for the 1st sample, and 2nd sample respectively, and (s) is sample standard deviation, and (n) is sample size. This statistic has a t-distribution with a degree of freedom of (n-2). The t-test statistic could be conducted under an assumption of equal variances (i.e., pooled variances) or unequal variance (i.e., weighted variances). Besides, t-test statistic is based on the assumptions of normality (normally distributed), and independence in measurements of a given underlying variable (i.e., no relationship between means of both samples). The normality assumption is one of the major limitations of the t-test. It assumes that both samples are following a normal distribution. However, this assumption is more likely to be subject to violation especially in a panel dataset (Wooldridge, 2010).

Wilcoxon Rank-Sum test:

Wilcoxon Rank Sum (WRS) test could be used as an alternative test to examine if distributions of a given two samples are similar and they are from one population. The advantage of the WRS test is it is a non-parametric test, i.e., it is not based on particular distribution assumptions for a given population. The WRS is valid for any form of distribution, and it is less sensitive to outliers (Wild Chris, 1997). The null hypothesis of this test is that means of both samples are the same, i.e.,

$$H_0: \mu_i = \mu_j$$

This hypothesis implies that there is no significant difference in the means of both samples. Wilcoxon Rank Sum (WRS) test start by ranking all observations from both samples (ascending or descending). The WRS test statistic is based on the sum of ranks $(R_{i,1})$ for each observation from one of the samples $(n1)$ tie with its average rank. The Wilcoxon statistic is computed as follow:

$$W_{rs} = \left(\sum_{i=1}^{n1} R_{i,1}\right) - \frac{n_1(n_1+1)}{2}$$

The p-value of the WRS test is computed based on the standard normal approximation using z-score. The results of both tests (i.e., t-test and WRS test) should be used with caution as both tests are based on pooled data.[157] Yet, both should be used in which limitations of one test is covered by other. Wilcoxon Rank Sum (WRS) test can be used as robust for t-test statistics. In case there is a difference between results for these two tests, this research will depend on the results of the non-parametric test, i.e., Wilcoxon Rank Sum (WRS) test.

[157] T-test statistic is conducted in the Stata Statistical Software using the command (***ttest***), while WRS test is conducted using the command (***ranksum***).

V. Appendix: Descriptive Summary per year

Table V:

Descriptive Statistics: This table presents the descriptive statistics of both dependent and independent variables per year. The study uses annual observations of 446 banks over the period 2003 to 2014. These variables are measured based on an unbalanced dataset that contains annual observations of 446 banks over the period 2003 to 2014. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.

Univariate Statistics	**NPLs /Assets**	**RWAs /Assets**	**EA Ratio**	**Total Capital /Assets**	**Log Assets**	**ROA**	**NII Ratio**	**Inflation Rate**	**GDP Growth Rate**
	Mean (Std. Div.)	Mean (Std. Div.)	Mean (Std. Div.)	Mean (Std. Div.)	Mean (Std. Div.)	Mean (Std. Div.)	Mean (Std. Div.)	Mean (Std. Div.)	Mean (Std. Div.)
2003	0.0347	0.7608	12.2642	0.0937	6.8310	0.0233	0.2259	2.6877	3.9666
	(0.0428)	(0.9031)	(15.8206)	(0.0766)	(1.0927)	(0.0265)	(0.1821)	(3.4156)	(6.2055)
2004	0.0353	0.7148	11.8105	0.0975	6.8330	0.0237	0.2498	3.4013	5.0291
	(0.0575)	(0.7586)	(13.7777)	(0.0869)	(1.1215)	(0.0282)	(0.1996)	(3.5223)	(4.3595)
2005	0.0296	0.6936	11.1457	0.0998	6.9971	0.0186	0.2562	3.1719	4.0562
	(0.0555)	(0.7788)	(12.6764)	(0.0958)	(1.1720)	(0.0190)	(0.1911)	(3.4484)	(2.4004)
2006	0.0261	0.6880	11.4270	0.1036	7.0544	0.0227	0.2584	4.0942	4.8376
	(0.0557)	(0.7110)	(12.0009)	(0.0944)	(1.1438)	(0.0280)	(0.2003)	(4.2650)	(4.0630)
2007	0.0235	0.6951	11.5686	0.1057	7.1270	0.0209	0.2408	4.1489	4.5567
	(0.0476)	(0.5584)	(11.5280)	(0.0958)	(1.1344)	(0.0222)	(0.1790)	(3.2429)	(3.2088)
2008	0.0206	0.6894	11.4719	0.1022	7.2148	0.0208	0.2123	7.1124	2.8718
	(0.0368)	(0.5056)	(11.8815)	(0.0968)	(1.1315)	(0.0218)	(0.2030)	(5.1986)	(3.9667)
2009	0.0217	0.6701	10.8539	0.1036	7.2564	0.0229	0.2040	2.2439	-0.4220
	(0.0316)	(0.3727)	(11.3354)	(0.1018)	(1.1144)	(0.0305)	(0.2360)	(3.8096)	(5.1329)
2010	0.0240	0.6478	11.3874	0.1088	7.2894	0.0249	0.2597	3.2711	3.7370
	(0.0305)	(0.3553)	(11.1940)	(0.1027)	(1.0930)	(0.0245)	(0.2078)	(3.3999)	(2.8703)
2011	0.0248	0.6279	11.5514	0.1050	7.3176	0.0216	0.2642	4.1994	1.3397
	(0.0367)	(0.3517)	(11.1610)	(0.0804)	(1.0847)	(0.0200)	(0.2266)	(4.2691)	(7.6138)
2012	0.0242	0.6457	11.7793	0.1095	7.3384	0.0219	0.2537	4.2647	3.6511
	(0.0355)	(0.4468)	(11.7640)	(0.0931)	(1.0756)	(0.0292)	(0.1990)	(6.0500)	(11.0689)
2013	0.0228	0.6457	11.8791	0.1086	7.3605	0.0189	0.2660	3.5765	1.9468
	(0.0330)	(0.4519)	(11.8818)	(0.0922)	(1.0616)	(0.0189)	(0.2288)	(4.9155)	(2.3675)
2014	0.0242	0.6344	11.7703	0.1060	7.3788	0.0186	0.2621	3.6533	1.9108
	(0.0390)	(0.3795)	(11.0814)	(0.0863)	(1.0503)	(0.0302)	(0.1803)	(5.8568)	(3.1671)
% Change in mean's 2003 and mean's 2014	12.38%	-50.12%	-9.64%	-7.88%	-84.62%	29.50%	-20.21%	117.91%	-20.16%

VI. Appendix: The Correlation Matrix for the OECD Banks and the MENA Banks

The correlation matrix for the risk-based regressions using the OECD subsample:

Table A

Correlations between variables for the sample of 235 banks from the OECD countries over the period of 2003 to 2014 using Pearson Method. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.

	NPLs/ Assets	RWAs/ Assets	Equity / Assets	Capital / Assets	Log Assets	ROA Ratio	NII Ratio	REGU	PCAU	REG-Ediz	Inflation Rate	GDP Growth Rate
NPLs/ Assets	1											
RWAs/ Assets	0.3889*	1										
Equity/ Assets	0.1260*	0.1320*	1									
Capital / Assets	-0.0800*	-0.1567*	-0.0911*	1								
Log Assets	-0.1752*	-0.2455*	-0.3129*	0.0860*	1							
ROA Ratio	0.5354*	0.1511*	0.3412*	-0.0932*	-0.1589*	1						
NII Ratio	0.1100*	0.2869*	0.2517*	-0.0669*	0.0393**	0.2344*	1					
REGU	0.0272	0.0093	0.0861*	-0.0389	-0.0056	0.0635*	0.0501**	1				
PCAU	-0.0694*	-0.1054*	-0.1083*	0.1362*	0.2128*	-0.0728*	0.0017	0.1074*	1			
REG-Ediz	0.0515**	0.0489***	0.0948*	-0.0609**	0.0507**	0.0391***	0.0351	0.0737*	-0.0177	1		
Inflation Rate	-0.0551*	0.0363	0.1311*	-0.0168	-0.0514*	0.0997*	0.1274*	-0.0069	-0.0024	-0.0096	1	
GDP Growth Rate	-0.0201	0.0584**	0.1391*	-0.0062	-0.1186*	0.0115	0.1797*	0.0088	-0.0590*	-0.0321	0.2518*	1

Notes: (*) significant level at 1%, (**) significant level at 5%, and (***) significant level of 10%

The correlation matrix for the risk-based regressions using the MENA subsample:

Table B

Correlations between variables for the sample of 211 banks from the MENA countries over the period of 2003 to 2014 using Pearson Method. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.

	NPLs to Assets	**RWAs to Assets**	**Equity / Assets**	**Capital / Assets**	**Log Assets**	**ROA Ratio**	**NII Ratio**	**REGU**	**PCAU**	**REG-Ediz**	**Inflation Rate**	**GDP Growth Rate**
NPLs/ Assets	1											
RWAs/ Assets	0.0766 **	1										
Equity / Assets	0.1518 *	0.2821 *	1									
Capital / Assets	-0.0184	-0.1550 *	-0.0228	1								
Log Assets	-0.2698 *	-0.0612 ***	-0.2041 *	-0.0087	1							
ROA Ratio	0.2226 *	0.1183 *	0.2317 *	0.0152	-0.1012 *	1						
NII Ratio	-0.0113	0.2522 *	0.1692 *	0.0609 **	-0.1938 *	0.2266 *	1					
REGU	0.0146	0.0136	-0.0154	-0.0290	0.0616 **	0.0106	0.0017	1				
PCAU	0.0192	0.0607	0.0326	0.0657 **	0.1048 *	0.0596 **	0.0600 **	0.2895 *	1			
REG-Ediz	-0.0106	0.0297	0.0583 **	0.0061	0.1295 *	0.0239	-0.0100	0.1192 *	0.3105 *	1		
Inflation Rate	-0.0174	-0.1380 *	-0.0834 *	-0.0091	-0.1785 *	-0.0120	0.1224 *	-0.0059	-0.0858 *	-0.0734 *	1	
GDP Growth Rate	-0.0203	0.0084	0.0469 **	0.0065	-0.0194	-0.0065	-0.0092	0.0065	0.0149	0.0552 **	0.0246	1

Notes: (*) significant level at 1%, (**) significant level at 5%, and (***) significant level of 10%

The correlation matrix for the performance-based regressions using the OECD subsample:

Table C:
Correlations between variables for the sample of 146 banks from the OECD countries over the period of 2003 to 2014 using Pearson Method. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I

	ROA Ratio	**NIM Ratio**	**Total Cost / Asset**	**Equity / Assets**	**Log Assets**	**NPLs / Assets**	**NII Ratio**	Interest Rate Spread
ROA Ratio	1							
NIM Ratio	0.6115 ***	1						
Total Cost / Asset	0.3120 ***	0.2446 ***	1					
Equity / Assets	0.3006 ***	0.3823 ***	0.1658 ***	1				
Log Assets	-0.1810 ***	-0.3058 ***	-0.3457 ***	-0.2412 ***	1			
NPLs to Assets	0.2912 ***	0.3734 ***	0.3949 ***	0.1834 ***	-0.2465 ***	1		
NII Ratio	0.0521 **	-0.0968 ***	0.0312	-0.0641 **	0.1700 ***	0.0738 **	1	
Interest Rate Spread	0.3241 ***	0.02312 ***	0.1993 ***	0.0469	-0.0573 **	0.2736 ***	-0.0542 **	1

Notes: (*), (**), and (***) indicates for the statistical significance level at 1, 5, and 10 % respectively.

The correlation matrix for the performance-based regressions using the MENA subsample:

Table B
Correlations between variables for the sample of 208 banks from the MENA countries over the period of 2003 to 2014 using Pearson Method. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.

	ROA Ratio	**NIM Ratio**	**Total Cost / Asset**	**Equity / Assets**	**Log Assets**	**NPLs / Assets**	**NII Ratio**	Interest Rate Spread
ROA Ratio	1							
NIM Ratio	0.0591 **	1						
Total Cost / Asset	-0.0332	0.0625 **	1					
Equity / Assets	0.2332 ***	0.0691 ***	-0.0880 ***	1				
Log Assets	-0.0660 **	-0.2252 ***	-0.4483 ***	-0.1817 ***	1			
NPLs to Assets	0.0735 **	0.1721 ***	0.1777 ***	0.1672 ***	-0.2671 ***	1		
NII Ratio	0.1145 ***	-0.1593 ***	0.1104 ***	0.1822 ***	-0.1866 ***	-0.0143	1	
Interest Rate Spread	0.0687 ***	0.1602 ***	0.2541 ***	-0.0227	-0.3869 ***	0.1377 ***	0.3556 ***	1

Notes: (*), (**), and (***) indicates for statistical significant level at 1, 5, and 10 % respectively.

VII. Appendix: Identifying the Most Appropriate Panel-based Model:

This appendix presents the further discussion of procedures and results of identifying the most appropriate panel-based regression model that is used in examining the relationship between risk level and bank level for the banks operating in the OECD countries and the MENA countries. As presented in Chapter Four, there are three different forms of a panel-based regression model: Pooled OLS Model, Fixed-Effects Model, and Random-Effects Model. Each one of these models differs in term of their treatment for the individual-specific effects that is defined as (∂_i) in equation (1-4). The following three tests are conducted to decide which form of the model is the most appropriate: F-statistic test, Lagrange Multiplier test, and Hausman test. These tests are conducted for the equation (1.-4.) that examines the risk level as follows:

$$Y_{i,t} = \beta_0 + \beta_k \boldsymbol{X}_{i,t}^k + u_{i,t} \tag{1-4}$$

$$\text{with } u_{i,t} = \partial_i + \varepsilon_{i,t}$$

Where, ($Y_{i,t}$) is risthe k level for a given bank (i) at a year (t), ($\boldsymbol{X}_{i,t}^k$) is a vector of the independent variables that explain the risk level for a given bank at a given period. These independent variables are: capital (Equity/Asset Ratio), size (Log Assets), profitability (ROA ratio), diversification (noninterest income to total income ratio), regulatory pressure (dummy variable), and macroeconomic variable (inflation rate and annual growth of GDP). The model has a composite error term ($u_{i,t}$) that combines both (∂_i) unobserved individual-specific effects, and ($\varepsilon_{i,t}$) is the random error term. The risk level is measured using two alternative risk measurements, namely:

Model I: using ($NPLs/A_{i,t}$)

Model II: using ($RWAs/A_{i,t}$)

Identifying the most appropriate model for Model I that use a dependent variable ($\boldsymbol{NPLs/A_{i,t}}$):

Table (VII-A) reports the results of the model (I) that is used ($NPLs/A_{i,t}$) as a proxy for the risk level. This model is run in the form of pooled OLS model (Panel A in Table VII-A), fixed-effects model (Panel B in table VII-A), and random-effects model (Panel C in Table VII-A). Testing for the most appropriate model is a post-testing in which it is carried out after running the regression. F-statistic, Lagrange Multiplier statistic, and Hausman statistic are all reported in Table (IX-A). The results of these tests are summarized as follow:

> **F-statistic test**: is based on a null hypothesis suggests that there are zero unobserved effects in the underlying linear model in equation (1-4) (i.e. $H_0 : (\partial_i \ ) = 0$). The sample includes observations that range from 2,638 to 2,597 observations.[158] At siga nificant level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in the panel B at Table VII-B.[159] Thus; there is no evidence to accept the null hypothesis, and hence fixa ed effects model will be more appropriate to deal with non-zero individual specific effects to obtain more consistent results.[160]

> **Lagrange Multiplier test**: is based on a null hypothesis suggests that there are no individual specific variance components in equation (1-4). (i.e. $H_0 : Var\left(\partial_i \ \right) = \sigma_\partial^2 = 0$). The sample includes between 2,844 and 2,862 observations.[161] At significa

[158] The number of observations is varied according to estimated model as reported in the panel (B) at Table VII-A.

[159] The significance level is the acceptable level of type I error, i.e., a probability of incorrect rejection for a true null hypothesis.

[160] A consistent estimator is the one whose distribution becomes more concentrated near to the true value of the estimated parameters as the sample size grow infinitely. The estimators of the fixed effects model are more consistent; since it eliminates individual heterogeneity in the model. This heterogeneity is not accounted in the pooled OLS model.

[161] The number of observations is varied according to estimated model as reported in the panel C in table VII-A.

ant level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in the panel C in Table VII-A. Thus; there is no evidence to accept the null hypothesis, and hence random effects model will be more appropriate to deal with a non-zero individual specific variance to obtain more efficient results.[162]

Hausman test: is based on a null hypothesis suggests that individual effects (∂_i) are uncorrelated with any explanatory variables in the underlying model, and hence estimates of random effects model are more consistent and efficient. The sample includes observations that range 2,638 and 2,597 observations.[163] At sia gnificant level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in the panel B at Table VII-A. Thus; there is no evidence to accept the null hypothesis, and hence fia xed effects model will be more appropriate to deal with a potential correlation between individual effects (∂_i) are uncorrelated with any explanatory variables. The fixed effects model has the advantage of eliminating individual effects to obtain consistent estimates.

The above results show that both the fixed effects model and random effects are more appropriate than the pooled OLS model. The latter ignores the potential influence of (∂_i). Based on the dataset of the whole sample, the results of Hathe usman test shows that the fixed effects model is the most appropriate model that provide consistent results.

As discussed in Chapter Four, this Hausman test is based on the assumptions that the error term is identically independently distributed. However, this

[162] The efficient estimator represents the best possible estimate for a given parameter. Coefficients of standard errors for the random effects model are expected to be smaller since random effects model accounts for within and between variations in each sample.

[163] The number of observations is varying according to estimated model as reported in the panel B in table VII-A.

assumption is no longer stand in case of appearance of the heteroscedasticity and/or serial correlation. Accordingly, diagnostic tests are used to assess the appearance of heteroscedasticity and serial correlation. As pointed out in chapter four, the coefficient estimates will lose its efficiency due to lack of exploiting all information in an underlying variance structure when the heteroscedasticity and serial correlation issues are not considered while they are existed in real. Hence; the next step of the analysis is to examine if there are any heteroscedasticity and serial correlation issues in the selected best model, i.e., fixed effects model. Modified Wald Test and Wooldridge test are used for testing heteroscedasticity and serial correlation in the fixed effects model respectively. Modified Wald statistic and Wooldridge statistic are reported in panel B in Table (VII-A). The results of these tests are summarized as follow:

Modified Wald Test: is based on a null hypothesis suggests that variances in the underlying model are the same across the whole sample (i.e., $H_0 : Var(u_{i,t}) = \sigma_i^2 = \sigma^2$). The sample includes observations that range from 2,638 and 2,597 observations. At significana t level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in the panel B at Table VII-A. Thus; there is no evidence to accept the null hypothesis, and hence the heteroscedasticity exists.

Wooldridge Test: is based on a null hypothesis suggests that there is no serial correlation in the underlying model (i.e., $H_0 : E(u_{i,t}u_{i,s}) = 0$, for all t > s). The sample includes observations that range from 2,638 and 2,597 observations. At significa ant level of 5%, the p-values are found to be 0.0000 which is less than the significant level (panel B at Table VII-A). Thus; there is no evidence to accept the null hypothesis, and hence the serial correlation exists.

The results of the above tests show that the standard assumption of homogeneity of the variances in the underlying model is invalid. In addition, there is a serial correlation in the error term. Therefore, the standard errors, which are used in obtaining reliable p-values in the given model, are bais and invalid. Accordingly, a clustered standard error is used to robust for the appearance of the heteroscedasticity and serial correlation in a panel-based model. The clustered standard errors have the advantage of controlling for both correlations between observations that are grouped in a cluster and accounts for a general pattern for heteroscedasticity. After considering the clustered robust model, the decision of choosing the fixed effects model or random effects model will be based on a robust version of the Hausman Test that is known as Sargan-Hasen test.

> **Sargan-Hasen Test**: is based on a null hypothesis suggests using the random effects model since it is consistent and efficient. This test compares the set of coefficients between the random effects model and fixed effects model. The sample includes observations that range from 2844 and 2862 observations.[164] At a significant level of 5%, the p-values are found to be above 0.05 in which it ranges between 0.1763 and 0.3303 as reported in panel C in Table VII-A. Thus; there is no evidence to reject the null hypothesis, and hence random effects model will be a more appropriate model.

Accordingly, this research uses the clustered random effects model as the more appropriate model to examine the relationship between the risk level and capital level. The random effects model has the following advantages:

A. The random effects model has the advantage of accounting for heterogeneity factors that are reflected in unobserved individual effects in the firm level entities and common unobserved factors at the country level too. Thus; random effects model is preferred where heterogeneity factors exist.
B. The random effects model, as shown earlier in the specification of the standard model, accounts for the total effects that consider

[164] The number of observations is varying according to estimated model as reported at the panel C in table VII-A.

for both within effects and between effects. The random effects model is more coherent than the fixed effects model.

C. As pointed out by Hsiao (2014, p48), the random effects model is more appropriate once T is finite and N is large. In this case, characteristics of the population are more interested than the specific-effects for each cross-sectional unit in the sample (Woodbridge, 2006). The unobserved effects of the random effects model are assumed to be random draws from the population.
D. The random effects model, which is based on the total variation, will reduce the potential loss of the degree of freedom.

Overall, the random effects model is more generalized model comparing to the fixed effects model. Furthermore, clustered random effects model has the advantage of considering both correlations between observations that are grouped in a cluster and accounts for a general pattern for heteroscedasticity. The empirical results for clustered random effects model are discussed in section 5.5.1.

Table (VII-A) Panel (A): Regression analysis based on the Pooled OLS Model: the independent variable is a risk level that is measured by NPLs/Asset ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.								
Estimated Models	**1** Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)	**5** Coefficient (p-value)	**6** Coefficient (p-value)	**7** Coefficient (p-value)	**8** Coefficient (p-value)
Capital (E/A)	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Size (log Assets)	-0.0130	-0.0132	-0.0129	-0.0129	-0.0139	-0.0142	-0.0139	-0.0139
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Profitability (ROA)	0.3998	0.3999	0.3998	0.4005	0.3911	0.3912	0.3911	0.3919
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Diversification (NII Ratio)	-0.0171	-0.0171	-0.0171	-0.0171	-0.0163	-0.0164	-0.0163	-0.0163
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
A) Undercapitalized banks (REGU)	0.0083				0.0081			
	(0.5350)				(0.5480)			
A) Better capitalized banks (REGO)	0.0070				0.0021			
	(0.7970)				(0.9380)			
B) Undercapitalized banks (PCAU)		0.0033				0.0034		
		(**0.0420**)				(**0.0400**)		
C) Esizs Regulatory Pressure (REG-Ediz)			0.0006				0.0008	
			(0.6440)				(0.5830)	
D) Better capitalized banks (REG-mcr)				0.0004				0.0003
				(0.8820)				(0.9070)
Inflation Rate					-0.0002	-0.0002	-0.0002	-0.0002
					(0.2940)	(0.3370)	(0.2980)	(0.2930)
GDP Growth					-0.0003	-0.0003	-0.0003	-0.0003
					(0.0710)	(0.0660)	(0.0650)	(0.0710)
Constant	0.1122	0.1133	0.1118	0.1118	0.1210	0.1220	0.1206	0.1207
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Observations	2,860	2862	2860	2860	2844	2846	2844	2844
No. Banks								
r2	0.2163	0.2191	0.2179	0.2178	0.2230	0.2242	0.2230	0.2229
Adj R2	0.2163	0.2177	0.2165	0.2164	0.2208	0.2223	0.2211	0.2210
F-test (Model Fitness)	132.4900	160.2200	158.9900	158.9400	101.7300	117.1600	116.2900	116.2300
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks, while the model 6 to 8 presents the regression results according to the same approaches with consideration for the macroeconomic controlling variables (i.e. inflation rate and annual growth of GDP).								

Table (VII-A) Panel (B): Regression analysis based on the Fixed Effects Model: the independent variable is a risk level that is measured by NPLs/Asset ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.				
Estimated Models	**1** Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)
Capital (E/A)	-0.0008 (**0.0000**)	0.0003 (**0.0360**)	-0.0005 (**0.0000**)	-0.0006 (**0.0000**)
Size (log Assets)	-0.0201 (**0.0000**)	-0.0194 (**0.0000**)	-0.0202 (**0.0000**)	-0.0190 (**0.0000**)
Profitability (ROA)	0.3126 (**0.0000**)	0.2999 (**0.0000**)	0.3118 (**0.0000**)	0.3788 (**0.0000**)
Diversification (NII Ratio)	0.0006 (0.9010)	-0.0029 (0.5600)	0.0003 (0.9480)	-0.0116 (**0.0250**)
A) Undercapitalized banks REGU*E/A-1	0.0011 (0.0840)			
A) Better capitalized banks REGO* E/A-1	0.0049 (**0.0010**)			
B) Undercapitalized banks PCAU* E/A-1		-0.0013 (**0.0000**)		
C) Edizs Regulatory Pressure REG-Ediz*E/A-1			-0.0004 (**0.0000**)	
D) Better capitalized banks REG-mcr*E/A-1				0.0004 (**0.0000**)
Constant	0.1723 (**0.0000**)	0.1727 (**0.0000**)	0.1744 (**0.0000**)	0.1605 (**0.0000**)
Observations	2,638	2640	2638	2597
No. Banks	410	410	410	406
r2_overall	0.1625	0.1438	0.1605	0.2060
r2_between groups	0.2121	0.1812	0.2059	0.2421
r2_within groups	0.0772	0.1086	0.0872	0.0890
F-test (Model Fitness)	30.9800 (**0.0000**)	45.1500 (**0.0000**)	42.4900 (**0.0000**)	42.7300 (**0.0000**)
Statistical Tests				
F-statistic that all (u_i) = 0	11.12 (**0.0000**)	11.44 (**0.0000**)	11.21 (**0.0000**)	11.31 (**0.0000**)
Hausman Statistic	36.8000 (**0.0000**)	18.6400 (**0.0009**)	13.3500 (**0.0097**)	31.6800 (**0.0000**)
Modified Wald test (heteroscedasticity test)	1.60E+37 (**0.0000**)	4.90E+35 (**0.0000**)	7.10E+35 (**0.0000**)	1.00E+37 (**0.0000**)
Wooldridge Test (Serial correlation test)	30.611 (**0.0000**)	30.096 (**0.0000**)	29.715 (**0.0000**)	27.687 (**0.0000**)
The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks				

Table (VII-A) Panel (C): Regression analysis based on the Random Effects Model: the independent variable is a risk level that is measured by NPLs/Asset ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.

Estimated Models	**1** Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)	**5** Coefficient (p-value)	**6** Coefficient (p-value)	**7** Coefficient (p-value)	**8** Coefficient (p-value)
Capital (E/A)	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0220)	**(0.0240)**	**(0.0240)**	**(0.0250)**	**(0.0280)**	**(0.0310)**	**(0.0300)**	**(0.0310)**
Size (log Assets)	-0.0169	-0.0169	-0.0168	-0.0167	-0.0177	-0.0176	-0.0175	-0.0175
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Profitability (ROA)	0.3172	0.3159	0.3165	0.3169	0.3163	0.3151	0.3157	0.3160
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Diversification (NII Ratio)	-0.0029	-0.0029	-0.0028	-0.0029	-0.0023	-0.0023	-0.0022	-0.0023
	(0.5280)	(0.5230)	(0.5350)	(0.5260)	(0.6160)	(0.6110)	(0.6240)	(0.6160)
A) Under-capitalized banks (REGU)	0.0131				0.0131			
	(0.1560)				(0.1560)			
A) Better capitalized banks (REGO)	0.0112				0.0117			
	(0.5980)				(0.5850)			
B) Under-capitalized banks (PCAU)		0.0016				0.0016		
		(0.1740)				(0.1970)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0004				0.0003	
			(0.7460)				(0.7610)	
D) Better capitalized banks (REG-mcr)				-0.0008				-0.0006
				(0.6770)				(0.7550)
Inflation Rate					-0.0004	-0.0004	-0.0004	-0.0004
					(0.0090)	**(0.0090)**	**(0.0090)**	**(0.0090)**
GDP Growth					0.0001	0.0001	0.0001	0.0001
					(0.6150)	(0.6160)	(0.6210)	(0.6160)
Constant	0.1445	0.1446	0.1439	0.1446	0.1517	0.1517	0.1511	0.1517
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Observation	2,860	2862	2860	2860	2844	2846	2844	2844
No. Banks	410	410	410	410	407	407	407	407
r2_overall	0.1995	0.2005	0.1996	0.1996	0.2046	0.2056	0.2047	0.2047
r2_between groups	0.2553	0.2560	0.2556	0.2553	0.2662	0.2669	0.2665	0.2662
r2_within group	0.0630	0.0627	0.0622	0.0623	0.0650	0.0646	0.0641	0.0642
Wald chi2 (Model Fitness)	305.7700	305.8000	303.7600	304.5100	316.9900	316.9900	315.0000	315.6200
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Breusch-Pagan LM (2sided test)	1426.6500	1421.0700	1427.0900	1426.6500	1406.0800	1395.8300	1402.7800	1403.2400
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Breusch-Pagan LM (1sided test)	37.7700	37.7000	37.7800	37.7700	37.5000	37.3600	37.4500	37.4600
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Sargan-Hansen Statistic	6.8990	6.8910	7.6240	7.1710	10.3550	10.0180	11.4010	10.2230
	(0.3303)	(0.2289)	(0.1782)	(0.2083)	(0.2410)	(0.1870)	(0.1220)	(0.1763)

The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks, while the model 6 to 8 presents the regression results according the same approaches with consideration for the macroeconomic controlling variables (i.e. inflation rate and annual growth of GDP).

Identifying the most appropriate model for Model I that use a dependent variable ($\boldsymbol{RWAs/A_{i,t}}$):

Table (VII-B) reports the results of the model (II) that is used ($RWAs/A_{i,t}$) as a proxy for the risk level. This model is run in the form of pooled OLS model (Panel A in Table VII-B), fixed-effects model (Panel B in table VII-B), and random-effects model (Panel C in Table VII-B). Testing for the most appropriate model is a post-testing in which it is carried out after running the regression. F-statistic, Lagrange Multiplier statistic, and Hausman statistic are all reported in Table (VII-B). The results of these tests are summarized as follow:

> **F-statistic test**: is based on a null hypothesis suggests that there are zero unobserved effects in the underlying linear model in equation 1.1. (i.e. $H_0 : (\partial_i \ ) = 0$). The sample includes observations that range from 1,708 to 1,773 observations.[165] At siga nificant level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in the panel B at Table VII-B. Thus; there is no evidence to accept the null hypothesis, and hence fixa ed effects model will be more appropriate to deal with non-zero individual specific effects to obtain more consistent results.

> **Lagrange Multiplier test**: is based on a null hypothesis suggests that there are no individual specific variance components in equation (1-4) (i.e. $H_0 : Var\left(\partial_i \ \right) = \sigma_{\partial}^2 = 0$). The sample includes between 1,861 and 1,867 observations.[166] At significa ant level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in the panel C in Table VII-B. Thus; there is no evidence to accept the null hypothesis, and hence random effects model will be more appropriate to deal with

[165] The number of observations is varied according to estimated model as reported in the panel B at Table VII-B.

[166] The number of observations is varied according to estimated model as reported in the panel C in table VII-B.

a non-zero individual specific variance to obtain more efficient results.

Hausman test: is based on a null hypothesis suggests that individual effects (∂_i) are uncorrelated with any explanatory variables in the underlying model, and hence estimates of random effects model are more consistent and efficient. The sample includes observations that range 1,708 and 1,773 observations.[167] At sia gnificant level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported at the panel B at Table VII-B. Thus; there is no evidence to accept the null hypothesis, and hence fia xed effects model will be more appropriate to deal with a potential correlation between individual effects (∂_i) are uncorrelated with any explanatory variables.

The above results show that both the fixed effects model and random effects are more appropriate than the pooled OLS model. The latter ignores the potential influence of (∂_i). Based on the dataset of the whole sample, the results of Hathe usman test shows that the fixed effects model is the most appropriate model that provide consistent results.

The next step of the analysis is to conduct diagnostic tests to assess the appearance of heteroscedasticity and serial correlation in the selected best model, i.e., a fixed effects model. Modified Wald Test and Wooldridge test are used for testing heteroscedasticity and serial correlation in the fixed effects model respectively. Modified Wald statistic and Wooldridge statistic are reported in panel B in Table (VII-B). The results of these tests are summarized as follow:

Modified Wald Test: is based on a null hypothesis suggests that variances in the underlying model are the same across the whole

[167] The number of observations is varying according to estimated model as reported in the panel B in table VII-B.

sample (i.e., $H_0 : Var(u_{i,t}) = \sigma_i^2 = \sigma^2$). The sample includes observations that range from 1,708 and 1,773 observations. At significana t level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in the panel B at Table VII-B. Thus; there is no evidence to accept the null hypothesis, and hence the heteroscedasticity exists.

Wooldridge Test: is based on a null hypothesis suggests that there is no serial correlation in the underlying model (i.e., $H_0 : E(u_{i,t}u_{i,s}) = 0$, for all t > s). The sample includes observations that range from 1,708 and 1,773 observations. At significa ant level of 5%, the p-values are found to be 0.0000 which is less than the significant level (panel B at Table VII-B). Thus; there is no evidence to accept the null hypothesis, and hence the serial correlation exists.

The results of the above tests show that the standard assumption of homogeneity of the variances in the underlying model is invalid. In addition, there is a serial correlation in the error term. Therefore, the standard errors, which are used in obtaining reliable p-values in the given model, are bais and invalid. Accordingly, a clustered standard error is used to robust for the appearance of the heteroscedasticity and serial correlation in a panel-based model. The clustered standard errors have the advantage of controlling for both correlations between observations that are grouped in a cluster and accounts for a general pattern for heteroscedasticity. After considering the clustered robust model, the decision of choosing the fixed effects model or random effects model will be based on a robust version of the Hausman Test that is known as Sargan-Hasen test.

Sargan-Hasen Test: is based on a null hypothesis suggests using the random effects model since it is consistent and efficient. This test compares the set of coefficients between the random effects model and fixed effects model. The sample includes observations that range 1,861 and 1,867 observations.[168] At a significant level of 5%, the p-values are found to be 0.0000 which is less than the significant level as reported in panel C in Table VII-B. Thus; there is no evidence to accept the null hypothesis, and hence a fixed effects model will be a more appropriate model.

This model, which is based on the risk indicator RWAs/Asset, found to be preferred estimated based on the clustered fixed effects model as the most appropriate model. However, the research chapter aims to capture the heterogeneity factors, in a particular, ownership nature, and regulatory pressure periods, to provide a better understanding of the relationship between the risk level and capital level. As discussed earlier, fixed-effects models do not consider for these heterogeneity factors, while random-effects models are more generalized models that account for the total effects considering for both within-effects and between-effects. The fixed-effects model accounts only within-effects. Hence, this research will adopt the random-effects model for the models at are estimated based in the RWAs/Asset indicator to obtain more comparative results with models that are estimated based on the NPLs/Asset indicator.

[168] The number of observations is varying according to estimated model as reported at the panel C in table VII-B.

Table (VII-B): Panel (A): Regression analysis based on the Pooled OLS Model: the independent variable is a risk level that is measured by RWAs/Asset ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.

Estimated Models	**1** Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)	**5** Coefficient (p-value)	**6** Coefficient (p-value)	**7** Coefficient (p-value)	**8** Coefficient (p-value)
Capital (E/A)	0.0012 (0.470)	0.0012 (0.4410)	0.0011 (0.493)	0.0012 (0.452)	0.0010 (0.528)	0.0011 (0.490)	0.0010 (0.544)	0.0011 (0.506)
Size (log Assets)	-0.0788 (**0.000**)	-0.0773 (**0.000**)	-0.0795 (**0.000**)	-0.0799 (**0.000**)	-0.0866 (**0.000**)	-0.0855 (**0.000**)	-0.0877 (**0.000**)	-0.0882 (**0.000**)
Profitability (ROA)	1.5771 (**0.002**)	1.5456 (**0.003**)	1.5884 (**0.002**)	1.5812 (**0.002**)	1.6219 (**0.002**)	1.5911 (**0.002**)	1.6323 (**0.002**)	1.6251 (**0.002**)
Diversification (NII Ratio)	0.8248 (**0.000**)	0.8267 (**0.000**)	0.8214 (**0.000**)	0.8249 (**0.000**)	0.8251 (**0.000**)	0.8272 (**0.000**)	0.8223 (**0.000**)	0.8257 (**0.000**)
A) Undercapitalized banks (REGU)	0.0970 (0.700)				0.1085 (0.666)			
A) Better capitalized banks (REGO)	-0.1269 (0.771)				-0.1798 (0.683)			
B) Undercapitalized banks (PCAU)		-0.0557 (**0.027**)				-0.0575 (**0.023**)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0193 (0.394)				0.0184 (0.419)	
D) Better capitalized banks (REG-mcr)								0.0012 (0.977)
Inflation Rate					-0.0093 (**0.013**)	-0.0095 (**0.012**)	-0.0092 (**0.015**)	-0.0092 (**0.014**)
GDP Growth					0.0028 (0.418)	0.0028 (0.408)	0.0027 (0.426)	0.0029 (0.390)
Constant	1.0295 (**0.0000**)	1.0271 (**0.0000**)	1.0200 (**0.0000**)	1.1126 (**0.0000**)	1.1126 (**0.0000**)	1.112 (**0.0000**)	1.1034 (**0.0000**)	1.1141 (**0.0000**)
Observation	1,865	1,867	1,865	1,865	1,861	1,861	1,861	1,861
No. Banks								
r2	0.1184	0.1207	0.1186	0.1182	0.1223	0.1247	0.1224	0.1221
Adj R2	0.1155	0.1184	0.1162	0.1159	0.1185	0.1214	0.1190	0.1187
F-test (Model Fitness)	41.5800 (**0.0000**)	51.1000 (**0.0000**)	50.0200 (**0.0000**)	49.8600 (**0.0000**)	32.2400 (**0.0000**)	37.7400 (**0.0000**)	36.9100 (**0.0000**)	36.8000 (**0.0000**)

The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks, while the model 6 to 8 presents the regression results according to the same approaches with consideration for the macroeconomic controlling variables (i.e. inflation rate and annual growth of GDP).

Table (VII-B) Panel (B): Regression analysis based on the Fixed Effects Model: the independent variable is a risk level that is measured by the RWAs/Asset ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.				
Estimated Models	**1** Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)
Capital (E/A)	0.0047 (**0.0040**)	0.0051 (**0.0010**)	0.0049 (**0.0030**)	0.0039 (**0.010**)
Size (log Assets)	0.0733 (**0.001**)	0.0723 (**0.001**)	0.0735 (**0.0010**)	0.0842 (**0.000**)
Profitability (ROA)	-0.2394 (0.483)	-0.2377 (0.486)	-0.2359 (0.4900)	-0.1112 (0.732)
Diversification (NII Ratio)	0.0417 (0.430)	0.0393 (0.457)	0.0427 (0.4190)	0.1041 (**0.026**)
A) Undercapitalized banks REGU*E/A -1	0.0034 (0.663)			
A) Regulatory Pressure for better-capitalized banks REGO*E/A -1	0.0110 (0.477)			
B) Regulatory Pressure for undercapitalized banks PCAU*E/A -1		-0.0006 (0.462)		
C) Edizs Regulatory Pressure REG-Ediz*E/A -1			0.0002 (0.786)	
D) Better capitalized banks REG-mcr*E/A -1				0.0009 (0.302)
Constant	0.0780 (0.6440)	0.0881 (0.603)	0.0777 (0.645)	-0.02111 (0.899)
Observations	1,771	1,773	1,771	1,708
No. Banks	329	329	329	325
r2_overall	0.0059	0.0058	0.0056	0.0024
r2_between groups	0.0056	0.0056	0.0054	0.0036
r2_within group	0.0147	0.0147	0.0144	0.0214
F-test (Model Fitness)	3.5800 (**0.0016**)	4.2800 (**0.0008**)	4.1900 (**0.0009**)	6.0300 (**0.0000**)
Statistical Tests				
F-statistic that all (u_i) = 0	34.9600 (**0.0000**)	35.0400 (**0.0000**)	34.9700 (**0.0000**)	51.1400 (**0.0000**)
Hausman Statistic	41.0500 (**0.0000**)	41.9100 (**0.0009**)	40.0600 (**0.0000**)	20.2800 (**0.0004**)
Modified Wald test (heteroscedasticity test)	7.1e+34 (**0.0000**)	5.9e+34 (**0.0000**)	3.3e+34 (**0.0000**)	1.2e+35 (**0.0000**)
Wooldridge Test (Serial correlation test)	56.0770 (**0.0000**)	63.2470 (**0.0000**)	58.0040 (**0.0000**)	7.6960 (**0.0000**)
The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.				

Table (IX-B) Panel (C): Regression analysis based on the Random Effects Model: the independent variable is a risk level that is measured by the RWAs/Asset ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I.

Estimated Models	**1** Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)	**5** Coefficient (p-value)	**6** Coefficient (p-value)	**7** Coefficient (p-value)	**8** Coefficient (p-value)
Capital (E/A)	0.0060	0.0060	0.0061	0.0061	0.0061	0.0061	0.0061	0.0062
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Size (log Assets)	0.0203	0.0185	0.0196	0.0207	0.0204	0.0187	0.0197	0.0208
	(0.2000)	(0.2400)	(0.2150)	(0.1910)	(0.2010)	(0.2390)	(0.2140)	(0.1920)
Profitability (ROA)	0.2485	0.2485	0.2453	0.2602	0.2481	0.2479	0.2446	0.2606
	(0.4400)	(0.4390)	(0.4460)	(0.4180)	(0.4420)	(0.4420)	(0.4490)	(0.4200)
Diversification (NII Ratio)	0.1035	0.1019	0.1025	0.1030	0.1087	0.1073	0.1078	0.1084
	(**0.030**)	(**0.032**)	(**0.031**)	(**0.030**)	(**0.0230**)	(**0.0250**)	(**0.0230**)	(**0.0240**)
A) Undercapitalized banks (REGU)	0.0512				0.0455			
	(0.607)				(0.6490)			
A) Better capitalized banks (REGO)	-0.1198				-0.1253			
	(0.538)				(0.5210)			
B) Undercapitalized banks (PCAU)		-0.0106				-0.0110		
		(0.318)				(0.3050)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0099				0.0100	
			(0.3320)				(0.3270)	
D) Better capitalized banks (REG-mcr)				-0.0174				-0.0177
				(0.322)				(0.3200)
Inflation Rate					0.0008	0.0007	0.0008	0.0177
					(0.7030)	(0.7300)	(0.7000)	(0.6780)
GDP Growth					-0.0016	-0.0017	-0.0016	-0.0016
					(0.3440)	(0.3170)	0.3300	(0.3410)
Constant	0.4175	0.4288	0.4124	0.4239	0.4168	0.4281	0.4111	0.4232
	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)
Observations	1,865	1,867	1,865	1,865	1,861	1,863	1,861	1,861
No. Banks	329	329	329	329	328	328	328	328
r2_overall	0.0430	0.0453	0.0430	0.0422	0.0417	0.0438	0.0419	0.0410
r2_between groups	0.0604	0.0631	0.0600	0.0589	0.0578	0.0602	0.0573	0.0564
r2_within groups	0.0087	0.0087	0.0088	0.0089	0.0095	0.0096	0.0416	0.0097
Wald chi2 (Model Fitness)	27.5600	27.9000	27.7800	27.8100	28.5600	29.0100	28.8300	28.8500
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0004**)	(**0.0001**)	(**0.0002**)	(**0.0002**)
Breusch-Pagan LM (2sided test)	4311.30	4287.48	4310.39	4308.89	4257.82	4233.21	4257.48	4254.91
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Breusch-Pagan LM (1sided test)	65.66	65.48	65.65	65.64	65.25	65.06	65.25	65.23
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Sargan-Hansen Statistic	51.0850	41.3730	43.7590	43.2550	64.9050	52.4400	57.847	52.5800
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)

The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks, while the model 6 to 8 presents the regression results according to the same approaches with consideration for the macroeconomic controlling variables (i.e. inflation rate and annual growth of GDP).

VIII. Appendix: The Relationship between the Capital Level and Banking Risk

Empirical results on the relationship between the capital level and risk with consideration for macroeconomic variables:

Table VIII-1

Relationship between the capital level and risk (all banks) over the sample period (2003 to 2014): The dependent variable is risk level as measured by the ratio of non-performing loans/Assets (NPLs/Asset). A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on the whole sample								
	Robust clustered Random Effects Model							
	Estimated Models using NPLs/Asset as dependent variable				**Estimated Models using RWAs/Asset as dependent variable**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/ Asset Ratio	-0.0002 (0.3610)	-0.0002 (0.3710)	-0.0002 (0.3690)	-0.0002 (0.3710)	0.0061 *** (**0.0000**)	0.0061 *** (**0.0000**)	0.0061 *** (**0.0000**)	0.0061 *** (**0.0000**)
Size: log Assets	-0.0177 *** (**0.0000**)	-0.0176 *** (**0.0000**)	-0.0175 *** (**0.0000**)	-0.0175 *** (**0.0000**)	0.0204 (0.3378)	0.0187 (0.3820)	0.0197 (0.3602)	0.0208 (0.3342)
Profitability: ROA Ratio	0.3163 *** (**0.0000**)	0.3151 *** (**0.0000**)	0.3157 *** (**0.0000**)	0.3160 *** (**0.0000**)	0.2481 (0.6417)	0.2479 (0.6417)	0.2446 (0.6456)	0.2606 (0.6259)
Diversification: NII Ratio	-0.0023 (0.7420)	-0.0023 (0.7390)	-0.0022 (0.7470)	-0.0023 (0.7420)	0.1087 * (**0.0625**)	0.1073 * (**0.0642**)	0.1078 * (**0.0639**)	0.1084 * (**0.0628**)
A) under-capitalized banks (REGU)	0.0131 ** (**0.0120**)				0.0455 (0.4904)			
A) better-capitalized banks (REGO)	0.0117 (0.6180)				-0.1253 (0.2855)			
B) under-capitalized banks (PCAU)		0.0016 ** (**0.0440**)				0.0110 ** (**0.0397**)		
C) Regulatory Pressure - Edizs(REG-Ediz)			0.0003 (0.7660)				0.0100 * (**0.0919**)	
D) better capitalized banks (REG-mcr)				-0.0006 (0.8020)				-0.0177 ** (**0.0410**)
Inflation Rate	-0.0004 ** (**0.0250**)	-0.0004 ** (**0.0260**)	-0.0004 ** (**0.0250**)	-0.0004 ** (**0.0260**)	0.0008 (0.5940)	0.0007 (0.6286)	0.0008 (0.5870)	0.0009 (0.5641)
Annual GDP growth	0.0001 (0.4710)	0.0001 (0.4690)	0.0001 (0.7250)	0.0001 (0.4720)	-0.0016 (0.2998)	-0.0017 (0.2759)	-0.0016 (0.2876)	-0.0016 (0.2987)
Constant	0.1517 *** (**0.0000**)	0.1517 *** (**0.0000**)	0.1511 *** (**0.0000**)	0.1517 *** (**0.0000**)	0.4168 *** (**0.0076**)	0.4281 *** (**0.0057**)	0.4111 *** (**0.0089**)	0.4232 *** (**0.0063**)
Panel (B): Summary Statistics								
Observations	2844	2846	2844	2844	1861	1863	1861	1861
No. clusters (Banks)	407	407	407	407	328	328	328	328
Wald chi2 Statistic	72.0700 (**0.0000**)	56.0800 (**0.0000**)	75.4400 (**0.0000**)	73.1800 (**0.0000**)	29.7600	34.0900	35.0800	31.3900
r2_overall	0.2046	0.2056	0.2047	0.2047	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_between groups	0.2662	0.2669	0.2665	0.2662	0.0417	0.0438	0.0416	0.0410
r2_withing group	0.0650	0.0646	0.0641	0.0642	0.0578	0.0602	0.0573	0.0564

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

All the above results are matching the results, which are reported in Chapter Five, obtained without considering for the macroeconomic controlling variables. In term of macroeconomic controlling variables, country inflation rate found to be a statistically significant negative relationship with banking risk. (GonzÁLez, 2009) pointed out that increases in the inflation rate could decrease lending activities and hence less risk level. Besides, the annual growth of gross domestic product (GDP) is also included in the model as a controlling variable for the different economic growth of countries that are included in the sample. In theory, higher growth of GDP level reflects the growth of economic activities, and hence more debtors can meet their obligations (Chortareas et al., 2011). Yet, the empirical result in above Table VIII-1 shows no evidence that the risk level is reduced in countries with annual growth of GDP. The annual growth of gross domestic product (GDP) is positively, but statistically insignificant, associated with the risk level. However, the quantitative effect of both macroeconomic controlling variables found to be as small as 0.0004 and 0.0001 respectively.

Empirical results on the risk level of domestic-owned banks versus foreign-owned banks:

Table VIII-2

Relationship between the capital level and risk (for three samples: all banks, domestic-owned banks, and foreign-owned banks respectively) during the sample period 2003 to 2014: The dependent variables is the risk level as measured by the ratio of non-performing loans (NPLs/Asset). A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on three samples: a full sample of all banks, a subsample of domestic-owned banks only, and a subsample of foreign-owned banks.

	Robust Clustered Random Effects Model Estimated Using NPLs/Asset as a Dependent Variable											
	The whole sample				**A subsample of domestic banks**				**A subsample of foreign banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	-0.0002 (0.342)	-0.0002 (0.352)	-0.0002 (0.350)	-0.0002 (0.352)	-0.0003 (0.128)	-0.0003 (0.131)	-0.0003 (0.131)	-0.0003 (0.131)	0.0004 (0.622)	0.0005 (0.603)	0.0005 (0.605)	0.0005 (0.602)
Size: log Assets	-0.0169*** **(0.000)**	-0.0168*** **(0.000)**	-0.0167*** **(0.000)**	-0.0167*** **(0.000)**	-0.0157*** **(0.000)**	-0.0159*** **(0.000)**	-0.0157*** **(0.000)**	-0.0157*** **(0.000)**	-0.0217*** **(0.000)**	-0.0215*** **(0.000)**	-0.0214*** **(0.000)**	-0.0214*** **(0.000)**
Profitability: ROA Ratio	0.3173*** **(0.000)**	0.3160*** **(0.000)**	0.3166*** **(0.000)**	0.3169*** **(0.000)**	0.2956*** **(0.000)**	0.2950*** **(0.000)**	0.2948*** **(0.000)**	0.2958*** **(0.000)**	0.4101** **(0.025)**	0.4119** **(0.024)**	0.4144** **(0.024)**	0.4130** **(0.024)**
Diversification: NII Ratio	-0.0028 (0.683)	-0.0028 (0.680)	-0.0028 (0.688)	-0.0028 (0.682)	0.0000 (0.997)	-0.0001 (0.696)	0.0001 (0.992)	-0.0001 (0.988)	-0.0150 (0.496)	-0.0155 (0.482)	-0.0154 (0.487)	-0.1547 (0.484)
A) Under-capitalized banks (REGU)	0.0131** **(0.012)**				0.0096** **(0.050)**				0.0287*** **(0.000)**			
A) Better-capitalized banks (REGO)	0.0112 (0.630)				-0.0078 (0.774)				0.0618 (0.118)			
B) Under-capitalized banks (PCAU)		0.0016** **(0.032)**				0.0015* **(0.073)**				0.0018 (0.294)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0004 (0.750)				0.0009 (0.478)				-0.0013 (0.598)	
D) better-capitalized banks (REG-mcr)				-0.0008 (0.734)				-0.0008 (0.788)				-0.0009 (0.766)
DV=1, for domestic banks	-0.0008 (0.848)	-0.0010 (0.8270)	-0.0009 (0.844)	-0.0010 (0.838)								
Constant	0.1448*** **(0.000)**	0.1450*** **(0.000)**	0.1443*** **(0.000)**	0.1450*** **(0.000)**	0.1377*** **(0.000)**	0.1378*** **(0.000)**	0.1367*** **(0.000)**	0.1379*** **(0.000)**	0.1679*** **(0.000)**	0.1689*** **(0.000)**	0.1689*** **(0.000)**	0.1693*** **(0.000)**
Panel (B): Summary Statistics												
No. Obs.	2,860	2,862	2,860	2,860	2,287	2289	2287	2287	576	573	573	573
No. Banks	410	410	410	410	330	330	330	330	80	80	80	80
Wald chi2 Statistics	71.2800 **(0.000)**	58.5000 **(0.000)**	74.8600 **(0.000)**	73.0700 **(0.000)**	42.7200 **(0.000)**	30.4200 **(0.000)**	52.3700 **(0.000)**	40.7700 **(0.000)**	127.000 **(0.000)**	31.0500 **(0.000)**	28.9800 **(0.000)**	28.8400 **(0.000)**
r2_overall	0.1996	0.2006	0.1997	0.1997	0.1650	0.1658	0.1652	0.1650	0.2877	0.2829	0.2821	0.2820
r2_between groups	0.2555	0.2561	0.2557	0.2554	0.2240	0.2246	0.2243	0.2241	0.2956	0.2920	0.2898	0.2909
r2_within group	0.0630	0.0627	0.0622	0.0623	0.0546	0.0546	0.0542	0.0541	0.1516	0.1485	0.1490	0.1482

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table VIII-3

Relationship between the capital level and risk (for three samples: all banks, domestic banks, and foreign banks respectively) during the sample period 2003 to 2014: The dependent variables is the risk level as measured by the ratio of the risk-weighted asset (RWAs/Asset). A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on subsamples of domestic and foreign

	Robust Clustered Random Effects Model Estimated Using RWAs/Asset as a Dependent Variable											
	The whole sample				**A subsample of domestic banks**				**A subsample of foreign banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity Ratio	0.0061 *** (**0.0000**)	0.0060 *** (**0.0000**)	0.0061 *** (**0.0000**)	0.0061 *** (**0.0000**)	0.0043 ** (**0.0153**)	0.0043 ** (**0.0160**)	0.0043 ** (**0.0145**)	0.0044 ** (**0.0129**)	0.0044 * (**0.0856**)	0.0044 * (**0.0856**)	0.0047 * (**0.0652**)	0.0045 * (**0.0780**)
Size: log Assets	0.0186 (0.3931)	0.0167 (0.4432)	0.0178 (0.4181)	0.0190 (0.3873)	-0.1103 ** (**0.0178**)	-0.1093 ** (**0.0182**)	-0.1104 ** (**0.0177**)	-0.1099 ** (**0.0179**)	-0.0569 ** (**0.0243**)	-0.0535 ** (**0.0328**)	-0.0547 ** (**0.0275**)	-0.0554 ** (**0.0251**)
Profitability: ROA	0.2440 (0.6489)	0.2442 (0.6484)	0.2407 (0.6525)	0.2556 (0.6341)	0.3457 (0.6969)	0.2426 (0.6999)	0.2330 (0.7116)	0.2714 (0.6665)	0.4496 (0.7248)	0.4601 (0.7120)	0.4566 (0.7215)	0.4636 (0.7119)
Diversification: NII Ratio	0.1023* (**0.0742**)	0.1007* (**0.0769**)	0.1013* (**0.0760**)	0.1019* (**0.0750**)	-0.0575 (0.4191)	-0.0588 (0.4107)	-0.0574 (0.4241)	-0.0593 (0.4069)	-0.0730 (0.4535)	-0.0764 (0.4327)	-0.0731 (0.4479)	-0.0734 (0.4407)
A) Undercapitalized banks (REGU)	0.0509 (0.4459)				0.1090 *** (**0.0077**)				-0.1011 *** (**0.0000**)			
A) Better capitalized banks (REGO)	-0.1200 (0.3032)				-0.1206 (0.3566)				0.1003 (0.6906)			
B) Undercapitalized banks (PCAU)		0.0109 ** (**0.0434**)				0.0070 (0.1903)				-0.0270 (0.1130)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0100* (**0.0934**)				0.0129* (**0.0650**)				0.0042 (0.7144)	
D)Better capitalized banks (REG-mcr)				-0.0172 ** (**0.0457**)				-0.0254 *** (**0.0075**)				0.0167 (0.4229)
DV=1, for domestic banks	0.0608 * (**0.0753**)	0.0623 * (**0.0682**)	0.0616 * (**0.0718**)	0.0600 * (**0.0789**)								
Constant	0.3799 ** (**0.0180**)	0.3908 ** (**0.0142**)	0.3743 ** (**0.0180**)	0.3867 ** (**0.0180**)	1.4678 *** (**0.0003**)	1.4572 *** (**0.0001**)	1.4562 *** (**0.0001**)	1.4815 *** (**0.0001**)	0.9657 *** (**0.0000**)	0.9507 *** (**0.0000**)	0.9486 *** (**0.0000**)	0.9427 *** (**0.0000**)
Panel (B): Summary Statistics												
No. Obs.	1,865	1,867	1,865	1,865	1,619	1,621	1,619	1,619	337	337	337	337
No. Banks	329	329	329	329	274	274	274	274	61	61	61	61
Wald chi2 Statistics	41.5900 (**0.0000**)	46.0800 (**0.0000**)	44.6400 (**0.0000**)	41.8500 (**0.0000**)	51.6500 (**0.0000**)	37.1900 (**0.0000**)	37.4800 (**0.0000**)	46.4700 (**0.0000**)	137.320 (**0.0000**)	18.6500 (**0.0022**)	16.0500 (**0.0000**)	15.36 (**0.0089**)
r2_overall	0.0463	0.0487	0.0465	0.0455	0.0466	0.0466	0.0470	0.0463	0.2145	0.2168	0.2184	0.2130
r2_between groups	0.0622	0.0650	0.0622	0.0609	0.0522	0.0520	0.0525	0.0519	0.1383	0.1363	0.1500	0.1380
r2_within group	0.0085	0.0085	0.0086	0.0087	0.0233	0.0227	0.0232	0.0230	0.0419	0.0505	0.0352	0.0396

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Empirical results on the impact of the capital on the risk level during per-period of announcing the Basel Accords II and post-period of announcing the Basel Accords III:

Table VIII-4: **Relationship between the capital level and risk during sub-period of** prior- and post-period of announcement for Basel Accords Amendments: The dependent variable is the risk level as measured by the non-performing loans (NPLs) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using NPLs/Asset as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for the period 2003-2004 (Pre-period of Basel II)				**A subsample for the period 2013-2014 (Post-period of Basel III)**			
	1 Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)	**1** Coefficient (p-value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0001 (0.8510)	0.0001 (0.8510)	0.0001 (0.8530)	0.0001 (0.8560)	0.0000 (0.9890)	0.0000 (0.9910)	0.0000 (0.9840)	0.0000 (0.9960)
Size: log Assets	-0.0172 *** (**0.0000**)	-0.0170 *** (**0.0000**)	-0.0171 *** (**0.0000**)	-0.0175 *** (**0.0000**)	-0.0107 *** (**0.0000**)	-0.0109 *** (**0.0000**)	-0.0108 *** (**0.0000**)	-0.0107 *** (**0.0000**)
Profitability: ROA Ratio	0.3400 (0.3940)	0.3360 (0.3990)	0.3414 (0.3910)	0.3374 (0.3930)	0.3840 ** (**0.0470**)	0.3852 ** (**0.0440**)	0.3847 ** (**0.0430**)	0.3804 ** (**0.0420**)
Diversification: NII Ratio	-0.0031 (0.8920)	-0.0041 (0.8620)	-0.0027 (0.8960)	-0.0036 (0.8770)	-0.0027 (0.7520)	-0.0029 (0.7250)	-0.0029 (0.7310)	-0.0027 (0.7440)
A) Under-capitalized banks (REGU)	-0.0018 (0.8720)				-0.0001 (0.985)			
A) Better-capitalized banks (REGO)	-0.0061 (0.9220)				-0.0130 (0.4270)			
B) Under-capitalized banks (PCAU)		-0.0046 (0.3090)				0.0029 (0.4150)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0036 (0.1320)				0.0001 (0.9620)	
D) Better-capitalized banks (REG-mcr)				0.0058 (0.6070)				-0.0024 (0.3780)
Constant	0.1444 *** (**0.000**)	0.1440 *** (**0.000**)	0.1410 *** (**0.000**)	0.1412 *** (**0.000**)	0.0969 *** (**0.0000**)	0.0975 *** (**0.0000**)	0.0972 *** (**0.0000**)	0.0989 *** (**0.0000**)
Panel (B): Summary Statistics								
No. Obs.	361	361	361	361	535	535	535	535
No. Banks	235	235	235	235	351	351	351	351
Wald chi2 Statistics	51.0300 (**0.0000**)	44.4000 (**0.0000**)	46.7200 (**0.0000**)	44.8800 (**0.0000**)	126.14 (**0.0000**)	26.8900 (**0.0000**)	26.8200 (**0.0000**)	26.1800 (**0.0000**)
r2_overall	0.2241	0.2310	0.2384	0.2303	0.2208	0.2214	0.2210	0.2189
r2_between groups	0.2578	0.2524	0.2624	0.2516	0.2117	0.2125	0.2117	0.2105
r2_within groups	0.0423	0.0567	0.0389	0.0565	0.1173	0.1151	0.1155	0.1247

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table VIII-5: **Relationship between the capital level and risk during sub-period of** prior- and post-period of announcement for Basel Accords Amendments: The dependent variable is the risk level as measured by the risk-weighted assets (RWAs) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using RWAs/Asset as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for the period 2003-2004 (Pre-period of Basel II)				**A subsample for the period 2013-2014 (Post-period of Basel III)**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0067	0.0069	0.0017	0.0068	0.0246	0.0255	0.0238	0.0263
	(0.1235)	(0.1121)	(0.1192)	(0.0504)	(0.1241)	(0.1141)	(0.1173)	(0.1048)
Size: log Assets	-0.0500*	-0.0487*	-0.0505*	-0.0508	-0.2320*	-0.2284*	-0.2440*	-0.2257*
	(**0.0733**)	(**0.0874**)	(**0.0816**)	(**0.0856**)	(**0.06558**)	(**0.0726**)	(**0.0621**)	(**0.0723**)
Profitability: ROA Ratio	1.4783*	1.4812*	1.4793*	0.1.4718*	0.5997	0.6555	0.5464	0.7032
	(**0.0595**)	(**0.0581**)	(**0.0596**)	(**0.0597**)	(0.4348)	(0.3591)	(0.5052)	(0.3483)
Diversification: NII Ratio	0.4653	0.4624	0.4620	0.4410	0.6226	0.5408	0.6216	0.5655
	(0.1564)	(0.1570)	(0.1570)	(0.1577)	(0.4348)	(0.2979)	(0.2310)	(0.2794)
A) Under-capitalized banks (REGU)	0.1846 ***				0.4164			
	(**0.0058**)				(0.6132)			
A) Better-capitalized banks (REGO)	-0.0617				0.4159			
	(0.7774)				(0.1012)			
B) Under-capitalized banks (PCAU)		-0.0225*				0.0069		
		(0.0555)				(0.4604)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0012				-0.0231	
			(0.9389)				(0.1223)	
D) Regulatory Pressure (REG-mcr)				-0.0028				-0.0226
				(0.8565)				(0.4078)
Constant	0.8195 ***	0.8132 ***	0.8206 ***	0.8230 ***	2.2063 **	2.2164 **	2.3440 **	2.2040 **
	(**0.0004**)	(**0.0005**)	(**0.0006**)	(**0.0004**)	(**0.0187**)	(**0.0220**)	(**0.0187**)	(**0.0215**)
Panel (B): Summary Statistics								
No. Obs.	352	352	352	352	159	159	159	159
No. Banks	235	235	235	235	114	114	114	114
Wald chi2 Statistics	122.0100	109.1500	111.3300	114.9000	10.4300	10.3800	11.8900	10.9600
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.1076)	(0.0652)	(**0.0364**)	**(0.0522)**
r2_overall	0.1111	0.1115	0.1096	0.1093	0.0724	0.0661	0.0723	0.0673
r2_between groups	0.1220	0.1223	0.1204	0.1201	0.0601	0.0532	0.0606	0.0542
r2_within groups	0.0412	0.0435	0.0419	0.0424	0.2355	0.2284	0.2536	0.2307

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Empirical results on the risk level during the prior- and post- period of regulatory pressure using the interaction term ($\boldsymbol{Inter_{it}} = \boldsymbol{REG^{k}_{it}} * \boldsymbol{X_{it}}$):

Part (A): Empirical results on banking risk during the period of less regulatory restrictions (i.e., 2003 to 2008):

Table VIII-6

Relationship between the capital level and risk (a subsample during the period of less the regulatory restrictions, i.e., 2003 to 2008): The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample during the period of less regulatory restrictions

Estimated Models using NPLs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration profitability interaction term				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0007 (0.3544)	0.0007 (0.3615)	0.0007 (0.3612)	0.0007 (0.3617)	0.0007 (0.3609)	0.0007 (0.3620)	0.0009 (0.3212)	0.0007 (0.3669)	0.0007 (0.3614)	0.0007 (0.3621)	0.0007 (0.3637)	0.0007 (0.3571)
Size: log Assets	-0.0197 *** (**0.0000**)	-0.0198 *** (**0.0000**)	-0.0197 *** (**0.0000**)	-0.0198 *** (**0.0000**)	-0.0201 *** (**0.0000**)	-0.0198 *** (**0.0000**)	-0.0200 *** (**0.0000**)	-0.0200 *** (**0.0000**)	-0.0199 *** (**0.0000**)	-0.0197 *** (**0.0000**)	-0.0198 *** (**0.0000**)	-0.0198 *** (**0.0000**)
Profitability: ROA Ratio	0.1125 (0.3116)	0.0811 (0.3188)	0.1223 (0.1928)	0.0549 (0.2900)	0.0810 (0.3143)	0.0771 (0.2993)	0.0690 (0.3233)	0.0839 (0.2997)	0.0767 (0.3000)	0.0767 (0.3001)	0.0778 (0.2947)	0.0767 (0.2984)
Diversification: NII Ratio	-0.0024 (0.7549)	-0.0028 (0.7144)	-0.0026 (0.7315)	-0.0028 (0.7127)	-0.0024 (0.7691)	-0.0024 (0.6975)	0.0006 (0.9388)	-0.0021 (0.7982)	-0.0028 (0.7234)	-0.0029 (0.7066)	-0.0029 (0.7064)	-0.0033 (0.6739)
REGU* Profitability	-0.3191 *** (**0.0088**)											
REGO* Profitability	-0.9004 (0.4387)											
PCAU* Profitability		-0.0207 (0.7675)										
REG-Ediz* Profitability			-0.0694 (0.2053)									
REGmcr* Profitability				0.0234 (0.2598)								
REGU* Diversify					-0.0284 ** (**0.0101**)							
REGO* Diversify					0.0081 (0.9203)							
PCAU* Diversify						-0.0021 (0.6945)						
REG-Ediz* Diversify							-0.0009 (0.1650)					
REGmcr* Diversify								-0.0041 (0.6128)				
REGU*Own									-0.0335 (0.3315)			
REGO*Own									0.0209 (0.6342)			
PCAU*Own										-0.0004 (0.8903)		
REG-Ediz*Own											-0.0022 (0.3653)	
REGmcr* Own												0.0019 (0.6207)
Constant	0.1607 *** (**0.0000**)	0.1613 *** (**0.0000**)	0.1607 *** (**0.0000**)	0.1616 *** (**0.0000**)	0.1634 *** (**0.0000**)	0.1611 *** (**0.0000**)	0.1621 *** (**0.0000**)	0.1632 *** (**0.0000**)	0.1612 *** (**0.0000**)	0.1613 *** (**0.0000**)	0.1622 *** (**0.0000**)	0.1608 *** (**0.0000**)
Panel (B): Summary Statistics												
Observations	1,324	1,325	1,324	1,324	1,316	1,325	1,313	1,316	1,324	1,325	1,324	1,324
No. Banks	364	364	364	364	361	364	361	361	364	364	364	364
Wald chi2 Statistics	49.1400 (**0.0000**)	47.8700 (**0.0000**)	50.9900 (**0.0000**)	48.9600 (**0.0000**)	50.4400 (**0.0000**)	47.4500 (**0.0000**)	48.0100 (**0.0000**)	48.5400 (**0.0000**)	50.0600 (**0.0000**)	48.1300 (**0.0000**)	52.2800 (**0.0000**)	48.7600 (**0.0000**)
r2_overall	0.2191	0.2164	0.2158	0.2164	0.2196	0.2166	0.2334	0.2198	0.2173	0.2167	0.2163	0.2174
r2_between groups	0.2269	0.2251	0.2247	0.2253	0.2299	0.2253	0.2408	0.2309	0.2261	0.2256	0.2249	0.2263
r2_within group	0.0633	0.0620	0.0638	0.0619	0.0647	0.0619	0.0650	0.0621	0.0612	0.0614	0.0627	0.012

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table VIII-7

Relationship between the capital level and risk (a subsample during the period of less the regulatory restrictions, i.e. 2003 to 2008): The dependent variable is the risk level as measured by the risk-weighted assets (RWAs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample during the period of less regulatory restrictions

Estimated Models using RWAs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration profitability interaction term				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0078*** (**0.0001**)	0.0074*** (**0.0001**)	0.0077*** (**0.0002**)	0.0076*** (**0.0001**)	0.0083*** (**0.0004**)	0.0077*** (**0.0002**)	0.0083*** (**0.0006**)	0.0082*** (**0.0008**)	0.0077*** (**0.0002**)	0.0077*** (**0.0002**)	0.0077*** (**0.0002**)	0.0077*** (**0.0002**)
Size: log Assets	-0.0156 (0.2340)	-0.0170 (0.1812)	-0.0161 (0.2222)	-0.0188 (0.1299)	-0.0153 (0.2587)	-0.0163 (0.2070)	-0.0147 (0.2777)	-0.0149 (0.2704)	-0.0165 (0.2053)	-0.0168 (0.1976)	-0.0171 (0.1916)	-0.0171 (0.1884)
Profitability: ROA Ratio	-0.3523 (0.6040)	0.3410 (0.4455)	0.3638 (0.4758)	-0.6108 (0.5869)	0.1870 (0.7453)	0.1980 (0.7016)	0.1725 (0.7647)	0.1844 (0.7508)	0.2027 (0.6973)	0.2041 (0.6941)	0.2049 (0.6943)	0.2026 (0.6957)
Diversification: NII Ratio	0.1286* (**0.0997**)	0.1269* (**0.0974**)	0.1312 (0.1040)	0.1230* (**0.0904**)	0.1262* (**0.0900**)	0.1378* (**0.0892**)	0.1212* (**0.0984**)	0.1237* (**0.0897**)	0.1335 (0.1010)	0.1305 (0.1048)	0.1315 (0.1040)	0.1295 (0.1082)
REGU* Profitability	7.0699** (**0.0202**)											
REGO* Profitability	13.9115** (**0.0271**)											
PCAU* Profitability		-0.5708 (0.2201)										
REG-Ediz* Profitability			-0.2197 (0.3062)									
REGmcr* Profitability				0.8949 (0.2860)								
REGU* Diversify					0.0714 (0.8131)							
REGO* Diversify					-0.4770* (**0.0996**)							
PCAU* Diversify						-0.0395* (**0.0892**)						
REG-Ediz* Diversify							-0.0003 (7429)					
REGmcr* Diversify								-0.0198 (0.5451)				
REGU*Own									0.1103** (**0.0394**)			
REGO*Own									0.0040 (0.9734)			
PCAU*Own										-0.0052 (0.3967)		
REG-Ediz*Own											-0.0049 (0.3974)	
REGmcr* Own												0.0116 (0.3038)
Constant	0.6348*** (**0.0000**)	0.6512*** (**0.0000**)	0.6399*** (**0.0000**)	0.6645*** (**0.0000**)	0.6328*** (**0.0000**)	0.6282*** (**0.0000**)	0.6433*** (**0.0000**)	0.6359*** (**0.0000**)	0.6432*** (**0.0000**)	0.6466*** (**0.0000**)	0.6498*** (**0.0000**)	0.6426*** (**0.0000**)
Panel (B): Summary Statistics												
Observations	1,143	1,144	1,143	1,143	1,138	1,136	1,144	1,138	1,143	1,144	1,143	1,143
No. Banks	327	327	327	327	326	326	327	326	327	327	327	327
Wald chi2 Statistics	47.1400 (**0.0000**)	35.1500 (**0.0000**)	33.5500 (**0.0000**)	37.7700 (**0.0000**)	33.2300 (**0.0000**)	30.6300 (**0.0000**)	43.0400 (**0.0000**)	30.7100 (**0.0000**)	39.5700 (**0.0000**)	34.5100 (**0.0000**)	35.6000 (**0.0000**)	35.2400 (**0.0000**)
r2_overall	0.1336	0.1342	0.1336	0.1318	0.1185	0.1201	0.1345	0.1197	0.1339	0.1324	0.1318	0.1343
r2_between groups	0.1374	0.1385	0.1381	0.1363	0.1291	0.1308	0.1396	0.1304	0.1385	0.1368	0.1362	0.1409
r2_within group	0.0374	0.0323	0.0269	0.0347	0.0298	0.0293	0.0282	0.0301	0.0261	0.0262	0.0264	0.0259

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Part (B): Empirical results on banking risk during the period of more regulatory restrictions (i.e., 2009 to 2014):

Table VIII-8
Relationship between the capital level and risk (a subsample during the period of more the regulatory restrictions, i.e. 2009 to 2014) a subsample for the period (2009-2014): The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample during the period of more regulatory restrictions

Estimated Models using NPLs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration profitability interaction term				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0001 (0.3555)	0.0002 (0.1973)	0.0001 (0.3612)	0.0001 (0.3555)	0.0001 (0.3938)	0.0001 (0.5519)	0.0001 (0.3712)	0.0001 (0.4047)	0.0001 (0.3712)	0.0001 (0.3675)	0.0001 (0.3708)	0.0001 (0.3682)
Size: log Assets	-0.0121 *** **(0.0000)**	-0.0157 *** **(0.0000)**	-0.0120 *** **(0.0000)**	-0.0120 *** **(0.0000)**	-0.0122 *** **(0.0000)**	-0.0159 *** **(0.0000)**	-0.0109 *** **(0.0000)**	-0.0121 *** **(0.0000)**	-0.0120 *** **(0.0000)**	-0.0120 *** **(0.0000)**	-0.0120 *** **(0.0000)**	-0.0119 *** **(0.0000)**
Profitability: ROA Ratio	-0.0118 (0.8521)	-0.0809 (0.1063)	-0.0022 (0.9574)	0.0387 (0.6412)	0.0118 (0.8062)	-0.0229 (0.6311)	0.0118 (0.8223)	0.0101 (0.8365)	0.0124 (0.7940)	0.0121 (0.7982)	0.0120 (0.7994)	0.0117 (0.8047)
Diversification: NII Ratio	0.0063 (0.1798)	0.0055 (0.1837)	0.0063 (0.1777)	0.0063 (0.1751)	0.0062 (0.1587)	0.0049 (0.2285)	0.0063 (0.2716)	0.0070 (0.1593)	0.0063 (0.1764)	0.0064 (0.1720)	0.0063 (0.1757)	0.0017 (0.1745)
REGU* Profitability	0.1745 (0.4017)											
REGO* Profitability	0.5834 (0.4912)											
PCAU* Profitability		0.0085 (0.7806)										
REG-Ediz* Profitability			0.0222 (0.5003)									
REGmcr* Profitability				-0.0300 (0.6772)								
REGU* Diversify					0.0184 (0.6863)							
REGO* Diversify					0.0518 (0.2718)							
PCAU* Diversify						-0.0008 (0.7695)						
REG-Ediz* Diversify							-0.0001 (0.4011)					
REGmcr* Diversify								0.0037 (0.4605)				
REGU*Own									0.0034 (0.5212)			
REGO*Own									-0.0009 (0.9546)			
PCAU*Own										0.0007 (0.5168)		
REG-Ediz*Own											0.0004 (0.6099)	
REGmcr* Own												-0.0018 (0.2901)
Constant	0.1083 *** **(0.0000)**	0.1382 *** **(0.0000)**	0.1078 *** **(0.0000)**	0.1079 *** **(0.0000)**	0.1080 *** **(0.0000)**	0.1400 *** **(0.0000)**	0.0994 *** **(0.0000)**	0.1632 *** **(0.0000)**	0.1077 *** **(0.0000)**	0.1075 *** **(0.0000)**	0.1078 *** **(0.0000)**	0.1081 *** **(0.0000)**
Panel (B): Summary Statistics												
Observations	1,400	1,345	1,400	1,400	1,380	1,388	1,138	1,380	1,400	1,401	1,400	1,400
Banks	391	388	391	391	388	392	378	388	391	391	391	391
Wald chi2 Statistics	52.5600 **(0.0000)**	45.5900 **(0.0000)**	52.6300 **(0.0000)**	52.3600 **(0.0000)**	53.9900 **(0.0000)**	41.2400 **(0.0000)**	47.8700 **(0.0000)**	51.0800 **(0.0000)**	52.4500 **(0.0000)**	52.1700 **(0.0000)**	52.6300 **(0.0000)**	52.5800 **(0.0000)**
r2_overall	0.1771	0.1494	0.1739	0.1736	0.1815	0.1528	0.1783	0.1821	0.1749	0.1745	0.1746	0.1709
r2_between groups	0.1663	0.1676	0.1647	0.1636	0.1631	0.1648	0.1619	0.1647	0.1651	0.1660	0.1647	0.1611
r2_within groups	0.0404	0.1494	0.0411	0.0422	0.0457	0.0597	0.0506	0.0444	0.0403	0.0395	0.0406	0.0448

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Table VIII-9

Relationship between the capital level and risk (a subsample during the period of more the regulatory restrictions, i.e., 2009 to 2014): The dependent variable is the risk level as measured by the risk-weighted assets (RWAs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample during the period of more regulatory restrictions

Estimated Models using RWAs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration profitability interaction term				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	-0.0009 (0.6692)	-0.0012 (0.6631)	-0.0008 (0.7110)	-0.0008 (0.7018)	-0.0012 (0.6048)	0.0017 (0.5456)	-0.0002 (0.9350)	-0.0009 (0.6632)	-0.0009 (0.6857)	-0.0008 (0.7270)	-0.0008 (0.7181)	-0.0006 (0.7629)
Size: log Assets	-0.1144*** (**0.0006**)	-0.0943*** (**0.0024**)	-0.1166*** (**0.0004**)	-0.1144*** (**0.0004**)	-0.1520*** (**0.0002**)	-0.0948*** (**0.0026**)	-0.1409*** (**0.0000**)	-0.1401*** (**0.0000**)	-0.1133*** (**0.0000**)	-0.1158*** (**0.0000**)	-0.1154*** (**0.0005**)	-0.1167*** (**0.0003**)
Profitability: ROA Ratio	1.0818 (0.2577)	1.1633 (0.2254)	0.9585 (0.1571)	0.9421 (0.4137)	0.9659 (0.2364)	0.8942 (0.3553)	0.6207 (0.3736)	1.2179 (0.1268)	1.0709 (0.1348)	1.0581 (0.1467)	1.0512 (0.1483)	1.1102 (0.1221)
Diversification: NII Ratio	0.0632 (0.1478)	0.0794* (**0.0774**)	0.0605 0.1645	0.06230 (0.1555)	0.0804* (**0.0961**)	0.0774* (**0.0906**)	0.1213** (**0.0134**)	0.1069** (**0.0154**)	0.0633 (0.1450)	0.0622 (0.1521)	0.0633 (0.1474)	0.0611 (0.1599)
REGU* Profitability	3.7976 (0.1724)											
REGO* Profitability	-0.2022 (0.9821)											
PCAU* Profitability		0.6103** (**0.0419**)										
REG-Ediz* Profitability			0.1720 (0.6749)									
REGmcr* Profitability				0.1129 (0.8891)								
REGU* Diversify					0.8046 (0.1925)							
REGO* Diversify					2.3554 (0.4074)							
PCAU* Diversify						-0.0302* (0.0906)						
REG-Ediz* Diversify							-0.0004 (0.8779)					
REGmcr* Diversify								-0.0382 (0.1280)				
REGU*Own									0.0892 (0.3063)			
REGO*Own									-0.4035* (**0.0849**)			
PCAU*Own										0.0075 (0.4900)		
REG-Ediz*Own											0.0120 (0.2800)	
REGmcr* Own												-0.0389 (0.1230)
Constant	1.5578*** (**0.0000**)	1.3857*** (**0.0000**)	1.5751*** (**0.0000**)	1.5792*** (**0.0000**)	1.8249*** (**0.0000**)	1.3888*** (**0.0000**)	1.7508*** (**0.0000**)	1.7557*** (**0.0000**)	1.5588*** (**0.0000**)	1.567*** (**0.0000**)	1.5617*** (**0.0000**)	1.5930*** (**0.0000**)
Panel (B): Summary Statistics												
Observations	722	701	722	722	717	712	628	717	722	723	722	722
No. Banks	232	235	232	232	232	236	228	232	232	232	232	232
Wald chi2 Statistics	21.6600 (**0.0014**)	24.1300 (**0.0002**)	19.6800 (**0.0014**)	22.0000 (**0.0005**)	44.7400 (**0.0000**)	21.5700 (**0.0006**)	48.5600 (**0.0000**)	47.1200 (**0.0000**)	21.6100 (**0.0014**)	20.0000 (**0.0012**)	21.0600 (**0.0008**)	19.8200 (**0.0000**)
r2_overall	0.0442	0.0548	0.0439	0.0444	0.0641	0.0527	0.0492	0.0439	0.0483	0.0440	0.0427	0.0527
r2_between groups	0.0557	0.0619	0.0550	0.0556	0.0736	0.0597	0.0622	0.0550	0.0585	0.0552	0.0541	0.0623
r2_within group	0.0070	0.0091	0.0042	0.0039	0.0170	0.0052	0.0019	0.0069	0.0084	0.0043	0.0049	0.0053

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Empirical results on the impact of the implementation of the Basel Accords II on the risk behaviour:

Part (A): Empirical results on the impact of the Base Accords II using NPLs ratio as a risk indicator:

Table VIII-10

Relationship between the capital level and risk (for a subsample of banks that applied the Basel Accords II): The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks that applied the Basel Accords I during 2003 to 2005, and then some of them applied Basel Accords II during the period 2006 to 2012.

Estimated Models using NPLs/Asset as a dependent variable	Robust Clustered Random Effects Model							
	A subsample for banks during the period (2003 to 2012)				A subsample for banks applied Basel II only (2006 to 2012)			
	1	2	3	4	5	6	7	8
	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0002	0.0002	0.0002	0.0002	-0.0002*	-0.0002*	-0.0002*	-0.0002*
	(0.6380)	(0.6420)	(0.6380)	(0.6460)	(**0.0690**)	(**0.0702**)	(**0.0710**)	(**0.0700**)
Size: log Assets	-0.0098 **	-0.0098 **	-0.0099 **	-0.0099 **	-0.0023 **	-0.0022 **	-0.0023 **	-0.0022 **
	(**0.0380**)	(**0.0390**)	(**0.0390**)	(**0.0410**)	(**0.0140**)	(**0.0228**)	(**0.0180**)	(**0.0210**)
Profitability: ROA Ratio	0.2954 ***	0.2962 ***	0.2948 ***	0.2969 ***	0.3541 ***	0.3525 ***	0.3513 ***	0.3528 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Diversification: NII Ratio	-0.0064	-0.0064	-0.0062	-0.0065	0.0021	0.0021	0.0021	0.0020
	(0.3270)	(0.3250)	(0.3430)	(0.3190)	(0.6811)	(0.6747)	(0.6790)	(0.6860)
A) Under-capitalized banks (REGU)	-0.0016				0.0058			
	(0.9130)				(0.6230)			
A) Better-capitalized banks (REGO)	-0.0179				0.0155			
	(0.4860)				(0.3597)			
B) Under-capitalized banks (PCAU)		-0.0008				0.0008		
		(0.1520)				(0.1520)		
C) Regulatory Pressure -Edizs (REG-Ediz)			0.0010				0.0008	
			(0.3050)				(0.3850)	
D) Better-capitalized banks (REG-mcr)				0.0005				-0.0002
				(0.8140)				(0.8750)
DV for banks implemented Basel II since 2006	-0.0045 ***	-0.0045 ***	-0.0045 ***	-0.0045 ***				
	(**0.0070**)	(**0.0070**)	(**0.0070**)	(**0.0070**)				
Constant	0.0928 **	0.0925 **	0.0919 **	0.0924 **	0.0256 ***	0.0256 ***	0.0258 ***	0.0261 ***
	(**0.0170**)	(**0.0170**)	(**0.0180**)	(**0.0160**)	(**0.0010**)	(**0.0010**)	(**0.0010**)	(**0.0010**)
Panel (B): Summary Statistics								
No. Observations	737	797	737	737	558	560	558	558
No. Banks	152	152	152	152	135	135	135	135
Wald chi2 Statistics	49.6900	31.7100	32.4800	57.3300	60.4400	63.4300	62.7600	61.2700
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.2081	0.2083	0.2083	0.2080	0.3807	0.3788	0.3761	0.3765
r2_between groups	0.2055	0.2057	0.2055	0.2052	0.3961	0.3964	0.3930	0.3915
r2_within group	0.1091	0.1085	0.1094	0.1085	0.2404	0.2400	0.2423	0.2407

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Part (B): Empirical results on the impact of the Base Accords II using RWAs ratio as a risk indicator:

Table VIII-11

Relationship between the capital level and risk (for a subsample of banks that applied the Basel Accords II): The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords I during 2003 to 2005, and then they applied Basel Accords II during the period 2006 to 2012

Estimated Models using RWAs/Asset as a dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for banks during the period (2003 to 2012)				**A subsample for banks applied Basel II only (2006 to 2012)**			
	1 Coefficient (p- value)	**2** Coefficient (p-value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)	**5** Coefficient (p-value)	**6** Coefficient (p- value)	**7** Coefficient (p-value)	**8** Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0158***	0.0156***	0.0158***	0.0159***	0.0170***	0.0171***	0.0179***	0.0173***
	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0007**)	(**0.0006**)
Size: log Assets	0.0613***	0.0582**	0.0573**	0.0609***	0.0169	0.0155	0.0153	0.0173
	(**0.0073**)	(**0.0157**)	(**0.0168**)	(**0.0094**)	(0.4405)	(0.779)	(0.4831)	(0.5163)
Profitability: ROA Ratio	1.6183***	1.6019***	1.6226***	1.6391***	2.2084**	2.1682**	2.1559**	2.0722**
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0218**)	(**0.0261**)	(**0.0267**)	(**0.0265**)
Diversification: NII Ratio	0.0037	-0.0057	0.0012	0.0020	0.0009	-0.0025	0.0025	0.0034
	(0.9328)	(0.8941)	(0.9783)	(0.9646)	(0.9848)	(0.9554)	(0.9571)	(0.9426)
A) Undercapitalized banks (REGU)	0.1494				0.1462			
	(0.1655)				(0.2595)			
A) Better capitalized banks (REGO)	-0.1677				-0.3062			
	(0.2730)				(0.1021)			
B) Undercapitalized banks (PCAU)		-0.0128*				0.0078		
		(**0.0607**)				(0.2939)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0029				0.0049	
			(0.7134)				(0.6219)	
D) Better capitalized banks (REG-mcr)				-0.0215				-0.0407
				(0.3182)				(0.1454)
DV for banks implemented Basel II since 2006	0.0670	0.0604	0.0583	0.0658				
	(0.5545)	(0.6008)	(0.6119)	(0.5640)				
Constant	-0.1240	-0.1004	-0.1010	-0.1088	0.2520	0.2495	0.2457	0.2982
	(0.5306)	(0.6282)	(0.6259)	(0.5967)	(0.1909)	(0.1970)	(0.2044)	(0.1133)
Panel (B): Summary Statistics								
No. Observations	644	646	644	644	468	469	468	468
No. Banks	130	130	130	130	118	118	118	118
Wald chi2 Statistics	26.3500	23.0000	20.6400	21.9500	21.7200	25.8000	21.3400	21.2400
	(**0.0004**)	(**0.0008**)	(**0.0021**)	(**0.0012**)	(**0.0014**)	(**0.0001**)	(**0.0007**)	(**0.0007**)
r2_overall	0.2298	0.2391	0.2406	0.2308	0.4202	0.4270	0.4256	0.4274
r2_between groups	0.2388	0.2449	0.2478	0.2403	0.4288	0.4330	0.4338	0.4343
r2_within group	0.0654	0.0654	0.0588	0.0614	0.0451	0.0391	0.0379	0.0401

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Unlink to the results of the baseline regressions in Table 5-6 in Chapter Five, Table VIII-10 reports a significant negative relationship between the capital level and the risk level for the banks that implemented the Basel Accords II during the subsample period 2006 to 2012. The coefficient of the capital level found to be significant at 10% as reported in models from five to eight. This result suggests that banks with relatively more capital level, which were implementing the Basel Accords II, tend to have less credit risk. This result implies that these banks assess their lending portfolio more effectively, and hence they tend to have less credit risk. They don't want to signal the regulators and the market for having a low-quality portfolio otherwise they will be asked to impose for a higher capital level. This result is consistent with the finding of (Ahmed et al., 1999) who found a negative relationship between loan loss provision and capital level during the period (1985 to 1990). This period experienced the introduction of the Basel Accords I and additional amendments into the regulatory capital framework in United States banks. (Aggarwal and Jacques, 2001) also found a significant negative relationship between capital level and credit risk level during the period of implementing the prompt corrective action plan (1993 to 1996) that is used penalties undercapitalized banks for breaching the minimum capital requirements.

At the same time, the second risk indictor shows that high-equity banks, which implemented the Basel Accords II during the period 2006 to 2012 as reported in Table VIII-11, associated with more risk-weighted assets in their asset portfolio. The coefficient of the capital level found to be significantly positive at a significant level of 1% as reported in models from five to eight in the same table. A positive association between the capital level, measured in equity level, and portfolio risk also found by (Beatty and Gron, 2001) who examined the U.S.A holding companies banks during the post-period of implementing the Basel Accords I (i.e., 1986 to 1995). Also (Beatty and Gron, 2001), who examined Swiss banks over the post-period of implementing the Basel Accords I (i.e., 1989 to 1995), also found a positive association between change in the risk level and change in the capital level. They pointed-out banks tend to re-adjust their RWAs in the same direction of the capital level to maintain their regulatory capital ratio. In view of the association between the capital level and these two risk indicators, these results imply that banks, which applied the Basel Accords II, increase in equity financing makes them to change riskiness of their portfolio mix. All other controlling variables are consistent to the results of baseline regressions that are based on the whole sample as discussed in Section 5.7.1 in Chapter Five.

Empirical results on the impact of the implementation of the Basel Accords III on the risk behaviour:

For robust purposes, another subsample is considered to examine the impact of the implementation of the Basel Accords III on the risk behaviour. The subsample includes banks from the following countries:

Table VIII-12: The subsample that is used to examine the prior- and post-period of implementing the framework of the Basel Accords III

No.	Subsample	Countries
1st Subsample	**A subsample of banks that were implementing Basel Accords II during the period 2006 to 2012**	Japan, Switzerland, and the European Union's Countries*
	A subsample of banks that started implementing Basel Accords III during the period 2013-2014	Japan, Switzerland, andthe European Union's Countries*

Note:
- European Unions' countries that are included in the sample are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, Sweden, and United Kingdom.

Table VIII-13: Relationship between the capital level and risk (for a subsample of banks that were implementing the Basel Accords II and then they shift to apply the Basel Accords III in 2013 and 2014):
The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio and the Risk-weighted Assets (RWAs) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in (Table 4-1). All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords II from 2006 to 2012 (2007-2012), and then they applied Basel Accords III during the period 2013 to 2014

Estimated Models	**Robust Clustered Random Effects Model**							
	A subsample for banks that start implementing Basel II during the period (2006 to 2012) and then Basel III during the period (2013-2014) using NPLs/Asset as a dependent variable				**A subsample for banks that start implementing Basel II during the period (2006 to 2012) and then Basel III during the period (2013-2014) using RWAs/Asset as a dependent variable**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0007* (**0.0722**)	0.0006* (**0.0762**)	0.0006* (**0.0779**)	0.0006* (**0.0797**)	0.0132 *** (**0.0003**)	0.0131 *** (**0.0002**)	0.0132 *** (**0.0003**)	0.0133 *** (**0.0002**)
Size: log Assets	-0.0019* (**0.0572**)	-0.0018* (**0.0714**)	-0.0020** (**0.0424**)	-0.0020** (**0.0476**)	-0.1300 *** (**0.0000**)	-0.1288 *** (**0.0000**)	-0.1302 *** (**0.0000**)	-0.1293 *** (**0.0000**)
Profitability: ROA Ratio	0.6329 *** (**0.0000**)	0.6342 *** (**0.0000**)	0.6263 *** (**0.0000**)	0.278 *** (**0.0000**)	1.0988 *** (**0.0001**)	1.0867 *** (**0.0001**)	1.0996 *** (**0.0001**)	1.1106 *** (**0.0000**)
Diversification: NII Ratio	-0.0077* (**0.0777**)	-0.0075* (**0.0777**)	-0.0077* (**0.0770**)	-0.0077* (**0.0807**)	-0.0479 (0.1742)	-0.0486 (0.1616)	-0.0479 (0.1771)	-0.0482 (0.1734)
A) Under-capitalised banks (REGU)	-0.0209* (**0.0868**)				-0.0190 (0.9000)			
A) Better capitalised banks (REGO)	-0.0223 (0.2299)				-0.0978 (0.4555)			
B) Under-capitalised banks (PCAU)		-0.0012 (0.2617)				-0.0150 ** (**0.0499**)		
C) Regulatory Pressure - Edizs (REG-Ediz)			0.0009 (0.2194)				0.0029 (0.6661)	
D)Better capitalised banks (REG-mcr)				0.0012 (0.3584)				-0.0482 (0.4787)
DV for period 2013-2014	0.0071 *** (**0.0002**)	0.0072 *** (**0.0002**)	0.0071 *** (**0.0002**)	0.0071 *** (**0.0003**)	-0.0475 *** (**0.0000**)	-0.0465 *** (**0.0000**)	-0.0476 *** (**0.0000**)	-0.0479 *** (**0.0000**)
Constant	0.0195** (**0.0321**)	0.0175* (**0.0542**)	0.0188** (**0.0010**)	0.01763* (**0.0522**)	1.4638 ***	1.4544 ***	1.4592 ***	1.4685 ***
Panel (B): Summary Statistics								
No. Obs.	645	647	645	645	611	613	611	611
No. Banks	119	119	119	119	120	120	120	120
Wald chi2 Statistics	104.90 (**0.0000**)	81.6500 (**0.0000**)	78.4200 (**0.0000**)	78.7000 (**0.0000**)	166.19 (**0.0000**)	166.93 (**0.0000**)	169.71 (**0.0000**)	156.62 (**0.0000**)
r2_overall	0.5240	0.5243	0.5237	0.5224	0.3701	0.3653	0.3704	0.3722
r2_between groups	0.7620	0.7658	0.7574	0.7558	0.3469	0.3411	0.3476	0.3496
r2_within group	0.2285	0.2265	0.2285	0.2284	0.1634	0.1742	0.1625	0.1624

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Empirical results on the impact of the capital on the risk from bank-size prospective:

Part (A): The results for the impact of the capital on the risk level using the NPLs/Asset ratio as a dependent variable: Comparison between small-sized, medium-sized, and large-sized banks during the sample period 2003 to 2014 using robust clustered random effects model.

Table VIII-14: Panel (A): Relationship between the capital level and risk for a subsample of small-sized, medium-sized, and large-sized banks during the sample period 2003 to 2013. The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using NPLs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for small banks				**A subsample for medium banks**				**A subsample for large banks**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0010	0.0010	0.0010	0.0010	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002*	0.0002*	0.0002
	(0.2319)	(0.2331)	(0.2330)	(0.2327)	(0.5638)	(0.5546)	(0.5567)	(0.5438)	(0.1013)	(**0.0881**)	(**0.0982**)	(0.1029)
Size: log Assets	-0.0418 ***	-0.0412 ***	-0.0409 ***	-0.0412 ***	-0.0094 ***	-0.0091 ***	-0.0092 ***	-0.0090 ***	0.0004	0.0005	0.0004	0.0004
	(**0.0008**)	(**0.0006**)	(**0.0006**)	(**0.0006**)	(**0.0009**)	(**0.0016**)	(**0.0015**)	(**0.0017**)	(0.7967)	(0.7649)	(0.8290)	(0.8046)
Profitability: ROA Ratio	-0.0726	-0.0674	-0.0691	-0.0693	-0.0322	-0.0316	-0.0309	-0.0305	-0.1492 ***	-0.1495 ***	-0.1495 ***	-0.1472 ***
	(0.5005)	(0.5176)	(0.5179)	(0.5138)	(0.3276)	(0.3383)	(0.3452)	(0.3523)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Diversification: NII Ratio	-0.0065	-0.00063	-0.0064	-0.0063	0.0013	0.0010	0.0012	0.0010	0.0039*	0.0041*	0.0042*	0.0038
	(0.5883)	(0.6029)	(0.5941)	(0.6037)	(0.8117)	(0.8478)	(0.8283)	(0.8578)	(**0.0991**)	(**0.0882**)	(**0.0788**)	(0.1142)
A) Under-capitalized banks (REGU)	0.0036				-0.0046				-0.0140			
	(0.8065)				(0.4844)				(0.4219)			
A) Better-capitalized banks (REGO)	-0.0612				0.0070				-0.0049			
	(0.4788)				(0.7443)				(0.6694)			
B) Under-capitalized banks (PCAU)		-0.0025				0.0003				0.0002		
		(0.6021)				(0.7113)				(0.7101)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0008				-0.0004				-0.0009	
			(0.8040)				(0.7185)				(0.2225)	
D) Better-capitalized banks (REG-mcr)				0.0009				-0.0015				0.0018*
				(0.8118)				(0.4631)				(**0.0838**)
Constant	0.2876 ***	0.2822 ***	0.2810 ***	0.2812 ***	0.0873 ***	0.0856 ***	0.0863 ***	0.0862 ***	0.0048	0.0042	0.0060	0.0034
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(0.7464)	(0.7716)	(0.6815)	(0.8096)
Panel (B): Summary Statistics												
No. Observations	912	912	912	912	1331	1332	1331	1331	481	482	481	481
No. Banks	137	137	137	137	185	185	185	185	78	78	78	78
Wald chi2 Statistics	14.6100	14.8400	15.3500	14.5200	16.3500	12.7700	12.9100	13.11	39.5600	37.1200	39.4400	37.6000
	(**0.0235**)	(**0.0111**)	(**0.0090**)	(**0.0126**)	(**0.0120**)	(**0.0256**)	(**0.0243**)	(**0.0224**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1018	0.1013	0.1016	0.1016	0.04557	0.0482	0.0476	0.0520	0.0374	0.0397	0.0360	0.0355
r2_between groups	0.0650	0.0647	0.0643	0.0650	0.0983	0.1019	0.1013	0.1081	0.2382	0.2382	0.2304	0.2403
r2_within group	0.1196	0.1190	0.1184	0.1182	0.0334	0.0317	0.0319	0.0315	0.1585	0.1579	0.1630	0.1579

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

The results for the impact of the capital on the risk level using the NPLs/Asset ratio as a dependent variable: Comparison between small-sized and medium-sized during the sample period 2003 to 2014 using robust clustered random effects model.

Table VIII-15: Panel (A): Relationship between the capital level and risk for a subsample of small-sized and medium-sized banks during the sample period 2003 to 2013. The dependent variable is the risk level as measured by the non-performing loans (NPLs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using NPLs/Asset as a dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for small banks during the sample period 2003 to 2014				**A subsample for medium, and large banks during the sample period 2003 to 2014**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p- value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p- value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0010	0.0010	0.0010	0.0010	0.0001	0.0001	0.0001	0.0001
	(0.2319)	(0.2331)	(0.2330)	(0.2327)	(0.5723)	(0.5649)	(0.5639)	(0.5547)
Size: log Assets	-0.0418 ***	-0.0412 ***	-0.0409 ***	-0.0412 ***	-0.0075 ***	-0.0074 ***	-0.0074 ***	-0.0073 ***
	(**0.0008**)	(**0.0006**)	(**0.0006**)	(**0.0006**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Profitability: ROA Ratio	-0.0726	-0.0674	-0.0691	-0.0693	-0.0382	-0.0385	-0.0376	-0.0372
	(0.5005)	(0.5176)	(0.5179)	(0.5138)	(0.2144)	(0.2141)	(0.2224)	(0.2267)
Diversification: NII Ratio	-0.0065	-0.00063	-0.0064	-0.0063	0.0023	0.0021	0.0022	0.0021
	(0.5883)	(0.6029)	(0.5941)	(0.6037)	(0.5413)	(0.6685)	(0.5562)	(0.5830)
A) Undercapitalized banks (REGU)	0.0036				-0.0041			
	(0.8065)				(0.5255)			
A) Better-capitalized banks (REGO)	-0.0612				0.0058			
	(0.4788)				(0.7225)			
B) Undercapitalized banks (PCAU)		-0.0025				0.0003		
		(0.6021)				(0.6685)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0008				-0.0005	
			(0.8040)				(0.4751)	
D) Better-capitalized banks (REG-mcr)				0.0009				-0.0011
				(0.8118)				(0.5285)
Constant	0.2876 ***	0.2822 ***	0.2810 ***	0.2812 ***	0.0733 ***	0.0725 ***	0.0729 ***	0.0729 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics								
No. Observations	912	912	912	912	1812	1814	1812	1812
No. Banks	137	137	137	137	263	263	263	263
Wald chi2 Statistics	14.6100	14.8400	15.3500	14.5200	32.9200	26.97	27.1600	27.0000
	(**0.0235**)	(**0.0111**)	(**0.0090**)	(**0.0126**)	(**0.0000**)	(**0.0001**)	(**0.0000**)	(**0.0001**)
r2_overall	0.1018	0.1013	0.1016	0.1016	0.0688	0.0803	0.0796	0.0835
r2_between groups	0.0650	0.0647	0.0643	0.0650	0.1231	0.1256	0.1237	0.1293
r2_within group	0.1196	0.1190	0.1184	0.1182	0.0308	0.0294	0.0303	0.0288

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

Part (B): The results for the impact of the capital on the risk level using the RWAs/Asset ratio as a dependent variable: Comparison between small-sized, medium-sized, and large-sized banks during the sample period 2003 to 2014 using robust clustered random effects model.

Table VIII-16: Panel (A): Relationship between the capital level and risk for a subsample of small-sized, medium-sized, and large-sized banks during the sample period 2003 to 2013. The dependent variable is the risk level as measured by the risk-weighted assets (RWAs/Asset) ratio. A short name abbreviates each variable, and list of abbreviation and its definition is presented in Appendix I. All models are estimated by an unbalanced panel-based random effects model with robust standard errors clustered by banks. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using RWAs/Asset as a dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for small size banks				**A subsample for medium-size banks**				**A subsample for large size banks**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0052*** **(0.0000)**	0.0052*** **(0.0000)**	0.0052*** **(0.0000)**	0.0053*** **(0.0000)**	0.0081*** **(0.0013)**	0.0081*** **(0.0013)**	0.0081*** **(0.0014)**	0.0082*** **(0.0011)**	0.0193*** **(0.0001)**	0.0192*** **(0.0002)**	0.0193*** **(0.0001)**	0.0193*** **(0.0002)**
Size: log Assets	-0.0087 (0.8190)	-0.0106 (0.7746)	-0.0081 (0.8305)	-0.0078 (0.8321)	0.0735* **(0.0853)**	0.0716* **(0.0925)**	0.0725* **(0.0925)**	0.0742* **(0.0845)**	0.1263*** **(0.0033)**	0.1288*** **(0.0033)**	0.1288*** **(0.0033)**	0.1288*** **(0.0033)**
Profitability: ROA Ratio	-1.5494* **(0.0585)**	-1.5709* **(0.0532)**	-1.5615* **(0.0547)**	-1.5598* **(0.0585)**	1.2403*** **(0.0007)**	1.2328*** **(0.0007)**	1.2278*** **(0.0009)**	1.2515*** **(0.0007)**	2.744*** **(0.0000)**	2.7645*** **(0.0000)**	2.7645*** **(0.0000)**	2.7126*** **(0.0000)**
Diversification: NII Ratio	0.1108 (0.1658)	0.1094 (0.1631)	0.1115 (0.1597)	0.1119 (0.1554)	0.0985 (0.4077)	0.0605 (0.3877)	0.0577 (0.4192)	0.0564 (0.4298)	0.1217** **(0.0131)**	0.1137** **(0.0220)**	0.1217** **(0.0131)**	0.1250** **(0.0114)**
A) Under-capitalized banks (REGU)	-0.0936*** **(0.0002)**				0.1320*** **(0.0000)**				-0.2630 (0.3537)			
A) Better capitalized banks (REGO)	0.1120 (0.6341)				-0.0629 (0.7035)				-0.2913* **(0.0931)**			
B) Under-capitalized banks (PCAU)		-0.0120 (0.3950)				-0.0070 (0.3315)				-0.0171* **(0.0590)**		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0041 (0.7089)				0.0119 (0.1704)				0.0100 (0.1908)	
D) Better-capitalized banks (REG-mcr)				-0.0006 (0.9665)				-0.0298** **(0.0114)**				0.0028 (0.8812)
Constant	0.6859*** **(0.0033)**	0.7037*** **(0.0021)**	0.6871*** **(0.0035)**	0.6832*** **(0.0029)**	0.0279 (0.9248)	0.0418 (0.8862)	0.0270 (0.9280)	0.04755 (0.8716)	-0.7669** **(0.0495)**	-0.7967** **(0.0472)**	-0.8234** **(0.0427)**	-0.8094** **(0.0453)**
Panel (B): Summary Statistics												
Observations	385	385	385	385	1,053	1,054	1,053	1,053	427	428	427	427
No. Banks	89	89	89	89	168	168	168	168	72	72	72	72
Wald chi2 Statistics	74.1500 **(0.0000)**	37.2800 **(0.0000)**	36.0400 **(0.0000)**	35.9000 **(0.0000)**	53.7100 **(0.0000)**	27.1400 **(0.0001)**	28.44 **(0.0000)**	30.0900 **(0.0000)**	52.3600 **(0.0000)**	46.65 **(0.0000)**	49.0000 **(0.0000)**	48.8600 **(0.0000)**
r2_overall	0.1580	0.1569	0.1623	0.1633	0.0047	0.0054	0.0048	0.0042	0.3907	0.3906	0.3837	0.3864
r2_between groups	0.0650	0.0652	0.0688	0.0690	0.0186	0.0202	0.0193	0.0175	0.4084	0.4070	0.4007	0.4036
r2_within group	0.1079	0.1070	0.1046	0.1042	0.0199	0.0188	0.0193	0.0200	0.1371	0.1393	0.1341	0.1295

The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test.

IX. Appendix: The Relationship between the Capital Level and Banking Performance

Empirical results on the performance of domestic-owned banks versus foreign-owned banks:

Table IX-2

Relationship between the capital level and performance (for three samples: all banks, domestic-owned banks, and foreign-owned banks respectively): The dependent variable is bank performance: total returns to total assets (ROA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on subsamples of domestic and foreign banks during the sample period 2003 to 2014

Estimated Models using ROA asthe dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample				**A subsample of domestic banks**				**A subsample of foreign banks**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-valu)	Coefficient (p-valu)	Coefficient (p-value)	Coefficient (p-valu)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-valu)
Capital: Equity/Asset Ratio	0.0003***	0.0003***	0.0003***	0.0003***	0.0004***	0.0004***	0.0004***	0.0004***	0.0001	0.00004	0.00005	0.00004
	(**0.005**)	(**0.005**)	(**0.006**)	(**0.004**)	(**0.002**)	(**0.007**)	(**0.003**)	(**0.006**)	(0.799)	(0.831)	(0.822)	(0.822)
Size: log Assets	-0.0022*	-0.0025**	-0.0024**	-0.0023**	-0.0015	-0.0019	-0.0018	-0.0016	-0.0033	-0.0035	-0.0034	-0.0033
	(**0.053**)	(**0.030**)	(**0.036**)	(**0.043**)	(0.211)	(0.123)	(0.145)	(0.163)	(0.214)	(0.194)	(0.201)	(0.205)
Risk: NPLs/Asset	-0.0188	-0.0192	-0.0186	-0.0182	-0.0173	-0.0176	-0.0169	-0.0168	-0.0324	-0.0309	-0.0311	-0.0309
	(0.135)	(0.124)	(0.139)	(0.144)	(0.223)	(0.208)	(0.2360)	(0.2313)	(0.3611)	(0.3787)	(0.3740)	(0.3801)
Diversification: NII Ratio	0.0048	0.0048	0.0048	0.0046	0.0033	0.0033	0.0033	0.0031	0.0130*	0.0129*	0.0128*	0.0127*
	(0.185)	(0.179)	(0.181)	(0.200)	(0.415)	(0.419)	(0.420)	(0.449)	(**0.080**)	(**0.073**)	(**0.070**)	(**0.083**)
A) Undercapitalized banks (REGU)	0.0032				-0.0010				0.0080***			
	(0.490)				(0.913)				(**0.005**)			
A) Better capitalized banks (REGO)	-0.0307**				-0.0402**				0.0059			
	(**0.023**)				(**0.013**)				(0.849)			
B) Undercapitalized banks (PCAU)		0.0012				0.0010				0.0023		
		(0.194)				(0.350)				(0.265)		
C) Edizs Regulatory Pressure			0.0017*				0.0020*				0.0012	
			(**0.054**)				(**0.061**)				(0.466)	
D) Better capitalized banks (REG-mcr)				-0.0030**				-0.0034**				-0.0022
				(**0.046**)				(**0.047**)				(0.541)
DV = 1 for domestic banks	0.0009	-0.0009	-0.0009	-0.0009								
	(0.655)	(0.670)	(0.670)	(0.649)								
DV =1, for period after 2009	0.0007	0.0009	0.0008	0.0008	0.0008	0.0010	0.0009	0.0009	-0.0009	-0.0006	-0.0007	-0.0008
	(0.487)	(0.379)	(0.411)	(0.403)	(0.504)	(0.381)	(0.420)	(0.405)	(0.667)	(0.747)	(0.720)	(0.706)
Interest rate Spread	0.0004	0.0004	0.0004	0.0005	0.0007*	0.0007*	0.0007*	0.0008*	-0.0008	-0.0008	-0.0009	-0.0008
	(0.284)	(0.286)	(0.278)	(0.250)	(**0.066**)	(**0.078**)	(**0.068**)	(**0.055**)	(0.432)	(0.437)	(0.401)	(0.426)
Constant	0.0317***	0.0321***	0.0308***	0.0336***	0.0245**	0.0256**	0.0238**	0.0269***	0.0463**	0.0472**	0.0467**	0.0489**
	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.014**)	(**0.014**)	(**0.015**)	(**0.007**)	(**0.031**)	(**0.023**)	(**0.023**)	(**0.027**)

Panel (B): Summary Statistics												
Observations	2,066	2,068	2,066	2,066	1,620	1,622	1,620	1,620	446	446	446	445
No. Banks	310	310	310	310	245	245	245	245	65	65	65	65
Wald chi2 Statistics	66.5400	60.7700	64.9100	63.0200	63.5100	56.7400	58.7400	59.6000	20.9000	8.72	8.7600	7.8600
	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.007**)	**(0.273)**	(0.270)	(0.345)
r2_overall	0.1310	0.1286	0.1313	0.1342	0.1764	0.1717	0.1764	0.1793	0.0115	0.0137	0.0122	0.0125
r2_between groups	0.2371	0.2324	0.2374	0.2445	0.3228	0.3149	0.3223	0.3305	0.0175	0.0197	0.0205	0.0203
r2_within group	0.0021	0.0019	0.0024	0.0021	0.0013	0.0008	0.0014	0.0011	0.0256	0.0269	0.0253	0.0255

Table IX-3

Relationship between the capital level and performance (for three samples: all banks, domestic-owned banks, and foreign-owned banks respectively): The dependent variable is bank performance: net interest margin (NIM) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on three samples: a full sample of all banks, a subsample of domestic-owned banks only, and a subsample of foreign-owned banks during the sample period 2003 to 2014.

Estimated Models using MIN asthe dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample				**A subsample of domestic banks**				**A subsample of foreign banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	-0.0002 ***	-0.0002 ***	-0.0002 ***	-0.0002 ***
	(0.3370)	(0.3487)	(0.3519)	(0.3537)	(0.1269)	(0.1248)	(0.1360)	(0.1362)	**(0.0027)**	**(0.0042)**	**(0.0043)**	**(0.0040)**
Size: log Assets	-0.0045 ***	-0.0044 ***	-0.0044 ***	-0.0044 ***	-0.0038 **	-0.0037 **	-0.0037 **	-0.0037 **	-0.0026	-0.0027	-0.0026	-0.0027
	(0.0004)	**(0.0007)**	**(0.0006)**	**(0.0006)**	**(0.0100)**	**(0.0138)**	**(0.0152)**	**(0.0149)**	(0.2363)	(0.2064)	(0.2298)	(0.2159)
Riskiness: NPLs /Asset	0.0309 **	0.0558 **	0.0558 **	0.0558 **	-0.0341 **	0.0588 **	0.0590 **	0.0587 **	0.0509 ***	0.0509 ***	0.0512 ***	0.0519 ***
	(0.0477)	**(0.0454)**	**(0.0460)**	**(0.0461)**	**(0.0424)**	(0.0417)	**(0.0407)**	**(0.0424)**	**(0.0020)**	**(0.0019)**	**(0.0019)**	**(0.0015)**
Diversification: NII Ratio	-0.0309 ***	-0.0309 ***	-0.0309 ***	-0.0309 ***	-0.0341 ***	0.0339 ***	-0.339 ***	-0.0339 ***	-0.0231 ***	-0.0239 ***	-0.0238 ***	-0.0238 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0001)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0012)**	**(0.0017)**	**(0.0011)**	**(0.0014)**
A) Undercapitalized banks (REGU)	0.0006				0.0004				-0.0028			
	(0.8115)				(0.9351)				(0.315)			
A) Better capitalized banks (REGO)	0.0168				0.0141				0.0372*			
	(0.1005)				(0.2244)				**(0.0936)**			
B) Undercapitalized banks (PCAU)		-0.0006				-0.0002				-0.0021 **		
		(0.3339)				(0.7395)				**(0.0298)**		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0001				0.0007				-0.0016 *	
			(0.9255)				(0.5631)				**(0.0929)**	
D) better capitalized banks (REG-mcr)				-0.0002				-0.0008				0.0024
				(0.8877)				(0.5598)				(0.1089)
DV=1, for domestic banks	-0.0013	-0.0013	-0.0013	-0.0013								
	(0.6400)	(0.6298)	(0.6241)	(0.6216)								
DV =1, for period after 2009	0.0012	0.0011	0.0011	0.0011	-0.0003	-0.0004	-0.0004	-0.0004	0.0051 ***	0.0050 ***	0.0050 ***	0.0050 ***
	(0.1545)	(0.1864)	(0.1795)	(0.1780)	(0.7499)	(0.6904)	(0.6878)	(0.6942)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
Interest rate Spread	0.0006	0.0006	0.0006	0.0006	0.0011*	0.0010	0.0010	0.0010	-0.0004	-0.0005	-0.0004	-0.0005
	(0.2850)	(0.2985)	(0.3059)	(0.3037)	**(0.938)**	(0.1026)	(0.1011)	(0.1037)	(0.5121)	(0.3880)	(0.4814)	(0.3875)
Constant	0.0579 ***	0.0579 ***	0.0581 ***	0.0582 ***	0.0505 ***	0.0505 ***	0.0500 ***	0.0510 ***	0.0489 ***	0.0523 ***	0.0513 ***	0.0494 ***
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0010)**	**(0.0003)**	**(0.0004)**	**(0.0007)**
Panel (B): Summary Statistics												
Observations	2,077	2,079	2,077	2,077	1,629	1,631	1,629	1,629	448	448	448	448
No. Banks	311	311	311	311	246	246	246	246	65	65	65	65
Wald chi2 Statistics	148.66	146.47	145.67	146.57	115.11	111.96	111.79	113.73	63.5500	58.6300	61.0700	59.7600
	(0.0000)	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**	**(0.0000)**
r2_overall	0.1442	0.1429	0.1426	0.1426	0.1677	0.1660	0.1659	0.1660	0.0690	0.0738	0.0685	0.0698
r2_between groups	0.1982	0.1956	0.1946	0.1946	0.2302	0.2268	0.2264	0.2263	0.0358	0.0450	0.0378	0.0376
r2_within group	0.0296	0.0297	0.0297	0.0297	0.0288	0.0291	0.0294	0.0293	0.2041	0.1997	0.2007	0.1994

Table IX-4

Relationship between the capital level and performance (for three samples: all banks, domestic-owned banks, and foreign-owned banks respectively): The dependent variable is bank performance: total cost to total asset (TCA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on three samples: a full sample of all banks, a subsample of domestic-owned banks only, and a subsample of foreign-owned banks during the sample period 2003 to 2014.

Estimated Models using TCA as the dependent variable	**Robust Clustered Random Effects Model**											
	The whole sample				**A subsample of domestic banks**				**A subsample of foreign banks**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	-0.0002 (0.1935)	-0.0002 (0.1969)	-0.0002 (0.2078)	-0.0002 (0.1949)	-0.0002 (0.2647)	-0.0002 (0.2674)	-0.0002 (0.2719)	-0.0002 (0.2618)	-0.0001 (0.2646)	-0.0002 (0.2567)	-0.0001 (0.3492)	-0.0001 (0.3134)
Size: log Assets	-0.0086 *** (**0.0000**)	-0.0084 *** (**0.0000**)	-0.0084 *** (**0.0000**)	-0.0084 *** (**0.0000**)	-0.0081 *** (**0.0002**)	-0.0080 *** (**0.0002**)	-0.0080 *** (**0.0002**)	-0.0079 *** (**0.0002**)	-0.0099 ** (**0.0000**)	-0.0099 *** (**0.0000**)	-0.0099 *** (**0.0000**)	-0.0100 *** (**0.0000**)
Riskiness: NPLs/Asset	0.0564 *** (**0.0009**)	0.0569 *** (**0.0008**)	0.0553 *** (**0.0011**)	0.0570 *** (**0.0009**)	0.0585 *** (**0.0022**)	0.0585 *** (**0.0022**)	0.0576 *** (**0.0027**)	0.0587 *** (**0.0021**)	0.0501 (0.1178)	0.0514 (0.1083)	0.0513 * (**0.0939**)	0.0517 (0.1083)
Diversification: NII Ratio	-0.0114 ** (**0.0219**)	-0.0114 ** (**0.0229**)	-0.0115 ** (**0.0210**)	-0.0113 ** (**0.0234**)	-0.0107 * (**0.0617**)	-0.0106 * (**0.0652**)	-0.0107 * (**0.0619**)	-0.0105 * (**0.0669**)	-0.0145 (0.1542)	-0.0155 (0.1436)	-0.0156 (0.1208)	-0.0154 (0.1425)
A) Undercapitalized banks (REGU)	-0.0031 (0.4431)				-0.0027 (0.7383)				-0.0040 (0.1298)			
A) Better capitalized banks (REGO)	0.0286 ** (**0.0327**)				0.0160 (0.2654)				0.0736 ** (**0.0290**)			
B) Undercapitalized banks (PCAU)		0.0007 (0.4064)				0.0010 (0.2397)				-0.0015 (0.3875)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0017 ** (**0.0147**)				-0.0011 (0.1350)				-0.0037 ** (**0.0239**)	
D) better capitalized banks (REG-mcr)				-0.0011 (0.3915)				-0.0020 (0.1549)				0.0031 (0.1398)
DV=1, for domestic banks	0.0039 (0.2068)	0.0037 (0.2298)	0.0039 (0.2084)	00.37 (0.2317)								
DV =1, for period after 2009	-0.0038 *** (**0.0000**)	-0.0039 *** (**0.0000**)	-0.0039 *** (**0.0000**)	-0.0039 *** (**0.0000**)	-0.0038 *** (**0.0005**)	-0.0039 *** (**0.0005**)	-0.0039 *** (**0.0005**)	-0.0039 *** (**0.0005**)	-0.0041 ** (**0.0179**)	-0.0043 ** (**0.0160**)	-0.0042 ** (**0.0154**)	-0.0043 ** (**0.0137**)
Interest rate Spread	0.0010 ** (**0.0470**)	0.0010 * (**0.0538**)	0.0010 ** (**0.0472**)	0.0010 * (**0.0520**)	0.0012 ** (**0.0331**)	0.0012 ** (**0.0376**)	0.0012 ** (**0.0326**)	0.0012 ** (**0.0350**)	-0.0003 (0.7219)	-0.0004 (0.5249)	-0.0003 (0.6633)	-0.0004 (0.5883)
Constant	0.1115 *** (**0.0000**)	0.1118 *** (**0.0000**)	0.1127 *** (**0.0000**)	0.1125 *** (**0.0000**)	0.1120 *** (**0.0000**)	0.1117 *** (**0.0000**)	0.1126 *** (**0.0000**)	0.1128 *** (**0.0000**)	0.1245 *** (**0.0000**)	0.1289 *** (**0.0000**)	0.1292 *** (**0.0000**)	0.1259 *** (**0.0000**)
Panel (B): Summary Statistics												
Observations	1,534	1.536	1,534	1,534	1,190	1,192	1,190	1,190	344	344	344	344
No. Banks	262	262	262	262	201	201	201	201	61	61	61	61
Wald chi2 Statistics	122.11 (**0.0000**)	113.60 (**0.0000**)	117.84 (**0.0000**)	113.76 (**0.0000**)	89.0300 (**0.0000**)	85.8200 (**0.0000**)	87.1400 (**0.0000**)	86.4400 (**0.0000**)	68.8600 (**0.0000**)	50.0000 (**0.0000**)	49.1300 (**0.0000**)	49.1600 (**0.0000**)
r2_overall	0.2062	0.2017	0.2065	0.2015	0.2201	0.2180	0.2203	0.2172	0.2023	0.2042	0.2065	0.1996
r2_between groups	0.2347	0.2330	0.2364	0.2338	0.2580	0.2570	0.2585	0.2584	0.1936	0.2111	0.2076	0.2034
r2_within group	0.1438	0.1414	0.1441	0.1415	0.1367	0.1372	0.1372	0.1382	0.1856	0.1628	0.1806	0.1685

Empirical results on the impact of the capital on banking performance during per-period of announcing the Basel Accords II and post-period of announcing the amendments of Basel Accords:

Table IX-5

Relationship between the capital level and performance (for three subsamples: a subsample for the period (2005-2008), a subsample for the period (2009-2012), and a subsample for the period (2013-2014) respectively): The dependent variable is profit performance as measured by the ratio of total returns to total assets (ROA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. Model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of prior- and post-period of announcement for Basel Accords Amendments

Estimated Models using ROA asthe dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**				**A subsample for the period 2013-2014**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0003 *	0.0003 *	0.0003 *	0.0003 *	0.0006 ***	0.0006 ***	0.0006 ***	0.0006 ***	0.0004	0.0004	0.0004	0.0004
	(**0.0869**)	(**0.0900**)	(**0.0958**)	(**0.0857**)	(**0.0005**)	(**0.0005**)	(**0.0005**)	(**0.0004**)	(0.1373)	(0.1375)	(0.1334)	(0.1359)
Size: log Assets	0.0010	0.0007	0.0007	0.0008	-0.0013	-0.0015	-0.0015	-0.0015	-0.0017	-0.0015	-0.0016	-0.0016
	(0.3662)	(0.5363)	(0.5051)	(0.4492)	(0.2832)	(0.2110)	(0.1866)	0.2120	(0.4589)	(0.5220)	(0.4796)	(0.4894)
Risk: 5 NPLs/Assets	0.0094	0.0096	0.0100	0.0094	0.0896 *	0.0880 *	0.0887 *	0.0887 *	0.1560 **	0.1553 **	0.1567 **	0.1560 **
	(0.6822)	(0.6814)	(0.6688)	(0.6850)	(**0.0541**)	(**0.0565**)	(**0.0545**)	(**0.0539**)	(**0.0432**)	(**0.0425**)	(**0.0431**)	(**0.0403**)
Diversification: NII Ratio	0.0274 ***	0.0274 ***	0.0273 ***	0.0274 ***	0.0073 *	0.0074 *	0.0073 *	0.0073 *	-0.0039	-0.0036	-0.0038	-0.0040
	(**0.0048**)	(**0.0051**)	(**0.0054**)	(**0.0051**)	(**0.0818**)	(**0.0817**)	(0.0804)	(**0.0846**)	(0.6846)	(0.7067)	(0.6933)	(0.6773)
A) Regulatory Pressure for undercapitalized banks (REGU)	0.0570				-0.0008				0.0159 ***			
	(0.1439)				(0.6762)				(**0.0442**)			
A) Regulatory Pressure for better-capitalized banks (REGO)	-0.0184				-0.0332 **				0.0108			
	(0.3902)				(**0.0430**)				(0.7943)			
B) Regulatory Pressure for undercapitalized banks (PCAU)		0.0012				-0.0006				-0.0019		
		(0.4397)				(0.5630)				(0.3831)		
C) Regulatory Pressure -Edizs Regulatory Pressure			0.0021				0.0016*				-0.0012	
			(0.1001)				(**0.0806**)				(0.5414)	
D) Regulatory Pressure (REG-mcr)				-0.0007				-0.0017				0.0001
				(0.6649)				(0.3349)				(0.9729)
DV=2007 for crisis period	0.0030 ***	0.0029 ***	0.0029 ***	0.0028 ***								
	(**0.0051**)	(**0.0051**)	(**0.0069**)	(**0.0065**)								
Interest rate Spread	0.0022 ***	0.0022 ***	0.0022 ***	0.0022 ***	-0.0001	-0.0001	-0.0001	-0.0001	0.0008	0.0007	0.0007	0.0008
	(**0.0014**)	(**0.0016**)	(**0.0017**)	(**0.0015**)	(0.9175)	(0.9099)	(0.9186)	(0.9114)	(0.5251)	(0.5366)	(0.5297)	(0.5150)
Constant	-0.0013	-0.0004	-0.0013	-0.0004	0.0209 **	0.0211 **	0.0207 **	0.0225 **	0.0270	0.0266	0.0276	0.0264
	(0.8931)	(0.9697)	(0.8911)	(0.9671)	(**0.0455**)	(**0.0428**)	(**0.0461**)	(**0.0304**)	(0.1576)	(0.1654)	(0.1450)	(0.1803)

Panel (B): Summary Statistics

Observations	954	955	954	954	993	994	993	993	407	407	407	407
No. Banks	354	354	354	354	376	376	376	376	265	265	265	265
Wald chi2 Statistics	72.6600	59.5100	68.7000	56.1800	40.5000	36.9100	39.2300	38.3400	27.5300	15.6500	15.4600	15.6700
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0003**)	(**0.0157**)	(**0.0170**)	(**0.0156**)
r2_overall	0.1457	0.1399	0.1406	0.1392	0.1818	0.1798	0.1823	0.1832	0.0891	0.0894	0.0892	0.0880
r2_between groups	0.1859	0.1779	0.1806	0.1786	0.2521	0.2505	0.2513	0.2562	0.1193	0.1190	0.1187	0.1188
r2_within groups	0.0194	0.0183	0.0202	0.0174	0.0236	0.0206	0.0236	0.0188	0.0242	0.0258	0.0249	0.0235

Table IX-6

Relationship between the capital level and performance (for three subsamples: a subsample for period (2005-2008), a subsample for period (2009-2012), and a subsample for period (2013-2014) respectively): The dependent variable is cost levle as measured by net interest margin (NIM) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of prior- and post-period of announcement for Basel Accords Amendments

Estimated Models using NIM as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**				**A subsample for the period 2013-2014**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0004 **	0.0004 **	0.0004 **	0.0004 **	0.0005 ***	0.0005 ***	0.0005 ***	0.0005 ***	0.00001	0.00001	0.00002	0.00001
	(**0.0175**)	(**0.0142**)	(**0.0174**)	(**0.0146**)	(**0.0025**)	(**0.0027**)	(**0.0017**)	(**0.0025**)	(0.7835)	(0.7859)	(0.7358)	(0.7977)
Size: log Assets	-0.0035 **	-0.0035 *	-0.0037 *	-0.0037 *	-0.0014	-0.0007	-0.0009	-0.0009	-0.0003	-0.0001	-0.0001	-0.0001
	(**0.0490**)	(**0.0688**)	(**0.0725**)	(**0.0679**)	(0.5107)	(0.7446)	(0.6686)	(0.6949)	(0.8125)	(0.9533)	(0.9160)	(0.9164)
Risk: 5 NPLs/Assets	0.0441	0.0449	0.0450	0.0449	0.1361 **	0.1396 **	0.1391 **	0.1393 **	0.1073 ***	0.1071 ***	0.1075 ***	0.1054 ***
	(0.3361)	(0.3200)	(0.3229)	(0.3198)	(**0.0367**)	(**0.0353**)	(**0.0350**)	(**0.0352**)	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)
Diversification: NII Ratio	0.0025	0.0027	0.0025	0.0026	-0.0237	-0.0238	-0.0240	-0.0239	-0.0368 ***	-0.0368 ***	-0.0368 ***	-0.0371 ***
	(0.8664)	(0.8594)	(0.8668)	(0.8639)	(0.1486)	(0.1516)	(0.1513)	(0.1504)	(**0.0003**)	(**0.0003**)	(**0.0003**)	(**0.0002**)
A) Regulatory Pressure for undercapitalized banks (REGU)	-0.0433				0.0054*				-0.0012			
	(0.0327)				(**0.0890**)				(0.6179)			
A) Regulatory Pressure for better-capitalized banks (REGO)	-0.0410				0.0622*				0.0223*			
	(0.5171)				(**0.0584**)				(**0.0513**)			
B) Regulatory Pressure for undercapitalized banks (PCAU)		-0.0022				-0.0022				-0.0004		
		(0.1944)				(0.1087)				(0.4077)		
C) Regulatory Pressure -Edizs Regulatory Pressure			0.0014				0.0010				-0.0007	
			(0.4391)				(0.6663)				(0.2991)	
D) Regulatory Pressure (REG-mcr)				0.0016				-0.0006				0.0004
				(0.2867)				(0.8410)				(0.5831)
DV=2007 for crisis period	-0.0009	-0.0010	-0.0009	-0.0009								
	(0.3793)	(0.3665)	(0.3894)	(0.3886)								
Interest rate Spread	0.0007	0.0007	0.0007	0.0007	-0.0003	-0.0003	-0.0003	-0.0003	0.0015*	0.0015*	0.0015*	0.0015*
	(0.4536)	(0.4233)	(0.4379)	(0.4270)	(0.7043)	(0.7127)	(0.7134)	(0.7126)	(**0.0798**)	(**0.0778**)	(**0.0840**)	(**0.0743**)
Constant	0.0469 ***	0.0451 ***	0.0456 ***	0.0448 ***	0.0314 **	0.0298 *	0.0305 *	0.0311 **	0.0309 ***	0.0302 ***	0.0309 ***	0.0302 ***
	(**0.0053**)	(**0.0035**)	(**0.0034**)	(**0.0038**)	(**0.0454**)	(**0.0605**)	(**0.0620**)	(**0.0371**)	(**0.0047**)	(**0.0056**)	(**0.0047**)	(**0.0057**)

Panel (B): Summary Statistics

Observations	955	956	955	955	1,001	1,002	1,001	1,001	409	409	409	409
No. Banks	354	354	354	354	378	378	378	378	266	266	266	266
Wald chi2 Statistics	52.16	51.8500	50.8600	51.6000	103.44	81.7600	79.0900	78.6300	44.2800	43.0800	40.5500	41.6100
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.0826	0.0859	0.0853	0.0859	0.0745	0.0726	0.0719	0.0716	0.0795	0.0782	0.0782	0.0762
r2_between groups	0.1031	0.1108	0.1105	0.1116	0.1223	0.1190	0./1145	0.1154	0.0846	0.0842	0.0838	0.0823
r2_within groups	0.0200	0.0121	0.0114	0.0099	0.0065	0.0072	0.0081	0.0076	0.3239	0.3182	0.3205	0.3220

Table IX-7

Relationship between the capital level and performance (for three subsamples: a subsample for the period (2005-2008), a subsample for the period (2009-2012), and a subsample for the period (2013-2014) respectively): The dependent variable is cost level as measured by total costs to assets (TCA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of prior- and post-period of announcement for Basel Accords Amendments

Estimated Models using TCA as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for the period 2005-2008				**A subsample for the period 2009-2012**				**A subsample for the period 2013-2014**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	-0.00004	-0.00004	-0.00003	-0.00005	0.0001	0.0001	0.0001	0.0001
	(0.3488)	(0.3555)	(0.3590)	(0.3517)	(0.7029)	(0.7139)	(0.7357)	(0.6432)	(0.4463)	(0.4331)	(0.4463)	(0.4330)
Size: log Assets	-0.0034**	-0.0033*	-0.0034**	-0.0035**	-0.0100***	-0.0099***	-0.0099***	-0.0099***	-0.0102***	-0.0098***	-0.0102***	-0.0096***
	(**0.0449**)	(**0.0502**)	(**0.0461**)	(**0.0398**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0001**)	(**0.0002**)	(**0.0001**)	(**0.0003**)
Risk: 5 NPLs/Assets	0.0485*	0.0492*	0.0486*	0.0493*	0.0631	0.0658	0.0654	0.0681	-0.0349	-0.0351	-0.0349	-0.0349
	(**0.0881**)	(**0.0797**)	(**0.0875**)	(**0.0787**)	(0.2957)	(0.2745)	(0.2804)	(0.2563)	(0.4210)	(0.4141)	(0.4210)	(0.4255)
Diversification: NII Ratio	0.0074	0.0074	0.0074	0.0075	-0.0108	-0.0112	-0.0111	-0.0109	0.0437*	0.0435*	0.0437*	0.0426*
	(0.3787)	(0.3836)	(0.3813)	(0.3760)	(0.1229)	(0.1120)	(0.1163)	(0.1213)	(**0.0687**)	(**0.0762**)	(**0.0687**)	(**0.0681**)
A) Regulatory Pressure for undercapitalized banks (REGU)	-0.0137				0.0190**				0.0083*			
	(0.5859)				(**0.0447**)				(**0.0928**)			
A) Regulatory Pressure for better-capitalized banks (REGO)	-0.0042				0.0478**				0.0523			
	(0.8628)				(**0.0233**)				(0.1908)			
B) Regulatory Pressure for undercapitalized banks (PCAU)		-0.0011				0.0013				-0.0005		
		(0.3089)				(0.2350)				(0.5969)		
C) Regulatory Pressure -Edizs Regulatory Pressure			-0.0007				-0.0012				-0.0020	
			(0.5600)				(0.2313)				(0.4689)	
D) Regulatory Pressure (REG-mcr)				0.0012				0.0010				-0.0002
				(0.3979)				(0.5571)				(0.8865)
DV=2007 for crisis period	0.0043***	0.0043***	0.0044***	0.0043***								
	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)								
Interest rate Spread	-0.0008	-0.0008	-0.0007	-0.0008	0.0005	0.0005	0.0004	0.0004	-0.0010	-0.0009	-0.0010	-0.0009
	(0.2812)	(0.2819)	(0.2900)	(0.2794)	(0.3668)	(0.4595)	(0.4776)	(0.4792)	(0.4524)	(0.4834)	(0.4638)	(0.4938)
Constant	0.0847***	0.0841***	0.0844***	0.0837***	0.1244***	0.1263***	0.1263***	0.1248***	0.1137***	0.1120***	0.1144***	0.1120***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0304**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)

Panel (B): Summary Statistics

Observations	742	743	742	742	882	823	822	822	350	350	350	530
No. Banks	227	227	277	277	321	321	321	321	226	226	226	226
Wald chi2 Statistics	25.4700	27.2700	24.5400	26.0100	64.79	55.2500	55.4300	56.0100	30.4900	31.0300	29.3200	30.0300
	(**0.0013**)	(**0.0003**)	(**0.0009**)	(**0.0005**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0001**)	(**0.0000**)	(**0.0001**)	(**0.0000**)
r2_overall	0.0801	0.0840	0.0830	0.0844	0.0425	0.0386	0.386	0.0387	0.1206	0.1152	0.1157	0.1138
r2_between groups	0.1076	0.1119	0.1104	0.1132	0.0184	0.0161	0.0162	0.0166	0.1393	0.1369	0.1364	0.1358
r2_within groups	0.0064	0.0062	0.0062	0.0057	0.0974	0.0983	0.0981	0.0971	0.0190	0.0123	0.0183	0.0127

Empirical results on the banking Performance during the prior- and post-period of regulatory pressure using the interaction term ($\boldsymbol{Inter_{it}} = \boldsymbol{REG_{it}^{k}} * \boldsymbol{X_{it}}$):

Part (A): Empirical results on the banking performance during the period of less regulatory restrictions (i.e., 2003 to 2008):

Table IX-8

Relationship between the capital level and performance (a subsample during the period of less the regulatory restrictions), a subsample for the period (2003-2008): The dependent variable is a profit-based performance as measured by total returns to total assets (ROA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

- ⇨ Key result: pressurized listed banks, which are measured by REG-Ediz, found to be associated with higher earnings compared to unlisted banks.

Panel (A): Regression Models based on a subsample during the period of less the regulatory restrictions

Estimated Models using ROA as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration riskiness interaction term				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0002 * (**0.0528**)	0.0002 ** (**0.0397**)	0.0002 ** (**0.0432**)	0.0002 ** (**0.0427**)	0.0002 * (**0.0874**)	0.0002 ** (**0.0470**)	0.0003 * (**0.0577**)	0.0002 * (**0.0880**)	0.0002 ** (**0.0351**)	0.0002 ** (**0.0429**)	0.0002 ** (**0.0360**)	0.0002 ** (**0.0358**)
Size: log Assets	-0.0008 (0.3619)	-0.0007 (0.3899)	-0.0007 (0.3921)	-0.0007 (0.4046)	-0.0006 (0.4809)	-0.0009 (0.2989)	-0.0007 (0.4079)	-0.0006 (0.4632)	-0.0009 (0.3190)	-0.0008 (0.3334)	-0.0007 (0.4018)	-0.0008 (0.3279)
Risk level: NPLs/Asset	0.0200 (0.2016)	0.0091 (0.4932)	0.0164 (0.2162)	0.0352 (0.2108)	0.0131 (0.3576)	0.0131 (0.3146)	0.0104 (0.4363)	0.0131 (0.3493)	0.0129 (0.3146)	0.0134 (0.2990)	0.0138 (0.2816)	0.0133 (0.3041)
Diversification : NII Ratio	0.0078 (0.1131)	0.0078 (0.1101)	0.0078 (0.1166)	0.0078 (0.1118)	0.0126 *** (**0.0025**)	0.0063 (0.2298)	0.0136 *** (**0.0008**)	0.0136 *** (**0.0029**)	0.0075 (0.1259)	0.0079 (0.1097)	0.0073 (0.1403)	0.0072 (0.1424)
REGU* Riskiness	0.1096 (0.6893)											
REGO* Riskiness	-0.2688 (0.3913)											
PCAU* Riskiness		0.0241 (0.2949)										
REG-Ediz* Riskiness			-0.0061 (0.5219)									
REGmcr* Riskiness				-0.0256 (0.3125)								
REGU* Diversify					0.1200 (0.2748)							
REGO* Diversify					-0.0200 (0.7773)							
PCAU* Diversify						0.0082 (0.2026)						
REG-Ediz* Diversify							-0.0003 (0.1109)					
REGmcr* Diversify								-0.0039 (0.5644)				
REGU*Own									0.0233 (0.2919)			
REGO*Own									0.0227 (0.2294)			
PCAU*Own										0.0023 (0.2154)		
REG-Ediz*Own											0.0029 ** (**0.0360**)	
REGmcr* Own												0.0016 (0.2744)

Continued (Table IX-8)												
	1	2	3	4	1	2	3	4	1	2	3	4
Interest rate Spread	0.0018 ***	0.0018 ***	0.0018 ***	0.0018 ***	0.0020 ***	0.0018 ***	0.0020 ***	0.0020 ***	0.0018 ***	0.0018 ***	0.0018 ***	0.0018 ***
	(**0.0054**)	(**0.0050**)	(**0.0053**)	(**0.0054**)	(**0.0014**)	(**0.0058**)	(**0.0013**)	(**0.0012**)	(**0.0048**)	(**0.0060**)	(**0.0051**)	(**0.0048**)
Constant	0.0150*	0.0144*	0.0144*	0.0150*	0.0123*	0.0155 **	0.0126*	0.0123*	0.0147*	0.0148*	0.0134*	0.0147*
	(**0.0515**)	(**0.0604**)	(**0.0592**)	(**0.0515**)	(**0.0888**)	(**0.0439**)	(**0.0782**)	(**0.0759**)	(**0.0545**)	(**0.0522**)	(**0.0780**)	(**0.0545**)
Panel (B): Summary Statistics												
Observations	1,007	1,008	1,007	1,007	1,000	1,008	997	1,000	1,007	1,008	1,007	1,007
No. Banks	285	285	285	285	283	285	283	283	285	285	285	285
Wald chi2 Statistics	86.0100	84.3800	83.8900	83.9500	110.05	86.2800	93.3800	99.3500	93.7100	90.1000	109.87	100.79
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1349	0.1379	0.1340	0.1370	0.1516	0.1376	0.1447	0.1505	0.1393	0.1384	0.1464	0.1378
r2_between groups	0.2348	0.2411	0.2333	0.2386	0.2496	0.2392	0.2299	0.2460	0.2430	0.2406	0.2547	0.2397
r2_within group	0.00001	0.00001	0.00001	0.0001	0.0020	0.0005	0.0079	0.0023	0.00001	0.0001	0.00001	0.00001

Table IX-9

Relationship between the capital level and performance (a subsample during the period of less the regulatory restrictions), a subsample for the period (2003-2008): The dependent variable is a profit-based performance as measured by net interest margin (NIM) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. key results:

- ⇨ Undercapitalized risky banks found to be associated with a higher net interest margin
- ⇨ Better-capitalized risky banks found to be associated with a lower net interest margin

Panel (A): Regression Models based on a subsample during the period of less the regulatory restrictions

Estimated Models using NIM as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration riskiness interaction term				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0002 (0.2494)	0.0002 (0.2245)	0.0002 (0.2586)	0.0002 (0.2183)	0.0002 (0.2231)	0.0002 (0.2463)	0.0002 (0.2124)	0.0002 (0.2142)	0.0002 (0.2434)	0.0002 (0.2445)	0.0002 (0.2458)	0.0002 (0.2411)
Size: log Assets	-0.0046 *** (**0.0001**)	-0.0046 *** (**0.0001**)	-0.0046 *** (**0.0001**)	-0.0045 *** (**0.0001**)	-0.0044 *** (**0.0001**)	-0.0046 *** (**0.0001**)	-0.0044 *** (**0.0001**)	-0.0044 *** (**0.0001**)	-0.0047 *** (**0.0001**)	-0.0046 *** (**0.0001**)	-0.0046 *** (**0.0001**)	-0.0047 *** (**0.0001**)
Risk level: NPLs/Asset	0.0362 (0.1108)	0.0362 (0.1361)	0.0528* (**0.0520**)	0.0799* (**0.0633**)	0.0414* (**0.0896**)	0.0416* (**0.0812**)	0.0408* (**0.0844**)	0.0415* (**0.0844**)	0.0415* (**0.0830**)	0.0416* (**0.0807**)	0.0416* (**0.0804**)	0.0416* (**0.0817**)
Diversification : NII Ratio	-0.0089 (0.1520)	-0.0086 (0.1545)	-0.0087 (0.1567)	-0.0085 (0.1570)	-0.0091 (0.1629)	-0.0093* (**0.0927**)	-0.0085 (0.1569)	-0.0087 (0.2012)	-0.0090 (0.1470)	-0.0090 (0.1427)	-0.0089 (0.1451)	-0.0091 (0.1403)
REGU* Riskiness	0.1100 (0.2233)											
REGO* Riskiness	0.1855 (0.3753)											
PCAU* Riskiness		0.0371* (**0.0629**)										
REG-Ediz* Riskiness			-0.0316 (0.1013)									
REGmcr* Riskiness				-0.0433 ** (**0.0366**)								
REGU* Diversify					0.0334 (0.3459)							
REGO* Diversify					0.0367 (0.3653)							
PCAU* Diversify						0.0025 (0.6743)						
REG-Ediz* Diversify							-0.0001 (0.5635)					
REGmcr* Diversify								0.0007 (0.9720)				
REGU*Own									0.0121 (0.1014)			
REGO*Own									0.0121 (0.2212)			
PCAU*Own										-0.0005 (0.3166)		
REG-Ediz*Own											0.00002 (0.9728)	
REGmcr* Own												0.0007 (0.4350)
Interest rate Spread	0.0006 (0.2589)	0.0005 (0.3141)	0.0006 (0.2013)	0.0005 (0.3094)	0.0007 (0.2079)	0.0006 (0.2839)	0.0007 (0.1976)	0.0007 (0.2227)	0.0006 (0.2793)	0.0006 (0.2799)	0.0006 (0.2832)	0.0006 (0.2906)
Constant	0.0536 *** (**0.0000**)	0.0536 *** (**0.0000**)	0.0540 *** (**0.0000**)	0.0533 *** (**0.0000**)	0.0514 *** (**0.0000**)	0.0542 *** (**0.0000**)	0.0517 *** (**0.0000**)	0.0517 *** (**0.0000**)	0.0542 *** (**0.0000**)	0.0540 *** (**0.0000**)	0.0541 *** (**0.0000**)	0.0541 *** (**0.0000**)

Panel (B): Summary Statistics												
Observations	1,008	1,009	1,008	1,008	999	1,009	996	999	1,008	1,009	1,008	1,008
No. Banks	285	285	285	285	283	285	283	283	285	285	285	285
Wald chi2 Statistics	78.2500 (**0.0000**)	74.9400 (**0.0000**)	82.0500 (**0.0000**)	74.9400 (**0.0000**)	78.2300 (**0.0000**)	78.9400 (**0.0000**)	78.6700 (**0.0000**)	76.9200 (**0.0000**)	80.5800 (**0.0000**)	76.6700 (**0.0000**)	77.4300 (**0.0000**)	78.4400 (**0.0000**)
r2_overall	0.2548	0.2500	0.2559	0.2511	0.2582	0.2536	0.2585	0.2542	0.2583	0.2560	0.2553	0.2564
r2_between groups	0.2653	0.2542	0.2670	0.2584	0.2751	0.2635	0.2756	0.2686	0.2707	0.2666	0.2664	0.2685
r2_within group	0.0366	0.0580	0.0562	0.0613	0.051	0.0373	0.0341	0.0352	0.0351	0.0353	0.0350	0.0349

Table IX-10

Relationship between the capital level and performance (a subsample during period of less the regulatory restrictions), a subsample for period (2003-2008): The dependent variable is cost level as measured by total cost to total assets (TCA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. key results:

- ⇨ Both undercapitalized and better-capitalized risky banks are associated with less operating costs
- ⇨ Undercapitalized diversified banks are associated with less operating costs

Panel (A): Regression Models based on a subsample during period of less the regulatory restrictions

Estimated Models using TCA as dependent variable	Robust Clustered Random Effects Model											
	A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration riskiness interaction term				A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration diversification interaction term				A subsample for banks during the period of less regulatory restrictions (2003 to 2008) with consideration for ownership interaction term			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	-0.0003 ** (**0.0180**)	-0.0003 ** (**0.0272**)	-0.0003 ** (**0.0240**)	-0.0003 ** (**0.0283**)	-0.0003 ** (**0.0298**)	-0.0003 ** (**0.0283**)	-0.0002 (0.1177)	-0.0003 ** (**0.0285**)	-0.0003 ** (**0.0257**)	-0.0003 ** (**0.0263**)	-0.0003 ** (**0.0237**)	-0.0003 ** (**0.0267**)
Size: log Assets	-0.0052 *** (**0.0020**)	-0.0050 *** (**0.0033**)	-0.0050 *** (**0.0030**)	-0.0050 *** (**0.0033**)	-0.0047 *** (**0.0054**)	-0.0049 *** (**0.0034**)	-0.0046 *** (**0.0065**)	-0.0047 *** (**0.0056**)	-0.0051 *** (**0.0026**)	-0.0050 *** (**0.0030**)	-0.0050 *** (**0.0026**)	-0.0050 *** (**0.0032**)
Risk level: NPLs/Asset	0.0872 *** (**0.0026**)	0.0634 ** (**0.0122**)	0.0627 ** (**0.0258**)	0.0869 ** (**0.0371**)	0.0688 *** (**0.0054**)	0.0670 *** (**0.0073**)	0.0663 *** (**0.0076**)	0.0687 *** (**0.0057**)	0.0669 *** (**0.0073**)	0.0669 *** (**0.0073**)	0.0656 *** (**0.0089**)	0.0670 *** (**0.0074**)
Diversification : NII Ratio	-0.0039 (0.5423)	-0.0037 (0.5519)	-0.0039 (0.5376)	-0.0035 (0.5749)	-0.0045 (0.5065)	-0.0037 (0.5574)	-0.0025 (0.6930)	-0.0043 (0.5066)	-0.0042 (0.5137)	-0.0039 (0.5342)	-0.0040 (0.5300)	-0.0040 (0.5321)
REGU* Riskiness	-0.1725 ** (**0.0417**)											
REGO* Riskiness	-0.7583 *** (**0.0069**)											
PCAU* Riskiness		0.0163 0.5548										
REG-Ediz* Riskiness			0.0082 (0.6209)									
REGmcr* Riskiness				-0.0248 (0.4283)								
REGU* Diversify					-0.0631 (0.1808)							
REGO* Diversify					-0.0266 (0.6454)							
PCAU* Diversify						-0.0015 (0.7165)						
REG-Ediz* Diversify							-0.0003 *** (**0.0022**)					
REGmcr* Diversify								-0.0010 (0.8333)				
REGU*Own									-0.0052 (0.6632)			
REGO*Own									0.0100 (0.6588)			
PCAU*Own										-0.0003 (0.8057)		
REG-Ediz*Own											-0.0018 (0.1283)	
REGmcr* Own												0.0001 (0.9520)

Interest rate Spread	0.00004	0.00001	0.00001	0.00001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.9468)	(0.8834)	(0.8542)	(0.8835)	(0.8973)	(0.8436)	(0.6930)	(0.8799)	(0.8507)	(0.8397)	(0.8127)	(0.8504)
Constant	0.0946 ***	0.0924 ***	0.0926 ***	0.0923 ***	0.0908 ***	0.0922 ***	0.0887 ***	0.0906 ***	0.0930 ***	0.0925 ***	0.0934 ***	0.0924 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics												
Observations	695	696	695	695	688	696	687	688	695	696	695	695
No. Banks	206	206	206	206	204	206	204	204	206	206	206	206
Wald chi2 Statistics	26.0700	22.4600	21.3100	21.6400	22.0000	24.6600	31.9300	21.1500	22.3200	22.4500	24.0500	22.0300
	(**0.0000**)	(**0.0010**)	(**0.0016**)	(**0.0014**)	(**0.0025**)	(**0.0004**)	(**0.0000**)	(**0.0017**)	(**0.0022**)	(**0.0010**)	(**0.0005**)	(**0.0012**)
r2_overall	0.1692	0.1601	0.1593	0.1623	0.1557	0.1583	0.1470	0.1555	0.1590	0.1592	0.1634	0.1582
r2_between groups	0.1812	0.1674	0.1678	0.1704	0.1577	0.1662	0.1520	0.1567	0.1667	0.1673	0.1704	0.1662
r2_within group	0.0384	0.0344	0.0327	0.0351	0.070	0.0333	0.0489	0.0366	0.0333	0.0328	0.0356	0.0330

Part (B): Empirical results on the banking performance during the period of more regulatory restrictions (i.e., 2009 to 2014)

Table IX-11

Relationship between the capital level and performance (a subsample during the period of more the regulatory restrictions), a subsample for the period (2009-2014): The dependent variable is a profit-based performance as measured by total returns to total assets (ROA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. key results:

- ⇨ Undercapitalized diversified banks are associated with high earnings
- ⇨ Undercapitalized listed banks are associated with high earnings

Panel (A): Regression Models based on a subsample during the period of less the regulatory restrictions

Estimated Models using ROA as the dependent variable	Robust Clustered Random Effects Model											
	A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration riskiness interaction term				A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration diversification interaction term				A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration for the ownership interaction term			
	1	2	3	4	1	2	3	4	1	2	3	4
Capital: Equity/ Asset Ratio	0.0004** (**0.0152**)	0.0004** (0.0446)	0.0004** (**0.0151**)	0.0004** (**0.0120**)	0.0004** (**0.0145**)	0.0004** (**0.0148**)	0.0002 (0.1605)	0.0004** (**0.0147**)	0.0004** (**0.0153**)	0.0004** (**0.0152**)	0.0004** (**0.0143**)	0.0004** (**0.0148**)
Size: log Assets	-0.0027** (**0.0470**)	-0.0028** (**0.0446**)	-0.0028** (**0.0435**)	-0.0027** (**0.0467**)	-0.0032** (**0.0234**)	-0.0029** (**0.0407**)	-0.0029** (**0.0466**)	-0.0026* (**0.0592**)	-0.0028** (**0.0444**)	-0.0028** (**0.0436**)	-0.0028** (**0.0463**)	-0.0028** (**0.0398**)
Risk level: NPLs/Asset	0.0736 (0.1030)	0.0509 (0.2051)	0.0098 (0.8712)	0.1197** (**0.0464**)	0.0497 (0.2147)	0.0533 (0.1717)	0.0738 (0.1289)	0.0565 (0.1415)	0.0515 (01928)	0.0516 (01913)	0.0533 (01714)	0.0520 (01861)
Diversification: NII Ratio	0.0030 (0.5532)	0.0029 (0.5716)	0.0032 (0.2469)	0.0029 (0.5789)	0.0021 (0.6824)	0.0007 (0.8872)	-0.0047 (0.3417)	0.0145 (0.1601)	0.0030 (0.5634)	0.0027 (0.5581)	0.0029 (0.5708)	0.0030 (0.5649)
REGU* Riskiness	0.0553 (0.5684)											
REGO* Riskiness	-0.6898 (0.3536)											
PCAU* Riskiness		0.0086 (0.8297)										
REG-Ediz* Riskiness			0.0666 (0.2469)									
REGmcr* Riskiness				-0.0714 (0.2326)								
REGU* Diversify					0.0111 (0.5768)							
REGO* Diversify					0.0830 (0.2929)							
PCAU* Diversify						0.0078 (0.1908)						
REG-Ediz* Diversify							0.0012*** (**0.0000**)					
REGmcr* Diversify								-0.0139 (0.1323)				
REGU*Own									0.0052 (0.2112)			
REGO*Own									0.0024 (0.9127)			
PCAU*Own										0.0016 (0.3203)		
REG-Ediz*Own											0.0027* (**0.0620**)	
REGmcr* Own												0.0007 (0.6882)

Interest rate Spread	0.0005 (0.4411)	0.0005 (0.4476)	0.0005 (0.4364)	0.0005 (0.4427)	0.0006 (0.3854)	0.0005 (0.4283)	0.0010 (0.1631)	0.0006 (0.4635)	0.0005 (0.4555)	0.0005 (0.4464)	0.0005 (0.4606)	0.0005 (0.4668)
Constant	0.0322 *** (**0.0089**)	0.0324 *** (**0.0085**)	0.0329 *** (**0.0082**)	0.0320 *** (**0.0088**)	0.0343 *** (**0.0063**)	0.0334 *** (**0.0079**)	0.0329 ** (**0.0117**)	0.0316 ** (**0.0109**)	0.0325 *** (**0.0085**)	0.0327 *** (**0.0086**)	0.0317 ** (**0.0105**)	0.0326 *** (**0.0082**)
Panel (B): Summary Statistics												
Observations	1,059	1,060	1,059	1,059	1,042	1,060	863	1,059	1,059	1,060	1,059	1,059
No. Banks	301	301	301	301	298	301	291	301	301	301	301	301
Wald chi2 Statistics	39.4200 (**0.0000**)	38.2900 (**0.0000**)	40.3000 (**0.0000**)	44.3100 (**0.0000**)	45.7000 (**0.0000**)	39.4300 (**0.0000**)	93.2900 (**0.0000**)	41.4800 (**0.0000**)	41.7400 (**0.0000**)	38.4700 (**0.0000**)	43.2600 (**0.0000**)	40.3700 (**0.0000**)
r2_overall	0.1804	0.1810	0.1822	0.1874	0.2040	0.1868	0.2700	0.1919	0.1809	0.1819	0.1874	0.1813
r2_between groups	0.2764	0.2854	0.2728	0.2942	0.3135	0.2911	0.3893	0.2928	0.2848	0.2843	0.2913	0.2870
r2_within group	0.0002	0.0001	0.0020	0.0001	0.00001	0.00001	0.0178	0.00001	0.0001	0.00001	0.00001	0.0001

Table IX-12

Relationship between the capital level and performance (a subsample during period of more regulatory restrictions), a subsample for period (2009 to 2014): The dependent variable is a profit-based performance as measured by net interest margin (NIM) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. key results:

- ⇨ Better-capitalized diversified banks are associated with a high net interest margin
- ⇨ Undercapitalized listed banks are associated with a high net interest margin

Panel (A): Regression Models based on a subsample during the period of less the regulatory restrictions

Estimated Models using NIM as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration riskiness interaction term				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	0.0002 * (**0.0777**)	0.0002 * (**0.0790**)	0.0002 * (**0.0753**)	0.0002 * (**0.0779**)	0.0003 ** (**0.0418**)	0.0002 * (**0.0719**)	0.0003 *** (**0.0046**)	0.0003 ** (**0.0418**)	0.0002 * (**0.0723**)	0.0002 * (**0.0779**)	0.0002 * (**0.0774**)	0.0002 * (**0.0736**)
Size: log Assets	-0.0042 *** (**0.0076**)	-0.0042 *** (**0.0083**)	-0.0041 *** (**0.0089**)	-0.0041 *** (**0.0091**)	-0.0048 *** (**0.0006**)	-0.0042 *** (**0.0041**)	-0.0037 ** (**0.0315**)	-0.0048 *** (**0.0006**)	-0.0044 *** (**0.0061**)	-0.0042 *** (**0.0032**)	-0.0042 *** (**0.0079**)	-0.0041 ** (**0.0167**)
Risk level: NPLs/Asset	0.0597 (0.1352)	0.0751 * (0.0795)	0.0905 ** (0.0336)	0.1133 * (0.0674)	0.0826 ** (**0.0412**)	0.0830 * (**0.0412**)	0.1038 * (**0.0681**)	0.0826 ** (**0.0412**)	0.0795 * (0.0604)	0.0822 * (0.0534)	0.0833 * (0.0552)	0.0820 * (0.0564)
Diversification : NII Ratio	-0.0432 *** (**0.0032**)	-0.0431 *** (**0.0032**)	-0.0432 *** (**0.0032**)	-0.0431 *** (**0.0032**)	-0.0527 *** (**0.0039**)	-0.0447 *** (**0.0076**)	-0.0484 ** (**0.0209**)	-0.0527 *** (**0.0039**)	-0.0432 *** (**0.0032**)	-0.0434 *** (**0.0032**)	-0.0433 *** (**0.0033**)	-0.0431 *** (**0.0031**)
REGU* Riskiness	0.0804 (0.1638)											
REGO* Riskiness	0.6240 (0.3095)											
PCAU* Riskiness		0.0415 (0.2874)										
REG-Ediz* Riskiness			-0.0140 (0.5855)									
REGmcr* Riskiness				-0.0336 (0.4093)								
REGU* Diversify					0.0943 (0.1388)							
REGO* Diversify					0.4203 *** (**0.0081**)							
PCAU* Diversify						0.0055 (0.5180)						
REG-Ediz* Diversify							-0.0002 (0.4168)					
REGmcr* Diversify								-0.0002 (0.9850)				
REGU*Own									0.0085 ** (**0.0126**)			
REGO*Own									0.0345 (0.1240)			
PCAU*Own										0.0020 (0.1045)		
REG-Ediz*Own											0.0029 (0.1732)	
REGmcr* Own												-0.0003 (0.9147)

Interest rate Spread	0.0011* (**0.0817**)	0.0011* (**0.0766**)	0.0011* (**0.0787**)	0.0011* (**0.0794**)	0.0007 (0.3188)	0.0011* (0.0623)	0.0008 (0.3038)	0.0011* (**0.0783**)	0.0011* (**0.0812**)	0.0011* (**0.0779**)	0.0011* (**0.0891**)	0.0011* (**0.0700**)
Constant	0.0557 *** (**0.0000**)	0.0558 *** (**0.0000**)	0.0553 *** (**0.0000**)	0.0554 *** (**0.0000**)	0.0591 *** (**0.0000**)	0.0561 *** (**0.0000**)	0.0529 *** (**0.0000**)	0.0554 *** (**0.0000**)	0.0565 *** (**0.0000**)	0.0557 *** (**0.0000**)	0.0549 *** (**0.0000**)	0.0554 *** (**0.0000**)
Panel (B): Summary Statistics												
Observations	1,069	1,070	1,069	1,069	1,043	1,070	864	1,069	1,069	1,070	1,069	1,069
No. Banks	303	303	303	303	299	303	292	303	303	303	303	303
Wald chi2 Statistics	176.73 (**0.0000**)	166.64 (**0.0000**)	163.47 (**0.0000**)	161.60 (**0.0000**)	182,09 (**0.0000**)	165.34 (**0.0000**)	171.79 (**0.0000**)	162.14 (**0.0000**)	180.63 (**0.0000**)	161.96 (**0.0000**)	160.60 (**0.0000**)	170.91 (**0.0000**)
r2_overall	0.1117	0.1113	0.1110	0.1112	0.1348	0.1119	0.1124	0.1109	0.1122	0.1116	0.1130	0.1109
r2_between groups	0.2184	0.2162	0.2163	0.2158	0.2732	0.2151	0.1753	0.2151	0.2197	0.2159	0.2169	0.2149
r2_within group	0.0124	0.0131	0.0127	0.0128	0.0103	0.0130	0.0179	0.0129	0.0125	0.0130	0.0141	0.0129

Table IX-13

Relationship between the capital level and performance (a subsample during the period of more regulatory restrictions), a subsample for the period (2009 to 2014): The dependent variable is cost level as measured by total cost to total assets (TCA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks. key results:

- ⇨ Undercapitalized diversified banks are associated with high banking costs
- ⇨ Undercapitalized listed banks and better-capitalized listed banks are associated with high banking costs

Panel (A): Regression Models based on a subsample during the period of less the regulatory restrictions

Estimated Models using TCA as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration riskiness interaction term				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration diversification interaction term**				**A subsample for banks during the period of less regulatory restrictions (2009 to 2014) with consideration for the ownership interaction term**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Capital: Equity/ Asset Ratio	-0.0002*** (**0.0088**)	-0.0002*** (**0.0082**)	-0.0002*** (**0.0090**)	-0.0002*** (**0.0084**)	-0.0002** (**0.0120**)	-0.0002** (**0.0046**)	-0.0003** (**0.0102**)	-0.0002** (**0.0037**)	0.0002*** (**0.0081**)	0.0002*** (**0.0086**)	0.0002*** (**0.0087**)	0.0002*** (**0.0074**)
Size: log Assets	-0.0121*** (**0.0000**)	-0.0122*** (**0.0000**)	-0.0120*** (**0.0000**)	-0.0121*** (**0.0000**)	-0.0119*** (**0.0000**)	-0.0120*** (**0.0000**)	-0.0115*** (**0.0000**)	-0.0118*** (**0.0000**)	-0.0123*** (**0.0000**)	-0.0121*** (**0.0000**)	-0.0121*** (**0.0000**)	-0.0122*** (**0.0000**)
Risk level: NPLs/Asset	0.0027 (0.9472)	0.0056 (0.8659)	0.0257 (0.4904)	0.0689 (0.4752)	0.0145 (0.7126)	0.0159 (0.6703)	0.0554 (0.2576)	0.0180 (0.6265)	0.0169 (0.6531)	0.0152 (0.6854)	0.0164 (0.6630)	0.0178 (0.6368)
Diversification : NII Ratio	-0.0147** (**0.0313**)	-0.0147** (**0.0313**)	-0.0145** (**0.0343**)	-0.0145** (**0.0309**)	-0.0146** (**0.0362**)	-0.0156** (**0.0189**)	-0.0154** (**0.0290**)	-0.0043 (0.6886)	-0.0146** (**0.0323**)	-0.0147** (**0.0289**)	-0.0146** (**0.0319**)	-0.0146** (**0.0333**)
REGU* Riskiness	-0.0530 (0.2165)											
REGO* Riskiness	0.5259 (0.2948)											
PCAU* Riskiness		0.0287 (0.6344)										
REG-Ediz* Riskiness			-0.0143 (0.5233)									
REGmcr* Riskiness				-0.0614 (0.4740)								
REGU* Diversify					-0.0071 (0.6899)							
REGO* Diversify					0.0287 (0.5092)							
PCAU* Diversify						0.0082* (**0.0737**)						
REG-Ediz* Diversify							0.0003** (**0.0403**)					
REGmcr* Diversify								-0.0101 (0.1712)				
REGU*Own									-0.0050 (0.1213)			
REGO*Own									0.0231 (0.1733)			
PCAU*Own										0.0021* (**0.0664**)		
REG-Ediz*Own											-0.0007 (0.4003)	
REGmcr* Own												0.0019* (**0.0668**)

Interest rate Spread	0.0013 ** **(0.0119)**	0.0013 *** **(0.0048)**	0.0013 ** **(0.0108)**	0.0013 ** **(0.0039)**	0.0014 *** **(0.0092)**	0.0013 *** **(0.0087)**	0.0010 (0.1044)	0.0013 *** **(0.0096)**	0.0013 ** **(0.0120)**	0.0013 *** **(0.0083)**	0.0013 ** **(0.0112)**	0.0012 ** **(0.0132)**
Constant	0.1377 *** **(0.0000)**	0.1387 *** **(0.0000)**	0.1373 *** **(0.0000)**	0.1377 *** **(0.0000)**	0.1360 *** **(0.0000)**	0.1371 *** **(0.0000)**	0.1358 *** **(0.0000)**	0.1350 *** **(0.0000)**	0.1386 *** **(0.0000)**	0.1371 *** **(0.0000)**	0.1382 *** **(0.0000)**	0.1381 *** **(0.0000)**
Panel (B): Summary Statistics												
Observations	839	840	839	839	817	840	670	839	839	840	839	839
No. Banks	254	254	254	254	251	254	241	254	254	254	254	254
Wald chi2 Statistics	111.14 **(0.0000)**	106.55 **(0.0000)**	109.94 **(0.0000)**	107.41 **(0.0000)**	110.96 **(0.0000)**	110.70 **(0.0000)**	131.09 **(0.0000)**	112.12 **(0.0000)**	115.60 **(0.0000)**	113.66 **(0.0000)**	112.46 **(0.0000)**	116.85 **(0.0000)**
r2_overall	0.2387	0.2300	0.2361	0.2298	0.2396	0.2454	0.2318	0.2491	0.2367	0.2371	0.2329	0.2348
r2_between groups	0.2475	0.2418	0.2463	0.2421	0.2356	0.2695	0.2393	0.2800	0.2462	0.2509	0.2416	0.2444
r2_within group	0.0968	0.0999	0.0951	0.1023	0.0969	0.0856	0.0967	0.0766	0.0972	0.0959	0.0986	0.0987

Empirical results on the impact of the implementation of the Basel Accords II on the banking performance:

Part (A): Empirical results on the impact of the Base Accords II using ROA ratio as a performance indicator:

Table IX-14

Relationship between the capital level and performance (for a subsample of banks that applied the Basel Accords II): The dependent variable is profit-based performance as measured by total returns to total assets ratio (ROA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords I from 2003 to 2005, and then some of them applied Basel Accords II during the period 2006 to 2012

Estimated Models using ROA as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for banks during the period (2003 to 2012)				**A subsample for banks applied Basel II only (2006 to 2012)**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	-0.00002	6.8e-08	-6.8e-06	1.7e-06	0.0004 **	0.0004 **	0.0004 **	0.0004 **
	(0.9892)	(0.9996)	(0.9699)	(0.9923)	(**0.0284**)	(**0.0288**)	(**0.0272**)	(**0.0271**)
Size: log Assets	-0.0032*	-0.0033*	-0.0034*	-0.0032*	-0.0011	-0.0012	-0.0011	-0.0011
	(**0.0620**)	(**0.0638**)	(**0.0585**)	(**0.0670**)	(0.5626)	(0.5323)	(0.5448)	(0.5624)
Risk: NPLs/Asset ratio	-0.0405 *	-0.0394 *	-0.0396 *	-0.0399 *	-0.1126 ***	-0.1145 ***	-0.1126 ***	-0.1130 ***
	(**0.0819**)	(**0.0957**)	(**0.0986**)	(**0.0872**)	(**0.0052**)	(**0.0047**)	(**0.0059**)	(**0.0052**)
Diversification: NII Ratio	0.0058	0.0057	0.0059	0.0057	0.0035	0.0036	0.0036	0.0033
	(0.2010)	(0.2015)	(0.1894)	(0.2099)	(0.4715)	(0.4614)	(0.4581)	(0.5097)
A) Regulatory Pressure for undercapitalized banks (REGU)	-0.0199 **				0.0221			
	(**0.0400**)				(0.4492)			
A) Regulatory Pressure for better-capitalized banks (REGO)	-0.0335				0.0073			
	(0.2084)				(0.6373)			
B) Regulatory Pressure for undercapitalized banks (PCAU)		-0.0004				0.0005		
		(0.7488)				(0.4599)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0021				0.0003	
			(0.1727)				(0.6827)	
D) Regulatory Pressure (REG-mcr)				-0.0025				-0.0050
				(0.5275)				(0.2882)
DV for banks implemented Basel II	-0.0032	-0.0031	-0.0032	-0.0031				
	(0.1483)	(0.1549)	(0.1566)	(0.1606)				
Interest Rate Spread	0.0005	0.0005	0.0005	0.0005	0.0008	0.0008	0.0008	0.0008
	(0.3963)	(0.3773)	(0.3671)	(0.3762)	(0.1611)	(0.1727)	(0.1684)	(0.1829)
Constant	0.0414 ***	0.0400 ***	0.0394 ***	0.0418 ***	0.0162	0.0170	0.0167	0.0167
	(**0.0084**)	(**0.0091**)	(**0.0085**)	(**0.0070**)	(0.3160)	(0.2978)	(0.3108)	(0.1711)
Panel (B): Summary Statistics								
Observations	764	766	764	764	545	546	545	545
No. Banks	148	148	148	148	131	131	131	131
Wald chi2 Statistics	45.4800	44.0200	42.5400	45.3300	29.8300	25.6900	19.4000	29.4900
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0001**)	(**0.0003**)	(**0.0035**)	(**0.0000**)
r2_overall	0.1162	0.1137	0.1206	0.1187	0.0665	0.0667	0.0690	0.0681
r2_between groups	0.1728	0.1736	0.1793	0.1769	0.0643	0.0648	0.0671	0.0622
r2_within group	0.0114	0.0083	0.0118	0.0082	0.1122	0.1105	0.1077	0.1228

Part (B): Empirical results on the impact of the Base Accords II using NIM ratio as a performance indicator:

Table IX-15

Relationship between the capital level and performance (for a subsample of banks that applied the Basel Accords II): The dependent variable is profit-based performance as measured by net interest margin (NIM) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords I from 2003 to 2005, and then some of them applied Basel Accords II during the period 2006 to 2012

Estimated Models using NIM as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for banks during the period (2003 to 2012)				**A subsample for banks applied Basel II only (2006 to 2012)**			
	1 Coefficient (p- value)	**2** Coefficient (p- value)	**3** Coefficient (p- value)	**4** Coefficient (p- value)	**1** Coefficient (p- value)	**2** Coefficient (p- value)	**3** Coefficient (p-value)	**4** Coefficient (p-value)
Capital: Equity/Asset Ratio	0.0004	0.0004	0.0004	0.0004	0.0001	0.0001	0.0001	0.0001
	(0.1028)	(0.1058)	(0.1039)	(0.1049)	(0.5934)	(0.5980)	(0.6110)	(0.6151)
Size: log Assets	-0.0032	-0.0030	-0.0031	-0.0031	-0.0077 ***	-0.0077 ***	-0.0077 ***	-0.0077 ***
	(0.1525)	(0.2011)	(0.1818)	(0.1955)	(**0.0004**)	(**0.0004**)	(**0.0003**)	(**0.0004**)
Risk: NPLs/Asset ratio	0.0559	0.0509	0.0503	0.0512	-0.1146	-0.1155	-0.1141	-0.1147
	(0.4587)	(0.4838)	(0.4876)	(0.4828)	(0.4975)	(0.4930)	(0.4985)	(0.4973)
Diversification: NII Ratio	-0.0318 *	-0.0316 *	-0.0315 *	-0.0316 *	-0.0108 **	-0.0109 **	-0.0109 **	-0.0110 **
	(**0.0956**)	(**0.0913**)	(**0.0918**)	(**0.0938**)	(**0.0218**)	(**0.0200**)	(**0.0209**)	(**0.0210**)
A) Regulatory Pressure for undercapitalized banks (REGU)	0.0095				0.0048			
	(0.4132)				(0.7314)			
A) Regulatory Pressure for better-capitalized banks (REGO)	0.0412				-0.0102			
	(0.2314)				0.4314			
B) Regulatory Pressure for undercapitalized banks (PCAU)		-0.0006				0.0002		
		(0.2984)				(0.6789)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0014				0.0004	
			(0.4807)				(0.4335)	
D) Regulatory Pressure (REG-mcr)				0.0006				-0.0017
				(0.8601)				(0.5331)
DV for banks implemented Basel II	0.0003	0.00002	0.0001	0.0001				
	(0.8675)	(0.9880)	(0.9720)	(0.9553)				
Interest Rate Spread	0.0023 ***	0.0022 ***	0.0023 ***	0.0022 ***	0.0013 ***	0.0012 ***	0.0012 ***	0.0012 ***
	(**0.0015**)	(**0.0019**)	(**0.0019**)	(**0.0016**)	(**0.0057**)	(**0.0062**)	(**0.0063**)	(**0.0065**)
Constant	0.0367 *	0.0380 **	0.0379 **	0.0378 **	0.0790 ***	0.0789 ***	0.0788 ***	0.0806 ***
	(**0.0553**)	(**0.0553**)	(**0.0438**)	(**0.0362**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics								
Observations	773	775	773	773	551	552	551	551
No. Banks	149	149	149	149	132	132	132	132
Wald chi2 Statistics	118.46 (**0.0000**)	67.5000 (**0.0000**)	59.0400 (**0.0000**)	82.5900 (**0.0000**)	76.4300 (**0.0000**)	69.1900 (**0.0000**)	73.2500 (**0.0000**)	75.5200 (**0.0000**)
r2_overall	0.1129	0.1095	0.1102	0.1096	0.2893	0.2881	0.2907	0.2885
r2_between groups	0.1677	0.1590	0.1606	0.1588	0.3617	0.3618	0.3638	0.3614
r2_within group	0.0071	0.0077	0.0079	0.0077	0.1182	0.1167	0.1161	0.1183

Part (C): Empirical results on the impact of the Base Accords II using TCA ratio as a performance indicator:

Table IX-16

Relationship between the capital level and performance (for a subsample of banks that applied the Basel Accords II): The dependent variable is cost level as measured by total cost to asset (TCA) ratio. Independent variables are defined and summarized in the Appendix. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords I from 2003 to 2005, and then some of them applied Basel Accords II during the period 2006 to 2012

Estimated Models using TCA as the dependent variable	**Robust Clustered Random Effects Model**							
	A subsample for banks during the period (2003 to 2012)				**A subsample for banks applied Basel II only (2006 to 2012)**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p- value)	Coefficient (p-value)	Coefficient (p-value)
Capital: Equity/Asset Ratio	-0.0004 ***	-0.0004 ***	-0.0004 ***	-0.0004 ***	-0.0004 ***	-0.0004 ***	-0.0004 ***	-0.0004 ***
	(**0.0002**)	(**0.0002**)	(**0.0002**)	(**0.0001**)	(**0.0003**)	(**0.0003**)	(**0.0004**)	(**0.0002**)
Size: log Assets	-0.0130 ***	-0.0130 ***	-0.0128 ***	-0.0129 ***	-0.0122 ***	-0.0122 ***	-0.0120 ***	-0.0121 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Risk: NPLs/Asset ratio	0.0196	0.0171	0.0147	0.0156	0.0144	0.0116	0.0091	0.0099
	(0.6419)	(0.6806)	(0.7238)	(0.7037)	(0.7300)	(0.7790)	(0.8249)	(0.8087)
Diversification: NII Ratio	-0.0163 **	-0.0163 **	-0.0163 **	-0.0162 **	-0.0168 **	-0.0167 **	-0.0167 **	-0.017 **
	(**0.0170**)	(**0.0161**)	(**0.0151**)	(**0.0170**)	(**0.0154**)	(**0.0150**)	(**0.0133**)	(**0.0154**)
A) Regulatory Pressure for undercapitalized banks (REGU)	-0.0146				-0.0178			
	(0.2289)				(0.1502)			
A) Regulatory Pressure for better-capitalized banks (REGO)	0.0087				0.0084			
	(0.6794)				(0.6981)			
B) Regulatory Pressure for undercapitalized banks (PCAU)		0.0001				-0.0001		
		(0.9490)				(0.9556)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0022 **				-0.0023 **	
			(**0.0197**)				(**0.0153**)	
D) Regulatory Pressure (REG-mcr)				-0.0032				-0.00003
				(0.4969)				(0.9774)
DV for banks implemented Basel II	0.0024	0.0025	0.0024	0.0026				
	(0.2695)	(0.2597)	(0.2914)	(0.2471)				
Interest Rate Spread	-0.0001	-0.0001	-0.00001	-0.0001	5.4e-06	-0.00004	-0.00001	-0.00003
	(0.9559)	(0.9100)	(0.9771)	(0.9300)	(0.9953)	(0.9651)	(0.9873)	(0.9774)
Constant	0.1540 ***	0.1550 ***	0.1537 ***	0.1572 ***	0.1498 ***	0.1503 ***	0.1500 ***	0.1524 ***
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Panel (B): Summary Statistics								
Observations	502	504	502	502	502	504	502	502
No. Banks	109	109	109	109	109	109	109	109
Wald chi2 Statistics	48.6600	49.5100	56.2000	49.6300	45.4900	44.2700	50.9700	44.7900
	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
r2_overall	0.1621	0.1580	0.1694	0.1588	0.1564	0.1523	0.1634	0.1527
r2_between groups	0.2431	0.2406	0.2504	0.2428	0.2341	0.2318	0.2409	0.2334
r2_within group	0.0968	0.0965	0.0965	0.0978	0.0905	0.0896	0.0920	0.0906

Empirical results on the impact of the implementation of the Basel Accords III on the banking performance:

Table IX-16

Relationship between the capital level and performance (for a subsample of banks that shift to apply the Basel Accords III): The dependent variable is bank performance: total returns to total assets ratio (ROA), net interest margin (NIM), and the total cost to total assets ratio (TCA) respectively. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. Model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Panel (A): Regression Models based on a subsample of banks apply only Basel Accords II from 2006 to 2012, and then they applied Basel Accords III during the period 2013 to 2014

	Robust Clustered Random Effects Model											
	A subsample for banks start implementing Basel II during the period (2006 to 2012) and then Basel III during the period (2013-2014) using ROA as the dependent variable				**A subsample for banks start implementing Basel II during the period (2006 to 2012) and then Basel III during the period (2013-2014) using NIM as the dependent variable**				**A subsample for banks start implementing Basel II during the period (2006 to 2012) and then Basel III during the period (2013-2014) using TCA as the dependent variable**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	-0.0004	-0.0004	-0.0004	-0.0004	0.0003 ***	0.0003 ***	0.0003 ***	0.0003 ***	0.0002	0.0002	0.0002	0.0002
	(0.304)	(0.305)	(0.305)	(0.306)	(**0.003**)	(**0.003**)	(**0.003**)	(**0.003**)	(0.6131)	(0.617)	(0.603)	(0.608)
Size: log Assets	-0.0010	-0.0011	-0.0010	-0.0010	-0.0042 ***	-0.0042 ***	-0.0042 ***	-0.0042 ***	-0.0099 ***	-0.0100 ***	-0.0099 ***	-0.0099 ***
	(0.304)	(0.275)	(0.305)	(0.311)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.0000**)	(**0.000**)	(**0.000**)	(**0.000**)
Riskiness: NPLs/Asset	0.6621 ***	0.6577 ***	0.6527 ***	0.6547 ***	0.0464	0.0449	0.0453	0.0451	0.0505	0.0480	0.0487	0.0517
	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(0.137)	(0.150)	(0.147)	(0.148)	(0.2717)	(0.256)	(0.287)	(0.254)
Diversification: NII Ratio	0.0074 ***	0.0073 ***	0.0073 ***	0.0073 ***	-0.0040 **	-0.0040 **	-0.0040 **	-0.0040 **	-0.0132 **	-0.0135 **	-0.0132 **	-0.0132 **
	(**0.004**)	(**0.004**)	(**0.006**)	(**0.005**)	(**0.016**)	(**0.015**)	(**0.015**)	(**0.015**)	(**0.0161**)	(**0.015**)	(**0.016**)	(**0.016**)
A) Regulatory Pressure for undercapitalized banks (REGU)	0.0041				0.0046				0.0750*			
	(0.676)				(0.400)				(**0.0683**)			
A) Regulatory Pressure for better-capitalized banks (REGO)	0.0151				0.0081				-0.0015			
	(0.247)				(0.111)				(0.9357)			
B) Regulatory Pressure for undercapitalized banks (PCAU)		0.0006				-0.0001				0.0012		
		(0.538)				(0.791)				(0.256)		
C) Regulatory Pressure -Edizs (REG-Ediz)			0.0005				0.0001				0.0006	
			(0.475)				(0.760)				(0.469)	
D) Regulatory Pressure for better-capitalized banks (REG-mcr)				-0.00004				-0.0003				-0.0056*
				(0.9664)				(0.6543)				(**0.0642**)
DV for period 2013-2014	-0.0058 ***	-0.0058 ***	-0.0057 ***	-0.0057 ***	-0.0013 ***	-0.0013 ***	-0.0013 ***	-0.0013 ***	-0.0086 ***	-0.0086 ***	-0.0084 ***	-0.0086 ***
	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)
Interest Rate Spread	0.0007 **	0.0006 **	0.0006 **	0.0006 **	0.0002	0.0002	0.0002	0.0002	0.0021 ***	0.0020 ***	0.0021 ***	0.0021 ***
	(**0.019**)	(**0.028**)	(**0.030**)	(**0.030**)	(0.464)	(0.486)	(0.466)	(0.471)	(**0.0037**)	(**0.004**)	(**0.003**)	(**0.003**)
Constant	0.0108	0.0121	0.0119	0.0119	0.0463 ***	0.0470 ***	0.0468 ***	0.0470 ***	0.1204 ***	0.1212 ***	0.1198 ***	0.1257 ***
	(0.232)	(0.186)	(0.202)	(0.2014)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)

Panel (B): Summary Statistics												
Observations	645	647	645	645	645	647	645	645	431	433	431	431
No. Banks	119	119	119	119	119	119	119	119	84	84	84	84
Wald chi2 Statistics	198.97	204.350	194.83	196.39	43.7300	43.3100	46.1600	43.3400	122.03	126.94	119.08	122.13
	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)
r2_overall	0.4961	0.4955	0.4953	0.4952	0.2608	0.2529	0.2569	0.2562	0.2368	0.2293	0.2345	0.2376
r2_between groups	0.8007	0.7978	0.7941	0.7945	0.2582	0.2513	0.2540	0.2533	0.2540	0.2448	0.2509	0.2553
r2_within group	0.1794	0.1818	0.1839	0.1830	0.0957	0.0930	0.0925	0.0928	0.1720	0.1718	0.1694	0.1720

Empirical results on the impact of the capital on the banking performance from bank-size prospective:

Part (A): Empirical results for the impact of the capital on the banking performance using profit-based performance (measured by ROA ratio) – Bank-size perspective: Comparison between small, medium, and large size banks during the sample period 2003 to 2014 using robust clustered random effects model.

Table IX-17

Relationship between the capital level and performance (for subsamples of small, medium, and large banks according to asset-size during the sampler period 2003 to 2014): The dependent variable is profit-based performance as measured by total returns to total asset ratio (ROA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using ROA as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for small banks				**A subsample for medium banks**				**A subsample for large banks**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0004 *** (**0.002**)	0.0004 *** (**0.002**)	0.0004 *** (**0.002**)	0.0004 *** (**0.002**)	-0.0001 (0.773)	-0.0001 (0.751)	-0.0001 (0.769)	-0.0001 (0.760)	0.0002 (0.270)	0.0002 (0.317)	0.0002 (0.3820)	0.0002 (0.2633)
Size: log Assets	0.0023 (0.508)	0.0021 (0.534)	0.0023 (0.511)	0.0022 (0.518)	-0.0048 * (**0.058**)	-0.0049 * (**0.055**)	-0.0048 * (**0.056**)	-0.0050 * (**0.055**)	-0.0004 (0.850)	-0.0004 (0.830)	-0.0004 (0.8539)	-0.0003 (0.8769)
Riskiness: NPLs Ratio	-0.0009 (0.954)	-0.0005 (0.972)	-0.0005 (0.974)	-0.0019 (0.972)	-0.1319 *** (**0.000**)	-0.1332 *** (**0.000**)	-0.1324 *** (**0.000**)	-0.1336 *** (**0.000**)	-0.1647 *** (**0.000**)	-0.1675 *** (**0.000**)	-0.1592 *** (**0.0008**)	-0.1610 *** (**0.0007**)
Diversification: NII Ratio	0.0024 (0.672)	0.0022 (0.689)	0.0025 (0.653)	0.0019 (0.729)	0.0186 *** (**0.000**)	0.0187 *** (**0.000**)	0.0187 *** (**0.000**)	0.0187 *** (**0.000**)	0.0096 *** (0.000)	0.0094 *** (0.000)	0.0094 *** (0.0001)	0.0096 *** (0.0001)
A) Under-capitalized banks (REGU)	0.0059 (0.285)				-0.0029 (0.675)				0.0515 ** (**0.021**)			
A) Better-capitalized banks (REGO)	-0.0269 (0.377)				-0.0144 (0.368)				0.0035 (0.7848)			
B) Under-capitalized banks (PCAU)		0.0044 ** (**0.037**)				-0.0005 (0.625)				0.0002 (0.692)		
C) Edizs Regulator Pressure (REG-Ediz)			0.0015 (0.415)				0.0010 (0.315)				0.0010 (0.1462)	
D) Better-capitalized banks (REG-mcr)				-0.0047 * (**0.056**)				0.0003 (0.755)				-0.0028 ** (**0.0335**)
DV = 1, for period 2009-12	0.0019 (0.202)	0.0033 (0.158)	0.0030 (0.190)	0.0032 (0.165)	-0.0013 (0.191)	-0.0013 (0.200)	-0.0013 (0.206)	-0.0013 (0.191)	-0.0002 (0.765)	-0.0002 (0.796)	-0.0002 (0.7566)	-0.0003 (0.7257)
Interest Rate Spread	-0.0001 (0.785)	-0.0002 (0.832)	-0.0002 (0.797)	-0.0002 (0.836)	0.0029 *** (**0.000**)	0.0028 *** (**0.000**)	0.0029 *** (**0.000**)	0.0029 *** (**0.000**)	0.0003 (0.505)	0.0003 (0.498)	0.0003 (0.5369)	0.0003 (0.4996)
	0.0047	0.0040	0.0031	0.0084	0.0488	0.0496	0.0482	0.0488	0.0097	0.0105	0.0096	0.0121

Constant	(0.836)	(0.855)	(0.889)	(0.705)	** (0.014)	** (0.014)	** (0.014)	** (0.014)	(0.587)	(0.566)	(0.5849)	(0.4955)
Panel (B): Summary Statistics												
Observations	907	907	907	907	855	856	855	855	304	305	304	304
No. Banks	136	136	136	136	121	121	121	121	53	53	53	53
Wald chi2	19.2300	16.7600	15.92	16.1000	63.3100	62.1300	61.4800	63.0400	82.9800	35.1300	32.8800	61.7600
Statistics	(**0.013**)	(**0.019**)	(**0.025**)	(**0.024**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)
r2_overall	0.0914	0.0985	0.0914	0.0989	0.1688	0.1681	0.1713	0.1677	0.0056	0.0088	0.0039	0.0048
r2_between groups	0.1613	0.1798	0.1596	0.1814	0.1878	0.1848	0.1939	0.1846	0.0401	0.0467	0.0332	0.0349
r2_within groups	0.0197	0.0222	0.0199	0.0215	0.0594	0.0594	0.0593	0.0593	0.1832	0.1847	0.1810	0.1806

Part (B): Empirical results for the impact of the capital on the banking performance using profit-based performance (measured by NIM ratio) – Bank-size perspective: Comparison between small, medium, and large size banks during the sample period 2003 to 2014 using robust clustered random effects model.

Table IX-18

Relationship between the capital level and performance (for subsamples of small, medium, and large banks according to asset-size during the sampler period 2003 to 2014): The dependent variable is profit-based performance as measured by net interest margin (NIM) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using NIM as the dependent variable	Robust Clustered Random Effects Model											
	A subsample for small banks				**A subsample for medium banks**				**A subsample for large banks**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
	(0.3534)	(0.358)	(0.363)	(0.372)	(0.344)	(0.355)	(0.340)	(0.354)	(0.353)	(0.3767)	(0.370)	(0.377)
Size: log Assets	-0.0059 *	-0.0061 *	-0.0062 *	-0.0062 *	-0.0020	-0.0020	-0.0020	-0.0020	0.0001	0.00003	0.0001	0.0001
	(0.0814)	**(0.069)**	**(0.058)**	**(0.065)**	(0.434)	(0.446)	(0.447)	(0.443)	(0.944)	(0.9814)	(0.923)	(0.958)
Riskiness: NPLs Ratio	0.0562 *	0.0559 *	0.0560 *	0.0560 *	0.0536 **	0.0544 **	0.0536 **	0.0544 **	0.1591 **	0.1567 **	0.1596 **	0.1599 **
	(0.0724)	**(0.072)**	**(0.071)**	**(0.072)**	**(0.042)**	**(0.041)**	**(0.043)**	**(0.040)**	**(0.030)**	**(0.0378)**	**(0.033)**	**(0.032)**
Diversification: NII Ratio	-0.0465 ***	-0.0466 ***	-0.0466 ***	-0.0467 ***	-0.0125 ***	-0.0125 ***	-0.0126 ***	-0.0125 ***	-0.0018	-0.0018	-0.0017	-0.0018
	(0.0000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.002)**	**(0.003)**	**(0.003)**	**(0.002)**	(0.469)	(0.4629)	(0.499)	(0.461)
A) Under-capitalized banks (REGU)	0.0017				-0.0013				-0.0075			
	(0.6765)				(0.765)				(0.812)			
A) Better-capitalized banks (REGO)	0.0299				0.0063				0.0069			
	(0.2355)				(0.492)				(0.351)			
B) Under-capitalized banks (PCAU)		-0.0005				-0.0003				-0.0001		
		(0.789)				(0.620)				(0.8408)		
C) Edizs Regulatory Pressure (REG-Ediz)			0.0003				-0.0001				-0.0001	
			(0.902)				(0.790)				(0.710)	
D) Better capitalized banks (REG-mcr)				-0.0009				0.0006				0.0015
				(0.634)				(0.430)				(0.441)
DV = 1, for period 2009-12	0.0031	0.0030	0.0031	0.0031	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003
	(0.1180)	(0.125)	(0.122)	(0.120)	(0.657)	(0.620)	(0.629)	(0.657)	(0.594)	(0.6074)	(0.553)	(0.566)
Interest Rate Margin	0.0009	0.0009	0.0009	0.0009	0.0008 **	0.0008 **	0.0008 **	0.0008 **	-0.0001	-0.0001	-0.0001	-0.0001
	(0.3134)	(0.323)	(0.325)	(0.326)	**(0.021)**	**(0.020)**	**(0.021)**	**(0.021)**	(0.843)	(0.8181)	(0.800)	(0.824)
Constant	0.0659 ***	0.0683 ***	0.0685 ***	0.0695 ***	0.0373 *	0.0372 *	0.0371 *	0.0373 *	0.0081	0.0091	0.0083	0.0073
	(0.0013)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.058)**	**(0.058)**	**(0.057)**	**(0.058)**	(0.520)	(0.4851)	(0.521)	(0.564)
Panel (B): Summary Statistics												
Observations	911	911	911	911	858	859	858	858	308	309	308	308
Banks	136	136	136	136	122	122	122	122	53	53	53	53
Wald chi2	56.8700	58.4400	64.590	57.620	29.220	25.390	27.700	26.590	20.080	10.46	11.870	13.700
Statistics	**(0.0000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.010)**	(0.1639)	(0.105)	(0.057)
r2_overall	0.1325	0.1315	0.1315	0.1318	0.1244	0.1230	0.1213	0.1212	0.3609	0.3619	0.3642	0.3568
r2_between groups	0.2265	0.2216	0.2213	0.2221	0.1326	0.1325	0.187	0.1291	0.4325	0.4245	0.4336	0.4265
r2_within groups	0.0328	0.0330	0.0330	0.0331	0.0970	0.0970	0.0963	0.073	0.0339	0.0278	0.0305	0.0351

Part (C): Empirical results for the impact of the capital on the banking performance using cost level (measured by TCA ratio) – Bank-size perspective: Comparison between small, medium, and large size banks during the sample period 2003 to 2014 using robust clustered random effects model.

Table IX-19

Relationship between the capital level and performance (for subsamples of small, medium, and large banks according to asset-size during the sampler period 2003 to 2014): The dependent variable is cost level as measured by total cost to asset (TCA) ratio. Independent variables are defined and summarized in Appendix I. The estimation method is robust clustered random effects model based on the whole sample for the sample period 2003 to 2014. The p-values are shown in parentheses. ***, **, and * indicate parameter significance at the 1%, 5%, and 10% significance level respectively, based on the two-tailed test. The model 1 to 4 represents the regression results according to the adopted approach to identify regulatory pressured banks.

Estimated Models using TCA as the dependent variable	**Robust Clustered Random Effects Model**											
	A subsample for small banks				**A subsample for medium banks**				**A subsample for large banks**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)	Coeff. (p-value)
Capital: Equity/Asset Ratio	-0.0002	-0.0002	-0.0002	-0.0002	0.0001	0.0001	0.0001	0.0001	0.0003	0.0003	0.0004	0.0003
	(0.1312)	(0.1212)	(0.1492)	(0.1196)	(0.6424)	(0.5761)	(0.6240)	(0.6102)	(0.6349)	(0.5676)	(0.4724)	(0.6248)
Size: log Assets	-0.0118 ***	-0.0123 ***	-0.0119 ***	-0.0123 ***	-0.0003	-0.0001	-0.0002	-0.0001	-0.0018	-0.0018	-0.0020	-0.0020
	(**0.0021**)	(**0.0013**)	(**0.0018**)	(**0.0012**)	(0.9376)	(0.9979)	(0.9619)	(0.9845)	(0.6121)	(0.6022)	(0.5508)	(0.5746)
Riskiness: NPLs Ratio	0.0606 ***	0.0603 ***	0.0591 ***	0.0605 ***	0.0280	0.0312	0.0264	0.0318	-0.0507	-0.0501	-0.0576	-0.0560
	(**0.0004**)	(**0.0004**)	(**0.0005**)	(**0.0004**)	(0.6157)	(0.5718)	(0.6344)	(0.5647)	(0.7155)	(0.7100)	(0.6764)	(0.6865)
Diversification: NII Ratio	-0.0071	-0.0069	-0.0073	-0.0071	-0.0220 **	-0.0218 **	-0.0221 **	-0.0219 **	-0.0165 **	-0.0165 **	-0.0157 **	-0.0167 **
	(0.2744)	(0.2815)	(0.2617)	(0.2699)	(**0.0178**)	(**0.0188**)	(**0.0163**)	(**0.0184**)	(**0.0423**)	(**0.0452**)	(**0.0470**)	(**0.0325**)
A) Under-capitalized banks (REGU)	-0.0015				-0.0042				-0.0551			
	(0.8119)				(0.4775)				(0.3816)			
A) Better-capitalized banks (REGO)	0.0485 **				0.0221				-0.0226			
	(**0.0429**)				(0.1665)				(0.2685)			
B) Under-capitalized banks (PCAU)		0.0027				-0.0001				-0.0001		
		(0.1045)				(0.8712)				(0.9525)		
C) Edizs Regulatory Pressure (REG-Ediz)			-0.0020 *				-0.0015				-0.0018	
			(**0.0912**)				(0.1160)				(0.2027)	
D) Better-capitalized banks (REG-mcr)				-0.0010 *				0.0015				0.0034
				(**0.0757**)				(0.2550)				(0.3908)
DV = 1, for period 2009-12	-0.0020	-0.0021	-0.0021	-0.0021	-0.0064 ***	-0.0065 ***	-0.0064 ***	-0.0065 ***	-0.0080 ***	-0.0079 ***	-0.0078 ***	-0.0078 ***
	(0.2662)	(0.2676)	(0.2357)	(0.2609)	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0001**)	(**0.0000**)	(**0.0000**)	(**0.0000**)	(**0.0000**)
Interest Rate Margin	0.0012 **	0.0010 **	0.0011 **	0.0010 **	-0.0002	-0.0002	-0.0002	-0.0002	0.0035	0.0035	0.0036 *	0.0035
	(**0.0252**)	(**0.0428**)	(**0.0283**)	(**0.0446**)	(0.7673)	(0.7843)	(0.7783)	(0.7624)	(0.1053)	(0.1010)	(**0.0925**)	(0.1005)
Constant	0.1320 ***	0.1367 ***	0.1358 ***	0.1401 ***	0.0557 *	0.0541 *	0.0566 *	0.0535 *	0.0547 *	0.0535 *	0.0558 *	0.0517 *
	(**0.000**)	(**0.00**)	(**0.00**)	(**0.00**)	(**0.06**)	(**0.07**)	(**0.05**)	(**0.07**)	(**0.07**)	(**0.08**)	(**0.0686**)	(**0.09**)
Panel (B): Summary Statistics												
Observation	732	732	732	732	563	564	563	563	239	240	239	239
No. Banks	130	130	130	130	90	90	90	90	42	42	42	42
Wald chi2 Statistics	57.5700	53.9400	58.1200	55.1600	53.1400	48.6100	54.1200	51.2300	62.2800	51.1700	51.2000	64.8900
	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)	(**0.000**)
r2_overall	0.1681	0.1718	0.1730	0.1755	0.0144	0.0097	0.0127	0.0118	0.1901	0.1890	0.2018	0.1877
r2_between groups	0.1133	0.1204	0.1192	0.1245	0.0115	0.0082	0.0105	0.0092	0.3070	0.3057	0.3218	0.3003
r2_within groups	0.1785	0.1761	0.1752	0.1767	0.1588	0.1559	0.1602	0.1579	0.1493	0.1471	0.1468	0.1498

X. Appendix: Conglomerate Index of Financial Structure

Demirguc-kunt and Levine (1999) provide a systematic approach to identify the structure of a given financial system, in a country, to be either a market-based-system or bank-based-system. In market-based-system, financial markets play a major role in facilitating the funding channel and easing risk management. While, bank-based-system relies on banks in mobilizing funds and providing risk management vehicles. Demirguc-kunt and Levine (2009) construct a conglomerate index based on a relative value of banking sector development (measured in term of size, activity, and efficiency) to stock market development (also measured in term of size, activity, and efficiency). Countries with a conglomerate index value lower than the mean are classified as a market-based system. A conglomerate index is constructed using the same variables that are adopted by Demirguc-kunt and Levine (2009) as follow:

1st Step) Structure Size: is a measure of the size of banking sector development relative to the size stock market development. It is defined as follow:

$$Size(SZ) = \frac{SZS_{it}}{SZB_{it}}$$

Where;

SZS_{it} is size of stockthe market measured using the variable stock market capitalization to GDP %

SZB_{it} is size of banking sector measured using the variable Liquid Liabilities to GDP %

(i) for a given country at the time (t)

2nd Step) Structure-Activity: is a measure of the activity of banking sector development relative to the activity of stock market development. It is defined as follow:

$$Activity(SA) = \frac{SAS_{it}}{SAB_{it}}$$

Where;

SAS_{it} is activity of stock market measured using the variable total value traded to GDP %

SAB_{it} is activity of banking sector measured using the variable Credit to Private Sector by Banks to GDP %

(i) for a given country at the time (t)

3rd Step) Structure Efficiency: is a measure of the efficiency of banking sector development relative to the efficiency of stock market development. It is defined as follow:

$$Efficiency(SE) = SES_{it} * SEB_{it}$$

Where;

SES_{it} is size of stock market measured using the variable total value traded to GDP %

SEB_{it} is size of banking sector measured using the variable overhead costs to GDP %

(i) for a given country at the time (t)

4th Step) Conglomerate Index: is a means-removed average of structure size, structure-activity, and structure efficiency. It is defined as follow:

$$Conglomerate\ Index(CI) = \frac{[(SZ_{it} - AVG_{SZ}) + (SA_{it} - AVG_{SA}) + (SE_{it} - AVG_{SE})]}{3}$$

Where;

SZ_{it} is size of stock market measured using the variable total value traded to GDP %

AVG_{SZ} is an average value of structure size across countries the sample in (i) year.

SA_{it} is size of banking sector measured using the variable overhead costs to GDP %

AVG_{SA} is an average value of structure activity across countries in the sample in (i) year.

SE_{it} is size of banking sector measured using variable overhead costs to GDP %

AVG_{SE} is an average value of structure efficiency across countries in the sample in (i) year.

(i) for a given country at time (t)

A higher value of this index indicates that financial structure in a particular country is market-based-system. Demirguc-kunt and Levine (2009) have also used this index to identify countries with a highly undeveloped financial system. They identify countries with a conglomerate index below the mean values for both bank and market development indicators, in which:

Bank development is measured by:

Domestic Credit to Private Sector / GDP ratio

Market development is measured by:

Total Value Traded / GDP ratio

Table X-1 shows index values for countries that are classified as bank-based-systems against market-based-system at both developed and undeveloped financial system.

Data Sample:

This index is constructed based on a recent dataset of 42 countries over the period (2000 to 2014). The sample includes countries with different level of income economies (as defined by the World Bank in term of gross national income). This is for the purpose of comparing the financial structure in the

Middle East and North Africa (MENA) countries against the structure of other countries. The sample includes:

> MENA countries: Bahrain, Egypt, Israel, Jordan, Kuwait, Lebanon, Malta, Morocco, Oman, Qatar, Saudi Aribia, Tunisia, United Arab Emirates, and West Bank and Gaza.
>
> Non-MENA countries: Australia, Austria, Belgium, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea Republic, Netherlands, Mexico, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

All the above variables are obtained from The World Bank; Financial Development and Structure Database (September 2015 Version).

Table X-1: Financial Structure in Developed vs. Undeveloped Financial Structure

Financial Structure					
Developed Financial Structure			**Undeveloped Financial Structure**		
A) Market Based Economies			**A) Market Based Economies**		
MENA=1	**Countries**	**Structure Index**	**MENA=1**	**Countries**	**Structure Index**
0	United States	198.04	0	Turkey	21.55
0	Switzerland	65.59	1	Jordan	5.95
0	Spain	34.48	0	Hungary	3.55
1	Saudi Arabia	28.54			
0	Korea, Rep.	27.87			
0	United Kingdom	27.43			
0	Sweden	21.63			
0	Australia	13.32			
0	Italy	11.57			
0	Netherlands	8.67			
0	Iceland	8.61			
Sub-group mean		**40.52**	**Sub-group mean**		**10.35**
B) Bank Based Economies			**B) Bank Based Economies**		
MENA=1	Countries	Structure Index	MENA=1	Countries	Structure Index
0	Finland	2.92	1	Israel	-2.71
0	Germany	0.96	1	Kuwait	-8.55
0	Japan	0.54	0	Poland	-12.49
0	France	-3.65	1	Egypt, Arab Rep.	-13.13
0	Greece	-7.87	1	Qatar	-13.33
0	Denmark	-8.01	0	Mexico	-13.65
0	Chile	-9.51	0	Czech Republic	-14.35
0	Portugal	-13.00	0	Belgium	-16.36
0	Austria	-17.18	1	Morocco	-16.40
0	Ireland	-23.15	1	Oman	-17.48
1	Malta	-23.17	1	United Arab Emirates	-17.55
			1	West Bank and Gaza	-17.62
			0	Slovenia	-21.79
			0	Slovak Republic	-22.16
			1	Bahrain	-22.53
			1	Tunisia	-23.15
			1	Lebanon	-23.33
Sub-group mean		**-9.19**	**Sub-group mean**		**-16.27**
mean of financially developed countries		**15.67**	**mean of financially developed countries**		**-12.28**
Overall mean		**2.36**			

Table X-2: Results of Conglomerate Index of Financial Structure for the MENA countries for the period (2000 to 2014)

Year	Malta	Saudi Arabia	Jordan	Kuwait	Lebanon	Bahrain	Egypt	Israel	Morocco	Oman	Qatar	Tunisia	UAE	West Bank and Gaza
2000	-25.09	-21.76	-22.78	-21.53	-26.49	-24.98	-21.04	-12.44	-10.93	a.n.	**a.n.**	-24.81	**a.n.**	-22.52
2001	-27.04	-21.74	-24.06	-27.27	-28.45	**a.n.**	-25.36	-17.09	-23.76	-27.40	**a.n.**	-26.99	**a.n.**	-25.47
2002	-22.29	-13.92	-15.86	-21.32	-22.77	**a.n.**	-21.51	-16.05	-19.83	-20.89	**a.n.**	-21.97	**a.n.**	-21.60
2003	-18.22	7.21	-6.88	-15.76	-18.62	**a.n.**	-17.55	-10.56	-15.69	-15.03	**a.n.**	-18.24	-18.39	-17.66
2004	-19.77	44.64	1.69	-5.50	-20.20	-19.25	-17.82	-7.23	-15.82	-13.08	**a.n.**	-19.97	-19.52	-17.64
2005	-23.12	104.8	50.49	9.49	-22.92	-22.50	-15.31	-7.25	-17.01	-16.14	-6.93	-23.27	-19.76	-11.43
2006	-26.35	153.4	62.11	1.86	-24.45	-25.36	-7.83	2.36	-16.14	-20.46	-11.69	-26.53	-22.38	-13.59
2007	-33.85	94.04	30.01	-7.56	-32.08	-32.73	-4.15	4.12	-21.09	-25.91	-20.94	-33.74	-26.99	-24.59
2008	-34.23	27.74	27.68	-3.87	-31.56	-32.38	-8.92	3.83	-18.06	-25.61	-20.37	-33.04	-25.83	-21.73
2009	-25.09	20.31	23.74	6.93	-23.33	-22.82	-2.21	4.93	-18.31	-15.52	-12.51	-23.24	-15.28	-17.70
2010	-21.11	2.64	0.95	-2.60	-19.77	-20.62	-7.79	11.05	-16.39	-15.77	-15.06	-18.56	-14.62	-16.74
2011	-17.53	-0.45	-5.23	-12.32	-16.42	-17.34	-11.58	9.46	-13.81	-14.62	-13.69	-15.53	-15.10	-14.35
2012	-16.51	7.44	-10.75	-11.72	-16.28	-16.31	-13.15	0.32	-13.95	-14.11	-13.15	-15.01	-14.81	-14.37
2013	-14.18	11.36	-9.12	**a.n.**	**a.n.**	**a.n.**	-11.20	-4.43	-12.26	-10.57	-10.59	a.n.	-12.25	-12.52
2014	**a.n.**	12.26	-12.70	**a.n.**	**a.n.**	-13.54	-11.49	-1.73	-12.96	-9.67	-8.35	a.n.	-5.70	-12.37
Averg.	**-23.17**	**28.54**	**5.95**	**-8.55**	**-23.33**	**-22.53**	**-13.13**	**-2.71**	**-16.40**	**-17.48**	**-13.33**	**-23.15**	**-17.55**	**-17.62**

Note: The table shows how the financial structure differs over the last 15 years. In years when the index value is negative, the financial system in a particular country (and in the year) is bank-based-system otherwise its market-based-system. The index values of the remaining MENA countries (mainly Algeria, Djibouti, Iran, Libya, Syria, and Yemen) are not reported due to lack of available market data for these countries. Results of other non-MENA countries are available up to request.

XI. Appendix: Regulatory Reforms in the MENA Countries

Table XI: Regulatory Reforms in the MENA countries in term of Deposit Insurance Scheme and Regulatory Capital Requirements since the 1990s:

No.	Countries	Establishment of the Deposit Insurance Scheme	Implementation of Basel I	Implementation of Basel II					Implementation of Basel II.5			Implementation of Basel III	Minimum capital requirements for a bank
1	Algeria	Explicit Deposit Insurance established in 1997 (with no risk-adjusted premiums).	Basel I implemented with the minimum adequacy ratio of 5%. In 1999, the level of minimum capital adequacy was increased to 8%.	Basel II implemented in 2014 with no change in the level of minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented:					Didn't Applied			Not Applied Yet	In 2008, the minimum capital requirement for banks was increased from DA 2.5 billion to DA 10 billion.
				P1			P2	P3					
				SA	SMM	BIA	-	-					
2	Bahrain	Explicit Deposit Insurance established in 1993 (with no risk-adjusted premiums).	Basel I implemented with the minimum adequacy ratio of 10%. In 2000, the level of minimum capital adequacy was increased to 12.5 (in which 0.5% is capital buffer).	Basel II implemented in 2008 with no change in the level of minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented:					Basel 2.5 is implemented in 2012. And the Basel framework is revised in the following pillars:			Started in 2015 and the level of minimum capital adequacy ratio is 12.5% (in which 2.5% is capital conservation buffer).	No change
				P1			P2	P3					
				SA	-	BIA & TSA	-	-	Rev P1	Rev P3	Mkt risk		
3	Djibouti	No Deposit Insurance Scheme	Basel I implemented with the minimum capital adequacy ratio of 8%.	No data available					Didn't Applied			Not Applied Yet	In 2009, the required minimum capital for banks increased from DJF 300 million to DJF 600 million. It is increased again to DJF 1 billion at the end of 2011.
4	Egypt	NO Explicit Deposit	Basel I implemented with the minimum capital adequacy	Basel II implemented in 2012 with no change in the level of minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented:					Basel 2.5 implemented in 2012. And the Basel framework is revised in the following pillars:			Not Applied Yet	No change

		Insurance Scheme	ratio of 8 %. In 2002 the capital adequacy ratio was increased to 10%.	P1			P2	P3	Rev P1	Rev P3	-		
				SA	-	BIA	-	-					
5	Israel	NO Deposit Insurance Scheme.	Basel I implemented with the minimum capital adequacy ratio of 9 %.	Basel II implemented in 2009 with no change in the level of minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented:					Basel 2.5 is implemented in 2012. And the Basel framework is revised in the following pillars:			Start implementing Basel III since 2014 and the level of minimum capital adequacy ratio is 9% (and its 10% for 2 largest banks).	No change
				P1			P2	P3	Rev P1	Rev P3	Mkt risk		
				SA	SMM	BIA							
6	Iran	Explicit Deposit Insurance established in 2010 (with no risk-adjusted premiums)	Still implementing Basel I with the minimum capital adequacy ratio of 8%.	Didn't Applied					Didn't Applied			Not Applied Yet	No change
7	Iraq	NO Deposit Insurance Scheme.	Basel I implemented with the minimum capital adequacy ratio of 12 %.	Didn't Applied					Didn't Applied			Not Applied Yet	No change
8	Jordan	Explicit Deposit Insurance established in 2000 (with no risk-adjusted premiums).	Basel I implemented with the minimum capital adequacy ratio of 12%.	Basel II implemented in 2008 with no change in the level of minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented:					Not Applied Yet			Not Applied Yet	In 2006, the required minimum capital for banks increased from JD 20 million to JD 40 million. It is increased again to JD 100 million at the end of 2011.
				P1			P2	P3					
				SA	SMM	BIA & TSA	in 2011	-					

9	Kuwait	NO Deposit Insurance Scheme.	Basel I implemented with the minimum capital adequacy ratio of 12%.	Basel II implemented in 2005 with no change in the level of minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented:					Basel 2.5 is implemented in 2013. And the Basel framework is revised in the following pillars:			Started in 2014 and the level of minimum capital adequacy ratio is 12% (targeting to increase it into 12.5% in 2015 and to 13% at the end of 2016)	No change
				P1			P2	P3					
				SA	-	BIA & TSA			Rev P1	Rev P3	Mkt risk		
10	Lebanon	Explicit Deposit Insurance established in 1967 (with no risk-adjusted premiums).	Basel I implemented with the minimum capital adequacy ratio of 8%. This level of minimum capital adequacy was increased to 10% at the end of 2000 and then to 12% at the end of December 2001.	Basel II implemented in 2008 and the level of minimum capital adequacy ratio is changed into 8%. The following pillars of the Basel framework are implemented:					Basel 2.5 is implemented in 2011. And the Basel framework is revised in the following pillars:			Started in 2014 and the level of minimum capital adequacy ratio is 12% (in which 2.5% is capital conservation buffer).	No change
				P1			P2	P3					
				SA	-	BIA & TSA			Rev P1	-	-		
11	Libya	Explicit Deposit Insurance established in 2010 (with no risk-adjusted premiums).	Basel I implemented with the minimum capital adequacy ratio of 8%.	Didn't Applied					Didn't Applied			Not Applied Yet	No change
12	Morocco	Explicit Deposit Insurance established in 1996 (with no risk-adjusted premiums).	Basel I implemented with the minimum capital adequacy ratio of 8%.	Basel II implemented in 2007 and the level of minimum capital adequacy ratio is increased to 10% in 2008. The following pillars of the Basel framework are implemented:					Basel 2.5 introduced in 2010 and the level of minimum capital adequacy ratio is increased to 12% in June 2013. And there is no revise in the Basel framework.			Started in 2014 and there is no change in the level of minimum capital adequacy ratio.	No change
				P1			P2	P3					
				SA	-	BIA & TSA	-	-	-	-	-		

<table>
<tr><td rowspan="3">13</td><td rowspan="3">Oman</td><td rowspan="3">Explicit Deposit Insurance established in 1995 (with no risk-adjusted premiums).</td><td rowspan="3">Basel I implemented with the minimum capital adequacy ratio of 12%.</td><td colspan="5">Basel II implemented in 2007 and the level of minimum capital adequacy ratio is changed to 10%. In 2010, the minimum capital adequacy ratio was increased by 12%. The following pillars of the Basel framework are implemented:</td><td rowspan="3" colspan="3">Didn’t Applied</td><td rowspan="3">Start implementing Basel III since 2014 with no change in the level of minimum capital adequacy ratio.</td><td rowspan="3">In 2007, the required minimum capital for banks increased from RO 50 million to RO 100 million.</td></tr>
<tr><td colspan="3">P1</td><td>P2</td><td>P3</td></tr>
<tr><td>SA</td><td>SMM</td><td>BIA & TSA</td><td>in 2011</td><td>-</td></tr>
<tr><td rowspan="3">14</td><td rowspan="3">Qatar</td><td rowspan="3">NO Explicit Deposit Insurance Scheme</td><td rowspan="3">Basel I implemented with the minimum capital adequacy ratio of 10%.</td><td colspan="5">Basel II implemented in 2006 with no change in the level of minimum capital adequacy ratio. The following pillars of the Basel framework are implemented:</td><td colspan="3">Basel 2.5 implemented partially in 2014. And the Basel framework is revised in the following pillars:</td><td rowspan="3">Start implementing Basel III since 2014 and the level of minimum capital adequacy is increased to 12.5%</td><td rowspan="3">No change</td></tr>
<tr><td colspan="3">P1</td><td>P2</td><td>P3</td><td rowspan="2">Rev P1</td><td rowspan="2">-</td><td rowspan="2">Mkt risk</td></tr>
<tr><td>SA</td><td>-</td><td>BIA</td><td>-</td><td>-</td></tr>
<tr><td rowspan="3">15</td><td rowspan="3">Saudi Arabia</td><td rowspan="3">NO Explicit Deposit Insurance Scheme</td><td rowspan="3">Basel I implemented in 1992 with the minimum capital adequacy ratio of 8%.</td><td colspan="5">Basel II implemented in 2008 with no change in the level of minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented:</td><td colspan="3">Basel 2.5 implemented partially in 2013. And the Basel framework is revised in the following pillars:</td><td rowspan="3">Start implementing Basel III since 2013 and the level of minimum capital adequacy ratio is increased to 10.5</td><td rowspan="3">No change</td></tr>
<tr><td colspan="3">P1</td><td rowspan="2">P2</td><td rowspan="2">P3</td><td rowspan="2">Rev P1</td><td rowspan="2">-</td><td rowspan="2">Mkt risk</td></tr>
<tr><td>SA</td><td>SMM</td><td>BIA</td></tr>
<tr><td rowspan="2">16</td><td rowspan="2">Sudan</td><td rowspan="2">Explicit Deposit Insurance established in 1996. (with no risk-adjusted premiums)</td><td rowspan="2">Basel I implemented with the minimum capital adequacy ratio of 8%.</td><td colspan="5">Basel II implemented in 2006 and the level of minimum capital adequacy is not changed. And no data available for which pillars of the Basel framework are implemented.</td><td rowspan="2" colspan="3">Didn’t Applied</td><td rowspan="2">Not Applied Yet</td><td rowspan="2">In 2008, banks were encouraged to meet the existing required minimum capital for banks which is SD 50 million.</td></tr>
<tr><td colspan="3">P1</td><td>P2</td><td>P3</td></tr>
<tr><td>17</td><td>Syria</td><td>NO Explicit Deposit Insurance Scheme</td><td>Basel I implemented with the minimum capital adequacy ratio of 12%.</td><td colspan="5">No data available</td><td colspan="3">Didn’t Applied</td><td>Not Applied Yet</td><td>No change</td></tr>
</table>

18	Tunisia	NO Explicit Deposit Insurance Scheme	Basel I implemented with the minimum capital adequacy ratio of 8%.	Basel II implemented in 2012 with no change in the level of the minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented: P1: - - - P2: P3:	Didn't Applied	Started in 2013 and the level of minimum capital adequacy is increased from 8% to 9 % at the end of 2013 and to 10% at the end2014.	No change
19	United Arab Emirates	NO Explicit Deposit Insurance Scheme	Basel I implemented with the minimum capital adequacy ratio of 10%.	Basel II is implemented in 2009 with no change in the level of the minimum capital adequacy ratio. And the following pillars of the Basel framework are implemented: SA, SMM, BIA, P2, P3	Basel 2.5 introduced in 2012 - - - -	Not Applied Yet	No change
20	West Bank & Gaza	Explicit Deposit Insurance established in 2013 (without risk-adjusted premiums).	Basel I implemented with the minimum capital adequacy ratio of 12%.	Start implementing requirements of Basel III in 2012 with no change in the level of minimum capital adequacy. And the following pillars of the Basel framework are implemented: SA, SMM, BIA, P2, P3	Didn't Applied	Start implementing Basel III from 2015 with no change in the level of minimum capital adequacy ratio.	No change
21	Yemen	Explicit Deposit Insurance established in 2008 (with risk-adjusted premiums).	Basel I implemented with the minimum capital adequacy ratio of 8%.	Didn't Applied	Didn't Applied	Not Applied Yet	In 2009, banks were encouraged to meet the existing required minimum capital for banks which is YR 6 billion.

Sources:

Demirgüç-Kunt, Asli, Edward Kane and Luc Laeven, (2013), "Deposit Insurance Database," Policy Research Working Paper #6934, Washington, DC: World Bank.

FSI Survey Basel II, 2.5, and III implementations (last update July 2015), Bank for International Settlements

Annual reports for different years at the website of Central Bank of each country

Note: The Basel Framework in version II and III contains three main pillars mainly: Pillar1 (P1): capital requirements, Pillar2 (P2): supervisory requirements, and Pillar3 (P3): disclosure requirements. The following abbreviations are used to indicate major elements that are implemented in each pillar at each country:

- ⇨ For Pillar1 (P1): credit risk – measured by: SA = Standardized approach; market risk – measured by: SMM = Standardized measurement method; the operational risk is measured by: BIA = Basic indicator or TSA = alternative standardized approach;
- ⇨ P2 = implementation of Pillar 2 of the Basel framework; For Pillar 3: P3 = implantation of Pillar 3 of the Basel framework; Rev. P1 = revision to Pillar 1; Rev. P3 = revision to Pillar 3; and Mkt. risk = revision to the Basel II market risk framework.

Due to lack of data limited information is found about Basel implementation in Djibouti, Sudan, and Syria.

XII. Appendix: The relationship between the capital level, risk level, and banking performance

For the purpose of comparing empirical results, a summary of empirical studies on the relationship between the capital level, banking risk, and banking performance was conducted. The following table is a template of a summary table. The complete table of this appendix is available upon request.

I. Table XII-1: Summary of Empirical Studies on the relationship between the Capital Level and Banking Risk:

S. No.	Authors (year)	Period (No. Observation)	Countries	Methodologies	Dependent Variables	Economic Rationale	Empirical Studies
1.	Shrieves and Dahl (1992)	1983 – 1987 (7,200 Obs.)	1,800 FDIC-insured commercial banks (USA)	Simultaneous estimation using Two stages least square (2SLS) (Reported R-squared for risk level is, 0.0399, and 0.1558)	Capital: *Equity/Assets* Risk: *NPLs/Loans* *Risk Index* -Accounting based data-	To examine bank behaviour with respect to observed changes in capital and risk (Regulatory Hypothesis)	A significant positive association between changes in risk and capital An insignificant positive relationship between capital and non-performing loans
2.	(Berger, 1995)	1983 – 1989 (89172 Obs.)	14,862 of the U.S. Commercial Banks	Ordinary Least Square (OLS) estimates (Reported R-squared for risk level is, 0.2000, 0.1000 and 0.0800)	Capital *Equity/Assets* Risk *NPLs/Assets* *RWAs/Assets* *Net charge off/Assets* Performance *ROE* -Accounting based data-	To examine the capital-earning relationship (Bankruptcy Costs Hypothesis & Signalling Hypothesis)	The significant negative relationship between capital and risk A positive relationship between capital and earnings (when banks are riskier)