Essays on the Role of the Incentives of Issuers, Transparency, and Culture on the Global IPO Underpricing Difference

A Thesis Submitted in Fulfilment of the Requirements for the
Degree of Doctor of Philosophy

Fouad Jamaani

BSc (Marketing), King Abdul-Aziz University, Saudi Arabia
MSc (Applied Finance), Queensland University of Technology, Australia

School of Economics, Finance and Marketing
College of Business
RMIT University

March 2019

Statement of Authorship

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and, any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics, procedures and guidelines have been followed.

Fouad Omar Y Jamaani

March 2019

Acknowledgement

بِسْمِ اللَّـهِ الرَّحْمَـٰنِ الرَّحِيمِ

(In the name of Allah the most gracious and the most merciful)

First and foremost, praise and glory be to Allah the Almighty God who provided me with the strength to reach the finish line of this marvellous journey. My sincere thanks and appreciation go to my principal supervisor, Associate Professor Abdullahi D. Ahmed, for his endless support during my PhD candidature. The constantly generous feedback that I have been lucky enough to receive from him undoubtedly brought this thesis to its current form and content. Constructing this thesis under his supervision is a great privilege. My special thanks also go to my second supervisor, Dr. Sivagowry Sriananthakumar, for her expert econometric guidance in ensuring that the content of this thesis fitted well and was consistent. The support and guidance of my supervisors were crucial for this thesis.

I extend my gratitude to all my family members including my father, uncle, brothers, sisters, father-in-law, mother-in-law, brothers-in-law, and sisters-in-law for their continuous prayers and support. Special gratitude goes to my wonderful and beautiful daughter, Tala, and delightful and handsome son, Alwaleed, who accompanied me along this thrilling journey of knowledge. They did indeed shape the right environment for me to fulfil this research. I also extend my appreciation to my former RMIT supervisors who departed but nonetheless offered valuable inputs for this work. These people include Professor Michael Dempsey, Associate Professor Vikash Ramiah, and Dr. Michael Gangemi.

Last but not least, sincere thanks go my close friends. They have been consistently compassionate enough to spare their valuable time listening to my grumbling in tough times, sharing the laughter during good times, and lending a helping hand when it was most needed. Amongst those wonderful characters, listed alphabetically, Dr. Khalid Aboalshamat, Dr. Abdullah Alawadi, Dr. Rawaf Albarakati, Mr. Mazen Bajoh, Mr. Torki Basheer, Dr. Hasan Beyari, Dr. Abdulhadi Bima, Associate Professor Abdulgafar Qurashi, and Mr. Sami Qattan. I would also like to acknowledge the professional and amazing editing and proof-reading work done by Mr. Phillip Thomas. He always ensured that this thesis was cohesive and the arguments within it well articulated.

Dedication

I dedicate this thesis to my country the Kingdom of Saudi Arabia, and particularly to my sponsor, Taif University, for its generous financial support and in entrusting me with this valuable scholarship.

My thesis is also dedicated to the precious souls of my mother, Fatimah AL Yamani and my uncle, Mr. Mohammad AL Yamani, who waited patiently for this moment but unfortunately they passed away during the mid-candidature period. Mother and Uncle, you will always be present in my mind and in my prayers. I hope that I made you proud of me. Please continue visiting me in my dreams.

This thesis is ultimately dedicated to my soul mate, my wife, Dr. Manal Alidarous. Darling, words fail me to express my appreciation to you, for your sacrifice and generous indulgence. Thank you for listening to my complaints and frustrations and for believing in me. Your love, compassion, and support have provided me with the energy to move forward and complete this thesis.

To all of you, I will be always indebted to you.

Abstract

Initial public offerings (IPOs) underpricing is a widely researched area in finance literature. Yet, empirical evidence demonstrating and theoretical models explaining differences in underpricing across countries have remained an enigma in academia for a long time. This thesis consists of three independently interconnected essays that explain differences in underpricing observed across the Group of Twenty (G20) IPO markets. This is achieved using the Entrepreneurial Wealth Losses' (EWL) theory, time-variant differences in country-level transparency, and differences in country-level national cultures. Specifically, the purpose is to answer the following three main research questions: (1) does entrepreneurial wealth losses theory explain underpricing differences across IPO markets?; (2) do differences in country-level transparency directly explain underpricing and moderate the relationship between firm-level variables and underpricing across IPO markets?; and (3) do differences in country-level national cultures directly explain underpricing and modify the relationship between firm-level variables and underpricing across IPO markets? A total of 10,217 IPOs, covering 12 developed and 10 developing G20 economies from January 1995 to December 2016, were obtained from secondary sources. The quantitative techniques of unbalanced cross-sectional regression models, Ordinary Least Squares (OLS), Two-Stage Least Squares (2SLS), one-way clustered 2SLS, and two-way clustered 2SLS models, Hierarchical Linear Modelling (HLM), and number of robustness tests were employed to test the hypotheses. The EWL model is adopted and extended in this thesis. This research contributes to the theoretical framework by providing methodological advances in various finance areas like IPOs, IPO-governance and IPO-cultural literature, and has practical implications for researchers, investors, entrepreneurs and policy-makers.

Executive Summary

Remarkably, only a comparatively small number of corporate events have garnered much attention from scholars, the business-world, media, and the general public when compared to Initial Public Offerings (IPOs). The general focus is on the high and occasionally remarkable first-day immediate returns that the share prices of newly listed firms record. Recently, Ritter (2018) indicates that 108 IPO firms floated part of their shareholdings in 2017, so raising total proceeds of US$24.53 billion. The money left on the table by these United States (U.S.) IPO issuers accounted for US$3.69 billion, attracting an average underpricing level of 15%. The IPO underpricing phenomenon is reported not only in the developed equity markets such as the U.S., but is also recognised in virtually in every stock market around the globe. In an annually updated report in January 9, 2018, Loughran et al. (1994) document average country-level underpricing ranging from 3.3% to 270.1% across 54 nations over the last three decades. It is not fully understood why entrepreneur founders across countries sell their own shares to initial IPO investors at large discount, an act that constitutes a considerable cost of going public (Liu & Ritter 2011). In fact, what is mystifying is trying to understand the willingness of IPO owners across countries to give away part of their firms very cheaply, particularly given the existence of substantial heterogeneity in underpricing across national economies, specifically within industrial and emerging nations. In Loughran et al.'s (1994) report, average underpricing for advanced countries such as Japan, the United Kingdom, and Denmark is recorded as being 44.7%, 7.4%, and 25.9%, respectively, while similar figures for developing nations of Saudi Arabia, Argentina, and Pakistan are 239.8%, 4.2%, and 22.1%, also respectively. What makes average underpricing to be as low as 4.2% and as high as 239.8% in emerging economies such as Argentina and Saudi Arabia. Also what makes average underpricing figures to be as high as 44.7% and as low as 7.4% in Japan and Denmark, respectively, these countries being advanced economies.

The critical question is what theoretical model and determining factors can explain such mystifying variations in underpricing across global IPO markets and in both developed and developing economies? In response the existence of varying levels of underpricing across IPO markets, Habib and Ljungqvist (2001) developed a theoretical model known as "Entrepreneurial Wealth Losses" (hereafter EWL) theory. The theory is based on three dimensions including the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty surrounding the offering. Habib and Ljungqvist

(2001) argue that the information asymmetry problem, causing underpricing in the IPO market and resulting from the presence of *ex-ante* uncertainty between IPO parties, can be endogenously controlled and influenced. This occurs through using promotion costs such as employing a reputable underwriter who certifies the quality of the IPO firm leading to lower underpricing particularly when *ex-ante* uncertainty surrounding the offering is high.

The model claims that IPO issuers will have incentives to reduce underpricing, thus endogenously affecting underpricing, using high-status underwriters when they are only selling more of a stake in their firms to the public. The authors assert that issuers of IPO firms do not randomly select underwriting banks, and neither do underwriters randomly agree to underwrite IPO companies. Therefore, the decision to choose an underwriter by the issuer is predetermined and it is likely to be based on their decision, at least in part, on the amount of underpricing they anticipate will occur. Consequently, Habib and Ljungqvist (2001) conclude that this results in endogeneity bias when regressing underpricing on the choice of underwriter. This thesis is primarily motivated by the work of Kennedy et al. (2006) who examine the relative importance of six asymmetric information models in explaining the mystifying phenomenon of IPO underpricing in the U.S. IPO market. The authors conclude that the EWL theory offers the most compelling explanation for IPO underpricing in that country's IPO market. Hence, the critical question is this: can the EWL model elucidate the mystifying variability in IPO underpricing across global IPO markets and in both advanced and emerging[1] stock markets?

This thesis establishes a theoretical and empirical basis, upon which the research progresses. This is achieved by empirically examining the validity of the EWL theory in global settings while controlling for some econometric problems related to the inherited clustering characteristics of the IPO data. However, this thesis is also motivated by observations noted by Engelen and van Essen (2010) and Gupta et al. (2018), who contend that IPO participants have to navigate between two problematic types of information asymmetry across different countries. An internal category of information asymmetry related to firm-level characteristics and an external category of asymmetric information associated with the physiognomies of their formal and informal institutional environments. Hence, this thesis extends the empirical testing of the EWL model by capturing the

[1] Please note that in this thesis, the author interchangeably uses the term 'developing' which refers to emerging countries and 'developed' to denote advanced or industrial countries.

direct and indirect influences of neglected country-level characteristics. This includes differences in country-level transparency and national cultures, in influencing differences in IPO underpricing across national economies. In pursuing the research, the author accounts for some econometric issues to capture the nesting structure of the IPO data across different formal and informal institutional environments by employing the application of Hierarchical Linear Modelling (HLM).

This thesis consists of three segregated but interlinked essays that examine the curious issue of IPO underpricing difference in the global IPO market. To this end, the author looks at employing a global dataset ranging over 22 years, incorporating 33 industries domiciled in three datasets including 22 countries, 12 advanced, and 10 emerging countries with heterogeneous levels of formal and informal institutional backgrounds. This thesis controls for a number of extended econometric issues in pursuing the objectives of examining the relevance of firm-level, country-level transparency, and country-level culture differences in influencing IPO underpricing difference.

The first essay (Chapter Two) examines if the perceived dispersion in IPO underpricing in the global IPO market is related to the following:

- Firstly, failure to account for the endogenous effect of underwriter reputation on underpricing; or
- Secondly, ignoring the effect of clustering in standard errors within years, industries, countries, and developed versus developing countries; or
- Thirdly, disregarding the simultaneous effect of endogeneity and clustering in the IPO data.

The author acquires the results utilising a battery of tests including OLS, 2SLS, one-way clustered 2SLS, and two-way clustered 2SLS models; controlling for year, industry, and country effects. The findings attribute variances in level of the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty amongst the G20 economies and developed G20 IPO markets to the manifestation of underpricing variance. Yet, the findings demonstrate that the EWL theory does not hold well in elucidating difference in IPO underpricing in developing G20 stock markets. This chapter uncovers significant evidence supporting the endogenous underwriting-underpricing association in the international IPO market and between developed IPO markets. Conversely, the author discovers that in emerging IPO markets this endogenous relationship does not exist. Instead, in emerging stock markets, the occurrence of what is known as spinning behaviour is evident in the results. This is because the findings illustrate that prestigious underwriting banks charge IPO issuers a large underwriting fee, and in turn, they leave significant amounts of money on the table to be cashed out by investors at the expense of IPO firms. The results attribute this important finding to the behaviour of entrepreneur founders in developing nations. The author uncovers evidence showing that IPO issuers in emerging economies appear not to get concerned by this spinning practice because they do not care much about their wealth losses in exchange for securing successful offering. This is because - as opposed to their counterparts in developed countries - issuers in developing economies, on average, sell 1% and create 10% less secondary and primary shares when they go public, respectively. This makes it possible to rationalise why issuers of IPO firms domiciled in an emerging G20 economy suffer from higher underpricing premiums by up to as much as 19%.

The second essay (Chapter Three) employs Hierarchical Linear Modelling (HLM) with an investigation of the following:

- Firstly, assessing the relative importance of the levels of firm and country on the variance of IPO underpricing;
- Secondly, testing the direct effect of the characteristics of country-level transparency on the variability of IPO underpricing in the global IPO market; and
- Thirdly, examining the indirect effect of the characteristics of country-level transparency in modifying the relationship between firm-level variables and IPO underpricing in the global IPO market.

The author finds that nearly 88%, 95%, and 75% of underpricing variance is related to intrinsic characteristics of firms between all (22 countries) within developed (12 countries), and developing (10 countries) G20 countries, respectively. The results reveal that dissimilarities in country-level formal institutions proxies including voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption directly explain up to 34% of the changeability in IPO underpricing across countries. While the results find no direct connection between changes in country-level transparency and underpricing difference within developed G20 economies, the author discovers that the variability of voice and accountability in developing G20 nations directly explains up to 28% of the underpricing variance. The results show that time-variant variability in country-level formal institutional quality indirectly impact on underpricing in three ways. The first is by improving the relationship between the incentive of IPO issuers and underpricing by up 1.4%. The second is by curtailing the association between underwriter reputation and underpricing by up to 12%. Lastly, the third is by diminishing the association between *ex-ante* uncertainty and underpricing by up to 5%.

The third essay (Chapter Four) utilises HLM to investigate the relative association of the levels of firm and country on the variance of IPO underpricing. Also looked at here is the direct effect of the characteristics of national cultures on the variance of IPO underpricing across countries. Furthermore, the indirect influence of the characteristics of national cultures in moderating the association between firm-level variables and IPO underpricing across nations is examined. The findings demonstrate that differences in country-level characteristics account for 22%, 5%, and 25% of the deviations in IPO underpricing between all G20, developed, and developing countries, respectively. Findings indicate that only differences in the level of power distance, individualism, femininity, and indulgence across countries directly affect the global IPO underpricing difference by up to 32%. The author finds that the difference in power distance and femininity in developing and developed G20 countries explains up to 40% and 59% of the underpricing variance, respectively. As well, the results confirm that culture indirectly affects underpricing variance in three ways: first, by influencing the relationship between the incentive of IPO issuers and underpricing by up 33%; second, by adjusting the relationship between underwriter reputation and underpricing by up to 10%; and third, by moderating the link between *ex-ante* uncertainty and underpricing by up to 30%.

Confidence in the findings across the three essays remained unimpaired after conducting a series of robustness tests, incorporating an extra firm and country-level covariates, and executing a number of diagnostic tests. The findings from this thesis provide a number of practical contributions to scholars, policy-makers, entrepreneurs and investors.

Thesis-Related Research Outcomes

Revised and Resubmitted Papers

Jamaani, F, Abdullahi, A (2019), ‘Bias, the Brian and Global Underpricing Difference: Do the simultaneous Effects of Clustering and Endogeneity Matter?’, *Journal of International Review of Financial Analysis.*

Refereed Conference Papers

Jamaani, F, Gangemi, M (2017), Can Entrepreneurial Wealth Losses Theory Explain Underpricing Difference in the Global IPO Market: Evidence from the G20 countries? In ‘The 8th International Conference on Economics, Business and Management (ICEBM 2017), Townsville, Australia, 17-19 November 2017’.

Research Excellence Award

Receiving the “Excellent Presentation” award for best presented paper for the business and finance group from the 8th International Conference on Economics, Business and Management (ICEBM 2017), Townville, Australia, 17-19 November 2017’. The paper was titled, “Can Entrepreneurial Wealth Losses Theory Explain Underpricing Difference in the Global IPO Market?”

Thesis-Unrelated Research Outcomes

Published Papers

Jamaani, F, Roca, E (2015), ‘Are the regional Gulf stock markets weak-form efficient as single stock markets and as a regional stock market?’, *Journal of Research in International Business and Finance*, 33, 221-246.
Bash, A, Al-Awadhi, AM, Jamaani, F (2016), ‘Measuring the Hedge Ratio: A GCC Perspective’, *International Journal of Economics and Finance*, 8(7), 1-20.

Under Review Papers

Alidarous, M, Clark, C, Prokofieve, M, Jamaani, F (2018), ‘Does IFRS Mandate Provide Economic Benefits to the Primary Market in emerging Countries? Evidence from Saudi Arabia’, *The International Journal of Accounting.*

Published Books

Jamaani, F 2014, *Market Integration: Overview of Relevant Issues*, 1st edn, LAP Lambert Academic Publishing.

List of Abbreviations

2SLS	Two-Stage Least Squares
AFC 1997	Asian Financial Crisis
BBM	Book-building Method
CC	Control of Corruption
CE	Country Effect
DF	Dilution Factor
DS	Developing Status
DSV	Developed Status
EWL	Entrepreneurial Wealth Losses
FDI	Foreign Direct Investment
FM	Femininity
FMS	Financial Market Sophistication
G20	Group of Twenty
GDP	Gross Domestic Products
GE	Government Effectiveness
GFC 2008	Global Financial Crisis
HLM	Hierarchical Linear Modelling
ICC	Intra-Class Correlation
IDG	Indulgence
IDV	Individualism
IE	Industry Effect
IOP	Integer Offer Price
IPOs	Initial Public Offerings
LET	Log Elapsed Time
LOP	Log Offer Proceeds
MS	Market Size
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PD	Power Distance
PF	Private Firm
PMV	Pre-IPO Stock Market Volatility
PR	Participation Ratio
RL	Rule of Law
RQ	Regulatory Quality
RSX	Regulation of Securities Exchanges
STO	Short-term Orientation
TF	Technology Firm
UA	Uncertainty Avoidance
UF	Underwriting Fees
U.K.	United Kingdome
UP	IPO Underpricing
UR	Underwriter Reputation
U.S.	United States
VA	Voice and Accountability
VIF	Variance Inflation Factor
WGIs	Worldwide Governance Indicators
YE	Year Effect

Table of Contents

Chapter Three: The Modifier Effect of Country-level Transparency on Global Underpricing Difference: New Hierarchical Evidence.......100

Table of Figures

Table of Tables

Chapter One: Introduction

The underpricing of Initial Public Offerings (IPOs) occurs when the share price of a newly listed firm on its first trading day exceeds its offer price. There has been ample scholarly and practical interest in understanding why entrepreneur founders of IPO firms have a propensity to offer their firms at a discount "underpricing". Beginning with early empirical evidence in the U.S. market, Ibbotson (1975) shows that IPO underpricing averaged around 16.8% during the 1960s. Recently, Ritter (2018) shows that 108 IPO firms floated part of their equities in 2017, thereby raising aggregate proceeds of US$24.53 billion. The money left on the table by these U.S. IPO issuers accounted for US$3.69 billion with an average underpricing level of 15%. Across the global IPO market, 1,974 firms floated part of their holdings in 2017 and amassed US$338.4 billion, of which countries in the Asia-Pacific, Middle East, and Africa accounted for approximately 82% of these IPOs (EY Global IPO 2017).

Loughran et al. (1994) provide an updated survey of international insights of 54 countries dated January 9, 2018 documenting the existence of varying levels of underpricing across the global IPO market. For example, the authors show average levels of underpricing of 6.4% for Austria, 33.1% for Brazil, 21.8% for Australia, 145.4% for China, 6.5% for Canada, 7.4% for Denmark, 50.80% for Greece, 88% for India, 24.90% for Indonesia, 44.70% for Japan, 239.8% for Saudi Arabia, and 16% for United Kingdom. These countries are heterogeneous in relation to the observed level of IPO underpricing, country-level transparency, and country-level national cultures. Hence, assuming the continuity of this heterogeneity, it seems that the academic and practical attention being paid to this subject is not going to subside anytime soon.

However, the critical question to ask is: how can these substantial underpricing differences across countries be explained? The common rationale is that buying shares in a newly listed company lacking historical market valuation processes and records makes IPO parties including issuers, underwriters, and investors apprehensive about the associated investment risk and returns (Gupta et al. 2018). Consequently, this means that IPO companies suffer from a syndrome known as "liability of newness", one which affects the balance of information asymmetry amongst IPO parties. Underpricing therefore is understood as a justifiable cost IPO issuers have to incur, in order to compensate for such liability of newness (Zattoni et al. 2017). This underpricing cost inflates the cost of going public to entrepreneur founders in many countries, depending on the existing level of information asymmetry within their equity markets (Liu & Ritter 2011). Consequently, a larger cost of going public is likely to deter prospective private companies from raising equity through equity markets. This in turn is likely to hinder future growth plans for private sector firms and subsequently affect the growth of equity markets. The explanation for this lies in the development of the IPO market, which supports the growth of economies wherein growing IPO listings are perceived as a vital strategic tool in boosting stock market growth (Tian 2011; Jamaani & Roca 2015). Despite the cost of this underpricing, IPO issuers attain a number of benefits from listing their firms, for example improving their firms' legitimacy, visibility, and prestige. This in turn supports the firm's long-term success (Luo 2008).

IPO underpricing researchers have employed a variety of firm- and country-level determining factors and utilised diverse theoretical models to explain why there is a notable difference in the level of underpricing from country to country (Ritter & Welch 2002; Kennedy et al. 2006; Colaco et al. 2009; Chourou et al. 2018). To pursue this aim, IPO underpricing scholars develop dozens of theories based on information asymmetry, institutional explanations, ownership and control reasons, and behavioural explanations aiming to comprehend this phenomenon (Jenkinson & Ljungqvist 2001; Ritter & Welch 2002). The authors contend that this underpricing phenomenon is ultimately explained by the existence of an asymmetric information problem between the key pillars of the IPO process including issuers, underwriter, and investors. They contend that asymmetric information models are deemed to be well-established and modelled theories compared to other non-information asymmetry-based models.

IPO underpricing literature asserts that besides firm-level characteristics that may trigger the problem of information asymmetry amongst IPO players, underpricing can be mitigated or seriously compromised by the prevailing formal (i.e., legal, governance, and transparency frameworks) and informal (i.e., cultural values) institutional environments across countries (Banerjee et al. 2011; Judge et al. 2014; Chourou et al. 2018; Gupta et al. 2018). Differences in the quality of both formal and informal institutions can therefore influence the observed level of information asymmetry in the IPO market, consequently affecting the perceived level of IPO underpricing from country to country (Engelen & van Essen 2010).

The law and finance literature including La Porta et al. (1997), Engelen and van Essen (2010), Boulton et al. (2010), Hopp and Dreher (2013), and Zattoni et al. (2017) demonstrates the considerable influence of differences in the quality of country-level legal systems on corporate financial decisions and asset pricing. According to this school of thought, a country with a feeble legal framework is likely to maintain an information environment characterised by a weak level of transparency, enabling an asymmetric information environment to form between market participants. This in turn leads to a market environment that suffers from an increasing *ex-ante* uncertainty problem related to two things: the value of firms; and the future distribution of realised company value among various stakeholders.

At the national level, an environment of asymmetric information may develop in some national cultures more effortlessly than in others (Aggarwal & Goodell 2010; Gupta et al. 2018). This is attributed to the manifestation of commonly acknowledged cultural values that facilitate the development of uncertain market environment amongst market participants (Kang & Kim 2010; Li et al. 2013). For instance, Hofstede (2001) contends a lack of social equality can be caused by the materialisation of a high level of power distance in a given society, and it easily transmits into inequality throughout that society. Once this low level of communal egalitarianism is established in a nation, then a low level of social trust amongst its members emerges (Hofstede 1980). Consecutively, in such cultures, it becomes problematic for socially isolated individuals to advance from a lower to a higher social category or caste. In this context, Bjørnskov (2008), Lewellyn and Bao (2014), and Chourou et al. (2018) associate a corrosion in social trust between peoples to an intensification of conflicts of interest and development of an environment with asymmetric information problem between market participants.

Consequently, investigations into the effects of differences in the formal and informal institutions on IPO underpricing difference across country institutional settings are critical research objectives discussed in this thesis. This thesis contributes to the literature by offering three interlinked essays dedicated to examining the phenomenon of underpricing difference in the global IPO market. A succinct discussion of these three essays is provided below.

The first essay (Chapter Two) examines issues so that the phenomenon of underpricing difference in the global IPO market can be explained and better understood. This essay employs the theoretical explanation offered by the Entrepreneurial Wealth Losses (EWL) model as it solves the problem of information asymmetry between the issuer and investor while accounting for the endogenous relationship between underwriter reputation and IPO underpricing. Specifically, it examines if the observed dispersion in IPO underpricing in the global IPO market is:

- Firstly, due to not capturing the endogenous effect of underwriter reputation on underpricing;
- Secondly, due to not capturing the effect of clustering in standard errors within years, industries, countries, and developed versus developing countries; or
- Thirdly, due to not capturing the simultaneous effect of endogeneity and clustering amongst IPO observations.

To achieve these goals, this essay employs a large set of global data comprising 10,217 IPO-issuing firms from 22 developed and developing countries between 1995 and 2016. The results are documented using a battery of tests including OLS, 2SLS, one-way clustered 2SLS, and two-way clustered 2SLS models; controlling for year, industry, and country effects. Results show that, from an international perspective, significant dissimilarities in IPO underpricing are attributed to the three dimensions of the EWL theory. The findings document that when the incentive of IPO issuers increases by 1% underpricing reduces by up to 1.4%. Furthermore, the results discover significant evidence presenting that when IPO firms' entrepreneur founders endogenously pick reputable underwriters to take their firms public, they effectively decrease their underpricing by up to 12%. This research finds that *ex-ante* uncertainty about IPO firms increases underpricing in the global IPO market. This is because the outcomes reveal that when the pre-IPO stock market volatility increases by one percent, on average, IPO firms underpriced by 5%. Results also show that underpricing decreases by 3.3% when the length of elapsed time between setting the offer price and first trading day increases by one unit. The findings document a reduction in IPO underpricing by 2.2% when the size of the IPO firms increases by one unit across countries.

Using developed stock market data, the findings confirm that difference in IPO underpricing is well explained by the three dimensions of the EWL theory also. Yet, dissimilarity in underpricing is elucidated by other factors as the EWL model provides weak explanation in developing economies. For instance, this research uncovers evidence showing that an increase in the incentive of IPO owners by one percent reduces underpricing by up to 1.1% in developed equity markets. The endogenous choice of high-status underwriters by IPO issuers is found to decrease underpricing by 4.2% in advanced stock markets. The findings confirm that an increase in the level of *ex-ante* uncertainty by one unit attracts underpricing by up to 2.5% in these developed economies.

Conversely, in developing stock markets, the findings confirm that the endogenous underwriting-underpricing association does not exist. Instead, traces of evidence found documenting the likelihood that underpricing variance are attributed to the spinning behaviour exclusively in developing equity markets. This is because the results show that in emerging nations entrepreneur founders of IPO firms suffer from the cost of employing prestigious underwriting banks paying them large underwriting fees. Sequentially, instead of attaining lower underpricing, issuers receive larger underpricing by 4.7%. This research attributes these findings to the lack of care issuers demonstrated about their inclination to accept larger wealth losses in exchange for achieving a successful listing. Therefore, the results relate the significant gap in initial return of 19% between advanced and emerging equity markets to the difference in the incentive of issuers when going public. This is because IPO firms in developing economies sell 1% and create 10% less secondary and primary shares when they go public, respectively. The conclusion remained robust after accounting for a number of robustness considerations including omitted variable bias, shared correlations in error terms between developed and developing economies, and existence of outliers.

The second essay (Chapter Three) examines the direct and indirect effects of time-variant changes in the formal institutional quality on the underpricing difference across countries. The intersection of law and finance literature suggests that time-invariant differences in the formal institutional quality could be or could not be related to the perceived underpricing variance across nations. Hence, current IPO underpricing-law literature has neither accounted for the time-variant changes in country-level transparency and underpricing across countries nor distinguished the indirect effect of country-level transparency on IPO underpricing simultaneously. This essay advances this literature through the application of Hierarchical Linear Modelling (HLM) to achieve three significant objectives:

- Firstly, study the relative prominence of the levels of firm and country on the variance of IPO underpricing;
- Secondly, investigate the direct effect of the characteristics of country-level transparency on the variability of IPO underpricing in the global IPO market; and

- Thirdly, examine the indirect effect of the characteristics of country-level transparency in modifying the relationship between firm-level variables and IPO underpricing in the global IPO market.

To accommodate these objects, this research employs five country-level formal institutions proxies (i.e., voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption). This research makes use of the EWL theory to control for traditional determining factors of IPO underpricing. To examine the proposed 20 research hypotheses, this research use 10,217 IPO companies listed in 22 different countries from January 1995 until December 2016. This research finds a significant percentage of the underpricing variance attributed to nearly 88%, 95%, and 75% are related to intrinsic characteristics of firms across, within developed, and within developing, G20 countries respectively. The results of this essay settle the confusion in the legal and IPO underpricing literature. This is done by confirming there is a significantly negative relationship between time-variant changes in country-level transparency and underpricing across countries. The results document that differences in country-level formal institutional quality's proxies directly explain up to 34% of the variability in IPO underpricing across G20 countries. This research uncovers evidence showing that time-variant differences in the level of voice and accountability in developing G20 countries directly clarify up to 28% of the underpricing variance. Not found here is any link between changes in country-level transparency countries and underpricing difference within developed G20 nations.

Remarkably, the findings also produce first-hand evidence documenting that time-variant changes in country-level transparency indirectly influence underpricing in three ways: first, through increasing the association between the incentive of IPO issuers and underpricing by up 1.4%; second, by reducing the relationship between underwriter reputation and underpricing by up to 12%; and third, by curtailing the relationship between *ex-ante* uncertainty and underpricing by up to 5% for every unit increase in the transparency proxies. Structural differences in the behaviour of firm-level variables are observed when this research split the data between IPO firms nested within developed and developing stock markets. For example, this research finds that when time-variant variability in country-level transparency is in effect, the EWL theory weakly elucidates IPO underpricing variance between all G20 countries, within advanced and emerging G20 economies. This finding allowed this thesis to conclude that in cross-country settings, differences in the formal institutional quality matter the most in IPO underpricing difference while firm-level determinants of IPO underpricing play marginal role. The findings continued to be significant after performing a series of robustness tests, including adding an extra eight firm- and country-level factors, and performing a number of diagnostic tests.

The third essay (Chapter Four) examines the influence of informal institutional quality on the underpricing difference across countries. Previous empirical evidence suggests that differences in national cultures may influence the observed variability in the level of IPO underpricing from country to country. Yet, current IPO underpricing-culture literature neither has a cognisance of the nesting structure of the IPO data nor recognises the indirect effect of national cultures on IPO underpricing. This essay advances the literature on this subject by implementing hierarchical linear modelling estimation to attain three important objectives.

- The first aim is to evaluate the relative importance of the levels of firm and country on the variance of IPO underpricing.
- For the second objective, this research tests the direct influence of the characteristics of national cultures on the variance IPO underpricing across countries.
- The third goal is to examine the indirect influence of the characteristics of national cultures in moderating the association between firm-level variables and IPO underpricing across nations.

To address these objectives, while this research controls for traditional factors of IPO underpricing at both company and country levels, this research uses Hofstede's (2010) national culture dimensions (i.e., power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence). This research employs the EWL theory to capture traditional determining covariates of IPO underpricing. To test the proposed 24 research hypotheses, this essay employs a global dataset of 10,217 IPO-issuing firms from January 1995 until December 2016 in 22 countries with varying levels of cultural characteristics. The results show that differences in country-level characteristics account for 22%, 5%, and 25% of the divergences in IPO underpricing between all G20, developed, and developing countries, respectively. The findings demonstrate that against the shared awareness in the IPO underpricing-culture literature, not all-cultural dimensions matter to the IPO market. This research shows that only differences in the level of power distance, individualism, femininity, and indulgence across countries matter directly in influencing the global IPO underpricing difference by up to 32%. This research finds that the variability of power distance and femininity in industrial and emerging G20 countries explains up to 40% and 59% of the underpricing variance, respectively.

This research also generates exclusive evidence confirming that culture indirectly impacts on underpricing variance in three ways: first, by transmogrifying the association between the incentive of IPO issuers and underpricing by up 33%; second, by modifying the liaison between underwriter reputation and underpricing by up to 10%; and third, by moderating the connection between *ex-ante* uncertainty and underpricing by up to 30%. Documented here are some structural differences in the behaviour of firm-level variables between IPO firms nested within developed and developing equity markets. For instance, while this research finds weak support for the EWL theory within the emerging G20 economies, this research uncovers strong support for the model using industrial IPO data when differences in country-level national cultures are captured. Confidence in the main findings remained unimpaired after conducting a series of robustness tests, incorporating an extra nine firm and country-level covariates, and executing a number of diagnostic tests.

In summary, this thesis seeks to contribute to advancing the understanding of the mystifying phenomenon of IPO underpricing difference in the global IPO market. To this end, this research provides the first international empirical evidence for testing the validity of a theoretical model - the EWL theory - in revealing simultaneous interactions between the three players in the IPO process. These are the issuers, underwriters, and investors. While examining this model, this research takes into account a largely ignored but important econometric issue related to capturing the effect of clustering in error terms. Subsequently, this research extends the EWL model to capture the nesting structure of the IPO data using the HLM technique. This helps to examine the direct and indirect effects of formal and informal institutional settings in shaping this global underpricing difference. The cross-country and long dataset that this research employs which contains heterogonous levels of underpricing, transparency, cultural characteristics, enabled this thesis to effectively assess the interaction of firm- and country-level covariates in reaching a better understanding - from a global perspective - of IPO underpricing variance. Hence, the results of this thesis will be of great importance to researchers in the literature on cross-country IPO underpricing, law-IPO underpricing, and culture-IPO underpricing. The findings also provide a number of practical contributions to policy-makers, entrepreneurs and investors.

This thesis comprises five chapters. Chapter One introduces the context of the topic and the subsequent three chapters are presented as separate papers. Chapter Two presents the first paper which is called "The Simultaneous Effects of Clustering and Endogeneity on the Underpricing Difference of IPO Firms: A Global Evidence". Chapter Three presents the second paper with the title "The Modifier Effect of Country-level Transparency on Global Underpricing Difference: New Hierarchical Evidence". Chapter Four is concerned with the third paper, "Hierarchical Explanation of the Direct and Indirect Effects of National Cultures on Underpricing Variance in the Global IPO Market". Finally, the conclusion of the thesis is provided in Chapter Five with a summary of the main themes covered here and directions for future research.

Chapter Two: The Simultaneous Effects of Clustering and Endogeneity on the Underpricing Difference of IPO Firms: A Global Evidence

2.1. Introduction and Research Background

It is now well documented[2] that the degree of underpricing in Initial Public Offerings (IPOs) varies substantially across global IPO markets, in particular across developed and developing IPO markets[3]. However, the critical question is how this substantial underpricing across countries can be explained. Loughran et al. (1994) report, in a yearly updated international insight on January 9, 2018, average underpricing stretching from 3.3% to 270.1% across 54 nations over the last 30 years. There is a lack of understanding why entrepreneur founders across stock markets float part of their holdings at great discount creating a substantial cost of going public (Liu & Ritter 2011). In reality, the existence of a considerable heterogeneity in underpricing across economies and within developed and developing nations can be mystifying, especially in trying to comprehend the inclination of entrepreneur founders IPO firms to give away part of their firms very cheaply. Loughran et al.'s (1994) report documents average underpricing for developed stock markets such as Japan, the United Kingdom, and Denmark at 44.7%, 7.4%, and 25.9%, respectively, while similar statistics for developing economies are reported at 239.8%, 4.2%, and 22.1% for Saudi Arabia, Argentina, and Pakistan, also respectively. What causes average underpricing to be as low as 4.2% and as high as 239.8% in developing economies such as Argentina and Saudi Arabia? Similarly, what causes average underpricing statistics in developed economies of Japan and Denmark to be as high as 44.7% and as low as 7.4%, respectively?

Understanding what explains underpricing difference in IPO firms in the global IPO market continues to be an ongoing and challenging research topic in the literature. Researchers endeavour

---

[2] See Loughran et al. (1994), Chowdhry and Sherman (1996), Dewenter and Malatesta (1997), Ljungqvist et al. (2003), Boulton et al. (2010), Engelen and van Essen (2010), Banerjee et al. (2011), Boulton et al. (2011), Hopp and Dreher (2013), Autore et al. (2014), Judge et al. (2014), Boulton et al. (2017), and Chourou et al. (2018).

[3] This thesis uses the Bloomberg definition of emerging IPO markets, that is, all listed IPOs in Latin America, the Middle East, Africa, Asia (excluding Japan and Singapore), and Eastern Europe stock markets. This chapter uses the words 'developing' or 'emerging' interchangeably.

to employ a range of determining factors, relying on different theoretical models, and seek to apply different econometric estimations to explain why there is a large dispersion in the level of underpricing in the global IPO market (Ritter & Welch 2002; Kennedy et al. 2006; Colaco et al. 2009; Boulton et al. 2017). The fusion of those empirical attempts has created a methodological problem in the literature leading to fragmented conclusions about what does explain underpricing difference in the global IPO market.

For example, one strand of research includes Habib and Ljungqvist (2001), Chahine (2008), Mantecon and Poon (2009), and Jones and Swaleheen (2010) who have proved empirically that IPO issuers are affected most from underpricing and concurrently made the absolute decision to select from the highest or lowest reputable underwriters proportionally. This depends on the stake of their holdings they intended to float, and implies that the decision to employ a prestigious underwriter is determined endogenously by IPO issuers in the pre-IPO stage. This literature argues the failure to account for this endogeneity explains the empirical claim that there is a positive relationship between hiring high-status underwriters and underpricing during the 1990s. When empirically controlling for this endogenous effect using an endogeneity correction model developed by Habib and Ljungqvist (2001) using a 2SLS estimation with a proper instrumental variable, this literature demonstrates that the employment of reputable underwriters is a costly promotion exercise. In fact, it curtails investors' uncertainty and subsequently leads to lower IPO underpricing.

This strand of the literature concludes that this erroneous methodological estimation caused by treating underwriter reputation as an exogenous factor, ensures the IPO underpricing literature maintains a false understanding of the phenomenon of IPO underpricing in the global IPO market. This strand of the IPO literature also suffers from two critical limitations. Firstly, this literature provides fragmented results for the endogenous underwriting-underpricing relationship making the understanding of this relationship largely distorted at best. For example, Habib and Ljungqvist (2001), Ljungqvist and Wilhelm Jr (2003), and Kennedy et al. (2006) prove the existence of a significantly negative relationship, while Franzke (2003) and Alavi et al. (2008) find no relationship at all. In contrast, Chahine (2008) contends that there is a significantly positive relationship. Secondly, the IPO data of this literature are heavily clustered during the 1990s and early 2000s and focused only on single developed countries such as the U.S., France, Germany, and Australia. They also concentrated on particular industries such as technology-related manufacture leading to potential year, country, and industry clustering effects. For example, Habib and Ljungqvist (2001), Ljungqvist and Wilhelm Jr (2003), Kennedy et al. (2006), Mantecon and Poon (2009), and Jones and Swaleheen (2010) employ only U.S. data while Franzke (2003), Alavi et al. (2008), and Chahine (2008) utilise German, Australian, and French IPO data.

Is there an influential difference using IPO data clustered in developed countries to understand the global underpricing difference across countries? The problem is that the developed IPO markets, for example, differ from developing IPO markets in that the former are characterised by a different information asymmetry environment and regulatory requirement. This occurs because developed countries impose tougher disclosure regulations and more transparent trading and listing regulations, making the findings of those studies difficult to generalise (Ritter 2003; Goergen et al. 2009). Kayo and Kimura (2011) acknowledge the impact of differences in information environments between developed and developing stock markets, and their impact on the capital structure of firms. The authors argue that firms clustered within developing stock markets exhibit similar firm-level information characteristics that are not similar to developed ones. Consequently, the evidence obtained by this strand of the IPO literature is likely to be biased because they are only clustered empirical evidence about the endogenous relationship between underwriter reputation and underpricing in the global IPO market without controlling econometrically for this clustering effect. This leads to questioning whether the theories designed to explain corporate finance behaviours in developed countries are applicable to developing countries.

Another literature strand concentrating on the impact of clustering in the IPO market focuses only on detecting the existence of numerous patterns of one-way and two-way clustering in the IPO market. This includes, for example, Lowry (2003), Torstila (2003), Benninga et al. (2005), and Jain and Kini (2006). Also, there are theorising models elucidating the materialisation of this clustering effect, such as the studies by Hoffmann-Burchardi (2001), Benveniste et al. (2002), and Lowry and Schwert (2002). Consequently, this research follow Cao and Shi (2006), Cameron and Miller (2015) and Thompson (2011) to contend that not accounting for the impact of clustered error terms in the IPO data may bias the results of previous studies. This research attributes the paucity in capturing this clustering effect to the existence of a distorted understanding in comprehending the underpricing difference in the IPO market. Yet, this scholarly perspective provides no knowledge of the consequences of the following: (i) one or two-way clustering effects on triggering the witnessed differences in underpricing across countries; (ii) between developed and developing countries; (iii) across years, industries and industries; or (iv) across years within similar countries, etc.

In this chapter, this research bridges the very different two literature strands by providing the first empirical evidence for the simultaneous effect of one-way and two-way clustering effects on the endogenous underwriter-underpricing relationship in the global IPO market. This allows this thesis to examine if the observed dispersion in IPO underpricing in the global IPO market is: due to not capturing the endogenous effect of underwriter reputation on underpricing; or due to not capturing the effect of clustering in standard errors within years, industries, countries, and developed versus developing countries; or due to not capturing the simultaneous effect of endogeneity and clustering in the IPO data.

Here, two deliberate departures from current empirical literature are made in relation to the empirical method and data. First, this research employs 48 OLS, 2SLS, one-way clustered 2SLS, and two-way clustered 2SLS models. This is accomplished in order to investigate the simultaneous effect of clustering in the IPO data on determinants of IPO underpricing in the global IPO market using the Entrepreneurial Wealth Losses (EWL) theory, which seeks to explain the endogenous underwriter-underpricing relationship. Second, this research employs a large set of global IPO underpricing data comprising 10,217 IPO-issuing firms from 22 developed and developing countries that operate within 33 different industries and listed between January 1995 and December 2016. The employment of this global dataset allows this thesis to produce the first comprehensive cross-country study that examines the validity of the EWL theory in explaining underpricing difference in a global context. It also permits the author of this thesis to conduct the first study that investigates the existence of the endogenous relationship between underwriter reputation and underpricing from an international perspective. Furthermore, this research can examine for the first time the impact of numerous forms of one-way and two-way clustering on causing underpricing difference in the global IPO market. This research is able to empirically capture the consequences of one-way and two-way clustering for the existence of the endogenous underwriter reputation-underpricing relationship in a global context.

A number of robustness checks are incorporated to ensure the findings are not an artefact of omitted variable bias, shared correlations in error terms between developed and developing stock markets, and existing of outliers. The findings document that comprehending the challenging phenomenon of IPO underpricing difference in the global IPO market is not straightforward. Yet, the employment of three phases of econometric analysis using OLS, 2SLS, and one- and two-way clustered robust 2SLS estimations led the author to solve part of this enigma. The findings attribute underpricing difference in the global IPO market to variations in level of the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty across the G20 countries. This is because this research finds that when in the incentive of IPO issuers increases by one percent underpricing decreases by 1.4%. Yet, issuers who endogenously choose to hire prestigious underwriters succeed to decrease their underpricing by 12%. IPOs that are listed when the pre-IPO stock market volatility is high by one percent, suffer from higher discount by 5%. When the span of elapsed time between setting the offer price and first trading day increases by one unit, underpricing falls by 3.3%. An increase in the size of the IPO company by one unit also results in decreasing underpricing by 2.2%. This research finds that underpricing difference across countries is linked to the difference in information asymmetry between developing versus developed markets. When IPO firms are listed in a developing country, then that adds more uncertainty to the offering due to the existence of more asymmetric information in developing countries compared to developed ones. Subsequently, the results indicate that those developing IPO issuers should accept a larger discount of up to 19% compared to their counterparts in developed stock markets.

From a developed G20 perspective, this study attributes differences in IPO underpricing to the three dimensions of the EWL theory as well. The results show that an increase in the incentive of IPO issuers by one percent results in alleviating underpricing by up to 1.1%. Conversely, the endogenous decision to select high-status underwriters by IPO owners decreases underpricing by 4.2% in developed equity markets. The amount of money left on the table by IPO firms increases by up to 2.5% when the level of *ex-ante* uncertainty surrounding the IPO firm increases by one unit. Yet, the EWL theory does not elucidate much of the underpricing variance in developing stock markets. This is because the findings document that the endogenous underwriting-underpricing does not exist in developing IPO markets. This possibly could explain why this research attained persistent outcomes rejecting the underwriting-underpricing relationship whenever this research captures correlations in error terms within developing versus developed G20 clusters. As a substitute, the findings lend support to the spinning behaviour rationale. This research finds that prestigious underwriters in developing stock markets burden IPO firms with hefty underwriting fee, sequentially, they leave big amount of money on the table for investors to cash it out at the expense of issuers[4]. Remarkably, this research discovers that in developing nations entrepreneur founders appear not at all disturbed by this spinning practice because they simply do not care much about their wealth losses in exchange for a successful listing. This is because, unlike their counterparts in industrial nations, owners of IPO firms in emerging stock markets, on average, sell 1% and create 10% less secondary and primary shares when they float their firms to the public, respectively.

This chapter provides several practical contributions to researchers, issuers, investors, and policy-makers. First, this research contributes methodologically to the intersection of IPO underpricing and the clustering literature by showing empirically the consequences of ignoring the effect of clustering in error terms and proposing a better way to capture it. Second, this research contributes to many strands of finance literature that employ data suffering from the clustering effect in error terms. For example, researchers in the field of seasonal equity offering (Mola & Loughran 2004), long-term underperformance of IPO firms (Schultz 2003), and merger and acquisition (Harford 2005; Netter et al. 2011), all document the existence of a clustering effect in their data without proper econometric adjustment. Hence the study contributes to the knowledge by demonstrating the consequences IPO clustering and how robust results could be achieved in this context. Third, the results will benefit researchers who embark on testing the validity of underpricing theories such as Kennedy et al. (2006) and examining determinants of IPO underpricing like Butler et al. (2014). The findings may alert researchers to pay more attention to the impact of IPO clustering and the consequences of ignoring it which may lead to erroneous conclusions. This is because the results document the sensitivity of accepting the explanatory of the EWL theory and the influential effect of clustering on the underwriter reputation-underpricing relationship after capturing the clustering effect in the IPO data, specifically between developed and developing countries.

Fourth, the losses of IPO issuers are gains made by IPO investors. Hence, the results will benefit those IPO parties in understanding two aspects that contribute to the observed dispersion in underpricing in the global IPO market. This enables them to formulate informed investment decisions. The important findings of this thesis such as the true nature of the endogenous relationship between prestigious underwriter and underpricing and the impact of IPO clustering on

[4] The results reported in this thesis document an opposing evidence in developed stock markets where reputable underwriters leave small amount of money on the table when they charge high underwriting fees.

the determinants of IPO underpricing across countries may aid investors to make more efficient investment decisions. Lastly, the traces of evidence documenting the possible existence of spinning behaviour could be of interest to policy-makers in developing economies. Legislators in emerging markets are interested in growing their local equity markets. This is because the progression of the IPO market supports their local economic growth objective in which more IPO listings are seen as an important strategic tool in ensuring continuous stock market expansion (Tian 2011; Jamaani & Roca 2015). The results show evidence that may contradict with the objectives of policy-makers in developing economies. This is because this research finds that high-status underwriters in emerging stock markets charge IPO firms large underwriting fees, and in turn, they leave large amounts of money on the table at the expense of IPO owners. This will increase the cost of going public, resulting in less incentive for private sector firms to expand their operations through raising equity using their local equity markets. Consequently, this leads to slower economic growth in emerging countries.

The remainder of the chapter proceeds as follows. Section 2.2 reviews the relevant literature on the impact of the endogenous relationship between underwriter reputation and IPO underpricing. Section 2.3 reviews the studies on the influence of clustering in the IPO market. Section 2.4 presents the theoretical framework while a discussion on the research questions and hypothesis development is presented in Section 2.5. Sections 2.6 and 2.7 present the data and methodology employed in this chapter, respectively. Sections 2.8 and 2.9 deliver the empirical results and concluding remarks, also respectively.

2.2. Related Literature on the Impact of Endogenous Relationship between Underwriter Reputation and IPO Underpricing

In recent decades, the volatile empirical evidence concerning the relationship between prestigious underwriter and underpricing in the IPO market has become one of the most disputed topics in the IPO underpricing literature. One school of thought provides empirical evidence documenting that the employment of a high-status underwriter by IPO firms alleviates the level of information asymmetry in the IPO market. This occurs through reducing the *ex-ante* uncertainty about the firm's value, providing a certification signal to investors resulting in the mitigation of underpricing (Beatty & Ritter 1986; Benveniste & Spindt 1989; Carter & Manaster 1990; Spatt & Srivastava

1991; Liu et al. 2011). One explanation for this negative effect of underwriter reputation on underpricing is offered by Ruud (1993) who contends that although IPO issuers may be involved in a restricted number of offerings, underwriters are permanent players in the IPO market. Underwriters fear setting a low offer price leading to higher underpricing of IPO firms, thus resulting in upsetting future IPO issuers from floating their firms at a large discount. Jenkinson and Ljungqvist (2001) also assert that the use of reputable underwriters leads to lower underpricing due to the development of an asymmetric information problem that may occur between underwriters and IPO investors. This is a scenario where the former deliberately overprice the IPO company, benefiting the issuer and themselves at the expense of investors.

In contrast, another school of thought provides contrary empirical evidence documenting the existence of either a positive relationship or no relationship at all between underwriter reputation and underpricing. Studies here include Beatty and Welch (1996), Logue et al. (2002), Loughran and Ritter (2004), and Autore et al. (2014), and Boulton et al. (2017). The argument in favour of this positive relationship is provided by Ljungqvist (2007) who argues that the asymmetric information problem may exist between underwriters and IPO issuers when the former intentionally underprice the latter for a personal gain. Liu and Ritter (2010) contend that some underwriters take advantage of their superior market knowledge and position for their own benefit by receiving side payments from large IPO investors. They want this in exchange for a discount offering or large allocation of IPO stocks, a practice known as “spinning”. In addition, Lowry and Shu (2002) argue that underwriters fear setting the offer price of IPO firms too high because this could result in upsetting or even being sued by angry IPO investors on the grounds the underwriter opportunistically overpriced the IPO.

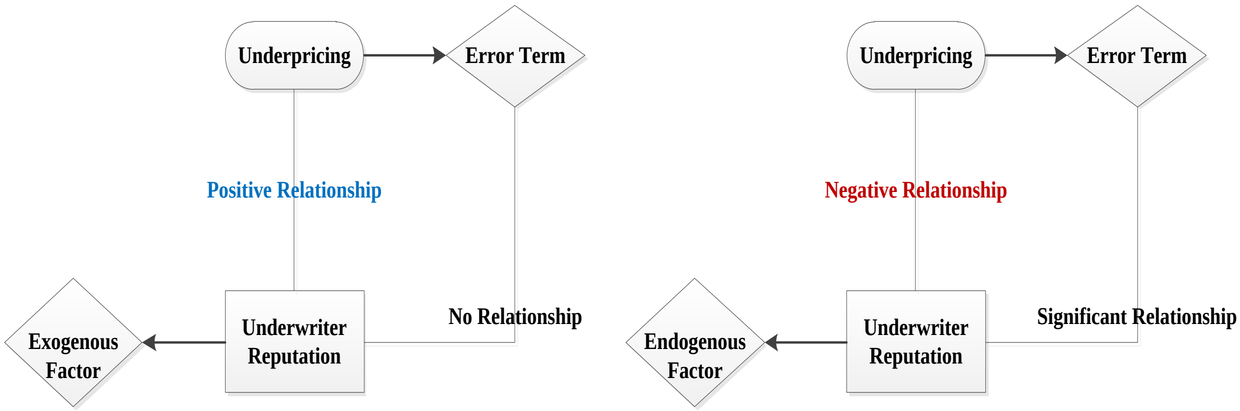
Fang (2005) argues that the observed reversal of the relationship between prestigious underwriter and underpricing from negative to positive is likely to be attributed to a radical shift in the incentive structure in the IPO market. This follows a similar proposition offered by Loughran and Ritter (2004). The authors hypothesise this shift is due to a change in the issuer’s objective function in which they postulate IPO issuers during the 1990s become less concerned about underpricing and more concerned about analysts’ research coverage. Consequently, those issuers are willing to accept underpricing in exchange for high post-IPO coverage service provided by highly ranked analysts who are employed by reputable underwriters.

Habib and Ljungqvist (2001) criticised the two above-mentioned strands of literature by developing and testing a theoretical model known as "Entrepreneurial Wealth Losses" (hereafter EWL) theory. The theory is based on three dimensions including the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty surrounding the offering. The second dimension of the theory attributes the mystifying results about the true nature of the relationship between underwriter reputation and underpricing in the IPO market to not accounting for the endogeneity in the matching between issuers and underwriters. Underwriter reputation serves as a proxy for promotion cost as employing prestigious underwriter is expensive. The authors contend that the change in the relationship between high-status underwriters and underpricing is a result of a failure to account for an endogeneity problem; it is not due to a shift in the incentive structure in the IPO market. Habib and Ljungqvist (2001) argue that the information asymmetry problem, causing underpricing in the IPO market and resulting from the presence of *ex-ante* uncertainty between IPO parties, can be endogenously controlled and influenced.

This occurs through using promotion costs such as employing a high-status underwriting bank that certifies the quality of the IPO firm leading to lower underpricing. Initial public offering issuers will have incentives to reduce underpricing, thus endogenously affecting underpricing, using reputable underwriters when they are only selling more of a stake in their firms to the public. The authors assert that issuers of IPO firms do not randomly select underwriters, and neither do underwriters randomly agree to underwrite IPO firms. Therefore, the decision to select an underwriter by the issuer is predetermined and it is likely to be based on their decision, at least in part, on the amount of underpricing they anticipate will occur. Consequently, Habib and Ljungqvist (2001) conclude that this results in endogeneity bias when regressing underpricing on the choice of underwriter.

Econometrically, endogeneity materialises when a significant correlation between the error term of the model and underwriter reputation variable occurs as shown in Figure 1. This implies that prestigious underwriter is not an exogenous variable as previous literature suggested, but is in fact an endogenous factor (Habib & Ljungqvist 2001).

Figure 1: Illustration of the Endogeneity Problem



(Designed by the author of this thesis)

Using 1,376 IPO issuing firms listed in the United States (U.S.) between 1991 and 1995, Habib and Ljungqvist (2001) empirically prove that the failure to account for this endogeneity explains the empirical claim that there is a positive relationship between hiring prestigious underwriters and underpricing during the 1990s. When empirically controlling for this endogenous effect using the 2SLS model with a proper instrumental variable, the authors find a significantly negative coefficient for underwriter reputation. As shown in Figure 1, Habib and Ljungqvist (2001) find that the sign between underpricing and the decision to employ reputable underwriters flipped to negative after being positive when the employment of a reputable underwriter is erroneously treated as an exogenous factor using an OLS model. The authors empirically confirm that the employment of reputable underwriters is a costly promotion exercise. In turn, the use of a reputable underwriter curtails investors' uncertainty, leading to lower IPO underpricing. Habib and Ljungqvist (2001) also show that the loss of wealth resulting from IPO underpricing is positively associated with the proportion of primary and secondary shares sold, along with the level of *ex-ante* uncertainty surrounding the offering. Consequently, issuers who increase their participation in offerings by selling more secondary shares and furthermore, incur more wealth loss caused by the dilution of their ownership due to the creation of more primary shares, may attempt to reduce underpricing. Their results show that issuers do this in order to reduce their wealth losses by incurring promotion costs such as employing a reputable underwriter, this being necessary when the magnitude of *ex-ante* uncertainty concerning the issue is higher.

Since the introduction of Habib and Ljungqvist's (2001) theory, endogeneity correction model, and empirical results, a third strand of literature emerges. This literature focuses on examining the validity of the EWL theory in explaining the phenomenon of IPO underpricing. The central aim of this school of thought directed towards testing the endogenous nature of the relationship between underwriter reputation and underpricing in the IPO market which is an important dimension of the EWL model. Remarkably, this literature – much like the previous two strands of literature - adds more mystery to the topic and fragmented results to the underwriting-underpricing relationship. For example, Ljungqvist and Wilhelm Jr (2003) find some support for the prediction of the EWL theory employing 2,178 listed IPO firms in the U.S. market between January 1996 and December 2000, specifically in relation to explaining the underpricing of technology IPO firms. The authors document significant evidence showing that underpricing is higher for technology compared to non-technology firms because IPO issuers of the former sell and create fewer secondary and primary shares, and there is less participation ratio and dilution factor when they go public, respectively.

The authors also find that when IPO issuers intend to sell fewer secondary shares, they show less care about underpricing and for this reason they employ less reputable underwriters who charger cheaper underwriting fees. They also find that when the *ex-ante* uncertainty of the technology firm is high proxied by a small size of the IPO firm, underpricing tends to be higher. Ljungqvist and Wilhelm Jr (2003) document that when they treated underwriter reputation as an exogenous factor using an OLS estimation, they find a positive and significant coefficient between underwriter reputation and underpricing. However, after applying an endogeneity correction model using a 2SLS model with a robust instrument variable following Habib and Ljungqvist (2001), the authors find a significant and negative coefficient between prestigious underwriters and underpricing.

Kennedy et al. (2006) examine the relative importance of six asymmetric information models in explaining the mystifying phenomenon of IPO underpricing of 2,381 IPO firms listed in the U.S. IPO market between 1991 and 1998. The authors discover that the EWL theory offers the most compelling explanation for IPO underpricing in that country's IPO market. The authors also document a significant change in the underwriter reputation-underpricing relationship from positive to negative after applying the endogeneity correction method proposed by Habib and Ljungqvist (2001). Fang (2005) also cautions for not accounting for the endogenous choice between the issuer-underwriter matching in the bond market using 3,000 corporate nonconvertible bonds issued between January 1991 and December 2000 in the U.S. market. The authors apply the endogeneity correction procedure proposed by Habib and Ljungqvist (2001), finding that reputable underwriters charge higher underwriting fees in exchange for lower yields leading to higher net proceeds for bond issuers. Similar evidence also documented by Mantecon and Poon (2009) and Akkus et al. (2016) shows that the positive relationship between underwriter reputation and underpricing found in the 1990s by previous studies disappears. This occurs after controlling for the endogenous choice of IPO issuers in selecting reputable underwriters when they intend to sell large portions of their holdings which changed to negative in the U.S. IPO market.

In contrast, a stream of opposing empirical evidence about the change in the relationship between underwriter reputation and underpricing of IPO firm due to the existence of this endogeneity effect emerges in the literature. For example, Franzke (2003) employs the endogeneity correction method of Habib and Ljungqvist (2001) on 160 listed IPO firms between March 1997 and March 2002. This is done to explain the underpricing phenomenon in the German IPO market. The author finds that after controlling for the endogeneity effect, underwriter reputation shows a positive but insignificant effect on underpricing in the German IPO market. Alavi et al. (2008) provide consistent results using 565 listed IPOs from 1995 to 2005 in the Australian stock market. The authors reject the exogeneity test for underwriter reputation. They reveal that after treating the choice of IPO issuers to select reputable underwriters being endogenous, underwriter reputation insignificantly increases underpricing. Chahine (2008) examines the validity of the EWL theory in elucidating underpricing in the French IPO market using 172 listed IPOs from 1997 to 2000. The author finds robust evidence indicating that IPO issuers endogenously determine the fraction of secondary and primary shares sold. The author factors the endogeneity effect between the choice of issuers in choosing reputable underwriters when they go public. Chahine (2008) concludes that underwriter reputation significantly increases the level of underpricing in the French IPO market.

Jones and Swaleheen (2010) attempted to resolve the fragmentary nature of results provided by the third strand of literature that employs the endogeneity correction method of Habib and Ljungqvist (2001). The authors use a dataset comprising 6,320 IPOs from January 1980 to December 2003 in the U.S. IPO market. The authors split their data into two periods, i.e. 1980-1991 and 1992-2003. They partitioned their data to investigate if the inconsistent results about the endogenous nature of the relationship between underwriter reputation and underpricing are driven by an unobserved year effect. Jones and Swaleheen (2010) commence their empirical testing by treating underwriter reputation as an exogenous variable. They document an insignificantly positive relationship between 1980 and 2003 while they find a negative and significant relationship between 1980 and

1991. They discovered this relationship shifted to a significantly positive one between 1992 and 2003 using OLS estimation. However, Jones and Swaleheen (2010) progress in their empirical testing to endogenise the decision to employ reputable underwriters based on the issuer's decision to sell secondary shares using a 2SLS model. The authors find that a positive and significant relationship exists between 1980 and 2003. The results of Jones and Swaleheen (2010) also show that between 1980 and 1991 a negative but insignificant relationship exists, while from 1992 to 2003 the sign of underwriter reputation coefficient became positive with no statistical significance.

The achieved fragmented results after controlling for the endogeneity effect documented in previous literature and after portioning the IPO data over two year groups by Jones and Swaleheen (2010) lead to a mystifying situation. They could imply the existence of unobserved autocorrelation or clustering in error terms for IPO firms within years or industries or countries as argued by Lowry and Schwert (2002) and Cao and Shi (2006) that causes this poorly understood change. Hence, there is no current understanding if the observed differences in IPO underpricing in the global IPO market are due to not capturing patterns of clustering in the IPO data that caused confusion in understanding the true nature of the relationship between underwriter reputation and the underpricing of IPO firms. Stated differently, could the observed effect of endogeneity between underwriter reputation and underpricing in the global IPO market be a temporary effect or even vanish once these unobserved autocorrelations or clustering in the IPO data are empirically captured? This research discusses this in more detail next.

2.3. Related Literature on the Impact of Clustering in the IPO Market

To clearly understand and appreciate the influential effect of clustering in the IPO market, this research should understand how clustering occurs, in what forms, and to understand what is the consequence of not accounting econometrically for this effect? The consequence of IPO clustering has attracted the attention of finance literature scholars who want to examine if the failure to observe the impact of clustered error terms in the finance and economic data may bias the results of previous studies (Ritter 1984; Lowry & Shu 2002; Helwege & Liang 2004; Benninga et al. 2005; Jain & Kini 2006; Colaco et al. 2009; Baschieri et al. 2015; Cameron & Miller 2015). For example, clustering literature including Petersen (2009), Sorokina and Thornton (2016), Smith (2016), and Onali et al. (2017) provides empirical evidence showing that finance and economic data suffer from an influential one-way clustering in the error terms across years, industries, and countries. They caution that failure to account for the impact of clustering results in biased standard errors and subsequently biased statistical results.

An explanation of the year clustering effect is offered by Ibbotson (1975) and Lowry and Schwert (2002). The authors observe a year clustering effect in the 1960s and 1990s in the U.S. IPO market. This occurred where periods with a large and small volume of IPO listing “hot IPO” and “cold IPO” periods are frequently shadowed by periods of intense and low IPO activity, respectively. Lowry (2003) develops an asymmetric information model linking the presence of time-varying difference in the *ex-ante* uncertainty surrounding the valuation of IPO firms and its influence on the existence of IPO waves. The author predicts the establishment of a negative association between the level of information asymmetry and IPO waves. Lowry (2003) also links the creation of year clustering effect due to the development of bullish price expectations by IPO investors about the first day return of IPO firms. Yung et al. (2008) also develop and test a model to predict the effect of year clustering on the development of information asymmetry in the IPO market using 7,409 IPOs from 1973 to 2004 listed in the U.S. stock market exchange. The authors show that IPO issuers reduce underpricing by strategically floating their IPO firms in specific years when the observed level of asymmetric information regarding those years is low.

The year clustering effect is not the only episode of one-way clustering because industry clustering also exists in the IPO market. This occurs where a disproportionate number of IPO companies within a specific industry list their firms simultaneously. Ritter (1984) highlights that the IPO market experiences industry clustering because the observed IPO waves in the primary market are attributed to some specific industries. Benveniste et al. (2003) and Benninga et al. (2005) contend that industry clustering occurs due to the development of a rapid IPO activity caused by the listing of IPO firms with similar high cash flow benefiting from higher market valuation. Consequently, important information about IPO firms with similar high cash flow is released to the market throughout the IPO process. This allows potential IPO investors to obtain valuable information about the future expected cash flows of those IPO firms as well as the overall investment opportunities in the whole industry. As a result, Benninga et al. (2005) argue there will be no benefits to remain private in that industry in which similar firms with high cash flow expectations find it worthwhile to float their firms. Eventually, a spillover effect occurs in the IPO market causing a large percentage of IPO firms in the same industry to float their companies within a short period of time (Altı 2005).

Similarly, Jain and Kini (2006) investigate differences between IPO firms that go public during industry clustered compared to non-clustered periods using 6,922 listed IPO firms in the U.S. market between 1980 and 1997. The authors also evaluate industry characteristics that cause clustering between IPO firms and examine the impact of industry clustering on the long-term performance of these firms. Jain and Kini (2006) find that IPO firms clustered within industries share similar characteristics including the ability to raise more capital, employ reputable underwriters, have higher underpricing, outspend their industry rivals on research and development, and attract more venture capital. The authors show that due to over-investing and investors' over-optimism for the initial return of IPO firms, industry clustering occurs in some industries inducing high growth and research-intensive industries. Jain and Kini (2006) conclude that non-clustered IPOs exhibit superior long-term performance when compared to clustered IPOs. The authors attribute the existence of industry clustering to the existence of the spillover effect. This occurs when IPO firms in a particular industry are floated during a short period. Consequently, a large amount of private information about that industry is disseminated to the market leading to a reduction in information asymmetry.

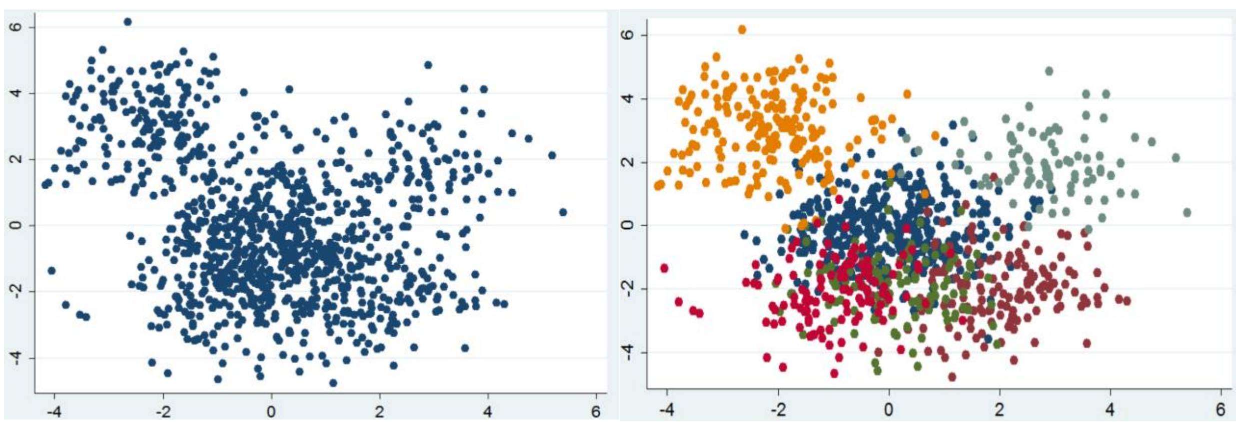
However, much of the empirical evidence for the existence of one-way clustering including year and industry in the IPO market refers to the U.S. market specifically and in the developed IPO markets such as the European countries generally (Hansen 2001; Hoffmann-Burchardi 2001; Cao & Shi 2006). If IPOs experience clustering effect between developed and developing countries based on the existence of clustering in the underwriting fees, then would the underwriter reputation-underpricing relationship be a global phenomenon or only exist in developed countries? Torstila (2003) intuitively addresses this hypothetical question. The author examines the existence of a clustering effect in underwriting fees for 11,000 IPOs from 27 developed and developing countries between 1986 and 1999. Torstila (2003) shows empirically that patterns of clustering in underwriting fees not only exist in the U.S. IPO market; they also constitute a pronounced global phenomenon across countries. The author finds average underwriter fees clustered at a rate ranging between 2% and 3% for 86%, 27.3%, 88.80%, 65.40%, and 42.90% of underwritten IPOs in developing Asian countries including India, Indonesia, Malaysia, Philippine, and Thailand, respectively. In contrast, the author shows that the underwriting fees of European IPOs cluster at a range of 3% to 4% for 25%, 25%, 34%, 38.6%, 40%, and 33.3% of IPO underwritten IPO firms in Denmark, Finland, France, Germany, Greece, and Switzerland, respectively.

Torstila (2003) also documents a large dispersion of underwriting fees between developed and developing IPOs. The author concludes that underwriting fees tend to exhibit similarity within advanced and emerging countries. This implies the existence of potential two-way clustering in the IPO market where some reputable underwriters cluster in specific countries or developed countries or industries or years. If this likelihood is to exist, then this research might expect observing unobservable multiple combinations of two-way clustering effects in the IPO market. For instance, this research might discover two-dimensional clustering for some IPOs within some industries in specific years, industries in specific countries, industries in developing countries, years in specific countries, years in developing countries, and so forth.

Helwege and Liang (2004) and Thompson (2011) contend that the clustering phenomenon in the finance and economic data including IPO data is distinct as it can develop in other forms of two-dimensional clustering. For example, Helwege and Liang (2004) assert the possibility of the two-way clustering in the IPO market where IPOs listed during hot market periods are typically caused by the bouncing of IPO volume in some industries. Similarly, Hoffmann-Burchardi (2001) highlights that the bouncing of IPO activity in the biotechnology industry on the London stock market during the 1990s is an example of the existence of two-way clustering such as year-industry clustering effect in the IPO market. Cao and Shi (2006) argue that two-way clustering occurs in the U.S. and the European IPO markets. The authors relate observing large numbers of highly underpriced IPO firms floated into market both during hot market periods, for example in the 1999s, and in specific industries, for example in biotech and technology industries, to the development of two-way clustering. The authors theorise the existence of this two-way clustering in the IPO data is caused by unobserved clusters of private information in the IPO market within a particular industry in a particular year.

Cao and Shi (2006) postulate that this clustered private information about the price expectations caused by valuation uncertainty of Internet IPO firms during the 1999 period. Hence, once this private information is channelled into the IPO market, a creation of clustered asymmetric information develops within a year and industry-wide scale. In this way, a group of IPO firms experiences a similar level of information asymmetry caused by similar *ex-ante* valuation uncertainty within specific years and industries causing the creation of unobserved correlations within error terms. Cao and Shi (2006) contend that this IPO clustering causes researchers to observe differences in underpricing of IPO firms between years and industries while it makes observing underpricing similar within specific years and industries. The question to follow is: how do this research visualise this clustering and what might happen when this research fail econometrically to capture its existence? Graphically, this research show in Figure 2 a hypothetical example of data that experiences one-way clustering in standard errors. This clustering occurs in error terms within 6 coloured years or industries or countries or clusters of which those error terms have a tendency to correlate each cluster. Yet, those error terms are uncorrelated between those years or industries or countries or clusters. Figure 2 implies that when this research fail to observe the effect of clustering, for example within 6 coloured years or industries or countries, then this research only observe one big cloud of clustered standard errors instead of six actual clouds.

Figure 2: Hypothetical Example of Data Experiences One-Way Clustering in Standard Errors



(Sourced from Smart (2017))

Cameron and Miller (2015) argue that a failure to empirically account for the effect of clustering in standard errors if they exist over years or industries or countries may result in two severe consequences. First, the authors caution that if errors are indeed correlated within a cluster, and this research fail to account for this effect, then the OLS or 2SLS estimator produces a less efficient estimation. Second, Cameron and Miller (2015) stress that the failure to account for within-cluster error correlation is likely to lead to utilising standard errors that are very small, leading to an overstatement of T-statistic or Z-statistic values. Consequently, this leads to over-rejecting the true null hypothesis. Colaco et al. (2009), Cameron and Miller (2015), Reinhardt and Riddiough (2015), Bradley et al. (2016), and Isshaq and Faff (2016) conclude that failure to account for within-cluster error correlation is a costly econometric problem frequently ignored in the literature. Thus, ignoring the effect of clustering in error terms has a detrimental effect on the reliability of inferences drawn from empirical testing.

To this end, the prior IPO literature focuses only on identifying the existence of various patterns of clustering in the IPO market and developing models to explain the formation of this clustering effect. Yet, there is no understanding of the consequences of those clustering effects on causing the observed differences in underpricing across countries, or between developed and developing countries or across years and industries, etc. Stated differently, can the failure to observe the existence of one-way or two-way clustering effects alter the relationship between determinants of IPO underpricing in the global IPO market? For example, can the observed effect of endogeneity between underwriter reputation and underpricing in the IPO market be a temporary effect or even vanish once these unobserved clustering effects are empirically captured? This thesis attempts to answer some of those important questions in this chapter.

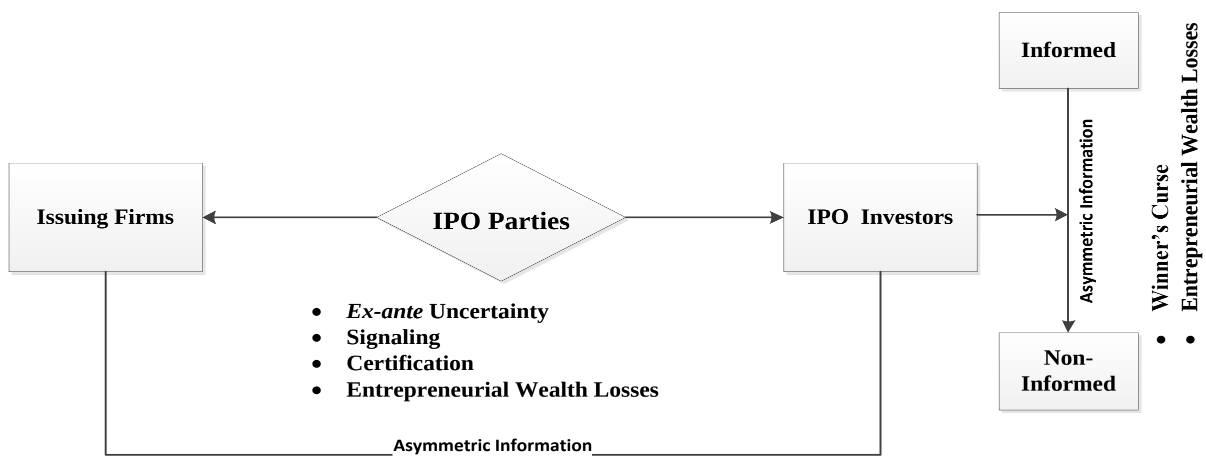
2.4. Theoretical Framework

Jenkinson and Ljungqvist (2001) and Ritter and Welch (2002) provide an extensive review of theories that claim to explain the underpricing phenomenon in the IPO market. The authors contend that this underpricing phenomenon is ultimately explained by the existence of asymmetric information in the IPO market. The authors contend that asymmetric information models are considered to be well-established and modelled theories compared to other non-information asymmetry-based models. Hence, this chapter formulates its explanation of differences in IPO underpricing across the global IPO market based on asymmetric information reasoning. In particular, this chapter employs the Entrepreneurial Wealth Losses (EWL) theory developed by Habib and Ljungqvist (2001).

This research employs the theoretical explanation offered by the EWL model since it is the only one that solves the problem of information asymmetry between the issuer and investor, while accounting for the endogenous relationship between underwriter reputation and IPO underpricing. There are other theoretical explanations of the phenomenon of IPO underpricing reviewed in the literature based on other information asymmetry, institutional, ownership and control, and behavioural explanations; these are briefly discussed in Appendix 1. This research also shows in Appendix 1 other reasons for those theories' unsuitability in explaining IPO underpricing across the global IPO market after this research present a brief discussion of why IPO companies decide to go public. Appendix 1 also presents the key IPO parties in order to provide an extended understanding of the mechanism of information asymmetry in the IPO market.

Conceptually, as shown in Figure 3, Habib and Ljungqvist's (2001) model explains the phenomenon of IPO underpricing by combining the "winners' curse" hypothesis of Rock (1986), the "*ex-ante* uncertainty" hypothesis of Beatty and Ritter (1986), the "certification" hypothesis of Booth and Smith (1986), and the "signalling" models of Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989).

Figure 3: Interaction between the Entrepreneurial Wealth Losses Theory and Other Asymmetric Information Models



(Designed by the author of this thesis)

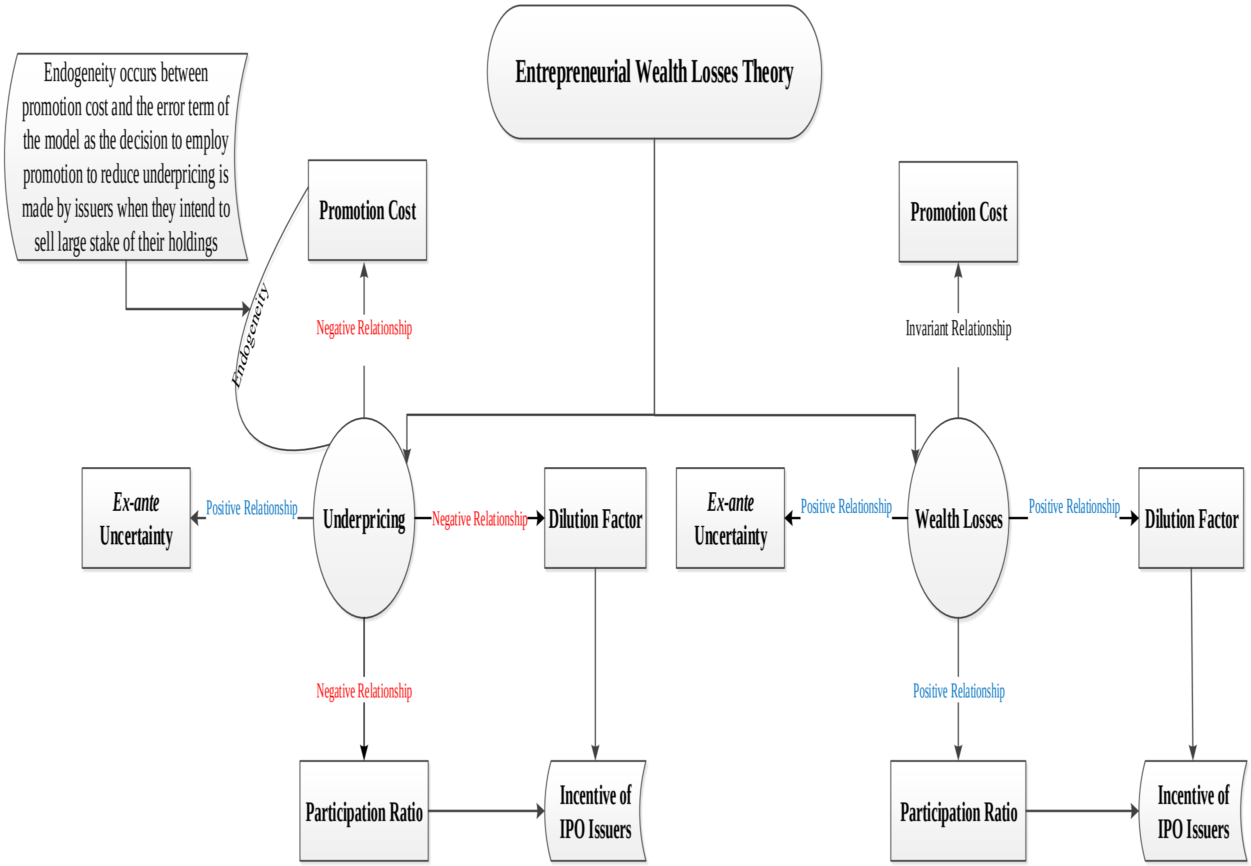
Habib and Ljungqvist (2001) address the "winners' curse" hypothesis by arguing that participation of uninformed investors can be determined endogenously by incurring more promotion costs. This is achieved, for example, by hiring reputable underwriters to reduce the "adverse selection" problem faced by uninformed investors. This in turn leads to lower underpricing. They also address the "*ex-ante* uncertainty" hypothesis by arguing that Beatty and Ritter (1986) do not take into account IPO issuers' incentives to alleviate investors' *ex-ante* uncertainty by increasing promotion costs, for example, employing underwriters with prestigious market reputation. Furthermore they address the “certification” hypothesis of Booth and Smith (1986), arguing that promotion costs can include the employment of a reputable underwriter or prestigious auditor as “certification” signals. These serve to verify the quality of the issuer that was endogenously determined by the issuer when they aim to sell part of their holdings. Habib and Ljungqvist (2001) also address “signalling” models by arguing that when IPO issuers reduce their ownership retention rate and bear the cost of promotion activities such as employing a reputable underwriter, prestigious auditor, or providing voluntary disclosure, promotion activities can serve as substitutes to underpricing.

Habib and Ljungqvist (2001) revolutionised the IPO underpricing literature by providing the first theoretical and empirical evidence for the existence of the endogeneity problem between the key IPO parties. The authors assert that the issuers of IPO firms do not randomly select underwriters, and neither do underwriters randomly agree to underwrite IPO firms. Therefore, the decision to select an underwriter by the issuer is predetermined and it is likely to be based on their decision, at least in part, on the amount of underpricing they anticipate will occur. Consequently, this results in endogeneity bias when regressing underpricing on the choice of underwriter. Habib and Ljungqvist (2001) model has two main premises and they are as follows:

- The first is that IPO owners care about underpricing, they are willing to stand to lose from it, and any such losses are proportionally conditional on the number of primary and secondary shares being sold.
- The second is that IPO owners can influence the degree of underpricing by promoting their offerings.

The EWL theory emphasises that neglecting the endogeneity in IPO issuers’ incentives to discourage information asymmetry, in turn, reduces underpricing results in the omitted variable bias and leads to biased inferences from empirical work. Based on this rationale, the EWL model provides two separately testable models to explain factors affecting wealth losses and underpricing of IPO issuers as shown below in Figure 4.

Figure 4: Information Asymmetry Based on Entrepreneurial Wealth Losses Rationale



(Designed by the author of this thesis)

The two testable hypotheses explain underpricing and wealth losses of IPO firms based on three dimensions: incentive of IPO issuers, promotion costs, and uncertainty surrounding the offering as shown in Figure 4:

- The first hypothesis, i.e. underpricing hypothesis, argues that underpricing decreases in line with promotion costs, participation ratio, and dilution factor[5] while underpricing increases in uncertainty when controlling for promotion costs.
- The second hypothesis, i.e. wealth losses hypothesis, argues wealth losses increase in line with the participation ratio, the dilution factor, and uncertainty,

[5] Habib and Ljungqvist (2001) argue that the relationship between underpricing and dilution factor is indeterminate. This means it could be positive or negative as they find that when using OLS models the relationship is positive but when accounting for endogeneity using 2SLS models the sign turns to negative. Ljungqvist and Wilhelm Jr (2003), Kennedy et al. (2006), Chahine (2008), Goergen et al. (2009), and Jones and Swaleheen (2010) also found empirical evidence detecting a negative relationship between underpricing and dilution factor. This evidence is followed in the thesis to predict a negative relationship between underpricing and dilution factor.

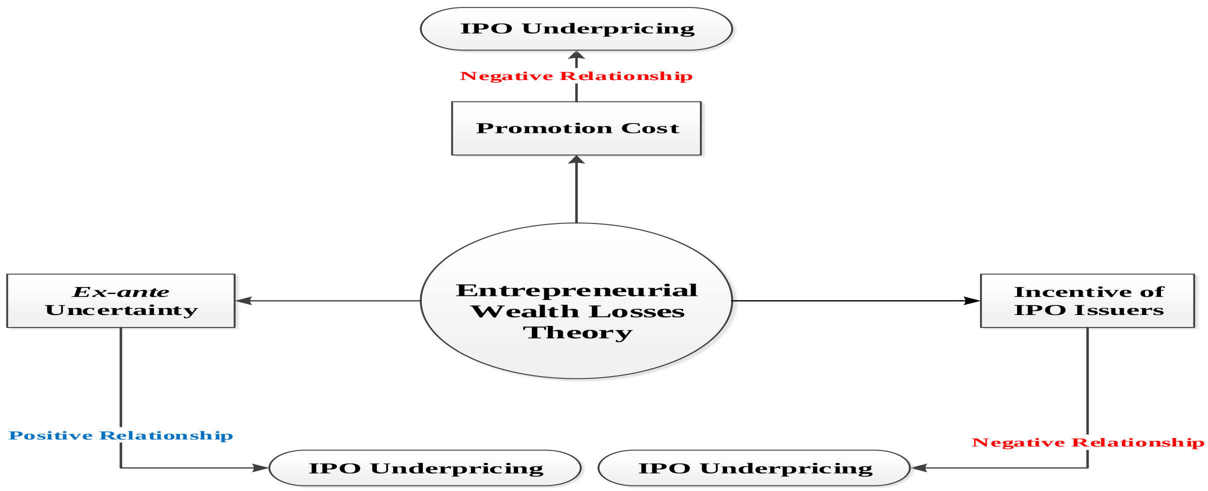
but are invariant to promotion costs. For both hypotheses, promotion costs increase in line with the participation ratio, the dilution factor, and uncertainty.

Habib and Ljungqvist (2001) calculate wealth losses as the sum of "auditing, legal, roadshow, exchange, printing, and other expenses of the offering as well as accountable and non-accountable underwriter expenses, but not the underwriter spread, which they view as a payment for underwriting risk and thus not as a choice variable". Unfortunately, such data is not adequately available for the cross-country setting. For example, this research finds only 1,458 out of the 10,217 IPO-issuing firms this thesis employs have data for wealth losses in the Bloomberg New Issues Database. It emerges that 85% of these 1,458 IPO firms are dominated by U.S. IPOs and for this reason the chapter only examines the underpricing hypothesis.

2.5. Research Questions and Hypothesis Development

In this chapter this thesis aims to examine if the observed dispersion in IPO underpricing in the global IPO market is due to: firstly, not capturing the endogenous effect of underwriter reputation on underpricing; secondly, not capturing the effect of clustering in standard errors within years, industries, countries, and developed versus developing countries; or thirdly, not capturing the simultaneous effect of endogeneity and clustering in the IPO data. To achieve this goal, this research employs the EWL theory, which aims to solve the problem of information asymmetry between the issuer and investor while accounting for the endogenous relationship between underwriter reputation and IPO underpricing. This research econometrically accounts for the effect of one-way and two-way clustering in several clustering forms on the three dimensions of the EWL model. The second dimension of the EWL theory - promotion cost proxy by underwriter reputation - allows the author to examine for the endogenous relationship between underwriter reputation and IPO underpricing. The EWL theory comprises three dimensions that can be tested to ascertain its validity in explaining differences in IPO underpricing across countries as shown in Figure 5.

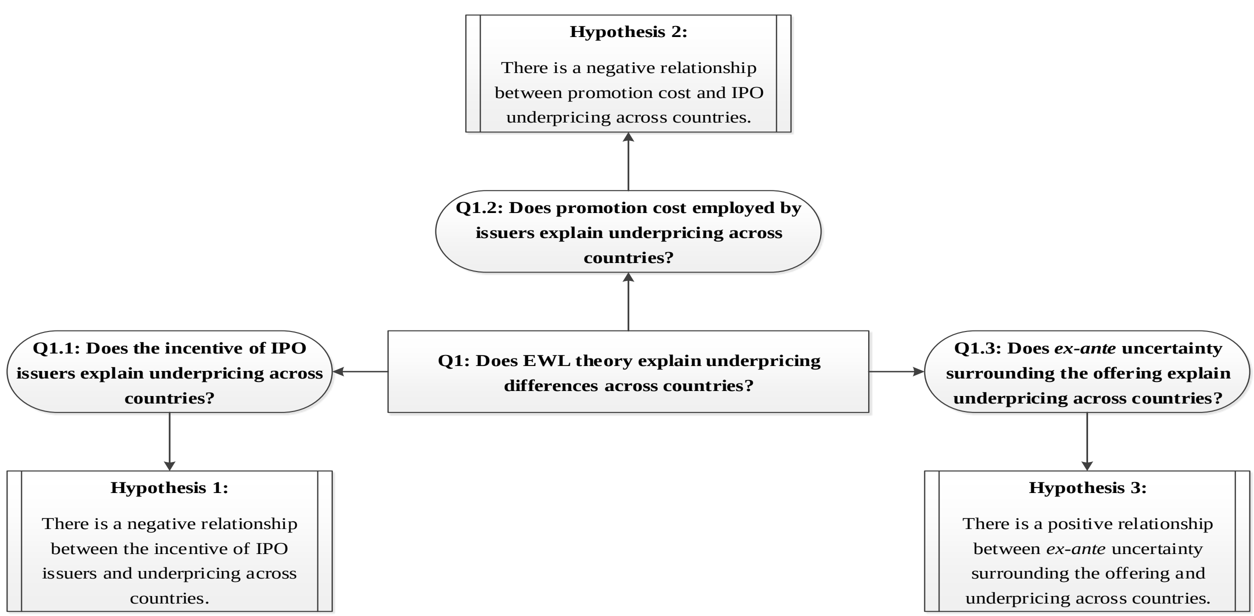
Figure 5: Dimensions of the Entrepreneurial Wealth Losses Theory



(Designed by the author of this thesis)

Those dimensions include the incentive of IPO issuers, promotion costs, and *ex-ante* uncertainty surrounding the offering. Based on those three dimensions, this chapter develops three sub-research questions in order to test every dimension, consequently leading to the development of three research hypotheses as shown in Figure 6.

Figure 6: Research Questions and Related Hypotheses



(Designed by the author of this thesis)

A successful testing of these three dimensions will provide strong support for the theory. This chapter answers the following question along with three related sub-research questions as follows:

Q1: Does EWL theory explain underpricing differences across countries?

Q1.1: Does the incentive of IPO issuers explain underpricing across countries?

Q1.2: Does promotion cost incurred by issuers explain underpricing across countries?

Q1.3: Does *ex-ante* uncertainty surrounding the offering explain underpricing across countries?

2.5.1. Relationship Between the Incentive of IPO Issuers and Underpricing

Habib and Ljungqvist (2001) measure the incentive of IPO issuers through the participation ratio and dilution factor. The former is defined as the percentage of secondary shares sold to pre-IPO outstanding shares while the latter is defined as the percentage of primary shares created to pre-IPO outstanding shares. The authors document the existence of a negative relationship between both participation ratio and dilution factor and the degree of underpricing at the time of IPOs. The authors contend that the greater the participation ratio and dilution factor, the more incentive issuers have to reduce underpricing. Despite the similarity between participation ratio and dilution factor, they differ slightly in creating the incentives of issuers to reduce underpricing. According to Habib and Ljungqvist (2001), participation ratio causes issuers to experience direct wealth losses since every percentage of underpricing causes a reduction in the wealth of owners of shares. Thus, the higher the percentage of secondary shares sold the greater the incentive of issuers to reduce underpricing.

Similarly, although the dilution factor seems to have no direct effect on underpricing, it does have a direct effect on issuers' wealth losses, as every new share created will dilute the entrepreneur's outstanding wealth. However, the creation of new discounted shares that are sold to new investors at the offering enlarges the investors' base at a cheaper value. Furthermore, it reduces both control and future cash benefits that were previously solely preserved for the entrepreneur, thus indirectly affecting underpricing. The negative association between participation ratio and dilution factor with underpricing is empirically supported by Ljungqvist and Wilhelm Jr (2003), Kennedy et al. (2006), Chahine (2008), Goergen et al. (2009), and Jones and Swaleheen (2010). Based on the above discussion, the following hypothesis is developed to answer the first sub-research question:

Hypothesis 1:
There is a negative relationship between the incentive of IPO issuers and underpricing across countries.

2.5.2. Relationship Between Underwriter Reputation and Underpricing

Habib and Ljungqvist (2001) empirically show that the loss of wealth resulting from IPO underpricing is positively associated with the proportion of primary and secondary shares sold, along with the level of *ex-ante* uncertainty surrounding the offering. Consequently, issuers who increase their participation in offerings by selling more secondary shares and incur more wealth loss caused by the dilution of their ownership due to the creation of more primary shares, may attempt to curtail underpricing. They will do this in order to reduce their wealth losses by incurring promotion costs, this being necessary when the magnitude of *ex-ante* uncertainty concerning the issue is higher.

To accomplish a reduction in IPO underpricing, issuers incur greater promotion costs, for instance hiring reputable underwriters who can certify the quality of the issuer in order to lessen the *ex-ante* uncertainty of uninformed investors (Benveniste & Spindt 1989; Spatt & Srivastava 1991; Liu et al. 2011). Of course, the hiring of a reputable underwriter comes at an additional cost compared to employing a cheaper underwriter with an inferior market reputation (Beatty & Ritter 1986; Kirkulak & Davis 2005; Jones & Swaleheen 2010). Incurring such promotion costs may attract more uninformed investors to participate in offerings, who demand less discounting since their uncertainty about the offerings is less, thus lowering underpricing. Beatty and Ritter (1986) and Habib and Ljungqvist (2001) assert that IPO firms’ use of reputable underwriters can reduce the *ex-ante* uncertainty about the firm’s value, providing a certification signal to investors and, in turn, mitigating underpricing. Based on the above discussion, the following hypothesis is created to answer the second sub-research question:

Hypothesis 2:

There is a negative relationship between promotion cost and IPO underpricing across countries.

2.5.3. Relationship Between *Ex-ante* Uncertainty and Underpricing

To capture and test the third dimension of Habib and Ljungqvist's (2001) model, *ex-ante* uncertainty, this thesis uses three commonly employed *ex-ante* uncertainty proxies in the literature: pre-IPO market volatility, elapsed time, and offer size. Firstly, Ljungqvist and Wilhelm Jr (2002) and Chang et al. (2017) find that the level of volatility of a stock reflects its degree of risk perceived by market participants in which more volatility makes pre-market prices to be less informative. Consequently, when IPO investors experience greater *ex-ante* uncertainty related to pre-market prices then greater discount is imposed on the offer price of IPO firms relative to the pre-market prices. Thus, a positive association between underpricing and pre-IPO market volatility is expected.

Secondly, Lee et al. (1996) and Ekkayokkaya and Pengniti (2012) argue that the longer the elapsed time between first trading day and IPO announcement day where offer price is set, the less demand informed investors will have for the issue. This implies that when informed investors indicate low demand for an IPO firm, then the IPO requires more time to be fully subscribed to avoid failure of subscription. Lee et al. (2003) explained this matter by contending that the low demand by informed investors would be favoured with high uncertainty about the quality of the IPO by uninformed investors. This leads to less demand for the offering on the first trading day and then in turn results in lower underpricing. Consequently, it is expected that IPOs with a long elapsed period of time will experience a higher level of *ex-ante* uncertainty leading to lower IPO demand and underpricing.

Thirdly, Beatty and Ritter (1986), Loughran et al. (1994), Kim et al. (2008), and Boulton et al. (2010) used IPO offer size measured by the gross proceedings to proxy for *ex-ante* uncertainty. Here they empirically documented that larger offerings are normally offered by established firms, while smaller offerings are offered by speculative firms, calling this phenomenon "empirical regularity". Thus, this thesis follows Beatty and Ritter (1986) in asserting that a negative association between gross proceeds of IPO firms and underpricing is present. Based on the above discussion, the following hypothesis sets out to answer the third sub-research question:

Hypothesis 3:

There is a positive relationship between *ex-ante* uncertainty surrounding the offering and underpricing across countries.

2.6. Data

The dataset contains firm-specific data, this being secondary data sourced from Bloomberg New Issues Database and DataStream databases covering the Group of Twenty (i.e., G20) market countries. The data covers the period January 1995 to December 2016, and consists of 10,217 IPO-issuing firms from 33 industries and 22 developed and developing countries. Why the G20 countries? This thesis chooses them because they offer a diverse and heterogeneous dataset that allows the research hypotheses to be rigidly tested. They also provide generalisable answers to the research questions posed in this thesis. The G20 is a global gathering that takes the form of an annual forum for advancing international cooperation and coordination among 20 major emerging and advanced economies[6] (The G20 China 2016).

The G20 includes Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, and the United States, and the European Union. Since its establishment in 1999, the G20 has emerged as a prominent international economic cooperation forum and had to deal with the global financial crisis of 2008-2009. The G20 leaders meet on an annual basis (at a "summit") to discuss primary issues related to the stability and growth of the international economy and financial system. Other topics are also discussed, including development, food security, and the environment (G20 Turkey 2015). The G20 countries include 19 nations and the European Union is considered to be the 20th country (The G20 China 2016).

The sheer size and importance of the G20 economies in the global economy make this body a focus of practitioners and academics worldwide (Christiansen et al. 2011; Johannesen & Zucman 2014;

[6] Some guest countries and the United Nations, the International Monetary Fund, the World Bank, the World Trade Organization, the Financial Stability Board, the International Labour Organization, the Organization for Economic Co-operation and Development (OECD) were also invited to attend the G20 Summit (G20 Turkey 2015).

Kelly et al. 2016). To understand the size of the G20 economies and financial markets, for example, Table 1 shows a summary of statistics illustrating the G20 economies' share of the world economy. It is in terms of gross domestic product (GDP), market capitalisation, number of listed companies, global population, export of goods and services, number of IPO listings, and size of IPO listings in 2014 (The World Bank Group 2015). In 2014, the contribution of the G20 economies' GDP to the global GDP was approximately 81% and 82.6% of global market capitalisation occurred in the G20 stock markets.

Table 1: Summary Statistics for the G20 Countries

	World	G20 countries	Share of G20 to World (%)
GDP at market prices (trillion US$)	77.80	63.10	81.1%
Market capitalisation (trillion US$)	66.5	54.90	82.6%
Listed domestic companies (total thousands)	44.00	33.40	75.9%
Population (total billion)	7.26	4.56	62.8%
Exports of goods and services (trillion US$)	23.60	12.10	51.1%
IPO listing (total thousands)	32.30	25.3	78.3%
Size of IPO listing (trillion US$)	3.60	2.90	80.4%

(Sourced from The World Bank Group (2015))

In 2014, 75.9% of global listed companies were traded on the G20 stock markets, and the population of the G20 countries accounted for more than 60% of the world's population. The G20 economies controlled 51.1% of global exports of goods and services, amounting to US$12.1 trillion. Up to 2014, approximately 25 thousand IPOs were listed in the G20 stock markets, accounting for 78.3% of all listed IPOs in the global market since 1995, and accounting for 80.4% of the value of all listed companies. Thus, a focus on the G20 countries allows for a more generalised coverage of a comprehensive dataset that encapsulates a variety of established and underdeveloped stock markets. This in turn permits rigid testing of the first set of research hypotheses.

The research sample is selected from this chapter and refers to these selection criteria following Ritter and Welch (2002) and Boulton et al. (2017) as exhibited in Table 2.

Table 2: Sample Selection Criteria for IPO Data

Selected search criteria	Description	Number of IPOs Matches
Exclusion of Duplicates	This research excludes all duplicate[7] IPOs from this sample from January 1995 to December 2016 (9,548 IPOs are excluded).	**32,585**
Exclusion non-trading IPOs	This research only includes IPO firms that are already traded at the time of inclusion; therefore, all pending, withdrawn, postponed, and rejected IPOs are excluded since they are beyond the research interest of this study (1,450 IPOs are excluded).	**23,037**
Exclusion of non-G20 IPOs	The G20 countries include Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, United Kingdom, and the United States plus the European Union as the 20th country. Within the European Union, there are other countries including Bulgaria, Denmark, Greece, Poland, Slovenia, Spain, Romania, and Sweden making up the G20 group. Due to IPO data unavailability, Argentina, Romania, Slovenia, and Spain were excluded making a final sample of 22 countries (5,951 IPOs are excluded).	**21,587**
Exclusion of IPO data with missing values for PR and DF, UR, PMV, LET, and LOP	This research excludes IPOs with missing values needed to calculate all explanatory variables (6,047 IPOs are excluded).	**15,339**
Exclusion of IPO data with missing values for UP	This research excludes IPOs with missing values of the dependent variable (2,045 IPOs excluded).	**12,886**
Exclusion of Non initial public offering data	This research excludes REITs, ADRs, units offer, close-end-funds, and stock with warrants (2,669 IPOs are excluded).	**10,217**

2.6.1. Variables Definition

The dependent variable is IPO underpricing. Explanatory variables are constructed following the three dimensions of the EWL theory, these being the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty surrounding the offering as shown in Table 3.

[7] This thesis follows cautionary observation made by Smart and Zutter (2003) to scrutinise into the existence of duplicate IPO records and to eliminate them from the sample to avoid double counting.

Table 3: Variables Definition

Dependent Variable

Variable	Description	Source of Data
IPO Underpricing (UP)	UP is the percentage return from the offer price to the first closing price on its first trading day.	Bloomberg New Issues Database

Independent Variables

Panel A: Incentive of IPO issuers

Variables	Description	Expected Coefficient Sign	Source of Data
Participation Ratio (PR)	PR is a calculated percentage of secondary shares sold to pre-IPO outstanding shares. This research provides a discussion of the expected sign in hypothesis 1 in Section 2.5.1.	**Negative**	Bloomberg New Issues Database
Dilution Factor (DF)	DF is a calculated percentage of primary shares sold to post-IPO outstanding shares. This research provides a discussion of the expected sign in hypothesis 1 in Section 2.5.1.	**Negative**	Bloomberg New Issues Database
Panel B: Promotion cost[8]			
Underwriter Reputation (UR)	UR is a dummy variable constructed based on a ranking scale that is designed to equal a ten-point scale based on the total proceeds raised (measured in US$) for the largest 10 underwriters in every G20 country. Each underwriter is assigned a rank of 0-9, where 0 (9) donates to the least (most) reputable underwriter. If an IPO underwriter is within those top ten underwriters,	**Negative**	Bloomberg New Issues Database

[8] Habib et al.'s (2001) model uses only U.S. data to calculate promotion cost including the fees paid to underwriters, auditors and lawyers and direct costs associated with road shows and listing fees. Global data related to those costs are not available in the data source, Bloomberg New Issues Database. For example, across the 10,217 IPO firms listed in the G20 countries this thesis covers, the author finds less than 829 IPOs match the selection criteria and at the same time have information related to fees paid to underwriters, auditors and lawyers and direct costs associated with road shows and listing fees. The research finds 64% of those 829 IPOs are listed in the United States. To solve this problem, the author treats the employment of reputable underwriters as a costly promotion activity following Franzke (2003), Chahine et al. (2007), and Migliorati et al. (2012). This is because Beatty and Ritter (1986) and Lewellen (2006) argue that underwriters can be classified into reputable and non-reputable ones where employing the former usually comes at high financial cost. The authors argue that reputable underwriters tend to control a large stake in the IPO market, have superior advisory teams, and tend to have established connections with institutional investors including hedge funds, mutual funds, and pension funds. They can subsequently conduct thorough evaluations for IPO firms. Lewellen (2006) pointed out that it is not surprising reputable underwriters are expensive to hire in exchange for the premium service they offer. In contrast, Jones and Swaleheen (2010) contend that non-reputable underwriters tend to have small market presentation, small advisory teams, and limited business connections; hence they tend to charge cheaper underwriting fees for taking the IPO firm public. Beatty and Welch (1996), Ljungqvist and Wilhelm Jr (2002), and Torstila (2003) also support the association between the employment of reputable underwriter and higher underwriting fees paid by IPO issuers.

	then it is labelled as "reputable underwriter" and given a dummy variable equal to 1; otherwise it is labelled as "reputable underwriter" with a dummy variable equal the value of 0. This calculation follows a similar ranking method for reputable IPO underwriters developed by Carter and Manaster (1990) and Megginson and Weiss (1991) based on the relative market share for underwriters. This is because Torstila (2003) argues that Carter and Manaster's (1990) metric of investment bank reputation is not applicable for international underwriters as it only includes United States banks. Hence, this research follows Ljungqvist and Wilhelm Jr (2002), Neupane and Thapa (2013), and Boulton et al. (2017) to mimic the ranking mechanism used by Carter and Manaster (1990). This is done by converting the reputable underwriter ranking scale into dummy method approach. This research provides a discussion of the expected sign in hypothesis 2 in Section 2.5.2.		
	Panel C: *Ex-ante* uncertainty		
Pre-IPO stock Market Volatility (PMV)	Standard deviation of local stock market returns 15 days before the first trading date. This research provides a discussion of the expected sign in hypothesis 3 in Section 2.5.3.	**Positive**	DataStream
Log Elapsed Time (LET)	Natural log of the length of time between the setting of the offering price and the first trading date. This research provides a discussion of the expected sign in hypothesis 3 in Section 2.5.3.	**Negative**	Bloomberg New Issues Database
Log Offer Proceeds (LOP)	Natural log of IPO proceeds. This research provides a discussion of the expected sign in hypothesis 3 in Section 2.5.3.	**Negative**	
	Panel D: Country-level control variable		
Developing Status (DS)	To capture the difference in IPO underpricing for listed IPO firms in developing as compared to developed G20 IPO markets, this research uses the DS variable, which refers to developing country status. It is a dummy variable that equals one when an IPO firm is listed in a developing G20 country; otherwise, it equals zero when the IPO is located in a developed (DVS) G20 country. Developed countries include Australia, Canada, Denmark, France, Germany, Greece, Italy, Japan, South Africa, Sweden, United Kingdom, and the United States. Developing countries include Brazil, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Korea, Poland, and Turkey. The classification of developed versus developing countries follows the classification offered by Bloomberg New Issues Database. Finance literature documents the considerable difference in underpricing between developed and developing IPO markets, highlighting that the latter differ from the former and this reflects the existence of varied market environments. A number of finance scholars argue for the presence of different informational environments between developed and developing stock markets in which more information asymmetry and underpricing are witnessed in the latter markets (Harvey 1995; Autore et al. 2014; Jamaani & Roca 2015). As a result, this research expects IPOs listed to developing countries to whines higher underpricing compared to IPOs listed in developed stock markets.	**Positive**	Bloomberg New Issues Database
Dummy Effects	This research adds number of dummies to capture for the impact of year effect (YE), industry effect (IE), and country effect (CE). This research follows prior IPO underpricing literature to control for differences in years, industries, and countries on the consistency of the results (Engelen & van Essen 2010; Banerjee et al. 2011; Boulton et al. 2011).	**No sign is expected**	Bloomberg New Issues Database
	Panel E: Additional firm-level control variables		

Book-building Method (BBM)	This research controls for the type of pricing method by designating a dummy variable that equals one when an IPO firm is underwritten using book-building pricing method. This research defines the IPO book-building price method as an offer price that is set after the showcase conducted by an underwriter. This is done in order to solicit indications of interest from investors and where the underwriter may have a full discretion over the allocation of shares. Ljungqvist et al. (2003) distinguished between three IPO principal pricing methods, including auction[9], fixed price[10], and book-building. Sherman (2005) argued that as the book-building method permits an underwriter to control share allocation decisions, in order to solicit information about the true market value of the IPO firm, book building reduces *ex-ante* uncertainty, leading to lower expected underpricing. Thus, this research follows Engelen and van Essen (2010) to expect lower underpricing for IPOs underwritten by book-building methods.	**Negative**	Bloomberg New Issues Database
Technology Firm (TF)	This research controls for technology IPO firms by specifying a dummy variable that equals one when an IPO firm is a technology firm type, otherwise it equals zero. This research follows a definition used by Ljungqvist and Wilhelm Jr (2002) of high technology firms that operate in the following type of industries: biotech, pharmaceuticals, medical instruments, software and hardware development, communications technology, advanced electronics, and specialty chemicals. Ritter (1984) and Ljungqvist et al. (2003) found that the degree of underpricing varies across industries due to the presence of different levels of information asymmetry, where a higher degree of *ex-ante* uncertainty tends to be inherited in high technology firms due to a valuation uncertainty problem. Thus, this research follows Boulton et al. (2010) in the contention that IPOs in the technology sector are expected to be underpriced more.	**Positive**	Bloomberg New Issues Database
Private Firm (PF)	This research controls for the type of IPO firm in relation of being private company by specifying a dummy variable that equals one when an IPO firm is not related to telecommunications, utilities, transportation, and banking firm type, otherwise it equals zero. Ljungqvist and Wilhelm Jr (2002) identify Privatisation firm IPOs compared to private IPO firms those who are classified as telecommunications, utilities, transportation, and banking firms, among others. Prior literature mainly discriminated between two types of IPO firms, including privatisation and private companies (Huang & Levich 2003; Shi et al. 2013). Privatisation IPOs often involve older firms and those well known in relatively regulated and well established industries, but private sector firm IPOs tend to be young, small, and relatively unknown (Jones et al. 1999). This implies that *ex-ante* uncertainty and its role on underpricing should be higher for private firm IPOs than for Privatisation IPOs; in turn, this research follow Fan et al. (2007) because this research expect more underpricing will occur in private firm IPOs.	**Positive**	Bloomberg New Issues Database
Integer Offer Price (IOP)	This research controls for IPO firms that are listed with integer offer price versus fractional offer price by specifying a dummy variable that equals one when an IPO firm has an integer offer price, otherwise it equals zero. Fractional offer price is hypothesised by Bradley et al. (2004) to be a result of negotiation between the underwriter and IPO firms, due to a valuation uncertainty about the true value of the firm[11]. This research follows Banerjee et al. (2011) in expecting the presence of a	**Positive**	Bloomberg New Issues Database

[9] According to Ljungqvist et al. (2003) the auction price method is defined as an offer price that is set in accordance with either discretionary or mandatory clearing rules. However, the allocations to bidders are not discretionary.

[10] Ljungqvist et al. (2003) defined the IPO fixed price method as an offer price that is set prior to the marketing of the offer to investors where the decisions of allocations are not discretionary.

[11] Bradley et al. (2004) proposed a "negotiation hypothesis", where IPO issuer and underwriter negotiate over finer offer price increments while ex-ante uncertainty surrounding the value of the firm gradually diminishes.

	higher degree of valuation uncertainty for IPOs with integer offer prices; in turn, this research expects IPOs with integer offer price to be underpriced more than those with fractional offer prices.		
Underwriting Fees (UF)	This thesis controls for the impact of underwriting fees on IPO underpricing. Therefore, the variable UF is the per cent of IPO proceeds (gross spread) charged for every underwriter for underwriting the IPO company. Fang (2005) found quality underwriters charge higher underwriting fees in exchange for lower underpricing. Hence, this research expects the variable UF to have a negative coefficient.	**Negative**	Bloomberg New Issues Database
AFC 1997 & GFC 2008	This research controls for effect of the Asian Financial Crisis (AFC) in 1997 and the Global Financial Crisis (GFC) in 2008. If an IPO underwriter is listed on the AFC or GFC year, then it is given a value of one otherwise it equals zero. Güçbilmez (2015) finds that IPO firms listed during financial crises period experience lower underpricing. The author relates his finding to an increase in uncertainty for both IPO investors and issuers about the stability of the global economy, so consequently IPOs become less desirable investments during crisis periods.	**Negative**	Bloomberg New Issues Database
	Panel F: Additional country-level control variables		
Regulation of Securities Exchanges (RSX)	This research controls for the level of financial market development by measuring the level of regulation of securities exchanges across countries. It is a time series index runs from 1995 to 2017 for the weight average ranking results of opinion survey to the following question: In your country, how effective are the regulation and supervision of securities exchanges? [1 = not at all effective; 7 = extremely effective]. This research follows Engelen and van Essen (2010) to create a dummy variable that equals one when an IPO firm is listed in a country where level regulation of securities exchanges in that country is above the mean of the entire sample, otherwise it equals zero if it is below. The degree of enforcement of securities exchanges differs widely from country to country (Pagano & Volpin 2001). The degree of required financial disclosure, compliance with financial reporting and auditing standards, effective governance, and implemented regulations related to anti-insider trading are all enforced by securities exchange bodies (Black 2001; Daouk et al. 2006). Engelen and van Essen (2010) find that investors' *ex-ante* uncertainty is lower in countries where securities regulations are effectively enforced. The authors found a negative association between underpricing and effective enforcement of securities regulation.	**Negative**	World Economic Forum[12]
Financial Market Sophistication (FMS)	This research controls for the level of market sophistication across countries measured by the level of financing through local equity market. It is a time series index runs from 1995 to 2017 for the weight average ranking results of opinion survey to the following question: In your country, to what extent can companies raise money by issuing shares and/or bonds on the capital market? [1 = not at all; 7 = to a great extent]. This research creates a dummy variable that equals one when an IPO firm is listed in a country where level regulation of securities exchanges in that country is above the mean of the entire sample, otherwise it equals zero if it is below. Boolaky and Cooper (2015) proxy financial market sophistication by the level of financing through local equity market across countries. The authors find a positive relationship between transparent market practices and the level of market sophistication. This research expects IPOs listed in financially sophisticated markets to experience higher levels of transparency resulting in lower expected levels of underpricing.	**Negative**	World Economic Forum
Market Size (MS)	This research controls for difference across countries in terms of the overall economic development by gauging the size of domestic markets. It is a time series index runs from 1995 to 2017 for the sum of gross domestic product plus value of imports of goods and services, minus value of exports of goods and services, normalized on a 1–7 (best) scale. This research creates	**Positive**	World Economic Forum

[12] Data is sourced from the Global Competitiveness Report published by The World Economic Forum (2017).

	a dummy variable that equals one when an IPO firm is listed in a country where level domestic market size in that country is above the mean of the entire sample, otherwise it equals zero if it is below. Hopp and Dreher (2013) observe that IPO firms that are listed in large economies tend to have higher levels of underpricing.

Additional firm-level and country-level variables are included in the table. This chapter also includes a number of control variables that account for the whole year, the industry, and specific country's effects. This research also includes a dummy variable to control for the impact of listing an IPO firm in a developing G20 stock market. This research also adds additional controlling firm-level and country-level variables known to influence IPO underpricing. Additional firm-level factors contain book-building, technology firms, private firms, integer offer price, underwriter fees, the 1997-98 Asian Financial Crisis and Global Financial Crisis that erupted in 2008. Additional country-level factors control for differences across stock markets in relation to the development of financial markets. This includes the enforcement of regulations concerning securities exchanges, financing through local equity markets, and the size of domestic markets.

2.7. Methodological Framework and Research Strategy

To fulfil the research objectives, the empirical examination progresses over three phases as follows:

- In the first phase, this research begins by testing the EWL theory using OLS estimation. This implies that this research intentionally treat the firm-level covariates, especially the variable underwriter reputation (UR), as exogenous factors following Habib and Ljungqvist (2001). This research produces two sets of tests here where in the first set this research observe the effects of the three dimensions of the EWL model on IPO underpricing while gradually adding year, industry, and country dummies. This is done to choose the best model fit. In the second set, the author captures the effect of listing an IPO firm in developing stock markets. This research does this to capture the change in the three dimensions of the EWL model after accounting for the impact of listing in developing economies. This is likely to assist this thesis to understand if the variance in IPO underpricing in the global IPO market is related to dissimilarity between developed and developing nations.
- In the second phase, this research reproduces the previous two sets of tests, as in the first phase, but after treating the UR variable as an endogenous factor using 2SLS estimation following Habib and Ljungqvist (2001). The objective of this phase is to observe if, first, the EWL model explains the problem of underpricing in the global IPO market and, second, the endogenous underwriter-underpricing link exists globally.
- In the third and final phase, this thesis advances the testing to extend the 2SLS estimation by capturing the one- and two-way clustering in standard errors following Cameron and Miller

(2015) and Isshaq and Faff (2016). This step makes it possible to observe if the existence of one-way or two-way clustering effects really influence the relationship between determinants of IPO underpricing in the global IPO market, specifically the endogenous reputable underwriter-underpricing relationship.

2.7.1. OLS Estimation

For testing hypotheses related to the research questions, this chapter follows the standard testing method used in the empirical IPO literature including Habib and Ljungqvist (2001), Boulton et al. (2010), Banerjee et al. (2011), and Boulton et al. (2017). It employs OLS estimation with unbalanced cross-sectional regression with the model having the following form as shown in Equation (1):

$$
\begin{aligned}
UP_{ij} = \beta_{0ij} &+ \sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij} + \sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij} \\
&+ \sum_{c=1}^{C} \beta_c \textit{Ex-ante} \text{ Uncertainty}_{cij} + \sum_{d=1}^{D} \beta_d \text{Country-level Control Variables}_{dij} \\
&+ \sum_{e=1}^{E} \beta_e \text{Additional Firm-level Control Variables}_{eij} \\
&+ \sum_{f=1}^{F} \beta_f \text{Additional Country-level Control Variables}_{fij} + \varepsilon_{ij}
\end{aligned} \quad (1)
$$

Where UP_{ij} refers to the dependent variable of IPO underpricing that is defined as the percentage return from the offer price to the closing price of an IPO firm on its first trading day following the calculation as shown in Equation (2):

$$
UP_{ij} = \left(\frac{\text{First-day Closing Price}_{ij} - \text{Offer Price}_{ij}}{\text{Offer Price}_{ij}} \right) \quad (2)
$$

Where the subscripts *i* and *j* indicate an IPO firm listed in a G20 country, β_{0ij} is the intercept of the model. Proxies of incentive of IPO issuers for firms listed in a G20 country include Participation Ratio (PR) and Dilution Factor (DF). The variable Underwriter Reputation (UR) is a proxy for promotion cost. *Ex-ante* uncertainty includes Pre-IPO Stock Market Volatility (PMV), Log Elapsed Time (LET), and Log Offer Size (LOP). Country-level control variables include Developing-country Status (DS), Year Effect (YE), Industry Effect (IE), and Country Effect (CE) dummies.

For extended robustness testing, this thesis employa number of additional firm-level control variables including Book-Building Method (BBM), Technology Firms (TF), Private Firms (PF), Integer Offer Price (IOP), Underwriter Fees (UF), the 1997-98 Asian Financial Crisis (AFC 1997) and the Global Financial Crisis in 2008 (GFC 2008). The author also utilises two additional country-level control variables as a part of the sensitivity testing for this chapter. These variables include Financial Market Sophistication (FMS) and Market Size (MS). Following Habib and Ljungqvist (2001), this research assumes the error term, $\varepsilon_{i,j}$, follows the normal distribution with mean = 0 and standard deviation = 1. This thesis applies unbalanced cross-sectional regression because the distribution of IPO data is not balanced across sample countries, which is a common case in the cross-country IPO underpricing literature (Boulton et al. 2010; Engelen & van Essen 2010; Autore et al. 2014; Boulton et al. 2017).

2.7.2. Endogeneity Issues Within the OLS Model

Endogeneity occurs due to the presence of significant correlations between the error term and one of the independent variables in the employed model (Maddala & Lahiri 2009). The presence of an endogenous variable may bias the results of a model leading to biased conclusions (Vella & Verbeek 1999). It is therefore imperative to test for the presence of endogeneity. Habib and Ljungqvist (2001) argue that although IPO issuers are financially hurt by underpricing they have the discretion to choose between the highest or least prestigious underwriters when large stakes of their firms are offered to the public. Thus, the decision to choose between them could be endogenously determined by the issuer, leading to biased OLS coefficients, which in turn generates erroneous conclusions. No account is taken of issuers' incentives to reduce underpricing when they aim to sell more shares. Furthermore, by incurring promotion costs such as those of employing reputable underwriters to verify the quality of issuers, in order to reduce the *ex-ante* uncertainty of investors and then reduce underpricing, this leads to endogeneity. This is theoretically justified by

Hausman (1978) and empirically proven by Habib and Ljungqvist (2001). To account for any potential endogeneity in equation (1), this chapter follows Habib and Ljungqvist (2001) who propose employing a 2SLS[13] procedure to correct for this endogeneity. Given the linear regression model mentioned above in Equation (1), subsequently, Equations (3) and (4) develop into the following two-step procedure as shown in:

$$\begin{aligned}
\text{Underwriter Reputation}_{ij} = \beta_{0ij} &+ \sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij} + \sum_{b=1}^{B} \beta_b \text{Instrumental Variables}_{bij} \\
&+ \sum_{c=1}^{C} \beta_c \textit{Ex-ante}\ \text{Uncertainty}_{cij} + \sum_{d=1}^{D} \beta_d \text{Country-level Control Variables}_{dij} \\
&+ \sum_{e=1}^{E} \beta_e \text{Additional Firm-level Control Variables}_{eij} \\
&+ \sum_{f=1}^{F} \beta_f \text{Additional Country-level Control Variables}_{fij} + \varepsilon_{ij}
\end{aligned} \tag{3}$$

In order to obtain the predicated values of $\text{Underwriter Reputation}_{ij}$, the aggregated endogenous variable from Equation (1), $\sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij}$ is individually regressed on the following aggregated exogenous variables from Equation (1):

$\sum_{b=1}^{B} \beta_b \text{Instrumental Variables}_{bij}$, $\sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij}$, $\sum_{c=1}^{C} \beta_c \textit{Ex-ante}\ \text{Uncertainty}_{cij}$, $\sum_{d=1}^{D} \beta_d \text{Country-level Control Variables}_{dij}$, $\sum_{e=1}^{E} \beta_e \text{Additional Firm-level Control Variables}_{eij}$,and $\sum_{f=1}^{F} \beta_f \text{Additional Country-level Control Variables}_{fij}$ .Then $\text{Underwriter Reputation}_{ij}$, is the aggregated residuals from the above mentioned individual regressions.

$\sum_{b=1}^{B} \beta_b \text{Instrumental Variables}_{bij}$ refers to the employed instrument variables to correct for this endogeneity. The second step begins by inserting the predicated values of UR ,

[13] Generalised Method of Moments (GMM) is an alternative efficient estimation method to model endogeneity, especially when data exhibits heteroscedasticity or serial correlation in the error terms (Baum et al. 2007). The employed data is cross-sectional, therefore unlikely to exhibit auto-correlation. This thesis therefore selected a more parsimonious model, 2SLS, instead. The author controls the heteroscedasticity issue using the White heteroscedastic-robust standard errors (Habib et al. 2001).

$\text{Underwriter Reputation}_{ij}$, which are derived from Equation (3) into Equation (1) to obtain Equation (4) as follows:

$$\begin{aligned} UP_{ij} = \beta_{0ij} &+ \sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij} + \sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij} \\ &+ \sum_{c=1}^{C} \beta_c \textit{Ex-ante} \text{ Uncertainty}_{cij} + \sum_{d=1}^{D} \beta_d \text{Country-level Control Variables}_{dij} \\ &+ \sum_{e=1}^{E} \beta_e \text{Additional Firm-level Control Variables}_{eij} \\ &+ \sum_{f=1}^{F} \beta_f \text{Additional Country-level Control Variables}_{fij} + \varepsilon_{ij} \end{aligned} \tag{4}$$

To examine if endogeneity is present, this research follows Habib and Ljungqvist (2001) to use Housman's (1978) endogeneity test to examine the null hypothesis which asserts that the identified regressor (i.e., underwriter reputation) is indeed an exogenous variable. However, Sanderson and Windmeijer (2016) argue that to correct for this endogeneity, researchers need to employ a robust instrumental variable to avoid causing an equivalent bias that could eventuate from the use of a weak instrumental variable. Hausman (1978) defines a robust instrument as one that is sufficiently correlated with the identified endogenous variable $\sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij}$ but must be uncorrelated with the $\hat{\varepsilon}_{i,j}$ in order to correct for the endogeneity problem.

Problems associated with the use of a weak instrument have attracted the attention of many researchers. For exmaple, Staiger and Stock (1997), Sanderson and Windmeijer (2016), and Jakob and Nam (2017) discuss two common challenges resulting from employing a weak instrument for the 2SLS estimator. First, the author argues that a weak instrument leads to far-reaching biased and misleading results compared to the OLS estimator. Second, the authors argue that the estimated parameters of hypothesis tests produced by a weak instrument may suffer from large size distortions.

IPO underpricing literature demonstrates no unanimity about the best instrument to use. For instance, while Habib and Ljungqvist (2001) and Alavi et al. (2008) utilise earnings per share and return on assets, Chahine (2008) and Jones and Swaleheen (2010) employ gross proceeds and number of IPO firms, respectively. This research could not obtain sufficient data related to earnings per share and return on assets for the international data. Moreover, in un-tabulated results for the weak instrument test, this research finds that both gross proceeds and number of IPO firms are not suitable instruments for the UR variable. Alternatively, this thesis employs two instrumental variables, $\sum_{b=1}^{B}\beta_b \text{Instrumental Variables}_{bij}$, which are defined as the ratio equalling to the average and median amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the average and median number of underwritten IPOs in that country, respectively, as shown in Equations (5) and (6);

$$\sum_{b=1}^{B}\beta_b \text{Instrumental Variables}_{bij} = \left(\frac{\text{Average Amount of Proceeds of All Underwritten IPOs for Every Underwriter for Every Country}_j}{\text{Average Number of Underwritten IPOs for Every Underwriter for every Country}_j} \right) \quad (5)$$

$$\sum_{b=1}^{B}\beta_b \text{Instrumental Variables}_{bij} = \left(\frac{\text{Median Amount of Proceeds of All Underwritten IPOs for Every Underwriter for Every Country}_j}{\text{Median Number of Underwritten IPOs for Every Underwriter for every Country}_j} \right) \quad (6)$$

The rationale for employing these two instruments is that prestigious underwriters have a tendency to underwrite enormous numbers of IPOs and retain a dominant stake of the IPO market. This research anticipates that the regressor, $\sum_{b=1}^{B}\beta_b \text{Underwriter Reputation}_{bij}$, is unlikely to have a strong correlation with the error term of the model. To protect against using a weak instrument that can lead to flawed inferences, this research employs a weak instrument test developed by Cragg and Donald (1993) following Boulton et al. (2017) and Jakob and Nam (2017). The null hypothesis of Cragg and Donald's Weak Instrument Test is that the utilised instrument is weak.

2.7.3. Clustered Robust Standard Errors

To deal with the possibility of a clustering effect in the IPO data, this chapter follows Cameron and Miller (2015) to apply one-way and two-way cluster-robust standard errors. This procedure was developed and incorporated into Stata by Rogers (1994) and later extended by Cameron and Miller (2015) in Stata 15. Below are three models illustrating a comparison of standard errors obtained using variance estimators in OLS or 2SLS, robust (un-clustered), and robust cluster standard errors estimators as shown in Equations (7), (8), and (9), respectively.

$$V_{OLS,\ 2SLS} = s^2 * (X'X)^{-1} \tag{7}$$

where:

$$s^2 = (\frac{1}{(N-K)}) * \sum_{i=1}^{n} \varepsilon i^2$$

$$V_{rob} = (X'X)^{-1} * [\sum_{i=1}^{n} (\varepsilon_i * x_i)' * (\varepsilon_i * x_i)] * (X'X)^{-1} \tag{8}$$

$$V_{cluster} = (X'X)^{-1} * \sum_{i=1}^{n} \eta_{i'} * \eta_i * (X'X)^{-1} \tag{9}$$

where:

$$\eta_i = \sum_{jcluster=1} \varepsilon_i * x_i$$

Where N refers to the number of obervations within every cluster, K indicates the number of regressors, and n indciates the number of clusters. X represents the matrix of predictors including the constant term and x_i represents ith row vector of X and ε_i denotes the error term for the ith observations. For one-way clustering the number of clusters is determined based on what this research are clustering. For example, when this research clusters by industries, then this research will have 33 industry clusters of which the observation within each cluster will be unbalanced. On the other hand, this research determines the number of clusters in the two-way clustering by using Stata to create an interaction term between two individual clusters to form a two-dimensional cluster following Cameron and Miller (2015). For example, when this research captures the two-way clustering in error terms within years or industries in developing versus developed countries, respectively, then this research has two-way clusters, and so forth. For simplicity, Rogers (1994) omits the multipliers that are near to a value of 1 from Equations (8) and (9). The difference between Equations (8) and (9) is that in the robust cluster estimator's model, Rogers (1994) adds a multiplication vector with the $\varepsilon_i * x_i$ substituted with their sums in each cluster. If the variability in a model of which the variance of the clustered estimator is high compared to the robust (un-clustered) estimator, then this suggests the model has high variability in the cluster sums of $\varepsilon_i * x_i$ rather than individual $\varepsilon_i * x_i$. Furthermore, it indicates the presence of a correlation within a cluster.

If the OLS or 2SLS model is unbiased, then the ε_i of the model should not be correlated with x_i (Cameron & Miller 2015).

2.8. Empirical Results

This section comprises three subsections. The first subsection presents the summary statistics for firm-specific variables, IPO underpricing by year, and IPO underpricing by industry. It also includes mean and median equality test of unequal variance for firm-specific variables in the G20 developed and developing IPO markets[14]. Also the variance inflation factors for firm-specific variables are provided. In the second subsection are the results and discussion of the OLS models, the results and discussion of the 2SLS models, results and discussion of the 2SLS models with one-way clustered robust standard errors, and results and discussion of the 2SLS models with two-way clustered robust standard errors. In the third subsection, number of robustness checks are provided.

2.8.1. Summary Statistics on the Nature of the Date

2.8.1.1. Summary Statistics for Firm-specific Variables

Table 4 summarises the range of descriptive statistics for firm-level variables. The table shows that the United States (Turkey) has the largest (smallest) number of IPOs in the sample with 3,211 IPOs (24 IPOs), followed by Japan, China, and Australia with 1,913, 1,533, and 1,138 IPOs (Denmark, Greece, and Mexico with 26, 28, and 28 IPOs), respectively. Across all the 10,217 G20 listed IPO firms, IPOs listed in developed countries are more than double the number of IPOs listed in developing countries where such IPO firms constitute approximately 30% of the entire sample. Figures related to the mean of IPO underpricing in Table 4 show that Saudi Arabia (Denmark) has the highest (lowest) mean value of UP equal to 213% (2%), followed by Japan and China (Germany and Mexico) with mean values of UP equal to 60% and 57% (2% and 3%), respectively.

[14] This thesis tests for mean and median equality in order to explore whether differences between firm-specific variables are similar or dissimilar across the two blocks of countries.

Across the entire sample, the mean UP is 38% of which the mean of UP for IPOs listed in developing countries is higher by 19% than the mean of UP for developed IPOs. By observing the median underpricing value across the entire sample, Saudi Arabia (France) maintains the highest (lowest) median value of UP equal to 77% (0%). It is followed by China, Japan, and South Korea (Italy, Mexico, and Brazil) with median values of UP equal to 44%, 22%, and 21% (0.1% equally), respectively. Throughout the G20 listed IPOs, the median UP is 14%, of which the median of UP for developed countries' IPOs is 22% lower than the median of UP for developing countries. The lowest (highest) recorded UP is observed in Italy and the United Kingdom (India and South Korea) with UP of -89% and -88% (1680% and 1600%), respectively. Saudi Arabia (Mexico) records the highest (lowest) dispersion from the mean of UP, equal to 309% (0.5%), followed by India, Italy, Poland, and Japan (Turkey, Germany, Denmark, Sweden, France, and Brazil), equal to 127%, 115%, 113%, and 104% (8%, 14%, 24%, and 25%), respectively. The table also shows that standard deviation. for the entire sample is equal to 84%, of which the dispersion from the mean of UP for developing countries is 30% larger than for developed countries.

According to Table 4, across all listed IPO firms in the G20 countries, the mean PR is 4% while mean DF is 24%. IPO issuers in developed G20 countries, on average, tend to sell 4% of their existing shares and create 27% in new shares. In contrast, G20 developing market IPO issuers prefer to sell 3% of PR and create 17% primary shares when they go public. On average, across all G20 countries, issuers in Italy, Russia, the United Kingdom, and the United States tend to sell the most PR with 12%, 8%, 65, and 5%, respectively, while issuers in the United States, Turkey, Sweden, and the United Kingdom tend to create more DF with 42%, 26%, 25%, and 24%, respectively, when they go public. Across the entire sample, Saudi Arabian, Japanese, and Brazilian IPO issuers tend to employ reputable underwriters when they go public as 73%, 64%, and 61% of their underwritten IPOs are managed by reputable underwriters. On average, 31% of IPOs listed in the G20 countries employ reputable underwriters, with IPO issuers in developed countries tending to rely less on reputable underwriters when they go public as compared to IPO issuers in developing countries.

Table 4: Summary Statistics of Firm-specific Variables of the G20 Countries

		UP	PR	DF	UR	PMV	LET	LOP
Total Sample	Mean	0.38	0.04	0.24	0.31	0.02	92	89
(Count: 10217)	Median	0.14	0.00	0.21	0.00	0.01	48	24
	Minimum	-0.89	0.00	0.00	0.00	0.00	0	0
	Maximum	16.80	0.90	2.30	1.00	0.10	3742	16007
	Standard Deviation	0.84	0.09	0.18	0.46	0.01	143	340
Developed Countries	Mean	0.32	0.04	0.27	0.30	0.02	75	88
(Count: 7192)	Median	0.10	0.00	0.24	0.00	0.01	47	22
	Minimum	-0.89	0.00	0.00	0.00	0.00	0	0
	Maximum	13.50	0.90	2.30	1.00	0.09	1627	16007
	Standard Deviation	0.74	0.10	0.20	0.46	0.01	93	361
Developing Countries	Mean	0.51	0.03	0.17	0.33	0.02	130	92
(Count: 3025)	Median	0.32	0.00	0.16	0.00	0.02	49	29
	Minimum	-0.88	0.00	0.00	0.00	0.00	0	0
	Maximum	16.80	0.73	0.53	1.00	0.10	3742	7988
	Standard Deviation	1.04	0.05	0.07	0.47	0.01	216	286
Australia	Mean	0.18	0.01	0.04	0.08	0.01	60	31
(Count: 1138)	Median	0.05	0.00	0.05	0.00	0.01	44	5
	Minimum	-0.77	0.00	0.00	0.00	0.00	3	0
	Maximum	6.50	0.21	0.09	1.00	0.05	928	2000
	Standard Deviation	0.49	0.01	0.02	0.28	0.01	65	122
Brazil	Mean	0.06	0.01	0.08	0.61	0.02	72	380
(Count: 88)	Median	0.01	0.00	0.09	1.00	0.02	25	294
	Minimum	-0.88	0.00	0.00	0.00	0.01	3	12
	Maximum	2.05	0.10	0.10	1.00	0.03	1208	3589
	Standard Deviation	0.28	0.02	0.02	0.49	0.01	160	446
Canada	Mean	0.21	0.02	0.10	0.47	0.01	98	46
(Count: 193)	Median	0.10	0.00	0.11	0.00	0.01	64	5
	Minimum	-0.51	0.00	0.00	0.00	0.00	3	0
	Maximum	5.72	0.13	0.13	1.00	0.05	1098	1097
	Standard Deviation	0.63	0.03	0.03	0.50	0.01	116	118
China	Mean	0.57	0.03	0.13	0.32	0.02	156	91

(Count: 1533)	Median	0.44	0.00	0.14	0.00	0.02	65	44
	Minimum	-0.77	0.00	0.00	0.00	0.00	7	1
	Maximum	8.64	0.19	0.19	1.00	0.08	1703	3671
	Standard Deviation	0.73	0.04	0.04	0.47	0.01	218	229
Denmark	Mean	0.02	0.04	0.14	0.35	0.01	29	238
(Count: 26)	Median	0.03	0.05	0.14	0.00	0.01	24	65
	Minimum	-0.65	0.00	0.04	0.00	0.00	5	0
	Maximum	0.50	0.15	0.19	1.00	0.02	130	1849
	Standard Deviation	0.24	0.04	0.04	0.49	0.00	25	469
France	Mean	0.04	0.04	0.15	0.05	0.01	41	69
(Count: 95)	Median	0.00	0.00	0.19	0.00	0.01	16	10
	Minimum	-0.86	0.00	0.00	0.00	0.00	3	0
	Maximum	1.90	0.19	0.19	1.00	0.06	1530	1216
	Standard Deviation	0.25	0.05	0.05	0.22	0.01	161	228
Germany	Mean	0.02	0.03	0.16	0.37	0.01	65	229
(Count:35)	Median	0.02	0.00	0.19	0.00	0.01	18	58
	Minimum	-0.38	0.00	0.06	0.00	0.00	3	2
	Maximum	0.39	0.13	0.19	1.00	0.04	692	1767
	Standard Deviation	0.14	0.04	0.04	0.49	0.01	142	437
Greece	Mean	0.16	0.02	0.18	0.11	0.02	49	15
(Count:28)	Median	0.04	0.00	0.19	0.00	0.02	38	7
	Minimum	-0.35	0.00	0.02	0.00	0.01	0	2
	Maximum	1.94	0.18	0.32	1.00	0.04	203	174
	Standard Deviation	0.49	0.05	0.08	0.31	0.01	39	33
India	Mean	0.29	0.02	0.18	0.24	0.02	168	59
(Count: 363)	Median	0.06	0.00	0.20	0.00	0.01	67	13
	Minimum	-0.80	0.00	0.00	0.00	0.00	3	0
	Maximum	16.80	0.20	0.20	1.00	0.07	1597	3483
	Standard Deviation	1.27	0.05	0.05	0.43	0.01	230	218
Indonesia	Mean	0.34	0.01	0.19	0.28	0.02	121	90
(Count: 103)	Median	0.15	0.00	0.20	0.00	0.02	83	27
	Minimum	-0.18	0.00	0.07	0.00	0.00	3	1
	Maximum	6.30	0.13	0.20	1.00	0.10	893	1323
	Standard Deviation	0.72	0.03	0.03	0.45	0.01	149	179

Italy	Mean	0.18	0.12	0.24	0.29	0.02	68	151
(Count: 63)	Median	0.01	0.04	0.17	0.00	0.02	22	34
	Minimum	-0.89	0.00	0.00	0.00	0.01	0	1
	Maximum	8.84	0.83	2.30	1.00	0.06	1109	2374
	Standard Deviation	1.15	0.16	0.33	0.46	0.01	151	350
Japan	Mean	0.60	0.03	0.20	0.64	0.02	33	44
(Count: 1913)	Median	0.22	0.00	0.22	1.00	0.02	33	11
	Minimum	-0.64	0.00	0.00	0.00	0.00	3	0
	Maximum	12.00	0.25	0.25	1.00	0.09	196	6355
	Standard Deviation	1.04	0.05	0.06	0.48	0.01	6	238
Mexico	Mean	0.03	0.02	0.23	0.39	0.01	82	159
(Count: 28)	Median	0.01	0.00	0.25	0.00	0.01	23	112
	Minimum	-0.06	0.00	0.00	0.00	0.00	3	6
	Maximum	0.17	0.25	0.25	1.00	0.04	997	541
	Standard Deviation	0.05	0.06	0.06	0.50	0.01	201	140
Poland	Mean	0.35	0.03	0.23	0.05	0.02	71	46
(Count:64)	Median	0.09	0.00	0.25	0.00	0.01	21	13
	Minimum	-0.52	0.00	0.10	0.00	0.00	3	1
	Maximum	7.86	0.15	0.26	1.00	0.07	2140	1281
	Standard Deviation	1.13	0.05	0.05	0.21	0.01	268	162
Russia	Mean	0.56	0.08	0.10	0.61	0.02	295	464
(Count: 31)	Median	0.05	0.00	0.00	1.00	0.02	18	100
	Minimum	-0.13	0.00	0.00	0.00	0.01	0	0
	Maximum	2.89	0.33	0.53	1.00	0.04	3742	7988
	Standard Deviation	0.92	0.11	0.14	0.50	0.01	805	1426
Saudi Arabia	Mean	2.13	0.03	0.23	0.73	0.02	113	263
(Count: 102)	Median	0.77	0.00	0.26	1.00	0.01	49	87
	Minimum	-0.18	0.00	0.00	0.00	0.00	3	7
	Maximum	14.00	0.26	0.26	1.00	0.08	1114	3600
	Standard Deviation	3.09	0.06	0.06	0.45	0.01	223	519
South Africa	Mean	0.17	0.04	0.22	0.41	0.01	50	89
(Count: 29)	Median	0.06	0.00	0.26	0.00	0.01	22	48
	Minimum	-0.34	0.00	0.00	0.00	0.01	3	1
	Maximum	1.18	0.26	0.26	1.00	0.03	401	616

	Standard Deviation	0.36	0.07	0.07	0.50	0.01	91	130
South Korea	Mean	0.37	0.04	0.23	0.33	0.02	60	35
(Count: 689)	Median	0.21	0.00	0.27	0.00	0.01	43	10
	Minimum	-0.87	0.00	0.00	0.00	0.00	3	1
	Maximum	16.00	0.73	0.29	1.00	0.10	1341	2835
	Standard Deviation	0.77	0.07	0.07	0.47	0.01	100	175
Sweden	Mean	0.06	0.04	0.25	0.42	0.01	27	101
(Count: 57)	Median	0.03	0.00	0.29	0.00	0.01	14	51
	Minimum	-0.77	0.00	0.11	0.00	0.00	3	0
	Maximum	1.33	0.18	0.29	1.00	0.06	183	681
	Standard Deviation	0.28	0.06	0.06	0.50	0.01	30	134
Turkey	Mean	0.06	0.04	0.26	0.04	0.02	224	27
(Count: 24)	Median	0.04	0.00	0.29	0.00	0.01	191	5
	Minimum	-0.04	0.00	0.07	0.00	0.01	11	2
	Maximum	0.22	0.22	0.29	1.00	0.04	727	229
	Standard Deviation	0.08	0.07	0.07	0.20	0.01	186	56
United Kingdom	Mean	0.27	0.06	0.24	0.13	0.01	38	134
(Count: 404)	Median	0.09	0.00	0.30	0.00	0.01	20	19
	Minimum	-0.88	0.00	0.00	0.00	0.00	3	0
	Maximum	10.67	0.31	0.31	1.00	0.04	1091	3294
	Standard Deviation	0.87	0.10	0.10	0.34	0.01	80	326
United States	Mean	0.24	0.05	0.42	0.19	0.02	113	128
(Count: 3211)	Median	0.10	0.00	0.39	0.00	0.01	83	53
	Minimum	-0.59	0.00	0.00	0.00	0.00	3	0
	Maximum	13.50	0.90	0.90	1.00	0.09	1627	16007
	Standard Deviation	0.52	0.13	0.19	0.39	0.01	109	475

Note: All variables are as defined before in Table 3.

The PMV, pre-IPO stock market volatility, is measured by the standard deviation from a local stock market for a specific IPO firm 15 days before listing. On average, the PMV for the entire sample of the G20 countries is 2%, whereas the maximum recorded PMV of 10% is seen in both South Korea and Indonesia. This is followed by Japan and the United States, with PMV values of 9%, followed by Saudi Arabia, and China, with PMV values of 8%. Looking at the median values of PMV of 2% and 1% for developing and developed stock markets, respectively, it appears that developing stock markets seem to experience double the volatility than what has been observed in developed stock markets when an IPO firm goes public. Table 4 also presents the LET variable that measures the length of time between the setting of the offering price and the first trading date. On average, across the G20 countries, Sweden has the lowest LET because it takes only 27 days for an IPO firm to be listed when the offer price is set, while Russian IPOs require the longest LET since for a Russian IPO to be listed, it takes almost 295 days. The mean LET for the G20 countries' IPOs is 92 days in which IPO firms listed in developing countries require 38 days above the mean, while IPO firms listed in developed countries require 17 days below the mean of LET across the entire G20 sample.

LOP measures the IPO proceeds for every G20 IPO denominated in United States dollars. Within the G20 countries, IPOs issued in Brazil (Australia), on a median perspective, raise the largest (smallest) total amount of proceeds, equal to approximately $294 ($5) million, followed by Mexico, Russia, and Saudi Arabia (Canada, Turkey, and Greece), with total amounts of LOP equal to $112, $100, and $87 ($5, $5, and $7) million, respectively. Across the entire G20 sample, average LOP is $89 million, of which LOP for developing countries is roughly 4% higher than the average LOP for developed countries.

In summary, Table 4 provides preliminary statistical evidence that the G20 countries do not share similar firm and market characteristics. This dissimilarity becomes notable when comparing firm and market characteristics in developing and developed G20 countries. For example, although differences in the mean and median results of UP clearly indicate that underpricing in developing IPO markets is far higher than developed markets, this argument is not mutually inclusive to developing countries, since UP for Brazil and Turkey is relatively lower than the UP in Australia, Japan, United Kingdom, and United States IPO firms. This implies that UP is heterogeneous across the G20 countries and its heterogeneity is observed within developed and developing IPO markets.

Moreover, the overall statistical evidence indicates the presence of early support for two out of the three sub-research hypotheses, conveying the idea that underpricing is higher in developing G20 countries because IPO issuers in those countries tend to sell and create less PR and DF. The extent of *ex-ante* uncertainty for IPO firms located in developing G20 countries as measured by PMV, LET, and LOP is higher compared to developed G20 IPO markets. Early support for the second research hypothesis seems to be absent because developing IPO issuers employ more reputable underwriters to provide a certification signal about the quality of their underwritten IPO firms.

2.8.1.2. Summary Statistics for IPO Underpricing by Year

Table 5 provides year-by-year analysis for the mean, median, minimum, maximum, and standard deviation related to IPO underpricing, and the number of IPOs listed in the G20 countries in the sample period covering the years 1995 to 2016. The highest (lowest) mean of IPO underpricing occurred in 1999 (2016), with 71% (13%) of IPOs underpriced, followed by 2007 (1997), with average IPO underpricing of 57% (14%). IPO issuers issued the highest (lowest) percentage of primary shares to outstanding shares in 2013 (1997), with the mean percentage dilution factor ratio that year being 40.8% (12.3%), followed by 1999 and 2006 (2000 and 2001), with average percentage of dilution factors of 38.4% and 36.5% (16.2% and 18.2%), respectively. Owners of IPO firms sold the largest (lowest) proportion of secondary shares in 2006 (1999), with the mean participation ratio equal to 26.1% (0.3%) that year, followed by 1997 and 2005 (2001 and 1996), with mean participation ratios equal to 12% and 11.1% (0.6% and 0.7%), respectively.

The largest recorded underpricing is witnessed in developing IPO markets in 2003 with 1680%, while the lowest documented underpricing recorded in developed IPO markets was in 1998 – at 89%. In the year 2007 (2016) the largest (lowest) number of IPOs occurred, with 979 (7) IPOs occurring, followed by 2006 and 2005 (2001 and 1998), with the number of IPOs issued equal to 779 and 629 (193 and 231), respectively.

Table 5: Summary Statistics of IPO Underpricing by Year in the G20 Countries

	Mean			Median			Minimum			Maximum			Standard Deviation			Number of Observations		
Year	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**
1995	0.27	0.26	0.40	0.13	0.13	0.11	-0.77	-0.77	-0.57	13.50	13.50	3.50	0.74	0.73	1.03	462	444	18
1996	0.18	0.18	-0.06	0.11	0.11	0.03	-0.80	-0.77	-0.80	2.18	2.18	0.33	0.28	0.28	0.37	654	645	9
1997	0.14	0.14	0.51	0.07	0.07	0.51	-0.86	-0.86	0.51	3.70	3.70	0.51	0.30	0.30	0	418	417	1
1998	0.27	0.26	0.88	0.09	0.09	0.88	-0.89	-0.89	0.88	6.08	6.08	0.88	0.68	0.68	0	231	230	1
1999	0.71	0.71	0	0.36	0.36	0	-0.32	-0.32	0	8.09	8.09	0	1.00	1.00	0	364	364	0
2000	0.34	0.34	0	0.10	0.10	0	-0.64	-0.64	0	4.40	4.40	0	0.66	0.66	0	301	301	0
2001	0.41	0.37	1.16	0.17	0.16	1.00	-0.77	-0.77	-0.16	6.30	6.04	6.30	0.89	0.79	1.99	193	184	9
2002	0.31	0.27	1.48	0.07	0.06	1.19	-0.46	-0.40	-0.46	10.67	10.67	4.31	0.92	0.87	1.45	252	243	9
2003	0.42	0.33	2.17	0.15	0.14	1.12	-0.59	-0.59	-0.10	16.80	2.97	16.80	1.18	0.58	4.64	259	247	12
2004	0.50	0.48	0.55	0.21	0.17	0.39	-0.57	-0.36	-0.57	5.94	5.94	5.60	0.79	0.81	0.70	592	454	138
2005	0.56	0.53	0.64	0.17	0.13	0.44	-0.68	-0.68	-0.24	14.00	8.84	14.00	1.15	1.10	1.35	629	492	137
2006	0.44	0.36	0.66	0.15	0.11	0.41	-0.88	-0.88	-0.71	13.50	8.64	13.50	0.96	0.81	1.26	779	572	207
2007	0.57	0.30	1.04	0.16	0.10	0.48	-0.88	-0.61	-0.88	12.00	12.00	11.05	1.21	0.73	1.66	979	620	359
2008	0.40	0.14	0.62	0.12	0.00	0.31	-0.67	-0.60	-0.67	6.80	6.50	6.80	0.87	0.66	0.96	369	172	197
2009	0.49	0.20	0.64	0.31	0.05	0.43	-0.64	-0.64	-0.29	6.70	2.18	6.70	0.78	0.42	0.87	278	94	184
2010	0.31	0.08	0.41	0.15	0.02	0.26	-0.77	-0.50	-0.77	16.00	1.25	16.00	0.85	0.25	0.99	724	217	507
2011	0.17	0.12	0.20	0.08	0.03	0.13	-0.73	-0.56	-0.73	5.72	5.72	1.99	0.40	0.46	0.35	666	249	417
2012	0.26	0.25	0.27	0.09	0.07	0.13	-0.40	-0.40	-0.26	10.06	10.06	8.64	0.73	0.77	0.68	450	233	217
2013	0.32	0.35	0.22	0.12	0.13	0.07	-0.87	-0.50	-0.87	4.72	4.72	2.00	0.64	0.68	0.41	364	291	73
2014	0.34	0.31	0.42	0.15	0.07	0.44	-0.60	-0.60	-0.50	10.37	5.88	10.37	0.74	0.74	0.75	603	404	199
2015	0.38	0.40	0.36	0.38	0.13	0.44	-0.68	-0.68	-0.23	5.13	5.13	1.60	0.57	0.78	0.25	643	318	325
2016	0.13	-0.10	0.17	0.09	-0.10	0.15	-0.10	-0.10	-0.08	0.44	-0.10	0.44	0.21	0	0.20	7	1	6
Total	0.38	0.32	0.51	0.14	0.10	0.32	-0.89	-0.89	-0.88	16.80	13.50	16.80	0.84	0.74	1.04	10217	7192	3025

Note: All variables are as defined before in Table 3.

In sum, the change in UP across the period of study from January 1995 to December 2016 reveals that time could play an influencing factor. It could help in explaining the underpricing difference across the G20 countries, specifically between developed and developing G20 IPO markets. A similar observation has been noted by Loughran and Ritter (2004), Boulton et al. (2010), and Engelen and van Essen (2010). Across the 22-year window that this study employs, UP seems to peak around the global financial crisis for G20 IPO markets. However, across this timeframe, the high level of UP seems to be persistent for developing IPO firms as IPO underpricing is higher in 19 out of the 22 yearly-occasions in developing countries compared to developed market IPOs. Consequently, this finding clearly indicates that it is necessary to control for the year effect.

2.8.1.3. Summary Statistics for IPO Underpricing by Industry

Table 6 presents summary statistics including mean, median, minimum, maximum, standard deviation, and the number of IPOs listed for IPO underpricing by industry grouping for the G20 countries from 1995 to 2016. Table 6 above shows that across the G20 market IPOs with the highest mean of IPO underpricing occurred in other utility industries, with underpricing being at 342%, followed by the regional agency and insurance industries, with average IPO underpricing equal to 163% and 109%, respectively. The IPO firms listed in developing markets and operating in other utility industries experienced the highest underpricing, with average underpricing of 579%, followed by the regional agency and insurance industries, with average underpricing of 454% and 334%, respectively. On the other hand, the table does demonstrate that IPO companies traded in developed stock markets and categorized under pers/bus/rep svc industry suffer the largest underpricing, equal to 54%, followed by the real estate and investment bank industries, with average underpricing equal to 47% and 37%, respectively.

Across the G20 countries, the largest recorded number of IPO listings occurred in the manufacturing, the pers/bus/rep svc, and natural resources industries, with 3,815, 2,176, and 932 listed IPOs from 1995 to 2016, respectively. Across the 33 IPO industries displayed in Table 6, UP indeed tends to be high in some industries, for instance agriculture, insurance, other utilities, and pers/bus/rep svc in the G20 IPO markets.

Table 6: Summary Statistics of IPO Underpricing by Industry in the G20 Countries

	Mean			Median			Minimum			Maximum			Standard Deviation			Number of Observations		
Industry	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**	**All**	**DVS**	**DS**
Agriculture	0.50	0.21	0.68	0.25	0.06	0.44	-0.14	-0.10	-0.14	2.33	2.03	2.33	0.63	0.47	0.65	73	28	45
Co-generation	-0.02	-0.02	-0.03	-0.02	0.00	-0.03	-0.23	-0.23	-0.05	0.14	0.14	0.01	0.11	0.14	0.02	13	9	4
Commercial Bank	0.29	0.09	0.76	0.07	0.06	0.13	-0.88	-0.54	-0.88	14.00	1.49	14.00	1.34	0.20	2.40	119	84	35
Construction	0.33	0.26	0.44	0.13	0.10	0.28	-0.46	-0.34	-0.46	6.63	6.63	3.40	0.74	0.79	0.63	182	111	71
Credit Inst.	0.14	0.15	0.09	0.10	0.10	0.09	-0.50	-0.34	-0.50	1.21	1.21	0.57	0.23	0.23	0.22	93	75	18
Electric Service	0.38	0.19	0.64	0.11	0.05	0.22	-0.24	-0.24	-0.21	7.86	2.17	7.86	1.06	0.46	1.51	65	37	28
Fedl Credit Agcy	-0.03	0	-0.03	-0.03	0	-0.03	-0.03	0	-0.03	-0.03	0	-0.03	0	0	0	1	0	1
Gas Distribution	0.23	0.17	0.39	0.16	0.09	0.43	-0.01	-0.01	0.18	0.55	0.55	0.52	0.21	0.20	0.15	16	12	4
Healthcare	0.29	0.28	0.46	0.13	0.11	0.35	-0.39	-0.39	-0.17	4.26	4.26	2.00	0.56	0.56	0.54	151	136	15
Insurance	1.09	0.20	3.34	0.14	0.09	2.67	-0.23	-0.23	-0.17	11.05	3.03	11.05	2.36	0.44	3.49	144	103	41
Investment Bank	0.32	0.37	0.20	0.11	0.12	0.04	-0.77	-0.77	-0.69	3.43	3.43	2.28	0.60	0.65	0.44	194	138	56
Leisure	0.29	0.28	0.33	0.13	0.10	0.27	-0.77	-0.77	-0.43	3.58	3.58	1.48	0.55	0.58	0.39	132	106	26
Manufacturing	0.35	0.23	0.48	0.16	0.08	0.35	-0.86	-0.86	-0.80	13.50	12.00	13.50	0.69	0.57	0.79	3815	1955	1860
Mortgage Bank	0.21	0.21	0	0.10	0.10	0	-0.15	-0.15	0	1.64	1.64	0	0.40	0.40	0	27	27	0
Mtg Securities	0.15	0.12	0.33	0.09	0.08	0.33	-0.02	-0.02	0.33	0.43	0.43	0.33	0.15	0.14	0	9	8	1
National Agency	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00	0	0	0	0	1	1	0
Natural Resource	0.22	0.19	0.59	0.07	0.06	0.38	-0.61	-0.61	-0.39	10.67	10.67	4.28	0.63	0.60	0.81	932	874	58
Oil/Gas Pipeline	0.14	0.09	1.00	0.09	0.08	1.00	-0.05	-0.05	0.51	1.49	0.33	1.49	0.27	0.10	0.69	34	32	2
Other Finance	0.17	0.18	0.08	0.05	0.05	0.01	-0.88	-0.88	-0.73	3.50	3.50	1.00	0.45	0.47	0.33	201	176	25
Other Services	0.31	0.28	0.44	0.13	0.13	0.22	-0.50	-0.50	-0.13	2.23	1.87	2.23	0.49	0.45	0.67	100	84	16
Other Utility	3.42	-0.12	5.79	0.07	-0.12	1.29	-0.13	-0.13	0.07	16.00	-0.12	16.00	7.06	0.00	8.87	5	2	3
Pers/Bus/Rep Svc	0.52	0.54	0.40	0.20	0.19	0.30	-0.89	-0.89	-0.87	13.50	13.50	6.91	0.98	1.02	0.65	2176	1861	315
Radio/TV/Telecom	0.31	0.23	0.46	0.11	0.07	0.25	-0.41	-0.37	-0.41	5.60	3.13	5.60	0.70	0.54	0.93	155	104	51
Real Estate	0.45	0.47	0.38	0.10	0.14	0.06	-0.35	-0.35	-0.24	6.30	5.72	6.30	0.89	0.86	0.97	239	176	63
Regional Agency	1.63	0.17	4.54	0.28	0.09	4.54	-0.20	-0.20	0.44	8.64	0.70	8.64	3.45	0.38	5.80	6	4	2
Restaurant/Hotel	0.31	0.30	0.46	0.13	0.11	0.23	-0.52	-0.52	-0.08	4.44	4.44	2.71	0.55	0.53	0.70	210	189	21
Retail	0.34	0.34	0.32	0.12	0.11	0.28	-0.35	-0.35	-0.23	4.00	4.00	2.33	0.60	0.62	0.43	416	362	54
S&L/Thrift	0.06	0.06	0	0.02	0.02	0	-0.08	-0.08	0	0.23	0.23	0	0.10	0.10	0	10	10	0
Sanitation	0.19	0.11	0.36	0.10	0.08	0.44	-0.28	-0.28	-0.25	1.20	0.67	1.20	0.29	0.19	0.39	35	24	11
Telephone Comm.	0.33	0.30	0.40	0.18	0.16	0.26	-0.50	-0.50	-0.09	2.20	2.20	1.40	0.42	0.43	0.41	73	53	20
Transportation	0.29	0.20	0.40	0.11	0.08	0.27	-0.34	-0.34	-0.24	8.84	8.84	3.81	0.76	0.82	0.66	223	128	95
Water Supply	0.31	0.09	0.49	0.30	0.01	0.44	-0.04	-0.04	0.09	0.89	0.39	0.89	0.33	0.20	0.32	9	4	5
Wholesale	0.34	0.26	0.62	0.12	0.09	0.33	-0.65	-0.65	-0.37	16.80	4.16	16.80	1.04	0.54	1.94	358	279	79
Total	0.38	0.32	0.51	0.14	0.10	0.32	-0.89	-0.89	-0.88	16.80	13.50	16.80	0.84	0.74	1.04	10217	7192	3025

Note: All variables are as defined before in Table 3.

The variation in UP between different IPO industries illustrates that some specific industries could play an important role in elucidating differences in underpricing across the G20 countries, particularly between developed and developing G20 IPO markets. For developing stock markets, the IPO industry concentration is seen in the manufacturing, pers/bus/rep svc, and transportation industries with total IPOs equal to 1,860, 315, and 95, respectively, during the study period. Similarly, IPOs listed in developed stock markets tend to concentrate the most in the manufacturing, pers/bus/rep svc, and natural resources industries, with total listings of 1,955, 1861, and 874, respectively, from 1995 to 2016. However, when comparing if these industries exhibit similarity in UP across developing and developed G20 IPO countries, then heterogeneity arises. For example, while UP in the insurance sector in developing countries is equal to 334%, it is very low in developed markets at only 20%.

However, the other observation to carry forward is that UP is also persistent in developing G20 market IPO industries since UP is high in 27 industries, which is comparable to only 6 industries in developed IPO markets. Loughran and Ritter (2004), Boulton et al. (2010), and Engelen and van Essen (2010) argue that controlling for industry effects when examining underpricing in IPO markets is an imperative procedure. This is because some industries have particular uncertainty characteristics that require investors to demand larger premiums, leading to higher underpricing. This finding indicates the importance of controlling for industry effect.

2.8.1.4. Mean and Median Equality Test of Unequal Variance for Firm-specific Variables in the G20 Developed and Developing Countries

Table 7 displays the results for both the mean and median equality tests of unequal[15] variances between the developing and developed G20 countries. The objective being to explore whether differences between firm-specific variables are similar or dissimilar across the two categories. The previous descriptive statistics subsections provide an indication that firm-specific variables could have a dissimilar impact on developed and developing IPO markets. In other words, the existence

[15] This thesis performed a variance ratio equality test to examine the equality of variance of IPO underpricing between developed and developing IPO markets in which the research rejected the null hypothesis of equal variance at 1% of significance. Thus, the author employs the mean and median equality test of unequal variance.

of such dissimilarity could suggest the presence of different market environments between developed and developing countries, as summarised by Kayo and Kimura (2011), Autore et al. (2014), and Jamaani and Roca (2015). If indeed there is a difference in terms of the divergent effect of firm-specific variables across developed and developing G20 market IPOs, then it would be necessary to control for this effect.

The presence of such differences without the supporting statistical testing would be a redundant pursuit. Inspecting the results of the mean values in Table 7 of UP, PR, DF, UR, PMV, and LET across developed and developing G20 countries, it emerges that developed and developing IPO markets are entirely different in all aspects, with the exception of LOP. For example, the mean difference in UP, PR, DF, UR, PMV, LET, and LOP indicates that in developing G20 countries underpricing is higher by 19% as IPO issuers: firstly, sell and create less secondary and primary shares by 1% and 10%, respectively; secondly, go public with reputable underwriters by 3% more; thirdly, experience higher pre-IPO stock market volatility by 0.04% more; fourthly, have longer time elapse between the time of offer price and the first trading day by 54 days; and fifthly, their IPOs have a much larger offering by almost $3.7 million compared to developed IPO issuers.

Table 7: Mean and Median Equality Test of Unequal Variance of Firm-specific Variables across Developed and Developing G20 Countries

Variables	Mean		Mean Difference	T-test	Median		Median Difference	Wilcoxon-test
	Developed Countries	Developing Countries	Developed – Developing Countries	Developed - Developing Countries	Developed Countries	Developing Countries	Developed – Developing Countries	Developed– Developing Countries
UP	0.32	0.51	-0.19	-9.09***	0.10	0.32	-0.22	-17.63***
PR	0.04	0.03	0.01	4.64***	0	0	0	-8.11***
DF	0.27	0.17	0.10	39.38***	0.24	0.16	0.07	25.84***
UR	0.3	0.33	-0.03	-2.85***	0	0	0	-2.88***
PMV	0.015	0.019	-0.004	-17.29***	0.012	0.016	-0.004	-18.86***
LET	75.41	129.76	-54.35	-13.33***	47	49	-2	-2.63***
LOP	87.99	91.72	-3.73	-0.5547	22.1	29	-6.9	-7.07***

Note: All variables are as defined before in Table 3. T-statistics and Wilcoxon-test's Z-statistics equal *** p<0.01, ** p<0.05, * p<0.1 for two-tail.

All these results are significant at the 1% level, with the exception of LOP because the difference in the mean of offer proceeds between developed and developing G20 IPO markets is not significant. Consistently, when looking at the results for the median equality test of firm-level variables across developing and developed G20 market IPOs, the difference between the two broad markets persists across all variables, including the LOP at the 1% level of significance. It is, consequently, imperative to control for this difference by including a new variable that accounts for IPOs listed in the G20 developing versus developed IPO markets.

2.8.1.5. Variance Inflation Factors for Firm- and Country-specific, and Control Variables

The presence of high correlations amongst independent variables can violate the OLS assumption of independence leading to a multicollinearity problem (Belsley et al. 2005). To detect the absence of this type of problem that could arise from the existence of collinear relationships amongst independent variables, Table 8 presents the Variance Inflation Factors (VIF) of the firm-level, country-level, additional firm-level, additional country-level, and dummy effects control variables. Liu et al. (2011) argue that a multicollinearity problem exists when the value of VIF exceeds a threshold value of 5. The table above shows that amongst all of the employed main and controlling covariates, the VIF values are largely lower than a value of 5. This implies that any concern about the presence of multicollinearity in the data is largely marginal.

Table 8: Variance Inflation Factors of Variables in the G20 Countries

Variables	**VIF**
	Model 1
	Firm-level variables
PR	1.67
DF	3.47
UR	1.12
PMV	1.15
LET	1.31
LOP	1.40
	Country-level variable
DS	2.22
	Additional firm-level variables
BBM	1.17
TF	1.10
PF	1.08
IOP	1.39
UF	1.07
AFC 1997	1.11

GFC 2008	1.14
	Additional country-level variables
FMS	1.83
MS	2.73
	Dummy Effects
IE	1.06
YE	1.58
CE	3.75
Mean VIF	1.71

Note: All variables are as defined before in Table 3.

2.8.2. Results and Discussion

2.8.2.1. Results and Discussion of the OLS Models

Table 9 presents the empirical results of ten OLS models using robust standard errors estimation to adjust for heteroscedasticity. The models differ in the gradual inclusion of year, industry, country, and developing status dummies. To accept H1, both PR and DF ought to provide negatively significant coefficients, thereby confirming the negative effect of the incentive of IPO issuers on underpricing in the G20 countries. The results of PR and DF are -0.6% and -0.7%, respectively, in Model 1 and they confirm the negative effect of PR and DF on IPO underpricing in the G20 countries at the 1% level of significance. This outcome suggests that the higher the proportion of secondary shares sold and primary shares created to pre-IPO outstanding shares, the lower the underpricing in the G20 countries. Thus, H1 is accepted and confirms the negative effect of the incentive of IPO issuers in explaining underpricing in the G20 countries, hence supports the first sub-research question. This supporting result for H1 is consistent with several empirical studies, including Habib and Ljungqvist (2001), Ljungqvist and Wilhelm Jr (2003), Kennedy et al. (2006), Chahine (2008), Goergen et al. (2009), and Jones and Swaleheen (2010).

To provide support for H2, UR should present a significantly negative coefficient in order to support the proposition that the use of reputable underwriters by IPO firms can reduce the *ex-ante* uncertainty about the firm's value, providing a certification signal to investors and, in turn, mitigating underpricing. The result of UR in Model 1 in Table 9 provides a significant coefficient but with the opposite prediction sign of H2 at the 1% level of significance.

Table 9: OLS Results for IPO Underpricing in the G20 Countries

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	Robust Standard Errors Estimation to Adjust for Heteroscedasticity									
	Firm-level variables									
PR	-0.006***	-0.006***	-0.006***	-0.015***	-0.014***	-0.005***	-0.005***	-0.005***	-0.014***	-0.014***
	[-8.81]	[-8.81]	[-8.85]	[-8.98]	[-8.92]	[-7.40]	[-7.87]	[-7.38]	[-8.93]	[-8.87]
DF	-0.007***	-0.007***	-0.007***	-0.015***	-0.015***	-0.005***	-0.006***	-0.005***	-0.014***	-0.014***
	[-20.5]	[-18.0]	[-20.7]	[-12.4]	[-12.2]	[-14.9]	[-15.5]	[-14.8]	[-12.1]	[-12.0]
UR	0.087***	0.088***	0.086***	0.091***	0.090***	0.088***	0.089***	0.086***	0.093***	0.092***
	[4.47]	[4.50]	[4.37]	[4.70]	[4.64]	[4.52]	[4.59]	[4.40]	[4.81]	[4.74]
PMV	0.057***	0.056***	0.056***	0.063***	0.063***	0.05***	0.04***	0.05***	0.05***	0.05***
	[7.35]	[7.30]	[7.33]	[8.03]	[8.04]	[6.11]	[5.70]	[5.99]	[6.39]	[6.06]
LET	-0.029***	-0.025***	-0.028***	-0.020**	-0.020**	-0.036***	-0.029***	-0.036***	-0.029***	-0.025***
	[-3.28]	[-2.69]	[-3.22]	[-2.15]	[-2.13]	[-4.12]	[-3.17]	[-4.06]	[-3.22]	[-2.66]
LOP	-0.021***	-0.019***	-0.020***	-0.025***	-0.025***	-0.026***	-0.023***	-0.025***	-0.032***	-0.030***
	[-3.61]	[-3.25]	[-3.53]	[-4.25]	[-4.19]	[-4.44]	[-3.96]	[-4.33]	[-5.51]	[-5.10]
	Country-level variable									
DS	N/A	N/A	N/A	N/A	N/A	0.12***	0.15***	0.13***	0.18***	0.20***
						[5.32]	[6.01]	[5.72]	[7.48]	[7.82]
Dummy Effects		**YE**	**IE**	**CE**	**YE & IE & CE**		**YE**	**IE**	**CE**	**YE & IE & CE**
Constant	0.90***	0.90***	0.85***	0.85***	0.83***	0.96***	0.98***	0.88***	0.93***	0.89***
	[8.90]	[8.97]	[8.64]	[8.40]	[8.50]	[9.50]	[9.80]	[8.94]	[9.19]	[9.10]
Observations	10,209	10,209	10,209	10,209	10,209	10,209	10,209	10,209	10,209	10,209
Adjusted R^2	0.03	0.03	0.03	0.05	0.05	0.04	0.04	0.04	0.06	0.06[16]
P-value of F-statistic	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Note: All variables are as defined before in Table 3. Robust T-statistics in brackets are adjusted for heteroscedasticity *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

[16] It may seem that adjusted R2 is too low, however, this is common in similar studies. For example, adjusted R2 values reported by Loughran and Ritter (2004) (0.05; Table VII; Model 2), Lowry et al. (2010) (0.03; Table V; Model c), Boulton et al. (2011) (0.07; Table 5; Model 2), Shi et al. (2013) (0.05; Table 6; Model 1), Leitterstorf and Rau (2014) (0.06; Table 2; Model 1), and Chang et al. (2017) (0.03; Table 4; Model 5).

This significantly positive coefficient indicates that when IPO issuers employ a reputable underwriter, then the underpricing of their firms should be higher by almost 9%. This result is consistent with the empirical evidence reported in Boulton et al. (2010), Banerjee et al. (2011), Autore et al. (2014), and Boulton et al. (2017). They assert that the employment of reputable underwriters increases underpricing. The authors explain this relationship by arguing that issuers accept higher underpricing to compensate for the high post-IPO coverage service provided by highly ranked analysts who are employed by prestigious underwriters.

To accept the proposition of H3, i.e. there is a positive relationship between *ex-ante* uncertainty surrounding the offering and underpricing, PMV should provide a positive significant coefficient, while Model 1 in Table 9 should present significantly negative coefficients for LET and LOP. Model 1 shows that the first proxy of *ex-ante* uncertainty, PMV, provides a positive significant coefficient of 5.70% at the 1% level of significance. This result means that prior to the listing of an IPO firm in the G20 countries from 1995 to 2016, IPO firms suffered from greater underpricing when stock market volatility is high. This finding is in harmony with those Ljungqvist and Wilhelm Jr (2002) and Chang et al. (2017). Moreover, the second proxy of *ex-ante* uncertainty, LET, demonstrates that the longer the elapsed time between the offer price set up and the first trading date, the lower underpricing will be in the G20 stock markets. This outcome suggests that when informed investors show low demand for an IPO firm then this IPO requires more time to be fully subscribed to avoid failure of subscription. In other words, informed investors' low demand would be interpreted by uninformed investors with high uncertainty about the quality of the IPO leading to lower demand for the offering on the first trading day, thus leading to even lower underpricing. The result of the LET in Model 1 is similar to what has been documented by Lee et al. (1996), Lee et al. (2003) and Ekkayokkaya and Pengniti (2012).

The third proxy of *ex-ante* uncertainty is LOP, which examines the proposition that the underpricing of IPO firms with large offer proceeds is lower as these firms tend to be well-established and considered non-speculative businesses. Thus, IPO investors regard firms with large size offerings with lower *ex-ante* uncertainty, as a harbinger of lower underpricing. The result of Model 1 in Table 9 clearly supports this proposition as the coefficient of LOP equals -0.021 and is significant at the 1% level. This finding is in line with similar supporting evidence obtained by Beatty and Ritter (1986), Loughran et al. (1994), Habib and Ljungqvist (2001), Kim et al. (2008), and Boulton et al. (2010). The collective results of PMV, LET, and LOP in Model 1 in Table 9 provide solid support for H3, that there is a positive relationship between *ex-ante* uncertainty surrounding an offering and underpricing in the G20 stock markets. Hence, the third sub-research question is supported.

Table 9 reveals how the results obtained from Model 1 remain qualitatively the same after controlling for year, industry, country, developing status effects as exhibited in Models 2 to 10. The DS variable is a dummy variable equal to 1 when the IPO is listed in a developing G20 country, otherwise it is equal to zero. After controlling for the effect of DS, the results of Models 6 and 10 that employ robust standard errors estimation to adjust for heteroscedasticity produce consistent results. Models 6 to 10 also provide statistical evidence that underpricing in developing versus developed G20 stock markets is not similar. In fact, the significantly positive coefficients of DS in Models 6 to 10 indicate that IPO firms listed in developing G20 stock markets should experience higher underpricing ranging from 12% to 20% as compared to developed G20 market IPOs. This result supports previous studies' conclusions that the market environment for developing stock markets is very different to that concerning developed markets. This is because the former possess inferior institutional quality, weaker price informativeness, greater earnings opacity, and lack of investor confidence (Bhattacharya et al. 2003; Gelos & Wei 2005; Biddle & Hilary 2006; Fernandes & Ferreira 2009; Fratzscher & Imbs 2009).

However, the conclusion drawn from the ten OLS models in Table 9 infers that the EWL theory may partially explain underpricing differences across market IPOs. This research finds that only the incentive of IPO issuers and *ex-ante* uncertainty surrounding the offering explains underpricing in the G20 market IPOs while promotional cost employed by issuers does not. This conclusion seems premature due to the fact that a concern related to the presence of endogeneity between UR and UP may exist as argued by Habib and Ljungqvist (2001). This conclusion should therefore be treated with caution as this research prove this cautionary note using the results documented in the next section.

2.8.2.2. Results and Discussion of the 2SLS Models

Table 10 presents the results of ten 2SLS models employing robust standard errors estimation to adjust for heteroscedasticity between the G20 countries. The results of PR and DF are -0.6% and -0.7%, respectively. For example, Model 1 confirms the negative effect of PR and DF on IPO underpricing in G20 countries at the 1% level of significance. This outcome infers that the larger the percentage of secondary shares sold and primary shares created to pre-IPO outstanding shares, the lower is the underpricing in the G20 countries. Therefore, H1 is accepted confirming the negative effect of the incentive of IPO issuers in explaining underpricing in the G20 countries. This supporting result of H1 is consistent with the evidence obtained in Table 9 using an OLS estimation.

Interestingly, after treating UR as an endogenous variable, the result of UR in Model 1 in Table 10 provides a significant and negative coefficient that is consistent with the prediction of H2 at the 1% level of significance. This significantly negative coefficient shows that the employment of reputable underwriters by IPO issuers reduces underpricing of IPO firms when they go public by 12% in the G20 countries. This result disagrees with the one in Table 9 that uses an OLS model, and is also in conflict with the finding documented by Boulton et al. (2010), Banerjee et al. (2011), Autore et al. (2014), and Boulton et al. (2017), i.e. the hiring of underwriters with a high market reputation increases underpricing.

In other words, this negative relationship between UR and UP confirms the presence of an endogeneity effect between UR and PR on the basis that the choice of a reputable underwriter is an endogenous decision made by issuers. Hence, the results support the second sub-research question. The implication is that H2 is supported and confirms the proposition that employing underwriters with a high market reputation can indeed reduce *ex-ante* uncertainty about a firm’s value, providing a certification signal to investors and, in turn, mitigating underpricing. This evidence supports the cautionary empirical note raised by Habib and Ljungqvist (2001) that empirical results obtained without accounting for the endogeneity between the issuer's decision in relation to the choice of hiring reputable underwriters and IPO underpricing can lead to omitted variable bias. This proves that the results obtained by OLS models lack methodological credibility.

Table 10: 2SLS Regression Results for IPO Underpricing in the G20 Countries

	Robust Standard Errors Estimation to Adjust for Heteroscedasticity									
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
Firm-level variables										
PR	-0.006***	-0.007***	-0.006***	-0.015***	-0.015***	-0.006***	-0.006***	-0.006***	-0.014***	-0.014***
	[-9.28]	[-9.21]	[-9.33]	[-9.14]	[-9.07]	[-15.3]	[-15.9]	[-15.3]	[-12.4]	[-12.2]
DF	-0.007***	-0.007***	-0.007***	-0.015***	-0.015***	-0.005***	-0.005***	-0.005***	-0.014***	-0.014***
	[-21.1]	[-18.4]	[-21.3]	[-12.7]	[-12.4]	[-7.85]	[-8.28]	[-7.83]	[-9.08]	[-9.01]
UR	-0.120***	-0.130***	-0.130***	-0.150***	-0.150***	-0.092**	-0.100**	-0.096**	-0.110**	-0.120***
	[-2.38]	[-2.52]	[-2.46]	[-2.98]	[-2.96]	[-1.80]	[-2.01]	[-1.87]	[-2.20]	[-2.37]
PMV	0.060***	0.060***	0.060***	0.070***	0.070***	0.05***	0.05***	0.05***	0.05***	0.06***
	[7.99]	[7.96]	[7.98]	[8.74]	[8.75]	[6.68]	[6.33]	[6.55]	[7.04]	[6.73]
LET	-0.036***	-0.033***	-0.035***	-0.028***	-0.029***	-0.042***	-0.036***	-0.042***	-0.036***	-0.033***
	[-3.99]	[-3.47]	[-3.92]	[-2.98]	[-2.97]	[-4.71]	[-3.84]	[-4.65]	[-3.89]	[-3.38]
LOP	-0.013**	-0.011**	-0.011**	-0.015**	-0.015***	-0.018***	-0.016***	-0.017***	-0.024***	-0.022***
	[-2.12]	[-1.80]	[-1.98]	[-2.54]	[-2.49]	[-3.13]	[-2.60]	[-2.98]	[-4.05]	[-3.58]
Country-level variables										
DS	N/A	N/A	N/A	N/A	N/A	0.12***	0.15***	0.13***	0.17***	0.19***
						[5.21]	[5.83]	[5.68]	[7.31]	[7.66]
Dummy Effects		**YE**	**IE**	**CE**	**YE & IE & CE**		**YE**	**IE**	**CE**	**YE & IE & CE**
Constant	0.85***	0.85***	0.79***	0.79***	0.76***	0.92***	0.93***	0.83***	0.88***	0.83***
	[8.46]	[8.49]	[8.10]	[7.89]	[7.86]	[9.13]	[9.39]	[8.49]	[8.79]	[8.55]
Observations	10,209	10,209	10,209	10,209	10,209	10,209	10,209	10,209	10,209	10,209
Adjusted R^2	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.05	0.05
P-value of F-statistic	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
P-value of Housman Endogeneity Test	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
P-value of Cragg and Donald Weak Instrument Test	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Note: All variables are as defined before in Table 3. Robust Z-statistics in brackets are adjusted for heteroscedasticity *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Consequently, the empirical results obtained by Boulton et al. (2010), Banerjee et al. (2011), Autore et al. (2014), and Boulton et al. (2017) should be treated with caution as they do not account for this endogeneity. Table 10 shows the results obtained from Model 1 remain qualitatively the same after controlling for year, industry, country, developing status effects as exhibited in Models 2 to 10. Hence, Table 10 provides supporting results to H1, H2, and H3. Models 6 to 10 in Table 10 also provide statistical evidence similar to the evidence obtained in Table 9 that underpricing in developing versus developed G20 stock markets is not alike.

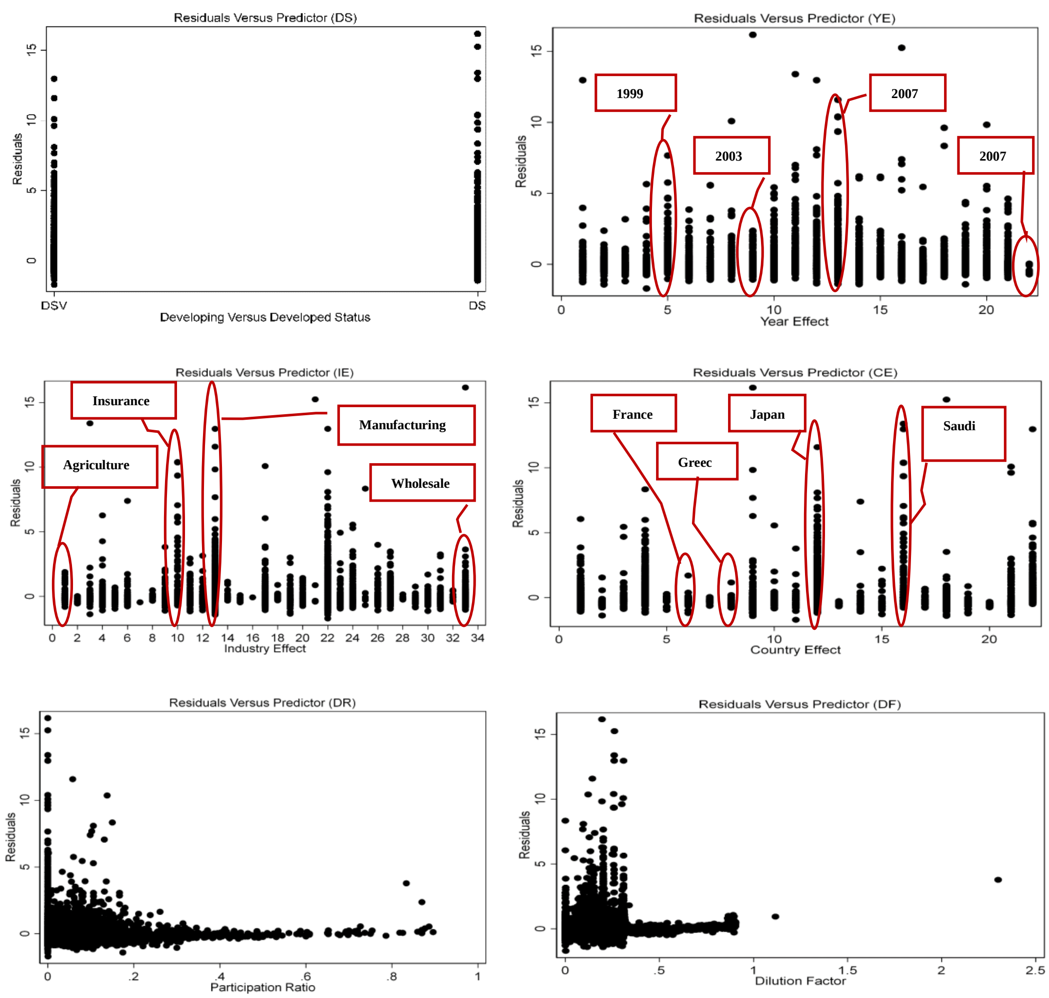
In fact, the significantly positive coefficients of DS in Models 6 to 10 indicate that, even after controlling for the problem of endogeneity and various dummy effects, IPO firms with DS status should experience higher underpricing ranging from 12% to 19% when compared to developed G20 market IPOs. Collectively, the results of the 2SLS models confirm that the EWL theory does explain IPO underpricing difference in the global IPO market.

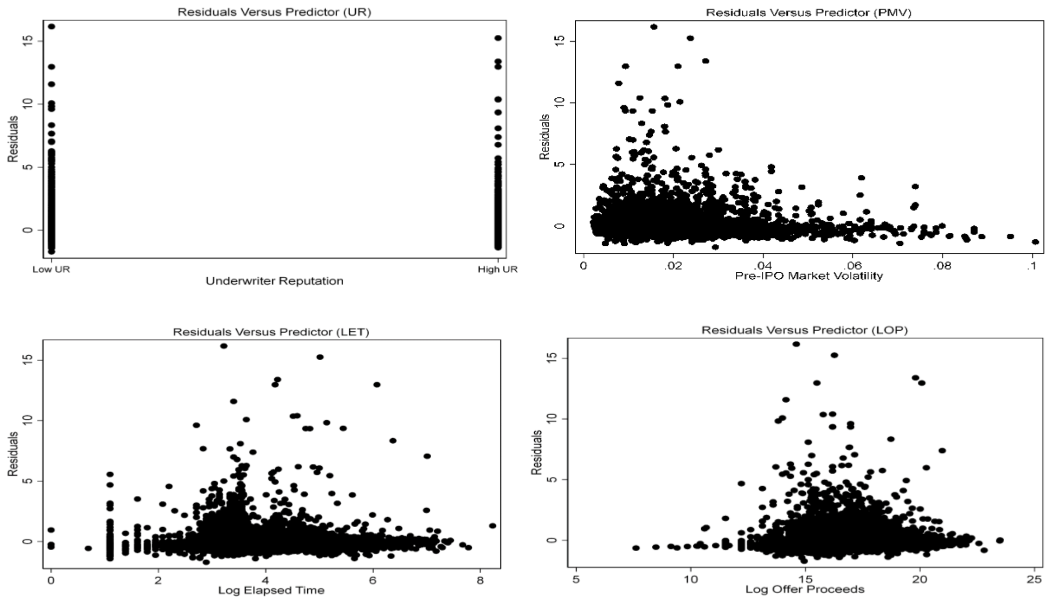
In summary, the results show that IPO firms underpriced differently across the G20 countries, because on average some IPO issuers care less about underpricing as they sell less secondary and create less primary shares when they go public. Those issuers also employ less reputable underwriters especially when the perceived level of *ex-ante* uncertainty surrounding their offering is low. Stated differently, in a G20 country where the average level of participation ratio and dilution factor is low, the likelihood of employing reputable underwriters will be low when the average level of *ex-ante* uncertainty of that country is low too. If those conditions occur, then this G20 country is likely to suffer from higher underpricing up to 19% when its stock market is classified as a developing one. The effect of the endogeneity on the relationship between underwriter reputation and IPO underpricing is a global effect. The results of the Housman Endogeneity Test confirm its existence across G20 countries. Not capturing this effect explains the fragmented results obtained by current literature on the true nature of the relationship between underwriter reputation and IPO underpricing. This eventually leads to biased conclusions being drawn from empirical testing and resulting in misunderstandings in the IPO literature. Next, this research examines if the consistency of the findings persists after the author controls for the effect of clustered standard errors.

2.8.2.3. Results and Discussion of the 2SLS Models with One-Way Clustered Robust Standard Errors

To illustrate graphically the possible existence of a clustering effect in the data, Figure 7 displays firstly, the one-way clustering standard errors by DS, YE, IE, CE, and secondly, the remaining firm-specific variable including PR, DF, UR, PMV, LET, and LOP. Across the ten figures shown below, this research indicates that the IPO data may suffer from the clustering effect of YE, IE, and CE.

Figure 7: Graphical Display of Clustered Standard Errors by Independent Variables





(Designed by the author of this thesis using Stata 15)

For example, observing the structural behaviour of the error terms and taking into consideration the clustering effect of standard errors in the period 1995 to 2016, Figure 7 shows there is visual year effect in 1999, 2003, 2007, and 2016. The error terms seem to be correlated within every year but between those years error terms exhibit uncorrelated structural behaviour. Likewise, looking at structural behavior when clustering standard errors are evident within industries, some industries - for example, the variance of error terms in agriculture and wholesale industries - seem to have a similar pattern of errors that correlate with every industry. On the other hand, error terms for insurance and manufacturing industries seem visually to have a larger variance in standard errors where these errors may correlate within every industry as shown in Figure 7.

When observing the structural behavior of the error terms and taking into account the clustering effect of standard errors within the G20 countries, Figure 7 illustrates the presence of the clustering effect of error terms within countries. For example, standard errors in France and Greece seem to present a similar pattern of low variance while the dispersion of standard errors in Japan and Saudi Arabia appear to have larger variability. The standard errors in Japan, for example, are likely to correlate while those errors are not likely to correlate between Japan and France.

For the remaining variables including DS, PR, DF, UR, PMV, LET, and LOP this research cannot detect a clear visual existence of clustering effect. This initial graphical evidence implies that the observations are grouped into a number of clusters where the error terms are uncorrelated across clusters but graphically seem to correlate within YE, IE, and CE. Cameron and Miller (2015) argue that not controlling for this within-cluster error correlation results in achieving biased values of standard errors. The outcome of this is obtaining large misleading T-statistic values and low p-values, and in turn an over-rejection of the true null hypothesis.

Cameron and Miller (2015) show that one way to understand the absolute effect of clustering in error terms is to compare the results of a model that uses clustered robust standard errors versus non-clustered robust standard errors to observe the change in standard error values post-estimation[17]. Petersen (2009) contends that if data experience a clustering effect, for example by time or industry or country, then one should observe a notable downward change in the standard errors for clustered robust estimator compared to the standard errors of the un-clustered robust estimator. To account for the impact of this one-way clustering within DS, YE, IE, and CE, Table 11[18] summarises the results after accounting for these clustering effects. Model 1 shows that when clustering the standard errors utilising two clusters including developing versus developed G20 countries, the results provide overall consistent support for H1, H2, and H3.

However, once the author clusters standard errors according to developing versus developed G20 countries, this research observes a negative change in the standard errors values for UR, PMV, LOP, and DS while this thesis observes positive changes in PR, DF, and LET variables in Model 1 in Table 11 compared to the reference point in Model 10 in Table 10[19]. For example, the Z-statistics for PR and DF changed by approximately +71% and +164% while the Z-statistics for PMV and LOP changed by -60% and -72%, respectively.

---

[17] Cameron and Miller (2015) recommend using White (1980) heteroscedastic-robust standard error for 2SLS estimator which the author implements in this thesis.

[18] For un-tabulated results, the author runs different models in which this thesis clusters standard errors by all employed independent variables to examine if the author may fail to recognize the presence of the DS, PR, DF, UR, PMV, LET, and LOP variables' clustering effect. The results found that only DS present a clustering effect and the author proceeds by presenting the empirical results in Table 11 by showing empirical clustering results for the DS, YE, IE, and CE effects.

[19] The author chooses Model 10 in Table 10 as the reference point of comparison to capture changes in Z-statistics as it provides the best model fit. The calculation of the change in the Z- statistics is done by dividing, for example, Z-statistic value of -23.80 for the variable DF in Model 1 in Table 11 on the Z- statistic value of -9.01 in Model 10 in Table 10, the reference point of comparison. Thus, change in the Z- statistic in Model 1 in Table 11 for the variable DF is +164% = ((-23.8/-9.01)-1) and so forth for all other variables.

Table 11: 2SLS Regression Results for IPO Underpricing after Controlling for Underpricing Difference Between Developing and Developed G20 Countries Using One-Way Clustered Robust Standard Errors

	One-Way Clustered Robust Standard Errors							
Variables	**Model 1 Clustered on DS**	**Change in Z-statistics**	**Model 2 Clustered on YE**	**Change in Z-statistics**	**Model 3 Clustered on IE**	**Change in Z-statistics**	**Model 4 Clustered on CE**	**Change in Z-statistics**
				Firm-level variables				
PR	-0.014***		-0.014***		-0.014***		-0.014***	
	[-20.9]	+71%	[-5.82]	-52%	[-3.99]	-67%	[-4.31]	-65%
DF	-0.014***		-0.014***		-0.014***		-0.014***	
	[-23.8]	+164%	[-6.60]	-27%	[-4.82]	-47%	[-4.49]	-50%
UR	-0.120**		-0.120**		-0.120**		-0.120	
	[-1.71]	-28%	[-1.88]	-21%	[-1.89]	-20%	[-1.20]	-49%
PMV	0.06***		0.06***		0.06***		0.06**	
	[2.70]	-60%	[2.63]	-61%	[6.69]	-1%	[2.31]	-66%
LET	-0.033***		-0.033**		-0.033***		-0.033	
	[-4.84]	+43%	[-1.93]	-43%	[-3.06]	-10%	[-0.97]	-71%
LOP	-0.022		-0.022**		-0.022**		-0.022	
	[-0.95]	-72%	[-1.98]	-45%	[-1.68]	-53%	[-0.82]	-77%
				Country-level variables				
DS	0.190***		0.190***		0.190**		0.190	
	[7.27]	-5%	[2.74]	-64%	[1.99]	-74%	[1.17]	-85%
Dummy Effects	**YE & IE & CE**		**YE & IE & CE**		**YE & IE & CE**		**YE & IE & CE**	
Constant	0.83***		0.83***		0.83***		0.83**	
	[6.84]	-20%	[4.47]	-48%	[3.71]	-57%	[1.80]	-79%
Observations	10,209		10,209		10,209		10,209	
Adjusted R^2	0.05		0.05		0.05		0.05	
P-value of F-statistic	0.05		0.01		0.01		0.01	
Number of Clusters	2		22		33		22	
P-value of Housman Endogeneity Test	0.01		0.01		0.01		0.01	
P-value of Cragg and Donald Weak Instrument Test	0.01		0.01		0.01		0.01	

Note: All variables are as defined before in Table 3. UP is the dependent variable. Robust Z-statistics in brackets are adjusted for heteroscedasticity *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

This implies that IPO data experiences one-way clustering effect within developing and developed countries even after controlling for year, industry, and country dummy effects. One explanation for observing positive[20] changes in the Z-statistics values instead of negative ones after clustering by DS is likely due to clustering over a small number of clusters, two clusters including developed versus developing. Cameron and Miller (2015) provide empirical evidence showing that the possibility for clustered robust standard errors to be negatively correlated within clusters. Here a smaller number when $N_{Cluster} = 2$ clusters result in smaller standard errors values leading to positive changes in Z-statistics values post-estimation. Cameron and Miller (2015) also contend that by definition cluster-robust standard errors estimation employs White (1980) heteroscedastic-robust standard errors estimation that sometimes provides larger or smaller standard errors than the default estimator.

Consistent with Petersen's (2009) note, when this research clusters the standard errors of 22 years and 33 industries as shown in Models 2 and 3 in Table 11, this research perceives substantial negative changes in the Z-statistics values in most variables. Overall, this result means that IPO data experiences remarkable one-way clustering effect within developing versus developed G20 countries, years, and industries even after controlling for year, industry, and country effects. That is, the results evidently indicate that residuals correlate within developing versus developed G20 country, years, and industries. These results are in line with similar empirical evidence regarding the impact of industry clustering as reported in Sorokina and Thornton (2016) and year clustering as noted in Smith (2016). However, the statistical power of most of the variables in Models 1, 2, and 3 in Table 11 remains significant, thus generating support for the hypotheses.

However, when the author clusters the standard errors by 22 countries as shown in Model 4, this research presents a different story. This thesis is not only observing the considerably larger negative change in the standard errors of all the variables, but the author fails to find significant results supporting H2 and H3. This research finds two of three *ex-ante* uncertainty proxies related to H3 of statistical insignificance including LET and LOP. Model 4 in fact shows that due to efficiently capturing within country correlations in error terms, the Z-statistic for the UR, LET, and LOP

[20] Petersen (2009) notes that clustering standard errors normally result in increasing standard errors, consequently producing lower T-statistic or Z-statistic values for the OLS or 2SLS estimators, respectively. Therefore, in this case a positive change in Z-statistic values resembles a reduction in the values of standard errors.

variables diminished by 50%, 71%, and 77%, respectively. The results support similar findings reported by Moulton (1990) who recorded a large reduction in T-statistic values from 13.3 to 3.7 after clustering standard errors on states. Similar findings on the influential impact of country-clustering are documented by De la Croix and Gobbi (2017) and Onali et al. (2017). Although the results of Model 4 provide full support for the prediction of H1, this research still documents considerable reduction in the Z-statistic values for the two variables including PR and DF related to H1 by 65% and 50%, respectively. Model 4 shows that the relationship between underwriter reputation and underpricing remains negative but becomes statistically insignificant. This is despite the result of the Housman Endogeneity Test confirming that UR is indeed an endogenous variable at the 1% level of significance.

Subsequently, the effect of country-clustering may differently affect the behaviour of underwriter reputation and *ex-ante* uncertainty factors in influencing the IPO underpricing across the G20 countries. This is most likely be due to unobserved large correlations between IPO observations within each G20 country. Furthermore, the impact of listing in developing G20 countries becomes statistically insignificant as the Z-statistic of the DS variable largely changed by -85% compared to the reference point in Model 10 in Table 10. This may suggest that when controlling for the effect of country-clustering, then the effect of listing in developing compared to developed G20 country does not explain the underpricing difference in the global IPO market. The reason is the presence of unobserved correlations observations within developed and developing G20 countries (Petersen 2009). The loss of significance in UR, LET, PMV, and DS variables may entail that standard errors become larger after this research account for unobserved correlations amongst residuals within countries. It leads to lower Z-statistic values and higher P-values, so consequently fewer stars appear next to the coefficients of the UR, LET, PMV, and DS variables as argued by Cameron and Miller (2015).

Collectively, the results of the 2SLS models using one-way clustering estimation are consistent with the previous section. This is in relation to the explanatory of the EWL theory and the global effect of endogeneity between underwriter reputation and underpricing. However, after the author captures the existence of correlation through one way clustering, these findings do not hold within the G20 countries. The relationship between IPO underpricing and its determinants may exhibit varying behaviours between countries. This occurs due to the existence of common shocks of a similar information environment that induces correlation amongst error terms to behave similarly within each G20 country. At the same time, they may behave differently across the G20 countries.

2.8.2.4. Results and Discussion of the 2SLS Models with Two-Way Clustered Robust Standard Errors

Tables 12 and 13 present the results of six 2SLS models that capture the simultaneous correlation along two dimensions in error terms using pairs of clusters. One important outcome is expected from the data. If this research obtains insignificant results for the three hypotheses, the author then infers that the IPO data do suffer from a significant two-way clustering effect. This leads the author to question the reliability of empirical results that failed to capture the existence of simultaneous correlation along two dimensions in error terms. Such results demonstrate the influential effect of the two-way clustering on the relationship between the dependent and independent variables.

Across the 6 two-way pairs of clustering models in Tables 12 and 13, this research continues to find a significant and negative association between the PR and DF variables and IPO underpricing in the G20 countries. This evidence provides solid re-support for H1. The results show large negative changes for the Z-statistic values for PR and DF compared to the reference point in Model 10 in Table 10. For example, this thesis observes a large increase in standard errors causing the Z-statistic values of PR and DF to decrease by 65% and 50%, respectively. This occurred due to the existence of correlations between error terms of IPO firms within 22 clusters of developing versus developed domiciles within G20 countries as shown in Model 3 in Table 12. Nonetheless, this research still observes explanatory power for the PR and DF variables in explaining IPO underpricing in the G20 countries at the 1% level of significance. It can be stated that capturing the simultaneous correlation along six pairs of two-way clustering in error terms has no effect on the behaviour of the PR and DF variables.

When this research assesses the consistency of the negative relationship between underwriter reputation and IPO underpricing across the six two-way pairs of clustering models in Tables 12 and 13, this research finds a different story. The author rejects H2 at the 5% level of significance in three out of six models. This indicates that the employment of reputable underwriters has an insignificant effect in reducing underpricing across the G20 countries.

Table 12: 2SLS Regression Results for IPO Underpricing after Controlling for Underpricing Difference Between Developing and Developed G20 Countries Using Two-Way Clustered Robust Standard Errors

	Two-Way Clustered Robust Standard Errors					
Variables	**Model 1 Clustered on DS & YE**	**Change in Z-statistics**	**Model 2 Clustered on DS & IE**	**Change in Z-statistics**	**Model 3 Clustered on DS & CE**	**Change in Z-statistics**
	Firm-level variables					
PR	-0.014***		-0.014***		-0.014***	
	[-5.84]	-52%	[-4.32]	-65%	[-4.31]	-65%
DF	-0.014***		-0.014***		-0.014***	
	[-6.56]	-27%	[-5.11]	-43%	[-4.49]	-50%
UR	-0.12**		-0.12**		-0.12	
	[-1.65]	-30%	[-1.75]	-26%	[-1.20]	-49%
PMV	0.06***		0.06***		0.06**	
	[2.42]	-64%	[4.50]	-33%	[2.31]	-66%
LET	-0.033**		-0.033**		-0.033	
	[-1.89]	-44%	[-2.24]	-33%	[-0.97]	-71%
LOP	-0.022*		-0.022*		-0.022	
	[-1.53]	-57%	[-1.34]	-63%	[-0.82]	-77%
	Country-level variable					
DS	0.19***		0.19**		0.19	
	[2.73]	-64%	[2.17]	-72%	[1.17]	-85%
Dummy Effect	**YE & IE & CE**		**YE & IE & CE**		**YE & IE& CE**	
Constant	0.83***		0.83***		0.83**	
	[4.02]	-53%	[4.01]	-53%	[1.80]	-79%
Observations	10,209		10,209		10,209	
Adjusted R^2	0.05		0.05		0.05	
P-value of F-statistic	0.01		0.01		0.01	
Number of Clusters	42		62		22	
P-value of Housman Endogeneity Test	0.01		0.05		0.05	
P-value of Cragg and Donald Weak Instrument Test	0.01		0.01		0.01	

Note: All variables are as defined before in Table 3. UP is the dependent variable. Robust Z-statistics in brackets are adjusted for heteroscedasticity *** p<0.01, ** p<0.05, * p<0.1 for one-tail

Table 13: 2SLS Regression Results for IPO Underpricing after Controlling for Underpricing Difference between Developing and Developed G20 Countries Using Two-Way Clustered Robust Standard Errors (Continues)

	Two-Way Clustered Robust Standard Errors					
Variables	**Model 4 Clustered on YI & IE**	**Change in Z-statistics**	**Model 5 Clustered On YE & CE**	**Change in Z-statistics**	**Model 6 Clustered on IE & CE**	**Change in Z-statistics**
			Firm-level variables			
PR	-0.014***		-0.014***		-0.014***	
	[-6.62]	-46%	[-5.26]	-57%	[-5.88]	-52%
DF	-0.014***		-0.014***		-0.014***	
	[-7.65]	-15%	[-5.99]	-34%	[-6.90]	-23%
UR	-0.12**		-0.12*		-0.12	
	[-1.96]	-17%	[-1.61]	-32%	[-1.21]	-49%
PMV	0.06***		0.06**		0.06***	
	[3.59]	-47%	[2.21]	-67%	[3.36]	-50%
LET	-0.033**		-0.033*		-0.033**	
	[-2.05]	-39%	[-1.37]	-59%	[-2.28]	-33%
LOP	-0.022**		-0.022*		-0.022**	
	[-2.08]	-42%	[-1.45]	-59%	[-2.02]	-44%
			Country-level variable			
DS	0.19***		0.19***		0.19***	
	[3.51]	-54%	[2.35]	-69%	[3.35]	-56%
Dummy Effect	**YE & IE & CE**		**YE & IE & CE**		**YE & IE & CE**	
Constant	0.83***		0.83***		0.83***	
	[5.25]	-39%	[3.37]	-61%	[4.90]	-43%
Observations	10,209		10,209		10,209	
Adjusted R^2	0.05		0.05		0.05	
P-value of F-statistic	0.01		0.01		0.01	
Number of Clusters	523		304		375	
P-value of Housman Endogeneity Test	0.01		0.01		0.05	
P-value of Cragg and Donald Weak Instrument Test	0.01		0.01		0.01	

Note: All variables are as defined before in Table 3. UP is the dependent variable. Robust Z-statistics in brackets are adjusted for heteroscedasticity *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

The loss of significance of the UR variable is most likely due to capturing the simultaneous correlations along two dimensions in error terms. This indeed causes the behaviour of the UR variable to be very sensitive. For example, the result in Model 3 in Table 12 shows that the Z-statistic value for the UR variable largely dropped by 49% compared to the reference point in Model 10 in Table 10. This happens when this research controls for the two-way clustering effect concerning the IPO observations within 22 clusters of developing versus developed countries within the G20 stock markets. Furthermore, this result indicates that IPOs underwritten by reputable underwriters in developing G20 economies compared to the ones underwritten by prestigious underwriters in developed G20 countries share similar unobservable features. Meanwhile those IPOs are distinctly different from each other between those 22 clusters. This evidence has not been captured by the prior underpricing literature. The author interprets this finding following Thompson (2011) to attribute the existence of underwriting industry-wide shocks that induce correlations between IPO firms within developed and developing G20 countries.

Collectively, the results of the UR variable provide strong evidence of the influential role played by two-way clustering in affecting the behaviour of underwriter reputation in explaining IPO underpricing across countries. The underwriting-underpricing relationship should be captured while accounting for the simultaneous correlations along two dimensions in error terms to avoid arriving at biased results. This research scrutinises the results of the Housman Endogeneity Test to examine if the reason for the failure to find support for H2 could be caused by the failure to reject the null hypothesis of exogeneity for the UR variable. Results from endogeneity test reject the null hypothesis of exogeneity for the UR variable. This research also inspects the results if this research perhaps employed weak instrumental variable to correct for this endogeneity problem. The results in Tables 12 and 13 show that this research rejects the Cragg and Donald Weak Instrument Test in all six models at 1% level of significance. This surely rejects the possibility of employing a weak instrument to correct for this endogeneity.

In relation to H3, the results of the three *ex-ante* uncertainty proxies including PMV, LET, and LOP in Tables 12 and 13 collectively provide supporting results. This thesis documents a large reduction in the Z-statistic values for the PMV variable reaching 67% when clustering error terms within 304 clusters across years and countries as shown in Model 5 in Table 13. Yet, the impact of pre-IPO market volatility on underpricing remains positively significant across the six two-way clustering models. However, the second proxy of *ex-ante* uncertainty LET, demonstrates significant correlations only within error terms when this research clusters them within the G20 countries and pair them with developing clusters as shown in Model 3 in Table 12. Hence, this research finds support for the variable LET in five of the six models. Likewise, the third proxy of *ex-ante* uncertainty, LOP, portrays a similar form of the influential impact of the two-way clustering when the author clusters residuals within the G20 countries and pair them with developing clusters as presented in Model 3 in Table 12. This is because this research only rejects the association between the offer size of IPO firm and IPO underpricing in the G20 countries in one out of six clustering pairs. For example, the results indicate that within developing G20 countries there is a large correlation in error terms in IPO observations existing. This causes error terms to correlate within 22 country-clusters while they are uncorrelated between those 22 clusters. This occurs to the extent that the Z-statistic of the variable LOP in Model 3 in Table 12 largely dropped by 77% compared to the reference point in Model 10 in Table 10 causing this observed statistical insignificance.

The results also document that the positive impact of listing IPO firms in a developing G20 country on underpricing difference remains significant in five out of six pairs of clustering. Once this research captures the two-dimensional correlations in error terms within 22 clusters of developing versus developed G20 countries as shown in Model 3 in Table 12, the impact of DS disappears. This thesis attributes this finding to the existence of within cluster correlations within 22 identified clusters in Model 3. In fact, those results confirm the sensitivity of the impact of listing IPO firms in developing G20 countries on underpricing post-clustering estimation. For example, the Z-statistic values for the variable DS in Model 3 in Table 12 dropped by 85% compared to the reference point in Model 10 in Table 10. The results imply there some correlations within developing versus developing G20 countries in which the behaviour of firm-level variables may be similar within every group yet differ between the two ‘blocks’ of economies.

To recapitulate, across the six two-clustering models presented in Tables 12 and 13, the author finds support for the three hypotheses of the EWL theory in four out of six models. This enables this thesis to reconfirm the answer of the first research question showing that the EWL theory does indeed explain underpricing difference across countries. The evidence this research uncovers here also permits the author to reconfirm answering the remaining three research questions. This research now confirms that the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty explain IPO underpricing difference across the G20 countries. This is because this research finds that when the incentive of IPO issuers increases by one percent underpricing decreases by 1.4%. This research also discovers that issuers who employ reputable underwriters manage to reduce their underpricing by 12%. IPO owners who list their firms when the pre-IPO stock market volatility is high by one percent, on average, experience higher discount by 5%. When the length of elapsed time between setting the offer price and first trading day increases by one unit, underpricing reduces by 3.3%. An increase in the size of the IPO firms by one unit also leads to reducing underpricing by 2.2%. When this IPO firm is listed in a developing stock market, it attracts 19% more discount in comparison to listing it in a developed G20 market. Jointly, the results using the one- and two-way clustering estimations show consistency in relation to the existence of correlations within error terms for IPO observations within developing versus developed G20 countries. The association between determinants of IPO underpricing and IPO underpricing difference is likely to exhibit varying behaviours between the two blocks of stock markets. The existence of common shocks of a similar information environment or market practices related to reputable underwriters induce correlations amongst residuals to behave similarly within but dissimilarly between developed and developing G20 countries.

2.8.3. Sensitivity Tests and Robustness Checks

In this section, this research carries out three robustness checks in order to maximise the confidence and reliability of the findings. This includes additional firm and country-level variables to avoid potential omitted variable bias concern. Also incorporated here is the process of splitting the data between developed and developing countries to completely isolate the effect of correlation. This thesis also excludes outliers to avoid potential misleading results. Specifically, these additional checks are done to moderate the possibility that the previous findings that rejected the underwriter reputation-underpricing relationship using some forms of one- and two-way clustering are not an artefact of omitted variable bias, shared correlations in residuals between developed and developing economies, and existence of outliers.

Firstly, the author captures additional firm- and country-level characteristics that IPO underpricing literature considers (Butler et al. 2014). Additional firm-level variables contain book-building, technology firms, private sector firms, integer offer price, underwriter fees, the 1997-98 Asian Financial Crisis and Global Financial Crisis that seriously undermined the world economy in 2008. This research also adds two country-level factors to control for development of financial markets' difference between the G20 stock markets. This is gauged by the level of financing through local equity markets and by the size of domestic markets.

Secondly, this research divides the data over two blocks of equity markets to check for what might have caused the previous results to show some rejections of the prestigious underwriter-underpricing relationship. This rejection repeatedly occurred when this research mainly clustered error terms between developed versus developing G20 countries. Kayo and Kimura (2011) discover a differential influence of information environments between developed and developing stock markets, and their influence on the capital structure of firms. They contend that companies clustered within developing economies illustrate comparable firm characteristics that are dissimilar to developed ones. Based on this evidence, Kayo and Kimura (2011) question whether the theories designed to explain corporate finance behaviours in developed countries are applicable to developing ones. This research checks if the EWL model would hold for both developed and developing stock markets.

Thirdly, the author safeguards the results against possible influence of outliers following Zattoni et al. (2017). Recall that in Table 4 this research finds a subnational underpricing observation of 1680% and 1350% recorded for developing and developed G20 economies while the average underpricing level for the entire sample of 10,217 IPOs is 38%. What makes a concern about the outlier problem becoming inevitable is that Table 4 shows the mean IPO underpricing for developed and developing countries' IPOs is 32% and 51%, respectively. Therefore, this research worries that the existence of such extreme underpricing observations may cause a bias in the findings. To overcome this problem, the author employs an outlier recognition procedure proposed by Rousseeuw and Leroy (2005) to remove those extreme underpricing observations greater than an underpricing value of 150%. This research implements this outlier procedure to eliminate 573, 388, and 188 observations related to the entire sample (22 countries), developed country sample (12 countries), and developing country sample (10 countries), respectively.

Table 14 presents the results of four one- and two robust clustered models using the 2SLS estimation for the whole sample of 22 countries. They aim to check if the previous findings this research obtained that rejected the association between underwriter reputation and underpricing is not driven by outliers and omitted variable bias. This is scenario let the author to partially refute the EWL model when clustering standard errors across countries, countries and years, countries and industries, and countries and developing stock markets. Table 14 shows that even after excluding the extreme underpricing values and adding the extra firm- and country-level variables, this research obtains consistently supporting results for H1.

Although PMV is insignificant in all of the four models in Table 14, this research finds strong support for the remaining two proxies of *ex-ante* including LEP and LOP lending overall support to H3. Table 14 demonstrates that the impact of country-clustering in standard errors remains influentially present in affecting the results. This is because the author continues to find the relationship between underwriter reputation and underpricing to be insignificant similar to previous results in Tables 11, 12, and 13. Across the four models in Table 14, the results of the DS variable are generally persistent documenting higher underpricing by up 7.6% for IPOs listed in developing G20 stock markets.

Table 14 also reports the results of Housman Endogeneity Test showing that the endogenous relationship between underwriter reputation and underpricing remains significant. Collectively, the Cragg and Donald Weak Instrument Test confirms that the null hypothesis of employing a weak instrument is rejected at the 1% level of significance. Thus, the identified instrument is indeed a robust one. Now this research turns the attention to checking what might have driven the rejection of the underwriter reputation-underpricing relationship after this research isolate the effect of correlated error terms between developed versus developing G20 countries.

Table 14: Excluding Outliers and Controlling for Omitted Variable Bias Using the Entire Sample

Variables	Model 1 Clustered on CE	Model 2 Clustered on YE & CE	Model 3 Clustered on IE & CE	Model 4 Clustered on DS & CE
	Firm-level variables			
PR	-0.010***	-0.010***	-0.010***	-0.010***
	[-5.41]	[-6.89]	[-6.42]	[-5.41]
DF	-0.011***	-0.011***	-0.011***	-0.011***
	[-6.53]	[-8.14]	[-8.83]	[-6.53]
UR	-0.032	-0.032	-0.032	-0.032
	[-0.68]	[-1.08]	[-0.93]	[-0.68]
PMV	0.071	0.071	0.071	0.071
	[0.70]	[0.86]	[0.98]	[0.70]
LET	-0.026***	-0.026***	-0.026***	-0.026***
	[-2.70]	[-2.49]	[-3.94]	[-2.70]
LOP	-0.021**	-0.021***	-0.021***	-0.021**
	[-2.02]	[-3.74]	[-3.18]	[-2.02]
	Country-level variable			
DS	0.076*	0.076**	0.076**	0.076*
	[1.35]	[2.16]	[1.95]	[1.35]
	Additional firm-level variables			
BBM	-0.010	-0.010	-0.010	-0.010
	[-0.43]	[-0.60]	[-0.48]	[-0.43]
TF	0.047***	0.047***	0.047***	0.047***
	[3.05]	[4.04]	[2.60]	[3.05]
PF	0.010	0.010	0.010	0.010
	[0.13]	[0.18]	[0.24]	[0.13]
IOP	0.035	0.035*	0.035	0.035
	[0.66]	[1.62]	[0.93]	[0.66]
UF	-0.010	-0.010	-0.010	-0.010
	[-0.57]	[-0.65]	[-0.67]	[-0.57]
AFC 1997	-0.10***	-0.10***	-0.10***	-0.10***

	[-2.54]	[-3.20]	[-4.58]	[-2.54]
GFC 2008	-0.031	-0.031	-0.031	-0.031
	[-0.74]	[-0.53]	[-0.91]	[-0.74]
Additional country-level variables				
FMS	-0.065***	-0.065**	-0.065***	-0.065***
	[-2.61]	[-2.03]	[-3.45]	[-2.61]
MS	0.20***	0.20***	0.20***	0.20***
	[6.13]	[5.75]	[10.1]	[6.13]
Dummy Effects	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**
Constant	0.68***	0.68***	0.68***	0.68***
	[3.41]	[6.29]	[5.21]	[3.41]
Observations	9,644	9,644	9,644	9,644
Adjusted R^2	0.16	0.16	0.16	0.16
P-value of F-statistic	0.01	0.01	0.01	0.01
Number of Clusters	22	303	370	22
Diagnostics				
P-value of Housman Endogeneity Test	0.01	0.01	0.01	0.01
P-value of Cragg and Donald Weak Instrument Test	0.01	0.01	0.01	0.01

Note: Firm-level variables and additional control variables are as defined before in Table 3. UP is the dependent variable. Robust Z -statistics in brackets donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail and are adjusted for heteroscedasticity. Error terms are clustered by one- and two-clusters as displayed under every model.

Table 15 presents the results for six one- and two clustered robust 2SLS models using only developed G20 data while excluding the extreme underpricing observations and including the additional firm- and country-level covariates. Interestingly, across the six models in Table 15, this research finds there is overall support for H1, H2, and H3. The results indicate that within advanced G20 equity markets, one percentage increase in PR and DF leads to reduced underpricing by 1% and 1.1%, respectively. Entrepreneur founders who employ reputable underwriting banks to underwrite their IPO firms in developed stock markets reduce their underpricing by 4.2%. When the length of the elapsed time and IPO size increases by one unit, underpricing of IPO firms listed in developed economies decreases by 1% and 2.5%, respectively.

Results related to the additional firm- and country-level variables show consistent results with previous literature. Within developed stock markets, this research finds that technology firms, integer offer price, and domestic market size increases IPO underpricing (Boulton et al. 2010; Banerjee et al. 2011; Hopp & Dreher 2013). In contrast, IPOs incur higher underwriting fees and those listed during a crisis period experience lower underpricing (Fang 2005; Güçbilmez 2015). Variables related to BBM, PF, and FMS were found not to affect underpricing in developed G20 stock markets (Engelen & van Essen 2010; Autore et al. 2014).

Remarkably, when this research employ developing G20 data as shown by the 18 models in Tables 16 and 17, this research obtains interestingly reverse evidence. This research first rejects the endogenous underwriting-underpricing relationship as shown by the results of the Housman Endogeneity Test for Models 1, 4, and 7 in Table 16 and for Models 10, 13, and 16 in Table 17[21]. However, the source of this rejection turned out to be due to the employment of a weak instrumental variable as indicated by the outputs of the Cragg and Donald Weak Instrument Test for the same models. To overcome this problem, this research employs the second instrumental variable that equals to ratio of the median amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the median number of underwritten IPOs in that country.

[21] For these models, the author employs a ratio equalling to the average amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the average number of underwritten IPOs in that country.

Table 15: Excluding Outliers and Controlling for Omitted Variable Bias Using the 2SLS Models for Developed G20 Countries

Variables	Model 1 Clustered on YE	Model 2 Clustered on IE	Model 3 Clustered on CE	Model 4 Clustered on YI & IE	Model 5 Clustered on YE & CE	Model 6 Clustered on IE & CE
Firm-level variables						
PR	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	[-6.85]	[-7.25]	[-4.89]	[-7.27]	[-6.64]	[-5.90]
DF	-0.011***	-0.011***	-0.011***	-0.011***	-0.011***	-0.011***
	[-8.14]	[-8.75]	[-6.17]	[-9.53]	[-7.82]	[-8.17]
UR	-0.042**	-0.042***	-0.042	-0.042***	-0.042**	-0.042**
	[-2.29]	[-2.70]	[-1.15]	[-2.37]	[-1.92]	[-1.65]
PMV	-0.056	-0.056**	-0.056	-0.056	-0.056	-0.056
	[-0.76]	[-1.69]	[-0.33]	[-1.08]	[-0.67]	[-0.61]
LET	-0.010**	-0.010**	-0.010	-0.010**	-0.010*	-0.010
	[-1.70]	[-1.93]	[-0.82]	[-1.96]	[-1.45]	[-1.22]
LOP	-0.025***	-0.025***	-0.025**	-0.025***	-0.025***	-0.025***
	[-4.89]	[-5.13]	[-1.98]	[-6.55]	[-4.59]	[-3.51]
Additional firm-level variables						
BBM	0.010	0.010	0.010	0.010	0.010	0.010
	[0.55]	[0.46]	[0.53]	[0.54]	[0.51]	[0.46]
TF	0.049***	0.049***	0.049***	0.049***	0.049***	0.049**
	[3.77]	[2.62]	[2.43]	[4.22]	[3.62]	[2.21]
PF	0.010	0.010	0.010	0.010	0.010	0.010
	[0.13]	[0.23]	[0.100]	[0.24]	[0.14]	[0.19]
IOP	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***
	[5.73]	[4.27]	[2.71]	[7.98]	[5.29]	[4.57]
UF	-0.016*	-0.016**	-0.016*	-0.016**	-0.016*	-0.016**
	[-1.30]	[-2.04]	[-1.55]	[-1.82]	[-1.43]	[-1.86]
AFC 1997	-0.090***	-0.090***	-0.090***	-0.090***	-0.090***	-0.090***
	[-5.55]	[-9.81]	[-2.65]	[-6.67]	[-2.67]	[-4.60]
GFC 2008	-0.090***	-0.090***	-0.090***	-0.090***	-0.090***	-0.090***
	[-6.40]	[-5.89]	[-4.37]	[-3.95]	[-2.50]	[-4.31]

			Additional country-level variables			
FMS	-0.011	-0.011	-0.011	-0.011	-0.011	-0.011
	[-0.34]	[-1.15]	[-0.88]	[-0.63]	[-0.38]	[-0.92]
MS	0.11***	0.11***	0.11***	0.11***	0.11***	0.11***
	[2.97]	[5.54]	[2.50]	[4.04]	[2.75]	[3.33]
Dummy Effects	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**
Constant	0.57***	0.57***	0.57***	0.57***	0.57***	0.57***
	[5.64]	[5.65]	[3.22]	[7.55]	[5.08]	[5.61]
Observations	6,804	6,804	6,804	6,804	6,804	6,804
Adjusted R^2	0.19	0.19	0.19	0.19	0.19	0.19
P-value of F-statistic	0.01	0.01	0.01	0.01	0.01	0.01
Number of Clusters	22	32	12	486	179	205
			Diagnostics			
P-value of Housman Endogeneity Test	0.01	0.01	0.01	0.01	0.01	0.01
P-value of Cragg and Donald Weak Instrument Test	0.01	0.01	0.01	0.01	0.01	0.01

Note: Firm-level variables and additional control variables are as defined before in Table 3. UP is the dependent variable. Robust Z -statistics in brackets donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail and are adjusted for heteroscedasticity. Error terms are clustered by one- and two-clusters as displayed under every model.

Consistently, this research continues to refute the endogenous underwriting-underpricing association as indicated by the outputs of the Housman Endogeneity Test for Models 2, 5, and 8 in Table 16 and for Models 11, 14, and 17 in Table 17. This indicates that the reason for this rejection is not due to the use of a weak instrument. In fact, the results of the Cragg and Donald Weak Instrument Test for the same models confirm that the second instrument is robust at the 1% level of significance. This important finding implies that the reputable underwriting-underpricing relationship does in fact have an exogenous nature in developing countries. Hence, in Models 3, 6, and 9 for Table 16 and in Models 12, 15, and 18 for Table 17, this research treats the variable UR as the exogenous factor using robust clustered OLS estimation with different forms of one- and two- clustering.

Remarkably, the results of these models only provide consistent confirmation for H1, lending a weak level of support to the EWL theory in developing stock markets. Collectively, the results of the UR variable reveal that the employment of prestigious underwriters by developing IPO issuers leads to higher underpricing by 4.7%. This result along with significant and positive coefficient of UF, indicating that IPO issuers pay higher underwriting fees[22] and instead of receiving lower underpricing by reputable underwriters they receive a larger discount by 6.7%. This situation points towards one probable outcome indicating the existence of spinning's effect on IPO underpricing in developing stock markets.

This perhaps could explain why this research obtained persistently rejected results for the underwriting-underpricing relationship whenever this research captures correlations in error terms within emerging versus advanced G20 countries. This finding is in line with Liu and Ritter (2010) who find evidence showing that some underwriters benefit from their market power by receiving side payments from investors. The authors argue that underwriters are involved in such practices by heavily discounting IPO firms or offering large allocations of IPO stocks.

[22] In the un-tabulated mean equality test, the author attains evidence showing that prestigious underwriters in developing countries charge almost double underwriting fees compared to their counterparts in advanced stock markets. This thesis finds that in emerging G20 countries, high-status underwriters charge an average gross spread of 4% compared to 2.2% in developed countries where the difference between the two means is significant at the 5% level. This evidence is consistent with a similar global observation made by Torstila (2003). Across the entire sample, we find that the average gross spread is 6.2% which is relatively consistent with average gross spread of 6.7% observed in the U.S. market (Abrahamson et al. 2011).

Table 16: Excluding Outliers and Controlling for Omitted Variable Bias Using the 2SLS Models for Developing G20 Countries

Variables	Model 1 2SLS Clustered on YE	Model 2 2SLS Clustered on YE	Model 3 OLS Clustered on YE	Model 4 2SLS Clustered on IE	Model 5 2SLS Clustered on IE	Model 6 OLS Clustered on IE	Model 7 2SLS Clustered on CE	Model 8 2SLS Clustered on CE	Model 9 OLS Clustered on CE
					Firm-level variables				
PR	-0.022***	-0.025***	-0.030***	-0.022***	-0.025 ***	-0.022***	-0.021*	-0.025	-.026*
	[-3.17]	[-4.43]	[-4.18]	[-3.34]	[-3.35]	[-3.17]	[-1.30]	[-1.24]	[-1.30]
DF	-0.024***	-0.025***	-0.022***	-0.024***	-0.025***	-0.022***	-0.024*	-0.025*	-0.022
	[-3.41]	[-4.58]	[-4.09]	[-3.61]	[-3.54]	[-2.99]	[-1.39]	[-1.35]	[-1.16]
UR	0.049	0.010	0.047**	0.049	0.010	0.047***	0.049	0.010	0.047***
	[0.14]	[0.043]	[2.05]	[0.17]	[0.054]	[4.14]	[0.12]	[0.036]	[3.97]
PMV	0.012	0.012	0.012	0.012***	0.012***	0.012***	0.012	0.012	0.012
	[0.83]	[0.83]	[0.79]	[4.20]	[4.14]	[3.51]	[1.01]	[1.14]	[1.07]
LET	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
	[-0.19]	[-0.24]	[-0.22]	[-0.38]	[-0.47]	[-0.40]	[-0.51]	[-0.99]	[-0.81]
LOP	-0.025	-0.021**	-0.025***	-0.025	-0.021**	-0.025***	-0.025	-0.021	-0.025
	[-0.83]	[-1.98]	[-2.70]	[-0.95]	[-2.02]	[-3.49]	[-0.55]	[-1.05]	[-1.23]
					Additional firm-level variables				
BBM	-0.10*	-0.100*	-0.10*	-0.10*	-0.100**	-0.10**	-0.10**	-0.100**	-0.10***
	[-1.49]	[-1.41]	[-1.45]	[-1.46]	[-1.66]	[-1.77]	[-2.57]	[-2.39]	[-2.57]
TF	0.039**	0.040**	0.039**	0.039***	0.040***	0.039***	0.039**	0.040**	0.039**
	[1.92]	[2.09]	[2.01]	[3.54]	[3.89]	[3.94]	[2.08]	[1.99]	[1.88]
PF	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
	[-0.048]	[-0.079]	[-0.051]	[-0.074]	[-0.12]	[-0.079]	[-0.049]	[-0.073]	[-0.045]
IOP	-0.12***	-0.11***	-0.12***	-0.12***	-0.11***	-0.12***	-0.12**	-0.11***	-0.12***
	[-3.23]	[-2.75]	[-2.76]	[-2.53]	[-4.24]	[-5.06]	[-2.06]	[-2.65]	[-2.97]
UF	0.067**	0.067**	0.067**	0.067***	0.067***	0.067***	0.067***	0.067***	0.067***
	[2.26]	[2.30]	[2.20]	[3.16]	[3.02]	[3.05]	[2.81]	[2.96]	[2.69]
AFC 1997	-0.078	-0.095	-0.079	-0.078	-0.095***	-0.079**	-0.078	-0.095	-0.079
	[-0.45]	[-0.81]	[-0.78]	[-0.80]	[-2.91]	[-2.17]	[-0.44]	[-1.08]	[-1.08]
GFC 2008	-0.010	0.010	-0.010	-0.010	0.010	-0.010	-0.010	0.010	-0.010

	[-0.068]	[0.037]	[-0.083]	[-0.085]	[0.059]	[-0.15]	[-0.043]	[0.026]	[-0.062]
Additional country-level variables									
FMS	-0.11**	-0.11**	-0.11**	-0.11***	-0.11***	-0.11***	-0.11**	-0.11***	-0.11**
	[-2.02]	[-2.19]	[-2.04]	[-4.02]	[-3.78]	[-3.71]	[-2.18]	[-2.73]	[-2.68]
MS	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***
	[5.42]	[5.40]	[5.23]	[13.2]	[12.7]	[12.6]	[4.64]	[4.76]	[4.42]
Dummy Effects	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**
Constant	1.17***	1.12***	1.16***	1.17**	1.12***	1.16***	1.17*	1.12**	1.16**
	[2.45]	[3.81]	[4.01]	[2.31]	[3.88]	[4.94]	[1.34]	[2.16]	[2.21]
Observations	2,840	2,840	2,840	2,840	2,840	2,840	2,840	2,840	2,840
Adjusted R^2	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
P-value of F-statistic	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Number of Clusters	20	20	20	30	30	30	10	10	10
Diagnostics									
P-value of Housman Endogeneity Test	0.95	0.64	N/A	0.99	0.42	N/A	0.96	0.43	N/A
P-value of Cragg and Donald Weak Instrument Test	0.25	0.01	N/A	0.30	0.01	N/A	0.30	0.01	N/A

Note: Firm-level variables and additional control variables are as defined before in Table 3. UP is the dependent variable. Robust Z -statistics in brackets donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail and are adjusted for heteroscedasticity. Error terms are clustered by one- and two-clusters as displayed under every model.

Table 17: Excluding Outliers and Controlling for Omitted Variable Bias Using the 2SLS Models for Developing G20 Countries (Continues)

Variables	Model 10 2SLS Clustered on YE & IE	Model 11 2SLS Clustered on YE & IE	Model 12 OLS Clustered on YE & IE	Model 13 2SLS Clustered on YE & CE	Model 14 2SLS Clustered on YE & CE	Model 15 OLS Clustered on YE & CE	Model 16 2SLS Clustered on IE & CE	Model 17 2SLS Clustered on IE & CE	Model 18 OLS Clustered on IE & CE
Firm-level variables									
PR	-0.021***	-0.025***	-0.024***	-0.021**	-0.025***	-0.024***	-0.021**	-0.25**	-0.024 ***
	[-2.90]	[-3.83]	[-4.41]	[-2.04]	[-2.48]	[-2.72]	[-2.54]	[-2.24]	[-2.34]
DF	-0.024***	-0.025***	-0.020***	-0.024**	-0.025 ***	-0.020***	-0.024***	-0.25 ***	-0.020 **
	[-3.22]	[-4.38]	[-3.88]	[-2.22]	[-2.73]	[-2.48]	[-2.81]	[-2.46]	[-2.13]
UR	0.049	0.0031	0.047***	0.049	0.0031	0.047**	0.049	0.0031	0.047***
	[0.12]	[0.053]	[2.43]	[0.11]	[0.041]	[2.20]	[0.12]	[0.049]	[3.23]
PMV	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012*	0.012*
	[0.89]	[1.00]	[0.98]	[0.81]	[0.89]	[0.86]	[1.16]	[1.37]	[1.36]
LET	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
	[-0.21]	[-0.30]	[-0.26]	[-0.20]	[-0.28]	[-0.24]	[-0.33]	[-0.54]	[-0.48]
LOP	-0.025	-0.021***	-0.025***	-0.025	-0.021**	-0.025**	-0.025	-0.021	-0.025*
	[-0.77]	[-2.62]	[-3.34]	[-0.63]	[-1.76]	[-2.25]	[-0.60]	[-1.24]	[-1.51]
Additional firm-level variables									
BBM	-0.10**	-0.100**	-0.10**	-0.10*	-0.100*	-0.10*	-0.10**	-0.100**	-0.10**
	[-1.74]	[-1.78]	[-1.86]	[-1.42]	[-1.45]	[-1.52]	[-1.99]	[-2.16]	[-2.28]
TF	0.039**	0.040**	0.039**	0.039**	0.040**	0.039**	0.039***	0.040***	0.039***
	[1.88]	[2.10]	[2.08]	[1.69]	[1.78]	[1.76]	[2.55]	[2.66]	[2.66]
PF	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010	-0.010
	[-0.044]	[-0.077]	[-0.050]	[-0.051]	[-0.082]	[-0.054]	[-0.060]	[-0.092]	[-0.061]
IOP	-0.12***	-0.11***	-0.12***	-0.12***	-0.11***	-0.12***	-0.12**	-0.11***	-0.12***
	[-3.25]	[-3.50]	[-3.58]	[-2.93]	[-3.05]	[-3.17]	[-2.33]	[-3.78]	[-4.03]
UF	0.067**	0.067**	0.067**	0.067**	0.067**	0.067**	0.067***	0.067***	0.067***
	[2.31]	[2.30]	[2.28]	[2.21]	[2.22]	[2.20]	[2.56]	[2.60]	[2.55]
AFC 1997	-0.078	-0.095	-0.079	-0.078	-0.095	-0.079	-0.078	-0.095*	-0.079
	[-0.42]	[-1.01]	[-0.92]	[-0.38]	[-0.83]	[-0.75]	[-0.51]	[-1.38]	[-1.30]
GFC 2008	-0.010	0. 010	-0.010	-0. 010	0.010	-0. 010	-0.010	0.010	-0.010

	[-0.082]	[0.044]	[-0.10]	[-0.044]	[0.022]	[-0.051]	[-0.052]	[0.035]	[-0.089]
				Additional country-level variables					
FMS	-0.11***	-0.11***	-0.11***	-0.11**	-0.11**	-0.11**	-0.11***	-0.11***	-0.11***
	[-2.41]	[-2.58]	[-2.53]	[-1.92]	[-2.07]	[-2.02]	[-2.96]	[-3.69]	[-3.73]
MS	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***	0.31***
	[7.13]	[7.10]	[7.06]	[4.45]	[4.44]	[4.42]	[8.19]	[8.49]	[8.33]
Dummy Effects	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**
Constant	1.17**	1.12***	1.16***	1.17**	1.12***	1.16***	1.17*	1.12***	1.16***
	[2.25]	[4.95]	[4.97]	[1.83]	[3.70]	[3.84]	[1.51]	[2.56]	[2.74]
Observations	2,840	2,840	2,840	2,840	2,840	2,840	2,840	2,840	2,840
Adjusted R^2	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
P-value of F-statistic	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Number of Clusters	267	267	267	124	124	124	165	165	165
				Diagnostics					
P-value of Housman Endogeneity Test	0.96	0.42	N/A	0.98	0.64	N/A	0.97	0.65	N/A
P-value of Cragg and Donald Weak Instrument Test	0.30	0.01	N/A	0.28	0.01	N/A	0.30	0.01	N/A

Note: Firm-level variables and additional control variables are as defined before in Table 3. UP is the dependent variable. Robust Z -statistics in brackets donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail and are adjusted for heteroscedasticity. Error terms are clustered by one- and two-clusters as displayed under every model.

Recently, Chen et al. (2017) also show that in developing stock markets such as China some IPO issuers suffer from the exploitation of influential investment banks. The authors show that powerfully connected underwriters charge IPO issuers higher underwriting fees compared to non-connected underwriters for the same service they offer.

Collectively, the findings attribute differences in level of the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty across the G20 countries and developed G20 IPOs to the occurrence of underpricing difference. Yet, in developing G20 stock markets, the EWL theory does not hold well in explaining underpricing variance. This research uncovers significant evidence documenting the endogenous underwriting-underpricing relationship in the global IPO market and between developed stock markets. However, this endogenous association does not exist in developing IPO markets. Instead, evidence of spinning behaviour is observed where high-status underwriters in developing stock markets charge IPO firms large underwriting fee, in turn, they leave large amount of money on the table for investors to cash it out at the expense of IPO owners. Entrepreneur founders in developing countries seem not to be upset by this practice because they simply do not care much about their wealth losses given that they obtain a successful listing. This is because, contrary to their developed country counterparts, developing[23] IPO issuers, on average, sell 1% and create 10% less secondary and primary shares when they go public, respectively. This is likely to justify why IPO firms domiciled in a developing G20 economy incur larger discount premiums by up to 19%.

2.9. Concluding Remarks

This chapter contributed to the ongoing debate in the IPO underpricing literature explaining differences in underpricing in the global IPO market. Here this research combined two broadly separated strands of literature. On one hand, the first strand provided fragmented results about the endogenous relationship between underwriter reputation and IPO underpricing. Conversely, the second strand focused on detecting the existence of one- and two-way clustering in error terms amongst IPO observations without proper econometric adjustment. Hence, the author provided the

[23] This is evident according to the results in Table 7 referring to the mean equality test between developed and developing nations in relation to the PR and DF variables.

first empirical evidence for the simultaneous effect of one-way and two-way clustering on the endogenous underwriter-underpricing relationship in the global IPO market. Joining those two strands of literature allowed the author to investigate important issues that could explain part of the mystifying phenomenon of underpricing difference in the global IPO market. Firstly, this thesis examined if the witnessed dispersion in IPO underpricing in the global IPO market is related to the failure to capture the endogenous effect of underwriter reputation on underpricing. Secondly, the author investigated if this underpricing difference is related to not capturing the effect of one- and two-way clustering in standard errors within years, industries, countries, and developed versus developing countries. Thirdly, this research examined if the global IPO underpricing difference is related to not capturing the simultaneous effect of endogeneity and clustering in the IPO data.

The three dimensions of the EWL theory were used to construct three research hypotheses that seek to answer the research questions. Those dimensions contained the incentive of IPO issuers, promotion costs, and *ex-ante* uncertainty surrounding the offering. This theory was chosen because it is the only one that captures the endogenous relationship between underwriter reputation and IPO underpricing built on asymmetric information explanation. This research employed a global dataset comprising 10,217 IPO-issuing firms from 22 developed and developing countries that operate within 33 industries between January 1995 and December 2016. To carry out the analysis, this thesis gradually employed a battery of empirical estimations including 48 OLS and 2SLS versions with one- and two-way clustering estimations while accounting for omitted variable bias, shared correlations in residuals between developed and developing economies, and existence of outliers. The aim of employing those models was to arrive at a reliable conclusion, i.e. if the observed variations in IPO underpricing in the global IPO market are linked to ignoring the endogenous relationship between underwriter reputation and underpricing.

This chapter emphasised that understanding IPO underpricing variance is a problematic topic in cross-country settings. Yet, the author capitalised on the three stages of econometric examination carried out by this study including the use of robust OLS, 2SLS, and one- and two-way clustered robust 2SLS models to disentangle part of this enigma. From an international perspective, this study attributed significant differences in IPO underpricing to the three dimensions of the EWL theory. This research confirmed that an increase by one percent in the incentive of IPO issuers results in lowering underpricing by up to 1.4%. Moreover, the findings uncovered significant evidence showing that when entrepreneur founders of IPO firms endogenously choose to hire high-status underwriters they successfully reduce their underpricing by up to 12%. This thesis also discovered robust evidence demonstrating that when the *ex-ante* uncertainty about IPO firms increases, IPO issuers experience higher underpricing. This is because the results revealed that IPO owners who list their firms when the pre-IPO stock market volatility is higher by one percent, on average, suffer greater IPO discount by 5%. More evidence reported showing that when the length of elapsed time between setting the offer price and first trading day increases by one unit, underpricing falls by 3.3%. The findings confirmed the observation that an increase in the size of the IPO firms by one unit also leads to reduced underpricing by 2.2% across countries.

The persisting refutation of the underwriter reputation-underpricing relationship that this research encountered whenever the author accounts for clustering in error terms between G20 stock markets motivated this thesis to dig deeper. After the author achieved complete separation of the influence of correlations between developed versus developing G20 countries, this research discovered remarkable evidence. In developed stock markets, the findings revealed that dissimilarity in IPO underpricing is related to the three dimensions of the EWL theory while it is attributed to something else in developing nations. For example, the evidence showed that an increase in the incentive of developed IPO issuers by one percent leads to reducing underpricing by up to 1.1%. This thesis also found that the endogenous choice of prestigious underwriters by IPO owners reduces underpricing by 4.2% in developed equity markets. The underpricing of IPO firms increases by up to 2.5% when the level of *ex-ante* uncertainty surrounding the IPO firm increases by one unit in these advanced economies.

In contrast, in developing equity markets, the findings documented that the endogenous underwriting-underpricing link is absent and has no effect on underpricing difference. Instead, the results provided significant evidence made this thesis inclined toward the possibility that underpricing difference is attributed to the spinning behaviour only within developing countries. The evidence this research uncovered pointed to this scenario because this research found that entrepreneur founders of IPO firms in developing nations incurred the cost of hiring reputable underwriters paying them high underwriting fees. In turn, instead of receiving lower discount, IPO firms suffered greater underpricing by 4.7% when hiring prestigious underwriters compared to non-reputable underwriting banks. The results related this finding to the lack of care IPO issuers illustrated about their willingness to accept wealth losses. Consequently, the results attributed the significant difference in underpricing of 19% between developed and developing stock markets to the variation in the incentive of IPO issuers when going public. This is because, on average, unlike their counterparts in developed economies, the evidence this thesis uncovered showed that owners of IPO firms in developing countries sell 1% and create 10% less secondary and primary shares when they go public, respectively.

Chapter Three: The Modifier Effect of Country-level Transparency on Global Underpricing Difference: New Hierarchical Evidence

3.1. Introduction

Underpricing of Initial Public Offerings (IPOs) occurs when the share price for a newly listed firm on its first trading day exceeds its offer price. This underpricing is a documented global phenomenon with notably varying levels of underpricing distinctions across countries (Engelen & van Essen 2010; Banerjee et al. 2011; Judge et al. 2014; Boulton et al. 2017). For instance, Loughran et al. (1994) report periodic global underpricing figures across 54 nations dated January 9, 2018. Specifically, they document the following for average initial return: 16% in the United States, 33.1% in Brazil, 21.8% in Australia, 145.4% in China, 6.5% in Canada, 7.4% in Denmark, 50.80% in Greece, 88% in India, 24.90% in Indonesia, 44.70% in Japan, 270.1% in the United Arab of Emirates, and 16% in the United Kingdom, etc. This wide underpricing dispersion emphasises the importance of understanding well what contributes to differences in IPO underpricing across countries by looking at country-specific characteristics (Boulton et al. 2010). This is because a nation's business environment is likely to be shaped and influenced by the formal institutional set-up it has put in place (Hopp & Dreher 2013).

The law and finance literature was advanced by La Porta et al. (1997) and La Porta et al. (2002). The authors established and demonstrated the vital impact of formal institutional environments, such as the quality of a nation's legal system or its level of transparency or its level of governance, on various corporate finance activities. This enabled the IPO literature to account for the impact of country-specific transparency characteristics on IPO underpricing difference from nation to nation. Two conflicting strands of law and IPO underpricing literature emerge to examine the association between variations in country-level formal institutional[24] environments and the phenomenon of underpricing difference across countries.

[24] The intersection of the law and finance literature measures differences in the formal institutional environments by variations in country-level legal system or governance or transparency aspects. Hence, these terms are used interchangeably by the law and IPO underpricing literature and also by this thesis.

The first strand employs OLS-based econometric modelling providing fragmented results in relation to the transparency-IPO underpricing relationship. This school of thought, for example, employs a number of country-level formal institutional measures including creditors' rights, property rights, efficient judicial system, public enforcement mechanisms, rule of law, anti-self-dealing, control of corruption, and voice and accountability. For instance, Boulton et al. (2010), Banerjee et al. (2011), Hopp and Dreher (2013), and Autore et al. (2014) provide contradictory evidence from being significantly positive to negative to being insignificant at all. This makes any understanding of the transparency-IPO underpricing relationship problematic. Therefore, it becomes unclear if the observed differences in IPO underpricing in the global IPO market are due to: firstly, a weakness in country-level transparency; secondly, a reinforcement of country-level transparency; or thirdly, a difference in country-level transparency is basically indeterminate to the IPO market. This motivates this thesis to pose the following question: could the observed differences in IPO underpricing in the global IPO market be related to the variability in country-level transparency?

The second group of the law and IPO underpricing literature is only represented by the work of Engelen and van Essen (2010) who demonstrate that IPO data has an unobservable hierarchical structure. These authors contend that ignoring the hierarchical structure of the IPO data leads to biased results. This creates a lack of methodological credibility in the findings of prior law and IPO underpricing literature that employed OLS-based modelling (Engelen & van Essen 2010). This is because OLS-based estimation does not capture the nesting structure in the IPO data. This hierarchical or nesting structure implies that IPO firms within a country could be more alike, on average, than IPO firms from different countries. These within-country IPOs, for example, share similar country-level transparency characteristics that differ from other IPO firms listed in other nations. For example, the notion of the hierarchical structure postulates that IPOs listed in China should share similar low country-level investor protection characteristics in comparison to high country-level investor protection characteristics observed in Australia. This implies that error terms between IPOs listed in Australia are likely to correlate because they share a similar level of transparency, likewise for China. Not accounting for the impact of sharing similar country-level transparency characteristics would lead to a violation of the assumption of independence of observations in statistical models, leading to biased results (Steenbergen & Jones 2002).

In nesting structure data such as IPO data, the independence assumption is frequently violated, encouraging OLS-based models to provide biased standard errors that are too small for the parameters estimates (Twisk 2006; Judge et al. 2014). Hox et al. (2018) argues that fixing the intercept of a model implies that observations only belong to one nest of which observations are scattered amongst unobserved several nests. The issue of nesting and hierarchical structure has a severe effect on standard errors as such data implies that error terms should be correlated within a nest or hierarchy. However, between nests or hierarchies are uncorrelated and this subsequently produces inflated T-statistic values, leading to erroneous conclusions being drawn from over-rejecting the true null hypothesis (Cameron & Miller 2015). Engelen and van Essen (2010) also argue that studies that employ OLS method aggregate the results by pooling all observations, creating a mean intercept for the entire model. They find that once they allow the intercept to vary across 21 countries, they find a statistically negative relationship between country-level legal system and underpricing across countries of which the variability in those 21 countries explained 10% of the underpricing difference. This leads the auhtor to pose the following hypothetical question; did failure to recognise the hierarchical structure of the IPO data lead to fragmentation in results of previous law and IPO underpricing literature in relation to the true nature of the transparency-IPO underpricing relationship? Stated differently, could the observed differences in IPO underpricing in the global IPO market be related to the variability in country-level transparency if the hierarchical structure in the IPO data is empirically captured?

The distinguished empirical work of Engelen and van Essen (2010) has a number of limitations might affect their generalisability and reliability. Firstly, they did not recognise the time-variant[25] property of country-level transparency, and secondly, employed IPO data that is largely dominated by developed countries. Thirdly, they did not control for the endogenous relationship between underwriter reputation and IPO underpricing, and fourthly, they neglected the importance of a possible modifier effect of inter-temporal "time-variant" changes in country-level transparency on the behaviour underpricing determinants. These issues could well impact on the relationship between firm-level variables and IPO underpricing across countries. This motivates this research to pose the following question; can capturing the modifier effect of inter-temporal changes in country-level transparency provide a better understanding of the phenomenon of underpricing

[25] This thesis uses the terms 'time-variant' and 'inter-temporal changes' interchangeably in this thesis since they both refer to changes over time.

difference in the global IPO market? This thesis attempts to answer some of those questions in this chapter.

In this chapter, the author bridges the two literature strands by providing exhaustive empirical evidence for the modifier effect of inter-temporal changes in country-level transparency on the underpricing difference across countries. Specifically, this chapter aims to find if the perceived differences in IPO underpricing in the global IPO market are due to: the direct effect of inter-temporal changes in transparency across countries; indirect effect of inter-temporal changes in country-level transparency on IPO underpricing; or to both while accounting for the simultaneous direct and indirect effects.

Here, a number of deliberate departures from the current empirical literature are noted. First, this research employs 34 Hierarchical Linear Modelling (HLM) models with random intercept only, random intercept with firm-level variables, and random intercept and random slope coefficient while controlling for various firm-level factors. This robust examination is undertaken for the purpose of investigating the direct influence of time-variant changes in country-level transparency on underpricing difference in the global IPO market using the Entrepreneurial Wealth Losses (EWL) theory, which seeks to explain the endogenous underwriter-underpricing relationship. More importantly, this research examines if the variability in country-level transparency significantly modifies the relationship between IPO underpricing and firm-level covariates. This thesis also examines the nature of the endogenous underwriter reputation-underpricing relationship in varying transparency environments. This allows the author to extend the empirical testing for the EWL theory by understanding how the relationship between the theory and the phenomenon of underpricing difference in the G20 countries may vary in terms of variability in country-level transparency. Second, this research employs a large set of global IPO underpricing data comprising 10,217 firms from 22 advanced and emerging countries that were listed between January 1995 and December 2016. Employing this global dataset helps this thesis to produce the first comprehensive cross-country study examining the impact of the nesting structure of the IPO data across different transparency nests. It also assists in explaining the underpricing difference in a global context.

The results confirm that by accounting for the hierarchical structure of the IPO data, 22%, 25%, and 5% of the variations in IPO underpricing are attributed to differences between all G20 (22 economies), developing G20 (10 economies), and 12 developed G20 (12 economies) countries, respectively. By employing five time-variant country-level transparency proxies including voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption, this research manages to explain up to 35% of the variability in IPO underpricing across G20 countries. Most importantly, this thesis provides a solid confirmation of the negative impact of time-variant variability in country-level transparency in reducing underpricing differences across the G20 countries. Hence, the results confirm that treating country-level formal institutional quality as time-invariant factor leads to biased conclusions. This finding has a serious implication for Engelen and van Essen (2010) in that these authors disregard the time-variant nature of changes in the quality of legal system across countries when deriving their underpricing difference results. The results provide new evidence linking the enhancement of formal institutional quality to wield an indirect influence on IPO underpricing in three possible ways. The first is by increasing the relationship between underpricing and the incentive of IPO issuers by up 1.4%. The second is marked by curtailing the relationship between underpricing and high-status underwriters by up to 12%. The third way is by weakening the connection between underpricing and *ex-ante* uncertainty surrounding the offering by up to 5% for every unit increase in transparency. Hence, the work confirms that capturing the simultaneous direct and indirect effects of variability in country-level formal institutional quality is very important in understanding the global underpricing difference in the primary market.

Additionally, more profound analysis of the split sample revealed that the dissimilarities in transparency factors elucidate up to 28% of underpricing difference within developing G20 economies. Contrarily, this research finds that only characteristics of firms in emerging economies elucidate up 8% of the underpricing difference. Not found here is any association between differences in country-level transparency and underpricing variance within developed G20 economies. This is perhaps because advanced economies already attain a mature level of transparency in their equity markets. Thus, any small improvements in a country's governance performance do not reflect on their stock markets in contrast to emerging countries. The findings also document that the three dimensions of the EWL theory partially explain underpricing dissimilarity across G20 countries when transparency is in play. This is because this research finds only support for the incentive of IPO issuers and *ex-ante* uncertainty in affecting IPO underpricing while the role of high-status underwriters is insignificant across the 22 largest economies. The theory has only a minor relevance to advanced and emerging G20 countries as well. This is because the author only attains support for the first dimension of the EWL model, the incentive of IPO issuers, in explaining IPO underpricing variance within developed and developing G20 countries. Although the results affirm the endogenous relationship between reputable underwriters and underpricing, the influence of high-status underwriters emerges as significantly and negatively related to underpricing only in advanced economies. Remarkably, when country-level formal institutional quality is in play, the findings reveal that prestigious underwriters in developing equity markets exploit the availability of fragile legal system in their nations. Therefore, they deliberately underprice issuers. This is possibly done to benefit themselves and their buy-side institutional investors. This finding encouraged the auhtor to assert that in such countries with a weak formal institutional environment, owners of IPO firms will be undermined in their intention to sue fraudulent underwriting banks when deliberate underpricing is evident.

The results thus suggest the probable existence of spinning behaviour in developing IPO markets. The findings reveal that this practice likely exists because IPO firms tolerate the expense of employing reputable underwriters and instead of attaining lower underpricing, IPOs underwritten by prestigious underwriters suffer from greater underpricing. Finally, this research finds the relationship between *ex-ante* uncertainty and underpricing contradicts the prediction of the EWL model within developed and emerging countries. This implies that in a cross-country setting, IPO underpricing difference is more closely related to differences in country-level formal institutional quality while firm-level determinants play a less important role. The confidence in the results remained intact after executing a series of robustness tests, including additional firm and country-level covariates, and performing several diagnostic tests.

Taken together, the results contribute to the growing but fragmented body of literature that examines the relationship between differences in country-level formal institutional quality on underpricing difference in the IPO market. The notable studies on this context, for example, include: Boulton et al. (2010), Banerjee et al. (2011), Hopp and Dreher (2013), Autore et al. (2014), and Hearn (2014). In a more focused way, the study contributes to the intersection of law and IPO underpricing literature that captures the importance of the hierarchical structure of the IPO data, while testing the direct and indirect effects of differences in country-level formal institutional quality on underpricing difference. This is evident only in the analysis conducted by the distinguished work of Engelen and van Essen (2010) which the author extends in this study. This is done by accounting for the modifier effect of inter-temporal changes in country-level transparency on affecting the relationship between firm-level variables and IPO underpricing across nations.

Second, this research contributes to several strands of literature that utilise data suffering from the nesting effect in error terms while examining the effect of differences in country-level formal institutional quality on different capital market outcomes. For instance, scholars in the field of IPO activity (Lewellyn & Bao 2014; Gupta et al. 2018), financial stability (Anginer et al. 2018), capitalisation strategies for banks (Anginer et al. 2016), mergers and acquisitions (Bris et al. 2008; Dang et al. 2018), and seasonal equity offering (Gupta et al. 2013; Fauver et al. 2017) all document the presence of a nesting structure in their data while investigating the impact of differences in institutional quality across countries without proper econometric adjustment. Such studies may benefit from the results which tackles econometrically the modifier effect of inter-temporal changes in country-level institutional quality in affecting the relationship between their independent and dependent variables. Furthermore, the results can benefit IPO issuers and investors in understanding the direct and indirect effects of differences in country-level formal institutional quality on underpricing difference in the global IPO market. For example, based on the findings, IPO issuers and investors can better understand that when the degree of transparency in a country is low then the positive impact of *ex-ante* uncertainty on underpricing increases, in turn triggering higher investor demand for underpricing.

Consequently, the low degree of country-level transparency works as a positive modifier effect in increasing the magnitude of the positive association between the *ex-ante* uncertainty of IPO investors and underpricing across countries. This surely allows IPO issuers and investors to articulate informed investment decisions. Policy-makers in G20 countries, specifically within developing economies, are interested in expanding their local stock markets. This of course would support their local economic growth plans where the growth of IPOs is seen as a fundamental tool in ensuring perpetual stock market growth (Tian 2011; Jamaani & Roca 2015). Thus, policy-makers in the G20 markets will benefit from a better understanding of the extent to which their country-level transparency can economically affect underpricing in local stock markets. The results offer them the opportunity to make the proper adjustment to reduce the impact of lack of transparency on their stock market growth.

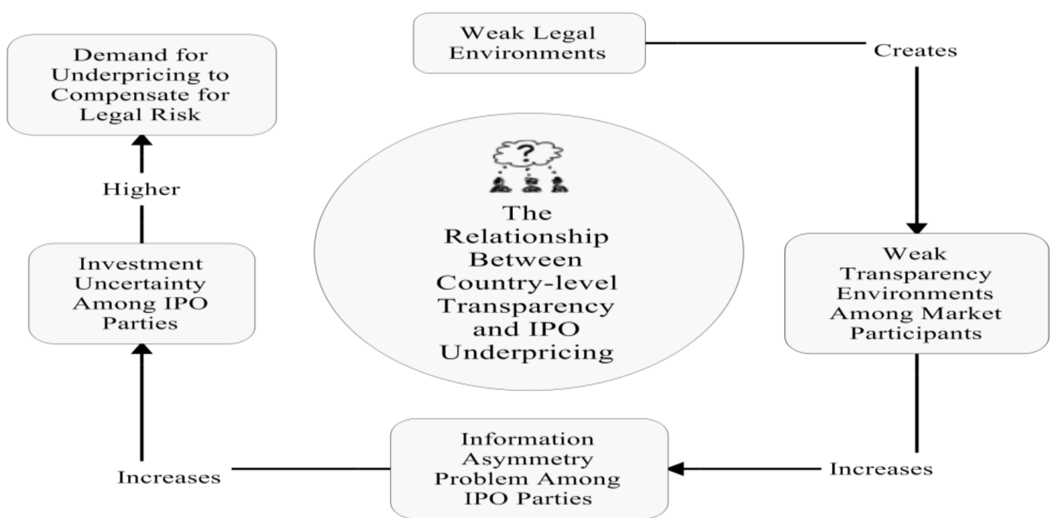
This chapter is organised as follows: Section 3.2 presents a brief literature review on the impact of country-level transparency on underpricing using OLS-based estimation. Section 3.3 discusses related literature on the impact of country-level transparency on underpricing using HLM-based estimation. Section 3.4 presents the research questions and hypothesis development. Sections 3.5 and 3.6 outline the data and methodology employed in this chapter. Sections 3.7 and 3.8 present the empirical results and concluding remarks, respectively.

3.2. Related Literature on the Impact of Country-level Transparency on Underpricing Using OLS-based Estimation

The law and finance literature has been advanced by the work of La Porta et al. (1997) and La Porta et al. (2002), who have recognised and confirmed the significant influence of variations in the formal institutional environments, such as differences in countries' legal system, on several corporate finance activities across countries. The prominence of differences in the quality of formal institutional framework in shaping country-level transparency environments that affect the information asymmetry environment and its impact on investment decisions and asset pricing, has been increasing in the finance literature. There is a significant strand of empirical research linking the existence of good transparency at the country-level with a decrease in the information asymmetry problem at the country-level, resulting in the following: an increase in investment attraction (Globerman & Shapiro 2003; Razin & Sadka 2007); reduced excessive capital flow volatility (Wei & Shleifer 2000; Gelos & Wei 2005); lower investor herding behaviour (Gelos & Wei 2002; Zhou & Lai 2009); enhanced market valuation (La Porta et al. 2002; Klapper & Love 2004); improved stock market liquidity (Brockman & Chung 2003; Pagano & Volpin 2012); reduced cost of equity capital (Easley & O'hara 2004; Chen et al. 2009); reduced susceptibility of a country's financial markets to a crash (Johnson et al. 2000; Mitton 2002); and finally, enhanced credit rating (Bhojraj & Sengupta 2003; Ashbaugh-Skaife et al. 2006).

The law literature facilitates the IPO literature to account for the influence of country-specific institutional environments[26] such as transparency characteristics on IPO underpricing across jurisdictions. In the pursuit of this understanding, a law and IPO underpricing literature arises. Conceptually, this literature in general attributes variations in underpricing across countries to the existence of weak legal environments reflecting the existence of weak transparency environments that increase the information asymmetry problem among IPO parties. The consequence of this is increased investment uncertainty, and higher demand for underpricing to compensate for legal risk as shown in Figure 8.

Figure 8: The Relationship Between Country-level Transparency and IPO Underpricing



(Designed by the author of this thesis)

The conceptualisation of the transparency-IPO underpricing relationship is assumed to be a negative one by the law and IPO underpricing literature. In practice, this literature progresses into two methodological strands producing fragmented empirical results about the true nature of the transparency-IPO underpricing relationship. The first strand employs transparency measures using OLS-based econometric models, while the second strand argues for the lack of efficiency of OLS models in capturing the nesting structure of the IPO data. Here it uses HLM estimation instead.

[26] The intersection of the law and finance literature measures differences in institutional environments by variations in country-level governance or transparency or legal aspects. Hence, three terms - governance or legal or transparency - are used interchangeably by the law and IPO underpricing literature.

The first strand of the law and IPO underpricing literature employs OLS-based econometric modelling providing fragmented results in relation to the transparency-IPO underpricing relationship. This makes the ability to understand this relationship challenging. For instance, Boulton et al. (2010) use 4,462 IPOs across 29 countries from 2000 to 2004 to examine how differences in country-level governance influence the underpricing of IPO firms. They employ a number of country-level transparency proxies including creditors' rights, property rights, efficiency of judiciary system, public enforcement mechanisms, rule of law, and anti-self-dealing. Boulton et al. (2010) find contradictory evidence fluctuating from being significantly positive to negative to being insignificant at all. For example, the authors document a significantly positive association between the level of creditors and property rights and the level of IPO underpricing across those 29 countries. In contrast, the results indicate a significantly negative relationship between the level of public enforcement mechanisms and rule of law with the underpricing of IPO firms across countries. Boulton et al. (2010) find no relationship between the efficiency of judiciary system and anti-self-dealing with differences in underpricing across their sample.

Banerjee et al. (2011) employ a larger set of data using 8,776 IPO listed in 36 countries between 2000 and 2006 to examine differences in underpricing across different transparency environments. The authors measure the level of transparency in a country by the effectiveness of contract enforcement mechanisms and accessibility of legal recourse. Banerjee et al. (2011) add more fragmentary understanding to the transparency-IPO underpricing relationship. They show that the higher the level of effective contract enforcement mechanisms the lower asymmetric information problem amongst IPO parties. In turn, this leads to significantly less underpricing across countries. In contrast, the authors document a significantly positive relationship between the accessibility of legal recourse and the level of underpricing across the 36 countries. Hopp and Dreher (2013) also aim to investigate the impact of differences in the formal institutional environments on equity markets of 24 countries using 500 country-year observations between 1988 and 2005. The authors provide additional contradictory evidence widening the lack of understanding to the true nature of the transparency-IPO underpricing relationship. While Hopp and Dreher (2013) find higher underpricing in jurisdictions with stronger investor protection mechanisms, they document lower underpricing in countries with a stronger law enforcement mechanism and availability of quality accounting information.

Autore et al. (2014) argue that the employment of time-invariant transparency measures by previous law and IPO underpricing literature biases the results about the true nature of the transparency-IPO underpricing relationship. Hence, they contend that omitting the time-variant nature of differences in institutional environments across countries plays a major role in observing the fragmentary results by prior studies. Autore et al. (2014) employ 7,397 IPOs offered in 37 countries between 1998 and 2008 to investigate the impact of time-variability in institutional quality on explaining differences in underpricing in the global IPO market. The authors measure the variability in country-level transparency by the annual change in voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption in 37 jurisdictions. They conclude the existence of overall significant evidence documenting a positive relationship between country-level transparency and IPO underpricing. However, the results of Autore et al. (2014) report the existence of a significantly positive association between the level of government effectiveness, regulatory quality, and control of corruption. In contrast, the results show no significant relationship to exist between the underpricing of IPO firms and the level of voice and accountability, political stability, and rule of law.

Opposing empirical evidence about the transparency-IPO underpricing relationship is still reported. Nonetheless Hearn (2014) argues for the importance of avoiding omitted variable bias in the law and IPO underpricing literature due to the employment of time-invariant transparency measures; the author also produces fragmented results, using 86 IPO firms from across six North African countries between 2000 and 2013. The author employs six time-variant country-level transparency proxies similar to the ones used by Autore et al. (2014). Hearn (2014) finds underpricing declines when corruption is better controlled, and effective government, political stability, and rule of law are in place. In contrast, the results show no association existing between differences in IPO underpricing and the level of regulatory quality and voice and accountability. Hearn's (2014) results contradict those of Autore et al. (2014), although they employ the same country-level time-variant transparency measures.

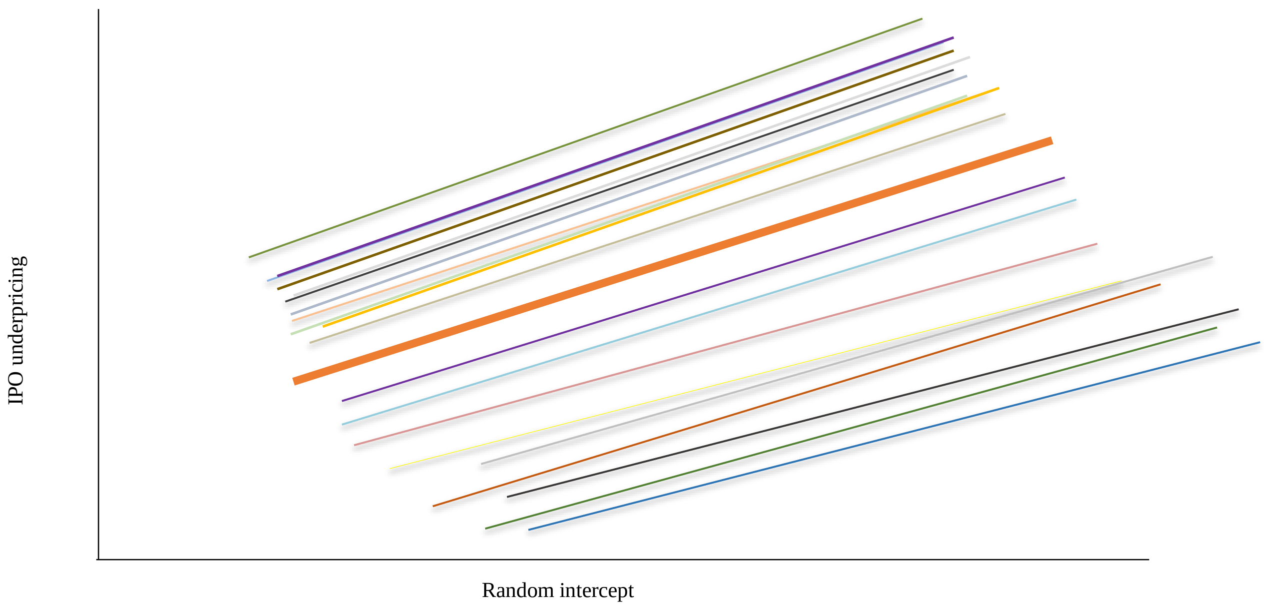
Understanding the true relationship between differences in country-level transparency and IPO underpricing across countries remains problematic in the law and IPO underpricing literature. Hence, it becomes ambiguous if the perceived variations in IPO underpricing in the global IPO market are related to either: a flaw in country-level transparency; a toughening up of country-level transparency; or a variation in country-level transparency having no relationship to the IPO market.

3.3. Related Literature on the Impact of Country-level Transparency on Underpricing Using HLM-based Estimation

The second strand of the law and IPO underpricing literature that employs the application of the HLM modelling is represented only by the work of Engelen and van Essen (2010). These authors advanced the methodological limitation of the law and IPO underpricing literature by accounting for the nesting structure of the IPO data. Engelen and van Essen (2010) employ 2,921 IPO firms nested within 21 countries between 2000 and 2005 by allowing the intercept to vary across 21 countries. They explained the variability of the intercept by differences in country-level transparency on the underpricing across countries. Engelen and van Essen (2010) measure the level of transparency or the quality of a country's legal framework by the observed annual level of anti-self-dealing index, rule of law control for corruption, legal enforcement, and legal origin in every country.

The authors employ a combination of the winner's curse hypothesis proposed by Rock (1986) and *ex-ante* uncertainty hypothesis proposed by Beatty and Ritter (1986). To visualise the concept of allowing the intercept to vary across nests such as countries or industries or years, Figure 9 provides a hypothetical example of what Engelen and van Essen (2010) achieved by using a HLM model with random intercept and fixed slope coefficients. The authors argued that once they allow the intercept to vary across 21 countries, they find a statistically and consistently negative relationship between country-level transparency and underpricing across countries of which the variability in those 21 countries explained 10% of the underpricing difference in their sample.

Figure 9: The Relationship Between Country-level Transparency and IPO Underpricing



(Designed by the author of this thesis)

However, other studies accounted for the nesting structure of the IPO data to explain underpricing difference in the IPO market including Luo (2008) and Judge et al. (2014). Yet, they do not examine the transparency-IPO-underpricing relationship. For example, Luo (2008) employs 1,981 IPOs listed in the United States stock market from 1996 to 2005, examining the nesting structure of IPO firms that nested within different industries. It was achieved by allowing the intercept to vary across industries to explain underpricing through the pre-IPO variability in marketing spendings for every industry. Judge et al. (2014) also apply HLM accounting for the nesting structure of the IPO data by allowing the intercept to vary across 17 countries using 927 IPOs between 2006 and 2008. They employ differences in the management knowledge base to explain these differences in underpricing. However, there are a number of limitations in the results reported by Luo (2008) and Judge et al. (2014) that make them difficult to be generalisable. Luo (2008) examines the impact of variability in marketing spendings across industries in the United States while Judge et al. (2014) focus on the variability of knowledge-based management across 17 countries in affecting differences in IPO underpricing. The former employs marketing-based theories developed by Srivastava et al. (1998) and Rust et al. (2004) while the latter employs knowledge-based management theory that does not account for the information asymmetry between IPO parties. Thus, they provide no understanding of the impact of the variability in country-level transparency in explaining underpricing difference across countries. Hence, the empirical work of Luo (2008) and Judge et al. (2014) cannot be generalised to the law and IPO underpricing literature.

To date, the law and IPO underpricing literature that accounts for the nesting structure of the IPO data is only represented by the unparalleled work of Engelen and van Essen (2010)[27], which has a number of limitations. First, Engelen and van Essen (2010) treat country-level transparency as a time invariant factor while in fact it is a time-variant factor. For example, they employ a number of country-level transparency measures, such as a rule of law index developed by the World Economic Forum. The index measures the extent to which individuals have assurance in and abide by the rules of society. The rule of law index includes elements that measure the incidence of violence, the effectiveness of judicial independence, and the legal enforcement of contracts. The authors used pooled average values for the rule of law index of 21 countries only for 2002 when examining IPO underpricing across these countries with IPO data between 2000 and 2005. This implies that they assume that rule of law in a country does not change over time. The World Economic Forum (2017) argues that country-level transparency proxies are time-variant factors, for example, showing the judicial independence for Chile, Brazil, Bangladesh, and South Korea from 2006 to 2014 has mean (standard deviation) values of 4.9 (55%), 3.54 (32%), 2.88 (45%), and 4.07 (56%) out of a total of 7, respectively.

In this regard, De la Torre et al. (2007) and Autore et al. (2014) argue that the status of country-level transparency varies over the course of time causing dramatic effects on capital market reforms over the last decade. This implies that the employment of contemporaneous measures provides an accurate portrayal of the relationship between institutional quality and IPO underpricing. In fact, Engelen and van Essen (2010) acknowledge this limitation by stating that "future research should look into the evolution of the institutional framework through time and its impact on IPO underpricing". Hence, the result of Engelen and van Essen (2010) is likely to suffer from omitted

[27] Recently, Zattoni et al. (2017) employ HLM modelling to capture the nesting structure of the IPO data. This is to investigate the influence of rule of law and power distance in a nation on the relationship between board independence and long-term performance "one-year" after the IPO has been listed in the secondary market. The authors use 1,024 firms listed between 2006 and 2008 in 18 countries. This thesis argues that the work of Zattoni et al. (2017) is completely different from this study. This is because this thesis examines the problem of short-term performance "IPO underpricing" of IPOs calculated as the difference from offer price and the closing price of the IPO share on its first trading day. In contrast, Zattoni et al. (2017) compute the long-term performance which is calculated as a one-year buy-and-hold abnormal market return for each IPO from the closing price of the firm on its first trading day.

variable bias as they omitted the time-variability of their transparency measures. Thus, their findings may not be reliable.

The second limitation is that the IPO data employed by Engelen and van Essen (2010) is largely dominated by developed countries. Thus, it may suffer from a lack of generalisability since their developing countries data represents less than 3% of their total data (92 out of 2,921). One possible explanation for the limited inclusion of developing market IPOs in previous empirical studies including Engelen and van Essen (2010), is that they restricted their sample selection to IPOs with offer price being no lower than $5. Interestingly, when this thesis replicates similar selection criteria that limit offer price to IPOs to more than $5 as stated in Engelen and van Essen (2010), the research sample drops from 10,217 to 2,457 observations (recall Engelen and van Essen's (2010) sample is 2,921 observations). Thus, this research argues that limiting the offer price range to exclude offerings with less than a value of $5 leads to dropping a large number of IPOs in developing countries. The reason is that average offering price of developing market IPOs is far less than in developed markets such as the U.S. stock market. For example, Kim et al. (2004) find that average offer price for IPOs listed in Thailand is equivalent to approximately $2.8, while Habib and Ljungqvist (2001) show that $11 is the average offer price in the U.S. IPO market and has been since 1970.

The third limitation to the work of Engelen and van Essen (2010) is that they do not control for the endogeneity problem between underwriter reputation and underpricing. This is because they do not control employ underwriter reputation regressor in their HLM models. Thus, they ignore the fact that choice of the underwriter is an endogenous decision made by issuers of which this happens when issuers intend to sell part of their holding before going public, and ignoring this endogeneity leads to omitted variable bias as argued by Habib and Ljungqvist (2001).

The fourth limiting characteristic of Engelen and van Essen (2010) is that they neglect the importance of a possible "modifier effect" of changes in country-level transparency in affecting the relationship between firm-specific variables and underpricing. Hence, it is possibly this "modifying effect" that could be responsible for the current differences in IPO underpricing across countries. To put this limitation into perspective, one can say that when country-level transparency is poor then a lack of trust between IPO parties exists. This leads to the information asymmetry problem, and, in turn, resulting in maximisation in the *ex-ante* uncertainty problem among investors. Consequently, this poor level of country-level transparency increases investors' *ex-ante* uncertainty requiring higher underpricing to alleviate this uncertainty. Therefore, this research argues that this modifier effect notion postulates that underpricing could be lower for IPO issuers, for example, who employ reputable underwriter and are simultaneously domiciled in a country with a high level of transparency. In contrast, IPO issuers who employ non-reputable underwriter and are simultaneously domiciled in a country with a low level of transparency will experience higher underpricing. That is, a weak level of transparency at the country-level adds more uncertainty to the existing level of uncertainty in the IPO market.

To understand and capture this modifier effect, firm-level variables have to be allowed to vary across nests, for example, across countries and to be explained by the variability in country-level transparency. This means the employment of a full HLM model utilising both random intercept and random slope coefficients in two levels of IPO data where firm-level factors are the lower level and country-level factors are the higher level (Raudenbush & Bryk 2002). Kayo and Kimura (2011) and Tennant and Sutherland (2014) allowed firm-level variables to be random across countries in examining the hierarchical explanation of determinants of capital structure for the former and to test the type of banks that profit most from fees charged for the latter. Therefore, the awareness of the modifier effect of inter-temporal changes in country-level transparency on the underpricing difference across countries is absent in the law and IPO underpricing literature. Stated differently, it is only vaguely understood if the observed variations in IPO underpricing across countries are: related to not controlling for the effect of inter-temporal changes in transparency across countries; or related to not controlling for the modifier effect of inter-temporal changes in country-level transparency; or related to not controlling for the simultaneous effects of both.

3.4. Developing Hypothesis and Research Questions

Building on the previous discussion, this chapter assesses the relevance of both firm- and country-level characteristics in explaining the variance of IPO underpricing. Specifically, this research tests the direct effect of time-variant variability in country-level transparency on explaining the underpricing difference in the global IPO market. This research also investigates the influence of time-variant differences in country-level transparency on affecting the relationship between firm-level variables and IPO underpricing across countries. These outcomes are achieved by employing the application of hierarchical linear modelling using two-level of covariates. For the lower level, the author of this thesis applies number of firm-level factors associated with the EWL theory – which has three examinable dimensions in order to examine differences in IPO underpricing across countries. Those dimensions include the incentive of IPO issuers, promotion costs, and *ex-ante* uncertainty surrounding the offering. For the upper level, this research employs five time-variant country-level transparency proxies related to the Worldwide Governance Indicators (WGIs) published by Kaufmann et al. (2017). They include voice and accountability, government effectiveness, regulatory quality, rule of law, and the control of corruption characteristics of nations. Based on this, this research pose four research questions as follows:

Q1: Do differences in country-level transparency explain IPO underpricing difference across IPO markets?

Q2: Do differences in country-level transparency influence the relationship between the incentive of IPO issuers and underpricing across IPO markets?

Q3: Do differences in country-level transparency influence the relationship between promotion costs and underpricing across IPO markets?

Q4: Do differences in country-level transparency influence the relationship between *ex-ante* uncertainty surrounding the offering and underpricing across IPO markets?

This research develops five hypotheses related to WGIs to answer the first research question related to direct influence of country-level transparency on IPO underpricing difference across IPO markets. The remaining three questions all intend to address the indirect "modifier" influence of differences in WGIs on the relationship between determining factors of IPO underpricing and underpricing difference from country to country. This thesis proposes five hypotheses to examine the influence of differences in WGIs on the link between the incentive of IPO issuers and underpricing across countries in order to answer the second research question. To address the third research question, another five hypotheses are developed to examine the influence of variability in

WGIs on the relationship between underwriter reputation and underpricing difference. To provide an answer to the fourth question, this research also proposes another five hypotheses to evaluate the effect of differences in WGIs on the link between *ex-ante* uncertainty surrounding the offering and underpricing difference across IPO markets.

3.4.1. The Direct Effect of Differences in Transparency on IPO Underpricing Difference

3.4.1.1. Voice and Accountability

The concept of voice and accountability is concerned with how a nation's people believe that their government's representatives and/or policy-makers value their opinion as worthy in relation to micro and macro government decisions (Kaufmann et al. 2017). It also captures how individuals in a state have a strong confidence in exercising their freedom to express their thoughts and communicate their affiliations to any party. Beck et al. (2004) have documented the influence of voice and accountability in a country beset by the information asymmetry problem. Houston et al. (2010) argue that the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media, affects the degree of trust or transparency existing between market participants. The more trustworthy or transparent a country is, the more it is perceived by investors to be transparent (Williams 2015). Investors in such countries that maintain a sound level of voice and accountability are likely to have a low level of *ex-ante* uncertainty about the freedom of business activities and the reliability of information from influences of government officials, firms, and well-connected citizens, as it affects the credibility of the business environment (Hearn 2012).

When investors believe that their country has a high level of voice and accountability, then their *ex-ante* uncertainty about the destruction of information in that country will consequently mitigate the information asymmetry problem in their country (Autore et al. 2014). Buchanan et al. (2012) find that a good level of voice and accountability in a country increases the inflow of foreign direct investment (FDI) and reduces FDI volatility. Hearn (2014) and Autore et al. (2014) find that when the degree of voice and accountability in a country is high then the level of *ex-ante* uncertainty amongst IPO parties is expected to be lower. Consequently, this research expects IPO firms domiciled in nations with a high level of voice and accountability to experience less *ex-ante* uncertainty leading to lower IPO underpricing. Based on the above discussion, this thesis develops the first research hypothesis as follows;

Hypothesis 1:
The underpricing IPO firm that is nested in a nation with a high level of voice and accountability is expected to be low.

3.4.1.2. Government Effectiveness

The quality of government effectiveness reflects the overall quality of government services and the liberation of policy-making in a nation from the influence of powerful members (Kaufmann et al. 2017). Beck et al. (2004) argue for the presence of a negative association between government effectiveness and the information asymmetry problem. Houston et al. (2010) contend that the transparency of a government is unlikely to be high when the following factors are also not high: quality of public sector services, quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Then the investors' uncertainty about government transparency likewise will be affected. That is, when a government is not functioning effectively in terms of safeguarding the business environment from political pressures, then it becomes easy for a business or for a connected group of investors to obtain specific information (Williams 2015).

This information is related to changes in government regulations and policies that may have an impact on their businesses before other affected parties (Hearn 2012). In such countries that lack an appropriate level of government effectiveness an asymmetric information problem emerges between market participants, including IPO parties. This leads to an increasing level of uncertainty being established among uninformed investors. Subsequently, this leads to greater required discount to offset this uncertainty (Hearn 2014). In turn, this research anticipate that IPO companies traded in stock markets where the level of government effectiveness is high to experience lower level of *ex-ante* uncertainty. Consecutively, this results in lower IPO underpricing. The second research hypothesis is presented below;

Hypothesis 2:
The underpricing IPO firm that is nested in a nation with a high level of government effectiveness is expected to be low.

3.4.1.3. Rule of Law

The rule of law in a country reflects how market participants are convinced about the enforceability of law in business and other aspects of life (Kaufmann et al. 2017). The influentially negative impact of the rule of law on the presence of the asymmetric information problem and the creation of *ex-ante* uncertainty environment amongst investors is also documented in the literature (Banerjee et al. 2011; Hopp & Dreher 2013; Williams 2015). In their argument, those authors contended that when investors have good confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence, then the business and investment environment will be fair and transparent.

Buchanan et al. (2012) uncover empirical evidence showing a positive relationship between the existence of a sound level of rule of law in a nation and an increase in FDI inflows and information symmetry. Helmke and Rosenbluth (2009), Drobetz et al. (2010), and Engelen and van Essen (2010) argue that the presence of an unfair and non-transparent business environment simply reflects weak rule of law. The authors contend that weak rule of law is blamed for triggering high asset volatility, high systemic risk, high earning management practices, and ineffective implementation of information disclosure regulations. Hearn (2011) and Hearn (2014) employed the rule of law as a proxy to examine the impact of transparency of a legal system and how it negatively affects information asymmetry amongst IPO parties. Thus, this thesis conjunctures that IPO firms nested within countries that provide a weak level of rule of law will experience greater investment uncertainty, and in turn, higher underpricing. Based on the above discussion, this research develops the third research hypothesis shown here;

Hypothesis 3:

The underpricing IPO firm that is nested in a nation with a high level of rule of law is expected to be low.

3.4.1.4. Regulatory Quality

Kaufmann et al. (2017) define a nation that has a good standard of regulatory quality as being effective in articulating and implementing legislation that supports its private sector to flourish. Chen et al. (2011) find a positive association between the existence of weak government practices and increased level of information asymmetry in the business sector. Buchanan et al. (2012) discover evidence relating lower level of asymmetric information to a reduction in FDI volatility in a country with a good standard of regulatory quality. Bruton et al. (2010) argue that in the IPO process, the asymmetric information problem can introduce moral hazard and adverse selection problems between management and the new owners. Cumming et al. (2014) assert that the former occasionally has the incentive to mislead the latter. Thus, Houston et al. (2010) and Williams (2015) contend that the efficacy of a government to formulate and implement sound policies and regulations that permit and promote private sector development can be seen as a realignment tool that works to enhance information communication and disclosure. Hearn (2014) finds that when the level of regulatory quality in a country is high then IPO firms suffer from lower level of asymmetric information problem. In turn, this research predicts that the availability of a sound level of regulatory quality in a country mitigates the asymmetric information problem amongst IPO parties resulting in lower underpricing. Based on the above discussion, posited here is the fourth research hypothesis;

Hypothesis 4:

The underpricing IPO firm that is nested in a nation with a high level of regulatory quality is expected to be low.

3.4.1.5. Control of Corruption

Kaufmann et al. (2017) define a country for being a corrupt nation when public authority is utilise d wrongly on a frequent basis to attain private interest at the expense of the public. The degree of corruption in government officials is believed to cause an asymmetric information problem amongst market participants (Drobetz et al. 2010; Lin et al. 2013). According to Engelen and van Essen (2010), the presence of bribery and corruption among government officials could allow certain groups of corrupt investors to access public information related to specific classes of information that are not readily accessible by all market participants. That is, in a market where information related to a firm's performance or related to changes in government regulation affecting the firm's activities can be easily sold, then the corrupt group of investors will be informationally advantaged, "informed" over the other uncorrupted class "uninformed" of investors (Boulton et al. 2011). The presence of this informational gap between corrupt and uncorrupted investors would increase *ex-ante* uncertainty about the true value of firms (Hearn 2012). Hearn (2014) empirically finds that IPOs offered in countries where public officials are corrupt suffer greater *ex-ante* uncertainty regarding their valuation uncertainty, in turn leading to a greater discount. Based on the above discussion, this research proposes the fifth research hypothesis below;

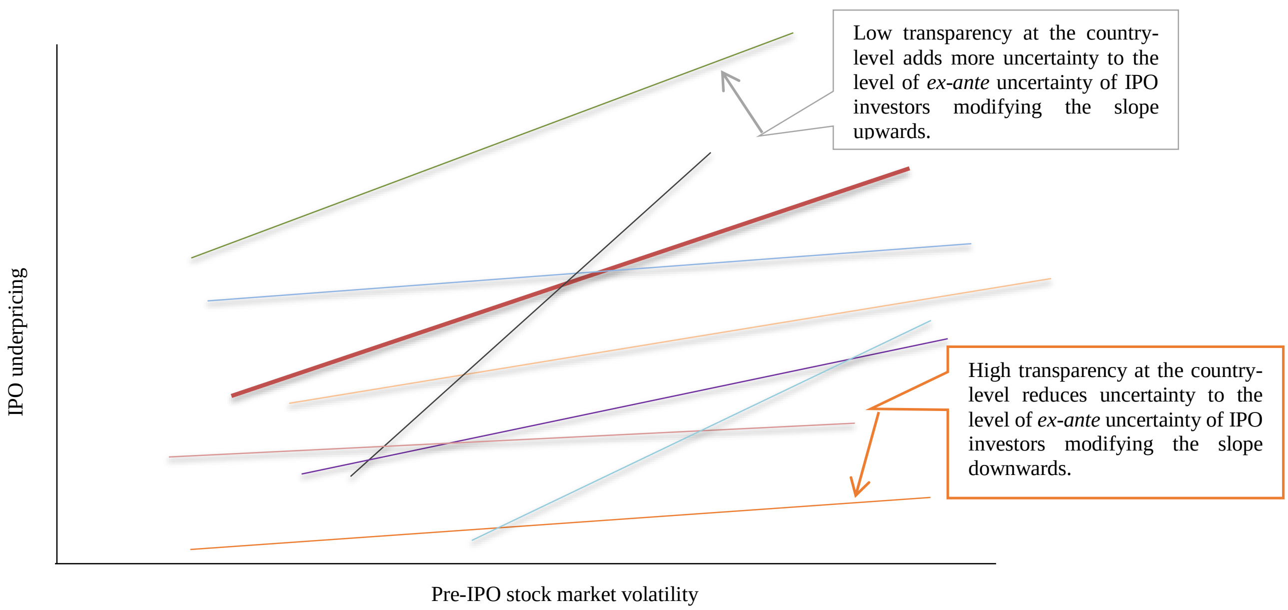
Hypothesis 5:
The underpricing IPO firm that is nested in a nation with a high level of control of corruption is expected to be low.

3.4.2. The Indirect Effect of Differences in Transparency on IPO Underpricing Difference

3.4.2.1. Relationship Between the Incentive of IPO Issuers and Underpricing

There is a paucity of empirical research into the indirect effect of formal institutional quality concerning the relationship between determinants of IPO underpricing and the observed variance in underpricing. Recently, Zattoni et al. (2017) examine the moderating effect of rule of law and how it influences the relationship between board independence and financial performance after the IPO listing. The authors employed HLM modelling for testing their indirect effect hypothesis using 1,024 firms listed between 2006 and 2008 in 18 countries. They find that a high level of rule of law modifies the link between board independence and long-term performance of IPO firms. To visualise this modifying effect, Figure 10 below provides a hypothetical example of what Zattoni et al. (2017) achieved.

Figure 10: HLM Model with Random Intercept and Random Slope Coefficients



(Designed by the author of this thesis)

In this hypothetical example, every country presents the slope coefficient of the relationship between an independent variable, for example, pre-IPO stock market volatility and a dependent variable such as IPO underpricing in that country indicating the existence of a positive relationship. Having a number of slope coefficients at different levels implies that the relationship between the dependent and independent variables is not constant as current law and finance literature assumes, in particular Engelen and van Essen (2010). By employing a full HLM model that includes random intercept and slope coefficient, Zattoni et al. (2017) conclude that differences in country-level characteristics significantly modify the relationship between the independent and dependent variables. Not accounting for this modifying effect leads to a lack of understanding of the true relationship between the independent and dependent variables across different transparency environments as argued by Osborne (2000) and Kayo and Kimura (2011).

This research conjectures that the observed positive association between pre-IPO stock market volatility and underpricing is not the same across those countries. For example, a country with a slope coefficient coloured orange has a lower positive coefficient value than a country with a slope coefficient in gray. This is because the level of transparency in the country with the orange slope coefficient is poorer than the gray one. Therefore, the level of transparency across those countries modifies the strength of the relationship between the dependent and independent variables without changing its directional nature. The change in the strength of the relationship occurs because of the low transparency level in the country with the gray slope coefficient breeding extra *ex-ante* uncertainty. Here the slope coefficient takes on a larger value as the more the *ex-ante* uncertainty, the more investors will be concerned about the price of the IPO firm on its first listing data. Hence, they demand higher underpricing to subscribe at the initial offering.

Building on the above rationale, this research anticipates that in a country with low voice and accountability, government effectiveness, regulatory quality, rule of law, and the control of corruption, the influence of IPO issuers' incentive to underprice is noticeably less. Habib and Ljungqvist (2001) and Jones and Swaleheen (2010) find a negative association between both the percentage of secondary shares sold and primary shares created and underpricing. The authors measure the incentive of IPO issuers by the percentage of secondary shares sold and primary shares created. They gathered empirical evidence showing that the higher the percentage of secondary shares sold and primary shares created, the higher the incentives of issuers to limit underpricing. This research predicts that in such countries with a low level of transparency, the formation of an asymmetric information atmosphere will make entrepreneur founders worry more about wealth losses triggered by higher anticipated underpricing. Hence, IPO issuers in such nations will have less incentive to sell more of their holdings when they go public. That is, the existence of poor formal institutional quality in the country will consequently fuel the anxiety of IPO issuers when they decide to go public. This is because in a nation with a poor transparency environment, influential players in the IPO market including politically connected institutional investors and underwriting institutions can possibly influence the law to exploit IPO issuers.

Ljungqvist (2007) and Liu and Ritter (2010), for instance, gathered evidence showing that some IPO firms were deliberately underpriced and offered at a large discount to buy-side institutional investors by powerful underwriters seeking private benefits at the expense of issuers. In a country such as China which has a poor record of voice and accountability and relaxes or ignores the rules and regulations concerning transparent market practices, Chen et al. (2017) present current evidence documenting anticipated exploitation of IPO issuers' wealth. The scholars gathered evidence presenting that politically affiliated underwriters charge entrepreneur founders of IPO enterprises greater underwriting fees when they go public. The authors show that when less powerful underwriters underwrite those IPO firms they incur lower fees. Subsequently, the wealth of IPO issuers will be seriously compromised by incurring higher underwriting fees.

There is vast empirical evidence reporting that the quality of corporate decisions and investment behaviours of entrepreneurs deteriorate when the level of voice and accountability, government effectiveness, regulatory quality, rule of law, and the successful control of corruption decline (John et al. 2008; Anokhin & Schulze 2009; Slangen & Van Tulder 2009; Acharya et al. 2011; Levie & Autio 2011). The author hypothesises that entrepreneur founders of IPO firms domiciled in countries with feeble transparency frameworks will be less interested in floating more of their shares when they go public. Based on the above discussion, this research develops the following hypotheses:

Hypothesis 6a:

High level of voice and accountability increases the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 6b:

High level of government effectiveness increases the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 6c:

High level of regulatory quality increases the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 6d:

High level of rule of law increases the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 6e:

High level of control of corruption increases the relationship between the incentive of IPO issuers and underpricing.

3.4.2.2. Relationship Between Underwriter Reputation and Underpricing

Prior IPO literature documents a positive relationship between employing reputable underwriters and a reduction in the *ex-ante* uncertainty about the firm's valuation uncertainty (Beatty & Ritter 1986; Habib & Ljungqvist 2001). Hence, IPO issuers who intend to float larger percentage of their holdings will find it necessary to employ prestigious underwriters. This need escalates when the overall observed level of information asymmetry in the country is high. This is because hiring high-status underwriters can provide a certification signal to IPO firms that in turn reduces the *ex-ante* uncertainty for anxious IPO investors about the quality of the IPO issuers. Lewellen (2006) argues that apart from demanding higher underwriting fees, underwriters with sound market reputations care more about sustaining their reputations. The author also contends that prestigious underwriters possess well-established financial and technical advisory teams that enable them to maintain strong relationships with institutional investors in the local market and abroad. Therefore, high-status underwriters have the ability to undertake inclusive evaluation for IPO firms differentiating superior quality from inferior quality issuers, which in turn facilitates a successful listing (Jones & Swaleheen 2010). For this reason, investors in the IPO market recognise prestigious underwriters are an assuring certification indicator that explains the problem of underpricing (Torstila 2003). This implies greater role for high-status underwriters in alleviating the perceived information asymmetry at the country-level.

That is why this research expects that when an IPO firm is located in a nation with low voice and accountability, government effectiveness, regulatory quality, rule of law, and the control of corruption, the link between underwriter reputation and underpricing improves. The reason behind this is that in such countries with a weak level of transparent market practices insiders tend to circulate private information (Houqe & Monem 2016). Prior literature documents a strong link between poor country-level institutional quality and the existence of an asymmetric information problem amongst market participants (Johnson et al. 2000; Ashbaugh-Skaife et al. 2006; Core et al. 2006; Fan et al. 2007; Bhagat & Bolton 2008). Consequently, in such nations with poor country governance practices where investors suffer from the existence of high level asymmetric information in their markets, IPO parties will find it difficult to make investment decisions based on inefficient information (Zattoni et al. 2017). For this reason, this thesis expects IPO investors in these sorts of transparency-poor countries will be concerned more about the endorsement role prestigious underwriters offer to IPO companies (Fang 2005; Hanley & Hoberg 2012).

Another reason for IPO investors' dependency on the certification role of reputable underwriters is to moderate the unattainability of an effective lawsuit system in the country. In such countries with weak formal institutional system investors will be incapacitated to litigate fraudulent IPO issuers when a scam is evident (Hughes & Thakor 1992; Lowry & Shu 2002; Hanley & Hoberg 2012). For instance, Hope (2003b), Khurana and Raman (2004), and Fan and Wong (2005) uncover empirical evidence documenting inferior audit quality, weak disclosure practices, and asymmetric information problem in countries where litigation risk is low. Houqe et al. (2012a) show that countries with low voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption simply motivates ongoing fraudulent financial reporting. Consequently, this research postulates that in countries that lack an adequate level of transparency, IPO investors will have to rely more on reputable underwriters. This is done to moderate their *ex-ante* uncertainty about the quality of IPO prospectus from fraudulent financial reporting. The following hypotheses are based on the above discussion:

Hypothesis 7a:

Low level of voice and accountability increases relationship between underwriter reputation and underpricing.

Hypothesis 7b:

Low level of government effectiveness increases relationship between underwriter reputation and underpricing.

Hypothesis 7c:

Low level of regulatory quality increases the relationship between underwriter reputation and underpricing.

Hypothesis 7d:

Low level of rule of law increases the relationship between underwriter reputation and underpricing.

Hypothesis 7e:

Low level of control of corruption increases the relationship between underwriter reputation and underpricing.

3.4.2.3. Relationship Between *Ex-ante* Uncertainty and Underpricing

The influence of weak formal institutional quality in a country on *ex-ante* uncertainty problem is supported in the literature. Several scholars gathered empirical evidence showing that some nations retain transparency characteristics that cause *ex-ante* uncertainty environment to be unavoidable (Black 2001; Bénassy-Quéré et al. 2007; Geiger & van der Laan Smith 2010; Abdi & Aulakh 2012; Li & Zahra 2012; Gupta et al. 2018). For instance, Li and Filer (2007) find evidence documenting the role of country-level transparency in increasing the *ex-ante* problem between entrepreneur founders and prospective investors. The authors show that in countries with weak country governance practices the volatility of foreign portfolio investment increases.

Li and Filer (2007) explained their findings by arguing that although foreign investors have ownership they lack control and trust with local managers due to the agency problem that triggers investors' *ex-ante* uncertainty. Consequently, the authors conclude that the degree of this agency problem makes *ex-ante* uncertainty of foreign investors higher when investors are investing in poor transparency nations. In this context, Bae et al. (2006) detect a positive relationship between the availability of poor country governance mechanisms and increases in stock market volatility. The authors attribute this evidence by stating that in poorly governed stock markets managerial discretion is frequently administered poorly, hence permitting managers to conceal bad news. Hope (2003b), Houqe et al. (2012a), and Houqe and Monem (2016) uncover evidence showing that investors and analysts in countries with a low level of transparency such as China, should anticipate an additional level of *ex-ante* uncertainty. The authors argue that this added uncertainty is initiated by the actuality of a poor level of disclosure quality at the country-level. This research therefore hypothesises that IPOs nested within high transparency economies, have characteristics moderating *ex-ante* uncertainty at the country-level. Subsequently, this moderates the impact of firm-level *ex-ante* uncertainty on underpricing. Based on the above discussion, this research develops the following hypotheses:

Hypothesis 8a:
Low level of voice and accountability increases the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 8b:
Low level of government effectiveness increases the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 8c:
Low level of regulatory quality increases the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 8d:
Low level of rule of law increases the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 8e:
Low level of control of corruption increases the relationship between *ex-ante* uncertainty and underpricing.

3.5. Data

This chapter employs two-level data to capture the direct and indirect effects of differences in country-level transparency on underpricing variance across the global IPO market. The first level of the dataset contains firm-level data while the second level has country-level transparency data. This results in the inclusion of 10,217 IPO-issuing firms IPOs listed between January 1995 and December 2016 in the G20 countries. The dataset is divided into three groups. The first group represents all 22 developed and developing countries. The second group includes only 12 developed economies while the third group contains only 10 emerging states. The previous and subsequent empirical chapters employ the same set of firm-level data while they differ for country-level data. In this chapter, country-level transparency data is time-variant and sourced from the annual reports of the WGIs published by Kaufmann et al. (2017) from 1995 to 2017.

The WGIs include five measures for more than 200 countries measuring institutional quality, namely voice and accountability, government effectiveness, regulatory quality, rule of law, and the control of corruption. Kaufmann et al. (2017) developed those measures and presented the combined aggregation of 30 individual data sources by gathering the opinions of numerous enterprises, citizen and expert survey respondents, think tanks, non-governmental organisations, international organisations, and private sector companies in both developed and developing countries. The employment of these country-level time-variant proxies of transparency levels from country to country, against the single dummy variable such as an individual legal origin dummy similar to the common law as opposed to civil law developed by La Porta et al. (2008), serves to enhance the understanding of the impact of variability in country-level transparency within and between markets on IPO underpricing. Thus, this time-variant feature allows this chapter to capture the improvement in institutional quality between and within countries over time. The WGIs have been used intensively in the literature to proxy for differences in institutional quality between and within countries and their implications for the capital market (Aguilera 2005; Asongu 2012; Hopp & Dreher 2013; Dewandaru et al. 2014; Hearn 2014; Zattoni et al. 2017). The number of IPO firms included in this chapter is determined following Ritter and Welch (2002) and Boulton et al. (2017) in constructing the sample selection criteria (see Table 18).

Table 18: Sample Selection Criteria for this Analysis

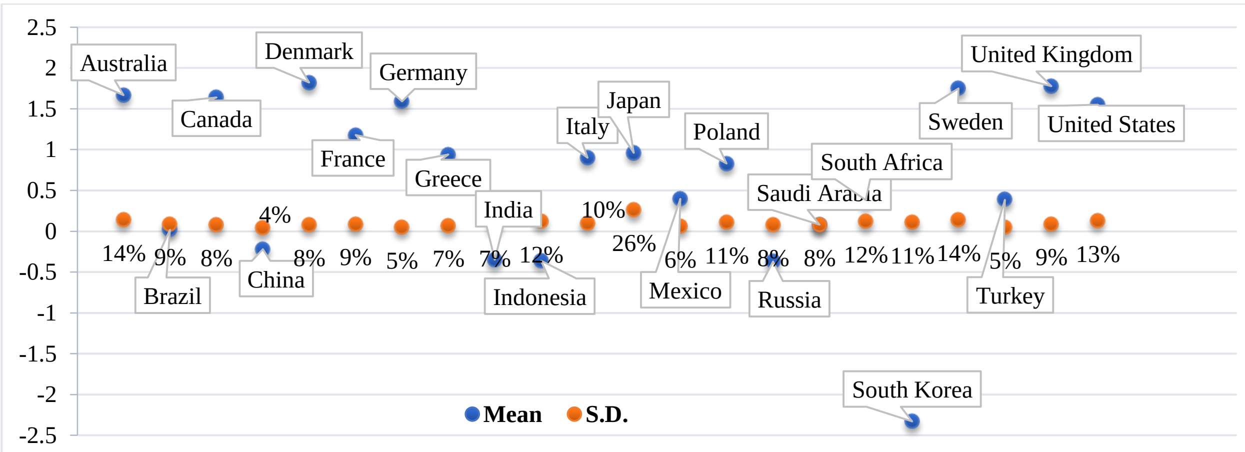
Selected search criteria	Description	Number of IPOs Matches
Exclusion of Duplicates	This research excludes all duplicate[28] IPOs from this sample from January 1995 to December 2016 (9,548 IPOs are excluded).	**32,585**
Exclusion non-trading IPOs	This research only includes IPO firms that are already traded at the time of inclusion; therefore, all pending, withdrawn, postponed, and rejected IPOs are excluded since they are beyond the research interest of this study (1,450 IPOs are excluded).	**23,037**
Exclusion of non-G20 IPOs	The G20 countries include Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, United Kingdom, and the United States plus the European Union as the 20th country. Within the European Union, Bulgaria, Denmark, Greece, Poland, Slovenia, Spain, Romania, and Sweden are included. Due to IPO data unavailability, Argentina, Slovenia, Spain, and Bulgaria, and Romania were excluded, creating a final sample consisting of 22 countries (5,951 IPOs are excluded).	**21,587**
Exclusion of IPO data with missing values for PR and DF, UR, PMV, LET, and LOP	This research excludes IPOs with missing values needed to calculate all explanatory variables (6,047 IPOs are excluded).	**15,339**
Exclusion of IPO data with missing values for UP	This research excludes IPOs with missing values of the dependent variable (2,045 are IPOs excluded).	**12,886**
Exclusion of Non initial public offering data	This research excludes REITs, ADRs, units offer, close-end-funds, and stock with warrants (2,669 IPOs are excluded).	**10,217**
Exclusion of IPO data with no country-level transparency data	All data is available. The WGIs were updated every two years between 1996 and 2002 while they are updated annually from 2003 and 2017. Hence, the author uses extrapolated values for the WGIs when their values are missing.	**10,217**

In addition to the attractive economic and stock market characteristics for the G20 countries discussed in the Data Section in the previous chapter, the G20 countries offer a distinctive dataset. The G20 economies provide diverse time-variant measures of country-level transparency. This allows for rigid testing of the research hypotheses and thereby provide generalisable answers to the research questions for this chapter. For example, Figure 11 below displays varying scores, from as

[28] This thesis follows cautionary observation made by Smart and Zutter (2003) to; firstly, scrutinise the existence of duplicate IPO records; and secondly, eliminate them from the sample to avoid double counting.

low (high) as -2.33 (1.85) out of 2.5 for Saudi Korea (Denmark), for a country-level transparency among the G20 countries proxy according to the level of regulatory quality from 1995 to 2016.

Figure 11: Regulatory Quality in the G20 Countries from 1995 to 2016



(Sourced from Kaufmann et al. (2017))

This measures the perceptions of the government's ability to formulate and implement sound policies and regulations that permit and promote private sector development. In this measure, estimate of governance ranges from approximately a value of -2.5 (weak) to 2.5 (strong) measuring the overall governance performance. The variability of this score for every country from 1995 to 2016 is considerably large as shown in Figure 11. Looking at this more closely, this research can clearly observe a large (small) change in the level of regulatory quality between 1995 and 2016 for 26% (4%) in Japan (China). Across the entire sample, the average standard deviation for G20 country is roughly 112% from the mean value of 0.80. This implies that on average the level of regulatory quality in G20 countries changes by 112% from 1995 to 2016. This simple statistical evidence clearly documents that country-level transparency is a time-variant factor within countries.

For the above discussion, the focus on the G20 countries makes it ideally possible to better understand the impact of time-variant differences in country-level transparency in explaining differences in IPO underpricing across countries. Also shown is how time-variant differences in country-level transparency can affect the relationship between firm-level variables and IPO underpricing across the G20 countries. The outcome variable is IPO underpricing (UP), which is defined as the percentage return from the offer price to the first closing price on its first trading day. Independent variables include two levels of data, specifically country-level transparency and firm-level data. The employed firm-level data along with control variables used in this chapter are similar to what was used in the previous chapter. For a detailed discussion of those firm-level data along with control variables employed, please see Table 3 in Section 2.6.1. where the variables are defined.

3.5.1. Country-level Transparency Data

Country-level transparency data includes voice and accountability (VA), government effectiveness (GE), rule of law (RL), regulatory quality (RQ), and control of corruption (CC). The rationale behind using five country-level transparency proxies is to prevent measurement error in cross-country level metrics. It is contended here that if one can attain uniform results across variables, it will provide greater confidence, in particular in cross-country research (Boulton et al. 2010; Banerjee et al. 2011; Houqe et al. 2012b). Table 19 presents the five country-level transparency variables along with description of variables, expected coefficient signs, and source of the variable.

Table 19: Key Country-level Transparency Variables

Variables	Description	Expected[29] Coefficient Sign	Source of data
Voice and Accountability (VA)	Voice and accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	**Negative**	Kaufmann et al. (2017)
Government Effectiveness (GE)	Government effectiveness reflects perceptions of the quality of public sector services, quality of the civil service and degree of its independence from political pressures, quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	**Negative**	Kaufmann et al. (2017)
Regulatory Quality (RQ)	Regulatory quality reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	**Negative**	Kaufmann et al. (2017)

[29] See Section 3.4.1. for a discussion on the expected sign of the transparency variables.

Rule of Law (RL)	Rule of law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	**Negative**	Kaufmann et al. (2017)
Control of Corruption (CC)	Control of corruption reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).	**Negative**	Kaufmann et al. (2017)

3.6. Methodology and Estimation Approach

3.6.1. HLM Estimation

Prior literature including Engelen and van Essen (2010), Li et al. (2013) Judge et al. (2014), Tennant and Sutherland (2014), and Zattoni et al. (2017) asserts that finance data including IPO data is commonly identified to embody a multilevel nesting structure. Therefore, this research structures the IPO data over two levels of data including firm- and country-level observations. At the lower level, firm-level, the data encompasses 10,217 IPO companies. At the upper level, country-level, the sample IPO firms are nested within 22 different developed and developing countries. Li et al. (2013) highlight the importance of differentiating the upper and lower levels and their outcomes, in order to better understand the individual effect for every level. Establishing accurate estimations of their interactions is important here. The IPO data take the form of an unbalanced cross-section, hence this research employs hierarchical nested estimation of the general linear modelling to investigate the nesting structure of the multilevel data (Raudenbush & Bryk 2002). To offset the effect of using unbalanced data in cross-country settings from reducing the efficiency of the estimation, this thesis follows Li et al. (2013) by employing a full maximum likelihood estimation to control for this problem.

This research attains three advantages from making use of the HLM technique in the cross-country setting. HLM, firstly, allows this thesis to capture econometrically for characteristics (i.e., dissimilarity in transparency measures) of the upper level (i.e., countries) data that is very likely to influence the characteristics (determinants of IPO underpricing) of the lower level (i.e., IPO firms).

Having such data structured in this way implies that error terms within the higher level, i.e. countries, may embody some inner strong correlations because they may share comparable country-level characteristics. Yet, across countries these error terms are not likely to exhibit any form of strong correlations (Hofmann 1997). The problem is that ignoring the existence of such a multilevel effect in finance data when it exists results in causing acute violations to basic statistical assumptions related to OLS regressions (Kayo & Kimura 2011).

The second advantage is that HLM permits this thesis to estimate the lower models, firm-level covariates, using a country mean-centered method (Kreft et al. 1995). By doing so, this research increases the accuracy of the estimation by isolating the variance of IPO underpricing into what is related to the characteristics of countries (i.e., difference in transparency proxies) in comparison with the characteristics of firms (determinants of IPO underpricing). For example, Li et al. (2013) employ a country mean-centered technique in their HLM method by centering determining factors of corporate risk-taking within each country. The authors also incorporate country-level means into the collection of independent variables, from which they manage to segregate perfectly the effects of covariances within- and between-country. For this reason, this research uses the extension of a country mean-centered method to decompose the effect of the firm-level determinants such underwriter reputation to what is attributable at the firm-level and country-level when this research creates interaction terms (i.e., transparency*underwriter reputation) (Osborne 2000). Consequently, the advantage of HLM estimation comes from its econometric competence to precisely estimate firm-level effects within every country while controlling for country-level effects (Hofmann 1997). While this research estimates the firm-level characteristics to be country-mean centered, the author models the country-level transparency covariates to be grand-mean centered following Li et al. (2013). This estimation permits this thesis to capture the direct and indirect influences of dissimilarities in country-level transparency on IPO underpricing variance from country to country (Raudenbush & Bryk 2002; Li et al. 2013).

The third advantage is that HLM technique corrects for potential size distortion which may materialise by using unbalanced sample size. It is something commonly observable in cross-section regressions related IPO underpricing testing (Li et al. 2013). IPO underpricing data is frequently distributed unevenly across industries, years, and countries. The problem is that when this research uses traditional OLS pooling estimation for unbalanced cross-section data, then the coefficient associated with a country-level covariate is likely to be spuriously significant. This is because of the effect of large sample size at the firm-level (Li et al. 2013). Ignoring the presence of such a problem may be dangerous when there are subnational dissimilarities between nations in terms of number of IPO companies attributed to every nation in the sample. Consequently, HLM rectifies this problematic issue by approximating simultaneously regression models at the country- and firm-level. In contrast, under the OLS estimation, observations related to firm-level are equally weighted. Li et al. (2013) show that this correction is attained under the HLM method by making country-level regressions weighted by the precision of the firm-level data that is contrarily associated within a country's sample size.

To accommodate the three research objectives, this research commences the empirical testing over three phases following Kayo and Kimura (2011). Phase 1 commences with the commonly named empty HLM model or the HLM null model. Here this research seeks to confirm the necessity of using HLM estimation due to the existence of a nesting structure in the data. This research also gathers some outputs related to the decomposition of IPO underpricing variance into what is related to firm- and country-level covariates. Phase 2 begins by estimating HLM models with only random intercepts. This is done to test the direct effect hypotheses related to the direct influence of dissimilarities in country-level transparency on underpricing variance across nations. Phase 3 follows by estimating a full HLM model that incorporates both random intercepts and random slopes. This step is important because it examines the indirect effect hypotheses concerned with the "modifier" effect of differences in country-level transparency covariates. These differences modify the association between determinants of IPO underpricing and underpricing variance across nations.

3.6.1.1. HLM Null Model

This phase commences formally by investigating the one-way ANOVA model. In this model, one fixed term - the grand mean - is included while a variance for the lower level (firm-level) and for the upper-level (country-level) is generated. This implies that this research omits deliberately all covariates (fixed effects) because this research focus here on the random effects component. Consequently, this research produces information related to the variance decomposition of the dependent variable (IPO underpricing). Stated differently, the empty HLM model permits this thesis to properly estimate the role for the lower level (firm-level) and for the upper-level (country-level) in the variance of the outcome variable (IPO underpricing). The empty model's null hypothesis is that there is no significant difference in the mean underpricing across the sample countries. Henceforth, this research seeks to test if differences in IPO underpricing (UP) across the G20 countries are significantly different from zero. Rejecting the null hypothesis allows this research to contend that the IPO data has a hierarchical structure. This of course justifies the employment of the HLM technique (Engelen & van Essen 2010). This research specifies the empty model as shown in Equations (1) and (2):

$$UP_{ij} = \alpha_{0j} + \eta_{ij} \tag{1}$$

where

$$\alpha_{0j} = \lambda_{00} + \mu_{0j} \tag{2}$$

The lower level, i.e. firm-level, is captured in Equation (1) while the upper level, country-level, is presented in Equation (2). In this model, a firm i is nested in the nation j where α_{0j} can be assumed as the mean IPO underpricing in the nation j, while λ_{00} is the grand mean (i.e., the mean of IPO underpricing across all IPO firms and nations). The term η_{ij} represents the random error term at the firm-level in Equation (1). This presents the extent to which a company's underpricing diverges from the mean of IPO underpricing in the country where this IPO company operates. The term μ_{0j} in Equation (2) specifies the random error term at the nation-level demonstrating how mean IPO underpricing in nation j diverges from the grand mean. The estimation of Equations (1) and (2) allows the auhtor to compute the Intra-Class Correlation (ICC) coefficient. This coefficient helps the author determine the relative importance of each level in explaining observed deviations in IPO underpricing across nations (Raudenbush & Bryk 2002). This research calculate the ICC estimator $\hat{\rho}$ by using estimates of $Var(\eta_{ij}) = \sigma^2$and $Var(\mu_{0j}) = \tau_{00}^2$, by adopting the below definition in Equation (3):

$$\hat{\rho} = \frac{\hat{\tau}_{00}^{2}}{\hat{\tau}_{00}^{2} + \hat{\sigma}^{2}} \tag{3}$$

Calculation of Coefficient of Determination

This research follows in the footsteps of Tennant and Sutherland (2014) to employ the information produced by the variance components in the random effects ANOVA model (the empty model) so that the succeeding estimations can be compared. Then this research can evaluate the efficiency and explanatory of every model this research estimate. This research assesses the elucidated variability in the variance using Equation (4):

$$R_{m}^{2} = 1 - \frac{Var(m)_{new}}{Var(m)_{ANOVA}} \tag{4}$$

The term *m* in Equation (4) denotes differences in every level where the lower level, for instance, accounts for within-country variance while between-country variance is accounted for in the second level. The term $Var(m)_{new}$ signifies the estimated variance for level *m* in the random intercept and random slope regressions. The term $Var(m)_{ANOVA}$, on the contrary, provides the required information for the one-way ANOVA model (the empty model) linked to the estimated variance in level *m*. This research runs these estimations whenever the author has a new model in order to calculate the within-country and between-country R-squares. Stated differently, HLM divdides the R-squares to elucidate variability in underpricing to what are related variations within every nation and between nations. Apart from this, HLM produces the deviance score for every estimated model. The score measures lack of fit between model and data (Gelman 2006). Overall, the rule of thumb is that the higher the deviance score, the inferior the fit to the data. The deviance is typically not inferred directly, but rather compared to deviance(s) from prior models fitted to the same data (Osborne 2000; Raudenbush & Bryk 2002).

3.6.1.2. Random Intercept HLM Models

In this phase, this research expands the basic one-way ANOVA model to include both firm-level and country-level covariates. The intercept (β_{0j}) is introduced in Equation 5 and this research allow this intercept to be random across different country-level transparency proxies. It serves to capture variability across nations in terms of UP in the lower model beyond what is explained by firm-level characteristics including $\text{Incentive of IPO Issuers}_{aij}$, $\text{Underwriter Reputation}_{bij}$, and $Ex\text{-}ante\ \text{Uncertainty}_{cij}$. By doing so, this research provides answers to hypotheses 1 to 5. Consequently, the lower level, firm-level, is specified as follows;

$$\begin{aligned} UP_{ij} = \beta_{0j} &+ \sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij} + \sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij} \\ &+ \sum_{c=1}^{C} \beta_c Ex\text{-}ante\ \text{Uncertainty}_{cij} + \in_{ij} \end{aligned} \quad (5)$$

and this research specifies the upper level using the five country-level transparency proxies as in random intercept models (6) to (10):

$$\beta_{0j} = \gamma_{00} + \sum_{D=1}^{D} \pi_d \textit{Voice and Accountability}_{dj} + \delta_{0j} \quad (6)\ (\text{H1})$$

$$\beta_{0j} = \gamma_{00} + \sum_{e=1}^{E} \pi_e \textit{Government Effectiveness}_{ej} + \delta_{0j} \quad (7)\ (\text{H2})$$

$$\beta_{0j} = \gamma_{00} + \sum_{f=1}^{F} \pi_f \textit{Rule of Law}_{fj} + \delta_{0j} \quad (8)\ (\text{H3})$$

$$\beta_{0j} = \gamma_{00} + \sum_{g=1}^{G} \pi_g \textit{Regulatory Quality}_{gj} + \delta_{0j} \quad (9)\ (\text{H4})$$

$$\beta_{0j} = \gamma_{00} + \sum_{h=1}^{H} \pi_h \textit{Control of Corruption}_{hj} + \delta_{0j} \quad (10)\ (\text{H5})$$

For the lower level equation, UP for company i in nation j is denoted by a function of firm-level characteristics, $\text{Incentive of IPO Issuers}_{aij}$, $\text{Underwriter Reputation}_{bij}$, and $Ex\text{-}ante\ \text{Uncertainty}_{cij}$ plus the random error term component $\in_{ij}$. For the upper level equation, the mean of UP in nation

j, β_{0j} is denoted as a linear combination of country-level characteristics proxies including $\textit{Voice and }\text{A}\textit{ccountability}_{dj}$, $\textit{Government }\text{E}\textit{ffectiveness}_{ej}$, $\textit{Rule of }\text{L}\textit{aw}_{fj}$, $\textit{Regulatory }\text{Q}\textit{uality}_{gj}$, and $\textit{Control of }\text{C}\textit{orruption}_{hj}$ plus interpret γ_{00} and the random error term α_{0j}. Equations (5) and (10) are consolidated to form what Tennant and Sutherland (2014) designate a mixed-effect model as shown in Equation (11):

$$
\begin{aligned}
UP_{ij} = \gamma_{00} &+ \sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij} + \sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij} \\
&+ \sum_{c=1}^{C} \beta_c \textit{Ex-ante } \text{Uncertainty}_{cij} + \sum_{D=1}^{D} \pi_d \textit{Voice and } \text{A}\textit{ccountability}_{dj} \\
&+ \sum_{e=1}^{E} \pi_e \textit{Government } \text{E}\textit{ffectiveness}_{ej} + \sum_{f=1}^{F} \pi_f \textit{Rule of } \text{L}\textit{aw}_{fj} \\
&+ \sum_{g=1}^{G} \pi_g \textit{Regulatory } \text{Q}\textit{uality}_{gj} + \sum_{h=1}^{H} \pi_h \textit{Control of } \text{C}\textit{orruption}_{hj} + \in_{ij} + \delta_{0j}
\end{aligned}
\tag{11}
$$

This thesis calls the model that has been developed in Equation (11) the formal model. This model examines the direct influence of differences in country-level transparency on underpricing variance between G20 nations. The assumption made here is that the model presented in Equation (11) is estimated based on random effects calculation. The objective here is to develop this random effects estimation, since it will have the competence to produce corresponding fixed effects coefficients for the lower level. The expectation is that this model is likely to create efficient outputs. This is because it simultaneously integrates country-level transparency characteristics for the upper level when it is properly estimated (Rabe-Hesketh & Skrondal 2008).

3.6.1.3. Random Intercept and Slope Coefficient HLM Models

In this testing phase, this research expands the previously developed model in Equation (11) following Kayo and Kimura (2011) and Tennant and Sutherland (2014). The rationale is here to develop a HLM model that permits the intercept to vary (i.e., similar to the model in Equation (11)) and to permit the slope coefficients for all of the firm-level characteristics to vary as well. Developing this model enables firm-level covariates to be elucidated by the changeability in country-level transparency covariates across nations. Therefore, such modelling allows this thesis to provide answers for the 15 hypotheses associated with the indirect influence of dissimilarities in country-level transparency. These dissimilarities moderate the association between determinants of IPO underpricing and IPO underpricing variance across nations. Equations (12), (13), and (14) present the required model for testing hypotheses 6a to 6e, 7a to 7e, and 8a to 8e, respectively:

$$\begin{aligned}\beta_a = \gamma_{10} + \gamma_{11} \textit{Voice and Accountability}_{dj} + \gamma_{12} \textit{Government Effectiveness}_{ej} \\ + \gamma_{13} \textit{Rule of Law}_{fj} + \gamma_{14} \textit{Regulatory Quality}_{gj} \\ + \gamma_{15} \textit{Control of Corruption}_{hj} + \delta_{0j}\end{aligned} \qquad \text{(12) (H6a to H6e)}$$

$$\begin{aligned}\beta_b = \gamma_{20} + \gamma_{21} \textit{Voice and Accountability}_{dj} + \gamma_{22} \textit{Government Effectiveness}_{ej} \\ + \gamma_{23} \textit{Rule of Law}_{fj} + \gamma_{24} \textit{Regulatory Quality}_{gj} \\ + \gamma_{25} \textit{Control of Corruption}_{hj} + \delta_{0j}\end{aligned} \qquad \text{(13) (H7a to H7e)}$$

$$\begin{aligned}\beta_c = \gamma_{30} + \gamma_{31} \textit{Voice and Accountability}_{dj} + \gamma_{32} \textit{Government Effectiveness}_{ej} \\ + \gamma_{33} \textit{Rule of Law}_{fj} + \gamma_{34} \textit{Regulatory Quality}_{gj} \\ + \gamma_{35} \textit{Control of Corruption}_{hj} + \delta_{0j}\end{aligned} \qquad \text{(14) (H8a to H8e)}$$

The formal random-effects model is represented below in Equation (15). The model simultaneously captures the direct effect and the estimations of interaction covariates demonstrating the indirect "modifier" effect of transparency characteristics on IPO underpricing.

$$\begin{aligned}UP_{ij} = {} & \gamma_{00} + \sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij} + \sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij} \\
& + \sum_{c=1}^{C} \beta_c \textit{Ex-ante} \text{ Uncertainty}_{cij} + \sum_{D=1}^{D} \pi_d \textit{Voice and Accountability}_{dj} \\
& + \sum_{e=1}^{E} \pi_e \textit{Government Effectiveness}_{ej} + \sum_{f=1}^{F} \pi_f \textit{Rule of Law}_{fj} \\
& + \sum_{g=1}^{G} \pi_g \textit{Regulatory Quality}_{gj} + \sum_{h=1}^{H} \pi_h \textit{Control of Corruption}_{hj} \\
& + \gamma_{11} \textit{Voice and Accountability}_{dj} * \text{Incentive of IPO Issuers}_{aij} \\
& + \gamma_{12} \textit{Government Effectiveness}_{ej} * \text{Incentive of IPO Issuers}_{aij} \\
& + \gamma_{13} \textit{Rule of Law}_{fj} * \text{Incentive of IPO Issuers}_{aij} \\
& + \gamma_{14} \textit{Regulatory Quality}_{gj} * \text{Incentive of IPO Issuers}_{aij} \\
& + \gamma_{15} \textit{Control of Corruption}_{hj} * \text{Incentive of IPO Issuers}_{aij} \\
& + \gamma_{21} \textit{Voice and Accountability}_{dj} * \text{Underwriter Reputation}_{bij} \\
& + \gamma_{22} \textit{Government Effectiveness}_{ej} * \text{Underwriter Reputation}_{bij} \\
& + \gamma_{23} \textit{Rule of Law}_{fj} * \text{Underwriter Reputation}_{bij} \\
& + \gamma_{24} \textit{Regulatory Quality}_{gj} * \text{Underwriter Reputation}_{bij} \\
& + \gamma_{25} \textit{Control of Corruption}_{hj} * \text{Underwriter Reputation}_{bij} \\
& + \gamma_{31} \textit{Voice and Accountability}_{dj} * \textit{Ex-ante} \text{ Uncertainty}_{cij} \\
& + \gamma_{32} \textit{Government Effectiveness}_{ej} * \textit{Ex-ante} \text{ Uncertainty}_{cij} \\
& + \gamma_{33} \textit{Rule of Law}_{fj} * \textit{Ex-ante} \text{ Uncertainty}_{cij} \\
& + \gamma_{34} \textit{Regulatory Quality}_{gj} * \textit{Ex-ante} \text{ Uncertainty}_{cij} \\
& + \gamma_{35} \textit{Control of Corruption}_{hj} * \textit{Ex-ante} \text{ Uncertainty}_{cij} + \in_{ij} + \delta_{0j}\end{aligned} \qquad (15)$$

Again, the main function of this model is to test the indirect influence of dissimilarities in country-level characteristics proxies on underpricing variance across G20 nations. This model represents the random coefficient model that embodies the fixed effects component defined as:

$$\gamma_{00} + \sum_{a=1}^{A} \beta_a \text{Incentive of IPO Issuers}_{aij} + \sum_{b=1}^{B} \beta_b \text{Underwriter Reputation}_{bij} + \sum_{c=1}^{C} \beta_c \textit{Ex-ante} \text{ Uncertainty}_{cij}$$
$$\sum_{D=1}^{D} \pi_d \textit{Voice and Accountability}_{dj} + \sum_{e=1}^{E} \pi_e \textit{Government Effectiveness}_{ej} + \sum_{f=1}^{F} \pi_f \textit{Rule of Law}_{fj} + \sum_{g=1}^{G} \pi_g \textit{Regulatory Quality}_{gj}$$
$$+ \sum_{h=1}^{H} \pi_h \textit{Control of Corruption}_{hj}.$$ It also embodies the random effects part defined as follows;

$${}_{11}\textit{Voice and Accountability}_{dj} * \text{Incentive of IPO Issuers}_{aij} + \gamma_{12} \textit{Government Effectiveness}_{ej} * \text{Incentive of IPO Issuers}_{aij}$$
$$+ \gamma_{13} \textit{Rule of Law}_{fj} * \text{Incentive of IPO Issuers}_{aij} + \gamma_{14} \textit{Regulatory Quality}_{gj} * \text{Incentive of IPO Issuers}_{aij}$$
$$+ \gamma_{15} \textit{Control of Corruption}_{hj} * \text{Incentive of IPO Issuers}_{aij} + \gamma_{21} \textit{Voice and Accountability}_{dj} * \text{Underwriter Reputation}_{bij}$$
$$+ \gamma_{22} \textit{Government Effectiveness}_{ej} * \text{Underwriter Reputation}_{bij} + \gamma_{23} \textit{Rule of Law}_{fj} * \text{Underwriter Reputation}_{bij}$$
$$+ \gamma_{24} \textit{Regulatory Quality}_{gj} * \text{Underwriter Reputation}_{bij} + \gamma_{25} \textit{Control of Corruption}_{hj} * \text{Underwriter Reputation}_{bij}$$
$$+ \gamma_{31} \textit{Voice and Accountability}_{dj} * \textit{Ex-ante} \text{ Uncertainty}_{cij} + \gamma_{32} \textit{Government Effectiveness}_{ej} * \textit{Ex-ante} \text{ Uncertainty}_{cij}$$
$$+ \gamma_{33} \textit{Rule of Law}_{fj} * \textit{Ex-ante} \text{ Uncertainty}_{cij} + \gamma_{34} \textit{Regulatory Quality}_{gj} * \textit{Ex-ante} \text{ Uncertainty}_{cij}$$
$$+ \gamma_{35} \textit{Control of Corruption}_{hj} * \textit{Ex-ante} \text{ Uncertainty}_{cij} + \in_{ij} + \delta_{0j}.$$

The assumption made by utilising random slopes highly anticipates that the association between a model's explanatory covariates and the outcome variable is expected to be random across nations (Twisk 2006; Hox et al. 2018). Osborne (2000) contends building an estimation based on this reasonable expectation is likely to improve the precision of the model. It does this by uncovering the influence of possible ignored forces that influence the behaviour of the outcome variable. Yet, Preacher et al. (2006) caution against trading off augmented model specification with precision of modelling random slopes because it decreases the degree of freedom. Consequently, if such a case occurs then the model's overall efficiency should be evident. The author of this thesis explores this issue further by following Kayo and Kimura (2011) in terms of comparing the overall efficiency of models drawn for the same dataset. The authors achieved this by comparing the outputs of the deviance score for models estimated with random slopes against fixed slopes to measure the overall fitness of the model.

3.7. Empirical Results

This section incorporates three subsections. The first subsection contains a brief presentation of key highlights for firm-specific variables, summary statistics for IPO underpricing by year, and, summary statistics for IPO underpricing by industry. In this way having to reiterate the firm-statistics-related discussions is negated because this research utilises the same set of IPO data in this chapter similar to the preceding chapter. This section also presents the summary statistics for country-level transparency variables in the G20 IPO markets. Also the variance inflation factors for firm and country-level transparency variables are provided in order to investigate possible multicollinearity in the dataset. In the second subsection, this research provides the results and discussion of: (1) the HLM null model; (2) the direct influence of differences in transparency on underpricing variance across states; and (3) the indirect influence of variations in transparency on underpricing variance across nations. In the third and final subsection, alternative specifications and robustness checks are provided.

3.7.1. Summary Statistics

3.7.1.1. Summary Statistics for Firm-level Variables

The previous discussion in Section 2.8.1.1 on preliminary statistical evidence showed that the G20 countries do not share similar firm-level characteristics. This implies that firm-level variables are heterogeneous across these countries and their heterogeneity may play a role in explaining underpricing difference in them over the last two decades. This difference turns out to be noticeable across the two blocks of developing and developed G20 countries. For example, the results for the mean and median of UP markedly demonstrate that underpricing in developing IPO economies is almost twice what is perceived in developed stock markets. This research also discovers some remarks signifying similar behaviours concerning the degree of dissimilarities in underpricing and firm-level covariates within developed compared to developing G20 economies.

This outcome might highlight the presence of a nesting structure in the IPO data; subsequently, it proposes that each block of stock markets may share comparable firm-level characteristics. For instance, this research uncovers that, on average, underpricing is greater in developing G20 nations because entrepreneur founders of IPO companies sell and create less secondary and primary shares, respectively. This research also obtains some evidence documenting that proxies of *ex-ante* uncertainties for IPO firms located in developing G20 countries are larger, on average, when compared to developed economies. Some indicative results demonstrate that developing (developed) IPO entrepreneur founders, on average, underwrite their firms using more (less) high-status underwriters. Their probable aims are to get their firms certified by prestigious underwriters in order to reduce the *ex-ante* uncertainty of their underwritten IPO firms.

3.7.1.2. Summary Statistics for IPO Underpricing by Year

In summary, Section 2.8.1.2 shows that the change in underpricing across the period of the study from 1995 to 2016 encapsulates that time could play an important role in explaining underpricing differences across the G20 countries. A similar observation has been documented by IPO underpricing literature including Loughran and Ritter (2004), Boulton et al. (2010), and Engelen and van Essen (2010). Across the 22-year window that this study employs, underpricing seems to peak around the financial crisis for G20 IPO markets. Consequently, the presence of such an effect provides the necessity to control for this yearly effect and financial crisis effect.

3.7.1.3. Summary Statistics for IPO Underpricing by Industry

Overall, Section 2.8.1.3 indicates that the variation in underpricing between different IPO industries illustrates that some specific industries could play a significant role in explaining differences in underpricing across the G20 countries. IPO underpricing scholars including Loughran and Ritter (2004), Boulton et al. (2010), and Engelen and van Essen (2010) argue that controlling for industry effect when examining underpricing in IPO markets is a vital consideration. This is because some industries have some uncertainty characteristics that require investors to demand a larger premium, leading to higher underpricing. Across the 33 IPO industries described in Section 2.8.1.3, underpricing indeed tends to be higher in certain industries, such as agriculture, insurance, other utilities, and pers/bus/rep svc in the G20 IPO markets. Therefore, the occurrence of such an effect emphasises the importance of controlling for industry effects.

3.7.1.4. Summary Statistics for Country-level Transparency Variables

Table 20 presents the summary of a descriptive statistics analysis of country-level transparency variables including mean, median, minimum, maximum, standard deviation, and number of IPO observations for the G20 countries. It is for the period January 1995 until December 2016. The mean of VA, GE, RL, RQ, and CC for the G20 countries is 0.48, 1.01, 0.91, 0.80, and 0.88 points, respectively, while the median values are 1.08, 1.51, 1.44, 1.26, and 1.32 points, also respectively. Dispersion from the mean values of VA, GE, RL, RQ, and CC for the G20 countries is 1.27, 1.02, 0.97, 1.12, and 1.08 points, respectively, indicating that there is great deal of heterogeneity in mean value country-level transparency between the G20 countries. An ideal opportunity is offered here to examine the impact of differences in country-level transparency in causing differences in underpricing in the G20 countries.

The VA proxy captures perceptions regarding the extent to which a country's citizens are able to participate in choosing their government, as well as freedom of expression, freedom of association, and a free media in the G20 countries from 1995 to 2016. For all G20 countries, Sweden (South Korea) has the highest (lowest) mean score of VA, equal to 1.6 (-2.2) out of 2.5 points (-2.5), followed by Denmark, Canada, and Australia (Saudi Arabia, China, and Russia), with mean scores of 1.59, 1.46, and 1.44 (-1.71, -1.60, and -0.93) out of 2.5 points (-2.5), respectively. Consistently, the median values of VA are similar to the mean values in the G20 countries. However, when looking at changes over time in VA for all G20 countries from 1995 to 2016, VA in the United States (India) shows the largest (smallest) dispersion from the mean, equal to 0.12 (0.02), followed by Indonesia, Saudi Arabia, and Poland (South Africa, Germany, and Australia), with standard deviation values of 0.12, 0.10, and 0.10 (0.03, 0.04, and 0.05), respectively. This finding implies that from the mid-1990s to the present time, the perceptions of the extent to which citizens of the United States, Indonesia, Saudi Arabia, and Poland are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media within those countries, had improved by 12%, 12%, 10%, and 10%, respectively.

Table 20: Summary Statistics of Country-level Transparency Measurements of the G20 Countries

		VA	GE	RL	RQ	CC
Total Sample (Count: 10217)	Mean	0.48	1.01	0.91	0.80	0.88
	Median	1.08	1.51	1.44	1.26	1.32
	Minimum	-2.29	-2.14	-1.57	-2.53	-1.79
	Maximum	1.75	2.36	2.09	2.02	2.55
	Standard Deviation	1.27	1.02	0.97	1.12	1.08
Developed Countries (count: 7191)	Mean	1.24	1.60	1.50	1.41	1.53
	Median	1.30	1.70	1.50	1.60	1.60
	Minimum	0.60	0.20	0.00	0.30	-.020
	Maximum	1.80	2.40	2.10	2.00	2.60
	Standard Deviation	0.20	0.27	0.23	0.35	0.36
Developing Countries (count: 3021)	Mean	-1.30	-0.35	-0.49	-0.67	-0.68
	Median	-1.60	0.00	-0.40	-0.30	-0.60 .6060
	Minimum	-2.30	-2.10	-1.60	-2.50	-1.80
	Maximum	1.10	0.80	0.81	1.10	0.60
	Standard Deviation	0.92	0.83	0.48	0.92	0.47
Australia (Count: 1138)	Mean	1.44	1.75	1.76	1.67	1.98
	Median	1.42	1.76	1.75	1.68	1.99
	Minimum	1.36	1.56	1.67	1.23	1.75
	Maximum	1.52	2.04	1.93	1.87	2.10
	Standard Deviation	0.05	0.11	0.05	0.14	0.10
Brazil (Count: 88)	Mean	0.47	-0.16	-0.32	0.02	-0.10
	Median	0.48	-0.20	-0.44	-0.03	-0.12
	Minimum	0.11	-0.24	-0.49	-0.21	-0.43
	Maximum	0.53	0.07	0.00	0.41	0.15
	Standard Deviation	0.06	0.06	0.17	0.09	0.09
Canada (Count: 193)	Mean	1.46	1.82	1.75	1.64	1.99
	Median	1.44	1.78	1.76	1.69	1.99
	Minimum	1.38	1.75	1.63	1.43	1.82
	Maximum	1.68	2.01	1.89	1.83	2.24
	Standard Deviation	0.07	0.08	0.06	0.08	0.11

China (Count: 1533)	Mean	-1.60	0.16	-0.38	-0.22	-0.50
	Median	-1.59	0.10	-0.34	-0.22	-0.55
	Minimum	-1.69	-0.10	-0.55	-0.53	-0.65
	Maximum	-1.36	0.42	-0.32	-0.13	-0.25
	Standard Deviation	0.05	0.13	0.06	0.04	0.12
Denmark (Count: 26)	Mean	1.59	2.10	1.98	1.82	2.42
	Median	1.57	2.09	1.99	1.81	2.43
	Minimum	1.52	1.81	1.80	1.72	2.23
	Maximum	1.69	2.36	2.09	1.92	2.55
	Standard Deviation	0.05	0.21	0.08	0.08	0.12
France (Count: 95)	Mean	1.25	1.50	1.43	1.18	1.37
	Median	1.21	1.48	1.43	1.21	1.35
	Minimum	1.09	1.34	1.20	0.87	1.24
	Maximum	1.47	1.81	1.51	1.31	1.52
	Standard Deviation	0.09	0.12	0.05	0.09	0.08
Germany (Count:35)	Mean	1.36	1.61	1.71	1.59	1.75
	Median	1.35	1.62	1.75	1.58	1.74
	Minimum	1.31	1.40	1.61	1.49	1.70
	Maximum	1.46	1.74	1.85	1.70	1.94
	Standard Deviation	0.04	0.07	0.07	0.05	0.05
Greece (Count:28)	Mean	1.05	0.76	0.80	0.94	0.46
	Median	1.06	0.75	0.80	0.99	0.42
	Minimum	0.90	0.59	0.71	0.73	0.10
	Maximum	1.14	0.83	0.92	1.00	0.91
	Standard Deviation	0.06	0.05	0.06	0.07	0.12
India (Count: 363)	Mean	0.42	-0.02	0.03	-0.35	-0.44
	Median	0.42	-0.01	0.02	-0.36	-0.42
	Minimum	0.37	-0.20	-0.11	-0.46	-0.57
	Maximum	0.45	0.12	0.27	-0.24	-0.29
	Standard Deviation	0.02	0.10	0.11	0.07	0.09
Indonesia (Count: 103)	Mean	-0.08	-0.26	-0.65	-0.36	-0.72
	Median	-0.07	-0.25	-0.64	-0.33	-0.74
	Minimum	-0.42	-0.45	-0.97	-0.78	-1.13

	Maximum	0.14	-0.01	-0.35	-0.10	-0.45
	Standard Deviation	0.12	0.08	0.11	0.12	0.14
Italy (Count: 63)	Mean	1.05	0.45	0.48	0.90	0.34
	Median	1.05	0.39	0.44	0.92	0.38
	Minimum	0.90	0.21	0.25	0.66	-0.11
	Maximum	1.16	0.87	0.87	1.09	0.72
	Standard Deviation	0.05	0.22	0.15	0.10	0.20
Japan (Count: 1913)	Mean	0.99	1.32	1.31	0.96	1.23
	Median	1.00	1.35	1.32	1.10	1.21
	Minimum	0.89	0.96	1.14	0.48	0.86
	Maximum	1.11	1.82	1.60	1.26	1.73
	Standard Deviation	0.05	0.24	0.10	0.26	0.23
Mexico (Count: 28)	Mean	0.01	0.22	-0.58	0.40	-0.48
	Median	0.09	0.21	-0.56	0.40	-0.45
	Minimum	-0.13	0.07	-0.77	0.26	-0.74
	Maximum	0.15	0.34	-0.45	0.48	-0.24
	Standard Deviation	0.10	0.10	0.11	0.06	0.17
Poland (Count:64)	Mean	0.89	0.49	0.48	0.83	0.29
	Median	0.84	0.41	0.37	0.77	0.19
	Minimum	0.76	0.40	0.35	0.71	0.17
	Maximum	1.10	0.82	0.82	1.06	0.59
	Standard Deviation	0.10	0.13	0.17	0.11	0.14
Russia (Count: 31)	Mean	-0.93	-0.37	-0.87	-0.37	-0.93
	Median	-0.90	-0.38	-0.93	-0.36	-0.95
	Minimum	-1.07	-0.46	-0.95	-0.52	-1.09
	Maximum	-0.68	-0.18	-0.72	-0.17	-0.78
	Standard Deviation	0.08	0.08	0.09	0.08	0.08
Saudi Arabia (Count: 102)	Mean	-1.71	-0.08	0.19	0.08	-0.09
	Median	-1.71	-0.07	0.19	0.09	-0.06
	Minimum	-1.86	-0.39	0.10	-0.06	-0.37
	Maximum	-1.31	0.23	0.27	0.18	0.10
	Standard Deviation	0.10	0.15	0.05	0.08	0.13
	Mean	0.61	0.38	0.11	0.38	0.00

South Africa (Count: 29)	Median	0.63	0.35	0.11	0.36	-0.04
	Minimum	0.55	0.27	0.03	0.30	-0.16
	Maximum	0.70	0.68	0.23	0.78	0.42
	Standard Deviation	0.03	0.10	0.05	0.12	0.16
South Korea (Count: 689)	Mean	-2.20	-1.85	-1.23	-2.33	-1.46
	Median	-2.20	-1.80	-1.27	-2.29	-1.39
	Minimum	-2.29	-2.14	-1.57	-2.53	-1.79
	Maximum	-2.02	-1.63	-0.89	-1.93	-1.17
	Standard Deviation	0.05	0.15	0.18	0.11	0.17
Sweden (Count: 57)	Mean	1.60	1.89	1.97	1.75	2.24
	Median	1.60	1.84	1.97	1.81	2.25
	Minimum	1.51	1.79	1.76	1.29	2.14
	Maximum	1.75	2.14	2.04	1.91	2.32
	Standard Deviation	0.05	0.10	0.07	0.14	0.05
Turkey (Count: 24)	Mean	-0.27	0.35	0.05	0.39	0.00
	Median	-0.26	0.38	0.04	0.41	0.03
	Minimum	-0.37	0.23	-0.06	0.30	-0.12
	Maximum	-0.09	0.41	0.12	0.44	0.17
	Standard Deviation	0.09	0.06	0.05	0.05	0.11
United Kingdom (Count: 404)	Mean	1.34	1.69	1.72	1.78	1.81
	Median	1.33	1.66	1.68	1.79	1.73
	Minimum	1.20	1.48	1.55	1.59	1.56
	Maximum	1.61	1.92	1.89	2.02	2.23
	Standard Deviation	0.09	0.12	0.10	0.09	0.16
United States (Count: 3211)	Mean	1.27	1.68	1.52	1.55	1.52
	Median	1.35	1.71	1.54	1.59	1.56
	Minimum	1.06	1.46	1.43	1.26	1.26
	Maximum	1.37	1.84	1.63	1.74	2.01
	Standard Deviation	0.12	0.12	0.06	0.13	0.17

Note: Country-level transparency variables are as defined before in Table 19.

Table 20 above also presents the second proxy of country-level transparency, GE, which measures perceptions of the quality of public sector services, quality of the civil service and degree of independence of the civil service from political pressures, the quality of policy formulation and implementation, and the credibility of government commitment to such policies in the G20 since 1995. The highest (lowest) mean score of GE of 2.1 (-1.85) out of 2.5 points (-2.5) is reported for Denmark (South Korea), followed by Sweden, Australia, and Canada (Russia, Indonesia, and Brazil), with mean scores of 1.89, 1.82, and 1.75 (-0.37, -0.26, and -0.16) out of 2.5 points (-2.5), respectively.

Since 1995, the effectiveness of governments' quality of public sector services and civil service, quality of policy formulation and implementation, and the credibility of governments' commitment in the G20 countries have changed significantly. For example, the Japanese government displays the largest change in GE score, with 0.24 dispersion from the mean value of GE from 1995 to date. This is followed by governments in Italy, Denmark, South Korea, and Saudi Arabia, with GE scores rising by 22%, 21%, 15%, and 15%, respectively. Moreover, Table 20 presents the RL score for all G20 countries where the highest mean score of 1.98 (-1.23) out of 2.5 points (-2.5) is achieved by Denmark (South Korea), followed by Sweden, Australia, and Canada (Russia, Indonesia, and Mexico), with mean scores of RL of 1.97, 1.76, and 1.75 (0.87, -0.65, and -0.58) out of 2.5 points (-2.5), respectively. South Korea records the lowest mean score of RL, indicating that perceptions of the extent to which its people have confidence in and abide by the rules of their society, with particular reference to the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence in their country. The score for the country changed significantly as dispersion from the mean value is 0.18 from 1995 to 2016. As with South Korea, RL scores in Poland, Brazil, and Italy change over time, with dispersion from mean values of 17%, 17%, and 15%, respectively, since 1995.

Table 20 also displays the fourth proxy of country-level transparency, RQ, which captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development in the G20 countries. Here, Denmark records the highest mean score at 1.82 out of 2.5 points, followed by the United Kingdom, Sweden, and Australia, which have mean scores of 1.78, 1.75, and 1.67, respectively. Meanwhile the quality of regulation is weakest in South Korea, with a mean score of -2.33 out of -2.5 points, followed by Russia, Indonesia, and India, with mean scores of -0.37, -0.36, and -0.35, respectively. Over the last two decades, the ability of governments to formulate and implement sound policies and regulations that permit and promote private sector development has improved in some G20 countries. For instance, the Japanese government records the largest change in RG score with 0.26 dispersion from its mean score of RE from 1995 to date, followed by Sweden, Australia, and the United States, with improvement in RQ scores of 14%, 14%, and 13%, respectively.

Table 20 also exhibits the scores of the fifth country-level measure of transparency in the G20 countries, CC, that measures the perception of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests since 1995. The control of corruption is at its best (worst) in Denmark (South Korea), with a mean value of 2.42 (-1.46) out of 2.5 points (-2.5), followed by Sweden, Canada, and Australia (Russia, Indonesia, and China), with mean scores of CC of 2.24, 1.99, and 1.98 (-.93, -0.72, and -0.50), respectively. Over the last two decades, some G20 countries have had considerable variability in corruption, including Japan, Italy, the United States, and South Korea, as deviation from mean values of CC for these nations is 23%, 20%, 17%, and 17%, respectively. On the other hand, Germany and Sweden have the lowest dispersion from mean score of CC since 1995, with their respective values in this area improving by only 5% in the last two decades. This suggests that country-level transparency status is a time-variant factor, so treating this variability as a constant would lead to omitted variable bias as argued by Autore et al. (2014) and Jamaani and Roca (2015).

Finally, Table 20 shows that even though there is a reasonable level of heterogeneity in the level of transparency within developed G20 countries, this heterogeneity is largely smaller than what is detected in developing countries. For instance, the table reports a large dispersion in the level of country-level transparency within developed countries of 20%, 27%, 23%, 35%, and 36% in relation to VA, GE, RL, RQ, and CC, respectively. When this level of dispersion is compared to what is observed in developing countries, this research can see a notable change over time in the average degree of transparency in developing countries over the last two decades. For example, Table 20 shows that the average levels of VA, GE, RL, RQ, and CC deviated from their mean values by 92%, 83%, 48%, 92%, and 47% from 1995 to 2016 within developing countries. This sizable dispersion in the level of country-level transparency within developing and developed markets may indicate the importance of time-variant property of institutional quality across countries.

In summary, the overall descriptive statistics of the five country-level transparency measures in the G20 countries for the last two decades show there is a great deal of heterogeneity in the results and, importantly, transparency in the G20 countries is a time-variant factor. Thus, the time-variability feature of transparency from country to country makes it important to account for this time-variant heterogeneity in country-level transparency. It is something previous studies on this topic have failed to account for, particularly Engelen and van Essen (2010).

3.7.1.5. Variance Inflation Factors for Country-level Transparency, Firm-specific, and Control Variables

The presence of high correlations amongst independent variables can violate the OLS assumption of independence leading to a multicollinearity problem (Belsley et al. 2005). The HLM model assumes and controls for the presence of correlations between level 1 observations including firm-specific variables. Meanwhile the presence of correlations between level 2 observations including country-level transparency data violates the assumption of independence of the HLM model (Hofmann 1997; Raudenbush & Bryk 2002). To detect the absence of a multicollinearity problem that could arise from the existence of a collinear relationship amongst independent variables, Table 21 presents Variance Inflation Factors (VIF) tests of the country-level transparency, firm-level, additional firm-level, additional country-level, and dummy effects control variables. Liu and Ritter (2011) argue that a multicollinearity problem exists when the value of VIF exceeds a threshold value of 5. The table below indicates that amongst the six VIF models, the Model 1 values for the five country-level transparency proxies are largely higher than a value of 5. On the other hand, once this research uses those proxies separately, Table 21 provides VIF values largely below the threshold value of 5. This means that country-level transparency proxies are collinear with each other, and consequently they cannot be used jointly. There is also high collinearity between transparency variables and the variable DS. This means that if this research controls for the impact of listing an IPO firm in a developing stock market when testing the impact of transparency, the model would suffer from a multicollinearity problem. The results of Model 2 to Model 6 imply that any concern about the presence of multicollinearity in both levels 1 and 2 is mainly minimal.

Table 21: Variance Inflation Factors of Country-level Transparency and Firm-specific, and Control Variables in the G20 Countries

Variables	VIF					
	Country-level transparency variable					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
VA	15.23	2.25				
GE	56.84		1.87			
RL	53.15			1.66		
RQ	44.09				1.59	
CC	48.76					1.72
DS	15.95					
	Firm-level variables					
PR	1.69	1.67	1.66	1.66	1.66	1.66
DF	3.54	3.49	3.45	3.46	3.45	3.45
UR	1.17	1.12	1.12	1.12	1.12	1.12
PMV	1.20	1.15	1.15	1.16	1.15	1.15
LET	1.36	1.32	1.31	1.30	1.30	1.30
LOP	1.50	1.40	1.40	1.40	1.41	1.40
	Additional firm-level variables					
BBM	1.25	1.17	1.16	1.14	1.14	1.14
TF	1.11	1.10	1.10	1.10	1.10	1.10
PF	1.09	1.08	1.08	1.08	1.08	1.08
IOP	1.61	1.38	1.42	1.38	1.41	1.40
UF	1.09	1.07	1.07	1.08	1.07	1.07
AFC 1997	1.13	1.11	1.11	1.11	1.11	1.11
GFC 2008	1.17	1.14	1.14	1.13	1.13	1.14
	Additional country-level variables					
FMS	2.17	1.89	2.93	1.76	1.73	1.83
MS	5.43	2.73	1.87	1.96	1.91	1.96
	Dummy Effects					
IE	1.06	1.06	1.06	1.50	1.06	1.51
YE	1.71	1.62	1.53	1.06	1.50	1.06
CE	4.62	3.65	3.62	3.43	3.44	3.43
Mean VIF	10.86	1.71	1.69	1.55	1.55	1.56

Note: Country-level transparency, firm-level, and additional control variables are as defined before in Table 19 and Table 3, respectively.

3.7.2. Results and Discussion

In this section, a discussion of the empirical results begins with a basic analysis using a simple random ANOVA model (HLM null model). The following section presents the results of the random-intercept models with empty[30] firm-level variables, followed by the results of the random-intercept models with firm-level variables, while the final section involves discussing the results of the full model using random-intercept and slope models with firm-level variables. All models employ heteroscedastic robust standard errors to control for the unequal error variance distribution of the number of IPO firms within the G20 countries. HLM 7 software package is used to execute the empirical testing because it relaxes the assumptions of the variance–covariance matrix (Steenbergen & Jones 2002; Twisk 2006; Hox et al. 2018).

3.7.2.1. Results and Discussion of HLM Null Model

The outcomes of the analysis of variance ANOVA model across the G20 countries from 1995 to 2016 are presented in Table 22. The results show that the adjusted all sample grand mean for IPO underpricing is 30%. In contrast, results related to the adjusted grand means for IPO underpricing for developed and developing G20 countries show values of 18% and 47%, respectively. The Likelihood Ratio (LR) test statistic for the null hypothesis that τ_{00}^{2}, that is, there is no significant statistical cross-country variance in IPO underpricing is also reported in the table. The main emphasis of the analysis is to assess if there is a significant variance between the G20 economies in IPO underpricing. Also provided here is an exploration of the null hypothesis which assumes there is no significant cross-developed and cross-developing nations in relation to differences in IPO underpricing. Rejecting the null hypothesis implies that empirical evidence exists and confirms that the independence assumption amongst observations is not violated (Raudenbush & Bryk

[30] The empty model means that the author uses a HLM model where this thesis runs two level equations of which level one (firm-level) and two (country-level) equations include the intercept of every equation in order to observe how much the differences between countries can explain underpricing the G20 countries without controlling for either firm-level and country-level variables (Engelen & van Essen 2010). The variance component - both level one and two at the empty model - will serve as the benchmark with the subsequent models that gradually add firm-level and country-level variables. This will help to observe the change in the variance of level one and two when the research adds more variables (Kayo & Kimura 2011).

2002). Subsequently, it can be interpreted that the IPO data does indeed possess a nesting structure across the three datasets including all G20, developed, and developing G20 countries.

Table 22: Analysis of Variance ANOVA Model

Fixed-Effects Parameter	Coefficient	Standard Error				P-value of LR Test Statistic
All Sample Grand Mean UP, λ_{00}	**0.30**	**0.09**				**0.00**
Developed Countries Grand Mean UP, λ_{00}	**0.18**	**0.05**				**0.00**
Developing Countries Grand Mean UP, λ_{00}	**0.47**	**0.19**				**0.00**
Random-Effect Parameter	**Variance Component for Level 2 Effect,** μ_{0j}	**Variance Component for Level 1 Effect,** η_{ij}	**ICC**	**Deviance**	**DF**	**Observations**
All Sample	0.18392	0.63905	0.22	24480[31]	21	10,217
Developed Countries	0.02517	0.49966	0.05	15439	11	7,188
Developing Countries	0.32764	0.97105	0.25	8520	9	3,021

Note: All variables are as defined before in Table 3. UP is the dependent variable. Robust T-statistics are adjusted for heteroscedasticity for two-tail.

Table 22 documents that this research obtain significant results for the 1% significance level of LR test statistic for the three subsamples. This means that this research confirms significant differences exist in IPO underpricing among all G20 (22 countries), developed (12 countries) and developing (10 countries) G20 economies. The table also indicates that $\hat{\tau}_{00}^{2}$ and $\hat{\sigma}^{2}$ for all samples, developed, and developing G20 countries are projected to be 0.18392 and 0.63905, 0.02517 and 0.49966, and 0.32764 and 0.97105, respectively. These numbers are essential in calculating the ICC for every group where this research document $\hat{\rho}$ results for 0.22, 0.05, and 0.25. Table 22 indicates that 22%, 5%, and 25% of the dissimilarities in IPO underpricing across nations are primarily driven to variances in core country-level characteristics between all G20, developed, and developing G20 countries respectively.

Remarkably, the outcomes of the ICC tests reported in Table 22 are in reverse inferences to Kayo and Kimura (2011). These writers uncover evidence showing that dissimilarities in capital structure

[31] Deviance results reported in Table 22 are comparable to similar deviance values reported by Kayo and Kimura (2011) for the whole sample of 114,788 firms (Deviance 816070; Table 5; Model 1), emerging country sample of 17,696 firms (Deviance 131989.6; Table 6; Model 2), and for developed country sample of 70,114 firms (Deviance 477682.6;Table 6; Model 1).

in 10,061 companies domiciled within 40 countries between 1997 and 2007 only elucidate 3.3% of the difference of firm leverage. Kayo and Kimura (2011) interpret the minute ICC outcome to the similarly capital structure determinants across nations irrespective of the presence of institutional dissimilarities among states. Conversely, the ICC outcomes provide the contrary in the IPO market. The results reveal that 22% of the variance in IPO underpricing is attributed to cross-country dissimilarities. This finding complements but is more economically vigorous than what Engelen and van Essen (2010) observed in relation to the variance of IPO underpricing across 2,921 IPOs companies listed within 21 countries from 2000 to 2005. The authors find merely 10% of the differences in IPO underpricing is attributed to institutional dissimilarities between nations. The results of the ICC tests are virtually twice what Engelen and van Essen (2010) perceived. This sizeable difference is attributed to the fact that the scholars' IPO data is overweighed by developed country observations[32], ranged only for 5 years, and has many country-level observations with very few[33] IPO observations.

A deeper analysis of the ICC results associated with the decomposition of the underpricing variance on the two groups of economies including developed compared to developing G20 countries uncovers something equally remarkable. This research uncovers evidence attributing the variability in the underpricing variance across countries of 25% (5%) to an enormous (minor) variability within developing (developed) economies. This is due to the fact ICC results attribute 25% of underpricing variance to cross-country dissimilarities within developing nations versus only 5% related to developed G20 economies. This finding has an important implication. It implies the need for paying attention for within cluster correlations in residuals within developed compared to developing nations. This is of course an essential observation in order to better comprehend the mystifying phenomenon of IPO underpricing in the global IPO market. This finding also emphasises that dissimilarity in country-level institutions could exert an influence on differences in IPO underpricing between developed and developed economies. This finding challenges a

[32] Engelen and van Essen (2010) include only 3 developing countries while they have 18 countries that are classified as developed countries of which their developing country data represents less than 3% of their total data (92 out of 2,921). In contrast, this thesis provides a more comprehensive dataset that includes 10,217 IPO firms nested within 22 countries of which 3,025 IPOs are nested in 10 developing countries. Meanwhile 7,172 IPO firms are nested within 12 developed nations over the 20-year window from 1995 to 2016. See Table 4 for more details.

[33] Engelen and van Essen (2010) have 3, 4, 4, 5, 7, 10, and 10 IPO firms nested within Portugal, Mexico, Argentina, the Netherlands, Spain, Austria, and Brazil, respectively. In contrast, the lowest IPO observation per country in this thesis's data is recorded for Turkey with 24 IPO firms. See Table 4 for more details.

reverse outcome provided by Booth et al. (2001) and Kayo and Kimura (2011). The authors argue that the variance in firms' leverage policies is not affected by country-level institutional dissimilarities between developed and developing countries. Consequently, the outcomes reveal that differences in country-level institutions within developing (developed) countries matter more (matters less) in triggering underpricing variance in the global IPO market. This research reaches a new understanding that the hierarchical structure in finance data may have contradictory market outcomes when it comes to dissimilarities in institutional characteristics across economies, particularly across developed compared to developing ones.

3.7.2.2. Direct Influence of Variations in Transparency on Underpricing Difference across Countries

This research begins the analysis here by presenting the results in Table 23 that include only firm-level variables. This is done in order to observe the consistency of the results before and after the inclusion of the five country-level transparency proxies. Model 1 to Model 4 present a similar HLM model with only firm-level variables, with the models differing only in the gradual inclusion of year and industry effects. All models in Table 23 treat the intercept as a random parameter while treating the slope coefficients of firm-level variables as fixed parameters. This means that those models assume that G20 countries vary in their underpricing levels, but that firm-level variables between the G20 countries do not behave differently. This follows a similar testing environment provided by Engelen and van Essen (2010).

For example, Model 1 reports the slope coefficients of the two proxies measuring the incentive of IPO issuers, including PR and DF, of which both coefficients exhibit strongly significant results at the 1% level of significance of -0.02, equally. These results confirm that the greater the incentive of IPO issuers, the lower is the underpricing in the G20 IPO markets. This outcome is consistent with the findings of Habib and Ljungqvist (2001) and Jones and Swaleheen (2010). Model 1 also presents the results of UR showing a negative but statistically insignificant coefficient. The result concerning UR is qualitatively similar to the negative coefficient results of Habib and Ljungqvist (2001) who control for the endogenous relationship between the decision to employ reputable underwriters and IPO underpricing. This implies that the results obtained using HLM models are made robust by factoring in this endogeneity problem regardless of the loss of statistical significance. In fact, endogeneity has no effect on HLM's level 1 model because the HLM model assumes the presence of correlations between level 1 observations (Hofmann 1997; Raudenbush & Bryk 2002).

Table 23: HLM Analyses on the Effect of Firm-specific Variables in G20 Countries with Random Intercept Model

	Model 1	Model 2	Model 3	Model 4
Transparency-level variables				
VA				
GE				
RL				
RQ				
CC				
Firm-level variables				
PR	-0.020***	-0.020***	-0.020***	-0.020***
	[-14.20]	[-14.31]	[-14.25]	[-14.28]
DF	-0.020***	-0.020***	-0.020***	-0.020***
	[-20.20]	[-20.21]	[-20.15]	[-20.17]
UR	-0.010	-0.010	-0.010	-0.010
	[-0.52]	[-0.60]	[-0.57]	[-0.59]
PMV	0.010*	0.010*	0.010*	0.010*
	[1.51]	[1.62]	[1.46]	[1.55]
LET	-0.050***	-0.050***	-0.050***	-0.050***
	[-5.30]	[-5.60]	[-5.31]	[-5.59]
LOP	-0.060***	-0.060***	-0.060***	-0.060***
	[-10.23]	[-10.40]	[-10.17]	[-10.32]
Dummy Effects	**NO**	**YE**	**IE**	**YE & IE**
Constant	1.800***	1.830***	1.780***	1.800***
	[12.29]	[12.32]	[11.90]	[11.91]
Observations	10,209	10,209	10,209	10,209
R^2 within countries	**0.05**	**0.05**	**0.05**	**0.05**
R^2 between countries	**0.00**	**0.00**	**0.00**	**0.00**
Random-Effect Parameter				
Variance Component for Level 2 Effect, μ_{0j}	0.18419	0.18420	0.18419	0.18420
Variance Component for Level 1 Effect, η_{ij}	0.60550	0.60533	0.60537	0.60519
Deviance	23936	23933	23934	23928

Note: Country-level transparency and firm-level variables are as defined before in Table 19 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Moreover, Model 1 presents the results of the three proxies of *ex-ante* uncertainty including PMV, LET, and LOP. For example, PMV provides a positively significant coefficient of 0.01 at the 10% level of significance, implying that prior to the listing of an IPO firm in the G20 countries from 1995 to 2016, IPO firms suffer from greater underpricing when stock market volatility is high. This finding is consistent with what Ljungqvist and Wilhelm Jr (2002) and Chang et al. (2017) reported. Moreover, the second proxy of *ex-ante* uncertainty, LET, demonstrates that the longer the elapsed time between the offer price set up and the first trading date, the lower is the underpricing in the

G20 stock markets. Indicated here is when informed investors show low demand for an IPO firm, then this IPO requires more time to be fully subscribed in order to avoid subscription failure. That is, low demand by informed investors is interpreted by uninformed investors with high uncertainty that the quality of the IPO is poorer. This situation leads to two things: firstly, lower demand for the offering on the first trading day; and secondly, lower underpricing. This result is similar to Lee et al. (1996) and Ekkayokkaya and Pengniti (2012). The third proxy of *ex-ante* uncertainty, LOP, proposes that underpricing of IPO firms with large offer proceeds is lower as these firms tend to be well-established and non-speculative businesses. Thus, IPO investors regard such firms that have high offer size with lower *ex-ante* uncertainty, consequently leading to lower underpricing. The result of Model 1 clearly supports this proposition as the coefficient of LOP equals -0.06 and is significant at the 1% level. This finding is in line with Habib and Ljungqvist (2001) and Boulton et al. (2010). Table 23 also shows that the results obtained from Model 1 remain qualitatively the same after controlling for YE and IE in Models 2, 3, and 4.

To recapitulate, the findings of Table 23 show that covariates related to the EWL model have the anticipated coefficients' sign and statistical significance with the exception of the underwriter reputation factor. The variable UR constantly provides a negative but insignificant coefficient across all models in Table 23. The finding supports a similar result obtained by Luo (2008). This particular author used the variable prestigious underwriter in a HLM model to investigate the influence of pre-IPO marketing spendings on difference in underpricing across nations. Luo (2008) finds a negative but insignificant association between underpricing and underwriter reputation. Hitherto, the insignificant coefficient of the variable UR differs from Habib and Ljungqvist (2001), Kennedy et al. (2006), and Chahine (2008) who apply OLS-based estimation. The authors find a significant role of high-status underwriters in alleviating IPO underpricing. An attribution of this critical and contrary result for coefficient UR is related to the use of a country "group" mean-centered approach to firm-level covariates. This extended estimation offered by the HLM estimation controls for size distortion influence triggered by utilising unbalanced IPO data (Kreft et al. 1995). The difference is that OLS-based estimation employs the overall mean of the independent variable, UR in the case, which is calculated using the mean from the full sample ($\bar{X}$).

The HLM model, conversely, is estimated using the group mean centering approach where it replaces the individual's group “country” mean ($\bar{X}_j$) from the individual's score (Enders & Tofighi 2007). From an econometric point of view, this implies that the UR coefficient provides an unbiased representation of the mean of 22 clusters “countries” in the data instead of reflecting the mean of the complete sample of 10,217 IPOs. Therefore, this research cautions that prior literature documents a significant relationship between prestigious underwriters and underpricing because the UR coefficient is likely to be spuriously significant. This problematic econometric shortfall is probably caused by the influence of large sample size for some nations that biased the overall T-statistic values and produced falsely significant results (Li et al. 2013). The results concerning the UR variable are therefore obtained after correcting this econometric error. This is done by approximating regressions where observations related to the variable UR are group centered by every nation in the sample, in turn removing the influence of nations with dominant UR observations as explained above.

This research concludes from Table 23 with reference to EWL theory that the model partly explains underpricing variance across nations. This summation implies that in a cross-country setting, IPOs are underpriced dissimilarly because entrepreneur founders sell more secondary shares and create more primary shares; this condition is also clarified by the degree of *ex-ante* uncertainty perceived at the time of offering. Differences in underpricing across nations are not explained by the employment of prestigious underwriters. The gathered evidence in Table 23 attributes a minor role played by characteristics of firms in elucidating the variance in IPO underpricing across nations. Therefore, this research contends that variances in the characteristics of nations should contribute largely in influencing the phenomenon of underpricing from nation to nation. This is indeed evident by the outputs of the adjusted R^2 within countries that attribute only 5% of dissimilarities in IPO underpricing across nations to the characteristics firms as shown across all models in Table 23. Prior IPO literature obtains similar low adjusted R^2 values in relation to the explanatory of firm-level variables to the phenomenon of underpricing using single and global IPO data. For example, adjusted R^2 values reported by Loughran and Ritter (2004) (0.05; Table VII; Model 2), Lowry et al. (2010) (0.03; Table V; Model c), Boulton et al. (2011) (0.07; Table 5; Model 2), Shi et al. (2013) (0.05; Table 6; Model 1), Leitterstorf and Rau (2014) (0.06; Table 2; Model 1), and Chang et al. (2017) (0.03; Table 4; Model 5).

In the next section, this research redirects the focus to testing the hypotheses related to the direct influence of transparency on IPO underpricing variance across nations. Table 24 provides the empirical outcomes of five HLM models that permit the intercept to be random at the upper level but without accounting for the characteristics of firms. The purpose of this arrangement is to segregate the influence of the characteristics of countries' transparency on underpricing. Doing so helps to avoid disturbing this influence when the characteristics of firms are included. Consequently, in these five models, the intercept of every HLM model is allowed to be random across the G20 nations and helps this thesis to examine if the dissimilarity in nations' transparency can actually elucidate the variance in the intercept for every model. In the upper level of the HLM model, five proxies for countries' transparency are employed, namely, VA, GE, RL, RQ, and CC. This research uses each proxy at a time in order to avoid a multicollinearity problem among the covariates of the upper level. Next, in Models 6 to 10 in Table 24, firm-level characteristics are incorporated along with both year and industry dummies to re-examine the direct influence of differences of transparency on IPO underpricing.

3.7.2.2.1. Voice and Accountability

This research employs the voice and accountability proxy of Kaufmann et al. (2017) to measure how individuals in an economy have a confidence that their legislators value their opinion as being valuable in relation to the development of government decisions. Hypothesis 1 anticipates there to be a negative association between the level of voice and accountability and underpricing of IPOs. The coefficients for voice and accountability are negative and significant for IPO underpricing under the HLM estimation with only VA covariate (-0.220; Table 24; Model 1; $p<0.05$) as well as for VA variable plus firm-level variables (-0.210; Table 24; Model 6; $p<0.01$). The results support the anticipation in the theoretical section. This outcome implies that when the perceptions of the extent to which IPO investors in the G20 countries are able to participate in selecting their government, as well as enjoying freedom of expression, having freedom of association, and having a free media increases by one unit, average underpricing decreases by 22%. In other words, this result suggests that an increase in VA score by one unit leads to 22 percent lower underpricing. The results evidently infer that when the voice and accountability in a country are high, this reflects the existence of a good degree of trust or transparency between market participants.

Table 24: Effect of Transparency on IPO Underpricing of the G20 Countries with Random Intercept Model with Firm-specific Variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
					Transparency-level variables					
VA	-0.22**					-0.21***				
	[-1.81]					[-3.10]				
GE		-0.13**					-0.13**			
		[-1.75]					[-1.73]			
RL			-0.09**					-0.08*		
			[-1.65]					[-1.60]		
RQ				-0.13**					-0.12**	
				[-1.90]					[-1.85]	
CC					-0.10**					-0.10**
					[-1.96]					[-2.00]
					Firm-level variables					
PR						-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
						[-14.20]	[-14.22]	[-14.30]	[-14.20]	[-14.00]
DF						-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
						[-20.10]	[-20.19]	[-20.20]	[-20.11]	[-20.00]
UR						-0.01	-0.01	-0.01	-0.01	-0.01
						[-0.54]	[-0.57]	[-0.59]	[-0.58]	[-0.53]
PMV						0.01**	0.01**	0.01**	0.01**	0.01**
						[1.73]	[1.74]	[1.70]	[1.72]	[1.70]
LET						-0.05***	-0.05***	-0.05***	-0.05***	-0.05***
						[-5.60]	[-5.56]	[-5.57]	[-5.60]	[-5.58]
LOP						-0.06***	-0.06***	-0.06***	-0.06***	-0.06***
						[-10.30]	[-10.39]	[-10.36]	[-10.30]	[-10.35]
Dummy Effects						**YE & IE**	**YE & IE**	**YE & IE**	**YE & IE**	**YE & IE**
Constant	0.41***	0.40***	0.36***	0.39***	0.36***	0.24***	1.90***	1.86***	0.23***	0.23***
	[3.13]	[2.85]	[3.10]	[3.10]	[3.10]	[2.70]	[2.42]	[11.40]	[2.40]	[2.41]
Observations	10209	10209	10209	10209	10209	10,209	10,209	10,209	10,209	10,209
R^2 within countries	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
R^2 between countries	**0.30**	**0.11**	**0.02**	**0.07**	**0.06**	**0.29**	**0.07**	**0.02**	**0.06**	**0.05**
					Random-Effect Parameter					
Variance Component for Level 2 Effect, μ_{0j}	0.12881	0.17068	0.18020	0.17173	0.17304	0.13025	0.17185	0.18145	0.17294	0.17423
Variance Component for Level 1 Effect, η_{ij}	0.63905	0.63905	0.63905	0.63905	0.63905	0.60507	0.60508	0.60508	0.60508	0.60508
Deviance	24457	24463	24465	24463	24464	23902	23908	23909	23907	23908

Note: Country-level transparency and firm-level variables are as defined before in Table 19 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

This means that the more trustworthy or transparent a country is, the more it is perceived by investors to be a less risky investment environment. Investors in such countries that maintain a sound level of voice and accountability are likely to have a low level of *ex-ante* uncertainty about the freedom of business activities and the reliability of information provided by government officials, firms, and well-connected citizens. Consequently, the VA result contends that when investors have an adequate level of belief that their country has reasonably high voice and accountability, then their *ex-ante* uncertainty about the destruction of information reliability in that country is expected to be marginal. In this way the information asymmetry problem in that country is mitigated.

The negative and significant results of the variable VA in Models 1 and 6 are inconsistent with positive and insignificant results obtained by Autore et al. (2014) and Hearn (2014) using OLS-based estimation. This research attributes this important contradiction in the signage and significance of the VA variable between the findings and Autore et al.'s (2014) and Hearn's (2014) outcomes to an econometric shortfall. It is due to capturing the within cluster "nation" correlations using HLM approach in the work. Hofmann (1997), Engelen and van Essen (2010), and Kayo and Kimura (2011) emphasise that the consequence of a failure to control for the nesting structure in the finance data means producing a false coefficient reading. This also means that the findings of Autore et al. (2014) and Hearn (2014) in relation to the VA variable are biased. This is because the authors do not capture the correlations amongst error terms within countries for nested finance data such as the IPO data. In fact, the VA results provide a perfect and empirical sketch of the incorrect conclusions that might be attained by disregarding the nesting structure of the IPO data.

The R^2 outcomes provide an accurate quantification of the direct influence of country-level characteristics (i.e., differences in voice and accountability between nations) and firm-level characteristics (i.e., differences in determinants of IPO underpricing within nations) on IPO underpricing. By applying the HLM approach, this research obtains R^2 between nations attributes 30% of the variance in IPO underpricing to differences in voice and accountability as shown in Model 1 in Table 24. In Model 6, this research attains closely similar results for R^2 between countries showing that the difference in voice and accountability elucidates 29% of underpricing difference. Yet, dissimilarities in the characteristics of firms within nations only explain 5%.

3.7.2.2.2. Government Effectiveness

The second proxy to estimate differences in countries' transparency is the level of government effectiveness in the G20 countries. Hypothesis 2 expects that the underpricing of IPO firms nested in nation with high government effectiveness will be lower. Models 2 and 8 in Table 24 present significant support for H2 with a coefficient for GE of -0.130 at the 5% level of significance. This implies that when G20 governments are perceived to provide quality public services, a quality civil service that is independent from political pressures, quality policy formulation and implementation, and credibility of government commitment to such policies increases by one unit, then IPO underpricing in a country will reduce by 13%.

This outcome suggests that when a government is not functioning effectively in terms of safeguarding the business environment from political pressures, it becomes easier for a business or for a connected group of investors to obtain first-hand information related to changes in government regulations and policies that may influence their businesses before other affected parties. In such countries that lack appropriate levels of government effectiveness or oversight, an asymmetric information problem exists between market participants, including IPO parties, leading to an increasing level of *ex-ante* uncertainty between politically connected and unconnected investors. Consequently, the GE results infer unconnected investors will demand greater underpricing to offset this *ex-ante* uncertainty.

The results of the variable GE in Models 2 and 7 disagree with the positive and significant results obtained by Autore et al. (2014) and negative and insignificant ones provided by Hearn (2014) using OLS-based estimation. This research again relates this significant conflict in the signage and significance of the GE covariate between the outcomes and Autore et al.'s (2014) and Hearn's (2014) findings to an econometric bias. This bias occurs from ignoring the within cluster "nation" correlations that are perfectly accounted for in the study employing the HLM approach. Again, the outcomes of Autore et al. (2014) and Hearn (2014) in relation to the GE variable should be treated with caution. Utilising the HLM approach allowed the author to obtain R^2 value of 11% between nations. This attributes the change in IPO underpricing to the divergence in government effectiveness across nations as shown in Model 2 in Table 24. In Model 8, this research reachs weaker results for R^2 between countries documenting that the variance in GE clarifies 7% of underpricing variance while differences in the characteristics of firms within nations only explain 5%.

3.7.2.2.3. Rule of Law

The level of rule of law provides the third country-level transparency measure which was developed by Kaufmann et al. (2017). It concentrates on perceptions of the extent to which individuals in the G20 countries have confidence in and abide by the rules of their society. It also focuses on the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The existence of poor rule of law suggests that companies do not firmly comply with the regulatory standards when conducting business and the economic success of enterprises may rely on personal relationships. Hypothesis 3 predicts that underpricing of IPO firms nested in high rule of law countries should be lower than nations with a lower level of respect for the law. The coefficients of the RL variable provide significant and negative values before (-0.090; Table 24; Model 3; $p<0.05$) and after controlling for firm-level determinants (-0.080; Table 24; Model 8; $p<0.10$). These results indicate that when the rule of law in the G20 countries increases by one unit, underpricing decreases by up 9%, thus supporting H3.

The findings assert that when investors do not believe their governments abide by the rules of society and are too strict in safeguarding contract enforcement and property rights, then the business and investment environments are expected be unfair and non-transparent to all market participants, including IPO parties. Consequently, the presence of an unfair and non-transparent business environment is a reflection of weak rule of law. Stated differently, the RL results infer that deterioration in the rule of law in a country should be blamed for triggering higher required underpricing by IPO investors. This is to compensate those investors for the unfair and non-transparent market practices that cause a higher level of *ex-ante* uncertainty. The negative and significant outcomes of the variable RL in Models 3 and 8 are contrary to the positive and insignificant results obtained by Autore et al. (2014) using OLS-based estimation. However, the RL result in Model 8 in Table 24 is perfectly aligned with Engelen and van Essen (2010) who employ HLM estimation to capture the nesting structure of the IPO data. The authors show that an increase in the rule of law leads to reduced underpricing by 8% at the 10% level of significance. An assessment of the explanatory relevance of the RL shows that R^2 between countries relates only

2% of the difference in IPO underpricing to changes in the level of rule of law between countries. Yet, variations in the characteristics firms within G20 countries elucidate 5% of the underpricing difference.

3.7.2.2.4. Regulatory Quality

Hypothesis 4 predicts that the level of IPO underpricing will be lower for IPO firms located in nations with a high level of regulatory quality. This is because Kaufmann et al. (2017) measure a government body in a sovereign state as being non-transparent when the quality of investment policies in such a country are ineffective and opaque, in turn hindering the growth of the private sector. Models 4 and 9 in Table 24 employ the fourth proxy of country-level transparency, RQ, providing consistent support for H4. The coefficients of the RQ factor present significant and negative values before (-0.130; Table 24; Model 4; $p<0.05$) and after adjusting for the characteristics of firms (-0.120; Table 24; Model 9; $p<0.05$). These findings indicate that when regulatory quality in the G20 countries, as measured by perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development, increases by one unit, underpricing reduces by up to 13%. To explain this result, this research contends that in the IPO process, the asymmetric information problem can introduce moral hazard and adverse selection problems between management and new owners, as argued by Bruton et al. (2010). Thus, the former occasionally has the incentive to mislead the latter, and thus the efficacy of a government to formulate and implement sound policies and regulations that permit and promote private sector development can be seen as a realignment tool that works to enhance information communication and disclosure. In turn, this overcomes the asymmetric information problem amongst IPO parties, and leads to lower underpricing in that country.

The findings of the variable RQ differ from the positive and significant outcome provided by Autore et al. (2014) and negative and significant result shown by Hearn (2014) using OLS-based estimation. This research again attributes this substantial inconsistency in the direction and significance of the RQ variable between Autore et al.'s (2014), Hearn's (2014) outputs, and the findings to a methodological shortfall. This research continues to caution, as explained in previous sections, that this problematic econometric issue causes bias in the results of Autore et al. (2014)

and Hearn (2014). They are driven by disregarding the within cluster “country” correlations that is flawlessly captured in the empirical work using HLM estimation. An evaluation of the explanatory importance of the RQ variable documents that R^2 between countries attributes up to 7% of the variability in IPO underpricing to variations in regulatory quality between G20 economies. Nevertheless, 5% of the underpricing variance is attributed to the characteristics of firms within G20 nations.

3.7.2.2.5. Control of Corruption

The fifth hypothesis is related to testing the direct effect of variances in control of corruption between IPO investors and its effect on IPO underpricing in G20 countries. It captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests (Kaufmann et al. 2017). Hypothesis 5 postulates that the degree of underpricing for IPO firms nested in nations that can control corruption to a great extent, is expected to be lower than nations that do not. The results for Models 5 and 10 show that CC provides a significant coefficient of -0.10 at the 5% level of significance.

This result offers strong support for H5, and suggests that when control of corruption in a G20 country increases by one unit, underpricing diminishes by 10%. The finding also indicates that the degree of corruption in government officials in a G20 country is related to the asymmetric information problem. This research explains this linkage by arguing that the presence of bribery and corruption amongst government officials could allow certain groups of corrupt investors to access specific classes of public information that are not readily accessible to all market participants. That is, in a market where information related to a firm’s performance or related to changes in government regulation affecting the firm’s activities can be easily sold, then the corrupt group of “informed” investors will be informationally advantaged over the uncorrupted “uninformed” class of investors (Hopp & Dreher 2013). The CC result confirms that the presence of this information gap between corrupt and uncorrupted investors increases *ex-ante* uncertainty about the true value of firms. In turn, a lack of transparency amongst IPO parties that consequently leads to higher IPO underpricing, is likely to occur.

The negative and significant coefficients of the variable CC in Models 5 and 10 are in disagreement with the positive and significant results reported by Autore et al. (2014) and negative and significant output attained by Hearn (2014). In contrast, the CC results in Table 24 are in line with Engelen and van Essen (2010) who apply the HLM approach to account for the nesting structure of the IPO data. This research reiterates that CC results provide an idyllic and empirical example of the flawed conclusions that might be accomplished by discounting the nesting structure of the IPO data. Outputs related to the explanatory relevance of the CC variable document that R^2 between G20 countries relates 6% of the variance in IPO underpricing to fluctuations in the level of control of corruption between G20 economies.

To recap, the findings this research achieves in relation to the direct influence of variances in country-level transparency on the dissimilarity of IPO underpricing permit this thesis to answer the first proposed research question: do differences in country-level transparency explain IPO underpricing difference across IPO markets? The answer is affirmative; dissimilarities in countries' transparency significantly influence the variability in IPO underpricing in the global IPO market by up to 30%. In contrast, 5% of underpricing variance is attributed to characteristics of IPO firms within the G20 economies. However, the findings should settle the fragmentation in the IPO literature in relation to the true nature of the transparency-IPO underpricing relationship. The results also lend support to Engelen and van Essen (2010) in regard to the importance of capturing the nesting structure of the IPO data by employing the HLM estimation.

3.7.2.3. The Indirect Influence of Variations in Transparency on Underpricing Difference across Countries

In this section, this research progresses in Table 25 by presenting the results of the full HLM models using both random coefficients for the intercepts and slopes. The coefficients in Panel A present the direct influence of country-level transparency characteristics along with controlling for the characteristics firms.

Table 25: Effect of Transparency on IPO Underpricing of the G20 Countries with Random Slope Coefficient Model with Firm-specific Variables

Model 1		Model 2		Model 3		Model 4		Model 5	
				Panel A: Direct Effect					
				Transparency-level variables					
VA	-0.23***	**GE**	-0.15**	**RL**	-0.11**	**RQ**	-0.13**	**CC**	-0.11***
	[-3.32]		[-2.00]		[-2.30]		[-2.21]		[-2.34]
				Firm-level variables					
PR	-0.05***	**PR**	-0.03***	**PR**	-0.02***	**PR**	-0.03***	**PR**	-0.03***
	[-21.44]		[-16.93]		[-12.50]		[-14.75]		[-14.22]
DF	-0.05***	**DF**	-0.04***	**DF**	-0.02***	**DF**	-0.03***	**DF**	-0.03***
	[-22.86]		[-18.80]		[-15.22]		[-17.12]		[-16.69]
UR	-0.03*	**UR**	-0.02	**UR**	-0.02	**UR**	-0.02	**UR**	-0.02
	[-1.53]		[-1.10]		[-0.80]		[-0.75]		[-.81]
PMV	0.01	**PMV**	0.01	**PMV**	0.02**	**PMV**	0.01**	**PMV**	0.01*
	[1.10]		[0.41]		[1.87]		[1.75]		[1.53]
LET	-0.04***	**LET**	-0.05***	**LET**	-0.05***	**LET**	-0.05***	**LET**	-0.05***
	[-3.79]		[-4.99]		[-5.03]		[-5.26]		[-5.26]
LOP	-0.06***	**LOP**	-0.06***	**LOP**	-0.06***	**LOP**	-0.07***	**LOP**	-0.07***
	[-10.90]		[-10.70]		[-10.61]		[-11.02]		[-11.34]
Dummy Effects	**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**
				Panel B: Indirect Effect "Interaction Variables"					
VA * PR	0.04***	**GE * PR**	0.01***	**RL * PR**	0.01***	**RQ * PR**	0.01***	**CC * PR**	0.02***
	[15.84]		[6.80]		[6.13]		[5.80]		[10.06]
VA * DF	0.04***	**GE * DF**	0.01***	**RL * DF**	0.01***	**RQ * DF**	0.01***	**CC * DF**	0.02***
	[16.56]		[8.38]		[7.64]		[6.70]		[11.38]
VA * UR	-0.03**	**GE * UR**	-0.03**	**RL * UR**	-0.03*	**RQ * UR**	-0.04***	**CC * UR**	-0.03**
	[-1.96]		[-1.82]		[-1.51]		[-2.34]		[-1.88]
VA* PMV	-0.01*	**GE* PMV**	0.02***	**RL* PMV**	0.01	**RQ* PMV**	0.01	**CC* PMV**	0.01**
	[-1.53]		[2.93]		[1.15]		[0.26]		[1.76]
VA * LET	0.01**	**GE * LET**	0.01	**RL * LET**	0.03***	**RQ * LET**	0.02***	**CC * LET**	0.01**
	[1.90]		[0.99]		[3.38]		[3.00]		[1.68]
VA * LOP	0.03***	**GE * LOP**	0.03***	**RL * LOP**	0.04***	**RQ * LOP**	0.02***	**CC * LOP**	0.02***
	[7.08]		[5.72]		[5.87]		[3.76]		[4.82]
Constant	0.30***		0.30***		0.30***		0.30***		0.30***
	[3.97]		[3.37]		[3.38]		[3.37]		[3.34]
Observations	10209		10209		10209		10209		10209
R^2 within countries	**0.08**		**0.07**		**0.07**		**0.06**		**0.06**
R^2 between countries	**0.34**		**0.08**		**0.09**		**0.11**		**0.06**
				Random-Effect Parameter					
Variance Component for Level 2 Effect, μ_{0j}	0.12050		0.16970		0.16729		0.16370		0.17313
Variance Component for Level 1 Effect, η_{ij}	0.58571		0.5947		0.59561		0.59843		0.59891
Deviance	23583		23666		23760		23808		23817

Note: Country-level transparency and firm-level variables are as defined before in Table 19 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

The estimations of interaction covariates demonstrating the indirect "modifier" influence of transparency characteristics on IPO underpricing are offered in Panel B. The emphasis here is primarily on the outcomes of Panel B. In this way, answers can be provided for the indirect influence hypotheses while this research evaluate the uniformity of outcomes provided in Panel A with prior direct effects findings summarised in Table 24.

3.7.2.3.1. The Influence of Transparency Characteristics on the Incentive of IPO Issuers-IPO Underpricing Relationship

In this section, this research shows the outcomes of five hypotheses regarding the indirect influences of variances in country-level transparency proxies on IPO underpricing through the incentive of IPO issuers. Hypotheses 6a, b, c, d, and e postulate that high levels of voice and accountability, government effectiveness, rule of law, regulatory quality, and control of corruption improve the association between the incentive of IPO issuers and underpricing, respectively. Table 25 shows that the positive and significant coefficients for the interaction terms VA*PR (0.04; Table 25; Model 1; $p<0.01$) and VA*DF (0.04; Table 25; Model 1; $p<0.01$) provide supporting outcomes for hypotheses 6a. These results confirm that impact of participation ratio and dilution factor on underpricing is higher by 4% when level of voice and accountability increases by one unit in G20 countries.

Similarly, Table 25 provides supporting results for hypotheses 6b, c, and d. This is because the interaction terms GE*PR (0.01; Table 25; Model 2; $p<0.01$), GE*DF (0.01; Table 25; Model 2; $p<0.01$), RL*PR (0.01; Table 25; Model 3; $p<0.01$), RL*DF (0.01; Table 25; Model 3; $p<0.01$), RQ*PR (0.01; Table 25; Model 4; $p<0.01$), and RQ*DF (0.01; Table 25; Model 4; $p<0.01$) provide positive and significant coefficients. Based on these results, the author confirms that across the G20 nations, an increase in the level of government effectiveness, rule of law, and regulatory quality by one unit leads to improving the influence of participation ratio and dilution factor on IPO underpricing by 1%, equally. Finally, Table 25 confirms the prediction of hypotheses 6e as the interaction terms CC*PR (0.04; Table 25; Model 5; $p<0.01$) and CC*DF (0.04; Table 25; Model 5; $p<0.01$) are both positive and significant coefficients.

The predictions of the hypotheses being true are achieved. These findings assert that entrepreneur founders of IPO companies in G20 countries indeed perceive the availability of a high level of voice and accountability, government effectiveness, rule of law, regulatory quality, and control of corruption in their countries as a reflection of the existence of an information environment that deters the presence of *ex-ante* uncertainty. The availability of such an environment with a solid formal institutional quality in a G20 economy relieves the anxiety of IPO issuers when they decide to go public. This is because owners of IPO firms in nations with strong governance practices are not afraid that powerful underwriting banks and institutional investors will purposely underprice their IPO firms for personal gain. In turn, those entrepreneur founders in such a transparent stock market create and sell a larger proportion of secondary and primary shares when going public. They in fact have strong confidence in the fairness and quality of their legal system, so their fear of a substantial loss of wealth is negligible. Consequently, issuers who are nested within high (low) transparency nations have more (less) inclination to sell and create more secondary and primary shares, respectively, when they float a portion of their holdings.

Overall, the findings confirm similar observations pinpointed recently by Zattoni et al. (2017). The authors confirmed that the quality of formal institutions significantly modifies the association between board independence and long-term financial performance of IPO firms across national economies. The results this research attained here in relation to the indirect influence of variations in countries' transparency on IPO underpricing difference enable this thesis to answer the second research question: do differences in country-level transparency influence the relationship between the incentive of IPO issuers and underpricing across IPO markets? The results provide a satisfyingly strong answer. In this chapter, this research reveals evidence confirming that dissimilarities in transparency across nations indirectly influence the variability in IPO underpricing in the global IPO market. It happens through affecting the association between the incentive of IPO issuers and IPO underpricing. The new empirical evidence this research provide in this chapter is likely to be foreign to the intersection of IPO underpricing-transparency literature, represented by Boulton et al. (2010), Engelen and van Essen (2010) Banerjee et al. (2011), Hopp and Dreher (2013), Autore et al. (2014), and Hearn (2014). This literature has no awareness that formal institutional quality wields a significant modifying influence in determining the behaviour of entrepreneur founders with reference to the proportion of shares they aim to sell or create when they go public.

3.7.2.3.2. The Influence of Transparency Characteristics on the Underwriter Reputation-IPO Underpricing Relationship

This research carries out the investigation in this section by presenting the results of five hypotheses related to the modifier influences of differences in country-level transparency on IPO underpricing via the choice to hire reputable underwriters. Hypotheses 7a, b, c, d, and e assume that in G20 economies with high levels of voice and accountability, government effectiveness, rule of law, regulatory quality, and control of corruption, the association between high-status underwriters and underpricing is expected to be weaker, respectively.

Table 25 provides agreeable results for all the research hypotheses. The negative and significant coefficient for the interaction term VA*UR (-0.03; Table 25; Model 1; $p<0.05$) supports the prediction of hypothesis 7a. Indicated here is that when the level of voice and accountability in G20 countries increases by one unit, the influence of prestigious underwriters on IPO underpricing falls by 3%. Likewise, the interaction terms GE*UR (-0.03; Table 25; Model 2; $p<0.05$), RL*UR (-0.03; Table 25; Model 3; $p<0.10$), and CC*UR (-0.03; Table 25; Model 5; $p<0.05$) support the theoretical argument pinpointed in hypotheses 7b, c, and e, respectively. These findings demonstrate that an increase in the level of GE, RL, and CC by one unit results in undermining the association between reputable underwriters and underpricing by 3%, equally. Lastly, Table 25 affirms the expectation of hypothesis 7d. This is because the interaction term RQ*UR (-0.04; Table 25; Model 4; $p<0.01$) provides a negative and significant coefficient. It implies that when the level of regulatory quality between G20 stock markets increases by one unit, the link between prestigious underwriters and underpricing weakens by 4%.

These outcomes imply that IPO investors indeed perceive the existence of a high level of transparency in their countries as additional tool that reduces their *ex-ante* uncertainty. In turn, the magnitude of the negative effect of underwriter reputation on underpricing becomes lower in such economics with strong legal system. To further explain these findings, the results infer that when the degree of VA, GE, RL, RQ, and CC in nations is at a high level, then the anxiety of IPO investors, in relation to *ex-ante* uncertainty about the credibility of information included in the IPO prospectus reduces. In this kind of scenario, hiring high-status underwriters to obtain a certification signal to IPO firms - in order to alleviate the *ex-ante* uncertainty for concerned IPO investors about the quality of the IPO issuers – becomes less important.

The motive behind this is that in such national economics with effective country governance practices, stakeholders will surely fear the law, hence refrain from circulating private information. In such nations that maintain quality formal institutions, IPO investors will not find it challenging to formulate investment decisions because they can access efficient and reliable information. The results contend that in countries with sound formal institutional systems, IPO investors are likely to prosecute fraudulent IPO issuers when fraud occurs. Consequently, it becomes unnecessary for those investors to have much concern regarding the reputation of IPO underwriters in providing an IPO prospectus with reliable information on the quality of IPO firms. To recapitulate, in such nations with a high level of transparency, IPO markets possess an information environment that is characterised by: firstly, low levels of information asymmetry, allowing for a lower level of *ex-ante* uncertainty between IPO parities; and secondly, less importance being given to the reputable underwriters' assurance role.

In general, the inferences for the indirect influence of dissimilarities in transparency on IPO underpricing difference help this research to answer the third research question: do differences in country-level transparency influence the relationship between underwriter reputation and underpricing across IPO markets? This research attains a strong answer to this question. This thesis learns that dissimilarities in formal institutional quality across the G20 nations significantly modify the association between the reputable underwriter and IPO underpricing. The findings of this chapter are the first in the IPO underpricing-transparency literature to empirically document that the quality of a country's legal system truly matters in adjusting the correlation between high-status underwriters and IPO underpricing.

3.7.2.3.3. The Influence of Transparency Characteristics on the *Ex-ante* Uncertainty-IPO Underpricing Relationship

The last set of hypotheses connected with testing the indirect influence of country-level transparency on the perceived underpricing variance across nations is provided in this section. Hypotheses 8a, b, c, d, and e propose that low levels of voice and accountability, government effectiveness, rule of law, regulatory quality, and control of corruption undermine the relationship between *ex-ante* uncertainty and underpricing, respectively. Table 25 provides supporting results for the three *ex-ante* measures earning firm support to hypothesis 8a. This is because the interaction term VA*PMV provides negative and significant (-0.01; Table 25; Model 1; $p<0.10$) result. The outcome infers that when the level of voice and accountability between G20 economies rises by one unit, the influence of pre-IPO stock market volatility on IPO underpricing declines by 1%. Following the hypothesised relationship in the hypothesis development section, VA*PMV proposes the following. The existence of fragile country governance regulations breeds a stock market environment that suffers from asymmetric information problem amongst market participants. Therefore, in this type of market with a low level of VA, participants in the IPO market will maintain the view that IPO managers have ultimate control of window dressing accounting numbers and finance-related information. In such a stock market environment, the *ex-ante* uncertainty amongst IPO investors accumulates to the extent investors become very sensitive to any bad news; in turn, they react aggressively to fluctuations in pre-IPO stock market volatility. This of course attracts more underpricing.

Similarly, the second interaction term of VA*LET provides positive and significant (0.01; Table 25; Model 1; $p<0.05$) outcome as anticipated in the theoretical section. It indicates that an increase in the level of voice and accountability by one unit amongst G20 stock markets results in increasing the influences of elapsed time on IPO underpricing by 1%. This finding can be explained as follows. Remember that previous IPO underpricing literature proxies the level of *ex-ante* uncertainty in amongst IPO investors utilising the variable elapsed time (Lee et al. 1996; Ekkayokkaya & Pengniti 2012). This literature asserts that when institutional investors[34] have some worries or are not enthusiastic about subscribing in full to some IPO companies, then the length of the elapsed time between the first trading day and fixing the offer price of the IPO firm increases. Subsequently, uninformed investors read the low appetite or demand by institutional investors for some IPOs as being of high uncertainty risk (Lee et al. 2003). This perception turns into less demand for an IPO firm on the first trading day and generates less pressure on the share prices of IPO firms leading to lower underpricing. The result suggests that when this IPO firm is traded in a

[34] Lee et al. (1996) and Ekkayokkaya and Pengniti (2012) argue that institutional investors can be seen as "informed" investors because they enjoy a high level of financial knowledge and resources. In contrast, the authors see "non-informed" IPO investors as retail investors who have limited financial awareness and capability.

nation with high voice and accountability standards, the influence of LET on UP becomes larger. The reason for this is that uninformed IPO investors in high VA stock markets have confidence in the investment actions of institutional investors. This is because IPO investors nested in such countries can rely on their legal system to protect them in case they were manipulated by the misleading actions of informed investors.

Likewise, the third interaction term of VA*LOP presents a positive and significant (0.03; Table 25; Model 1; p<0.01) coefficient as expected. Recall that IPO underpricing scholars including Beatty and Ritter (1986), Loughran et al. (1994), and Boulton et al. (2010) employed IPO offer size to proxy for *ex-ante* uncertainty. The authors confirm that well-established IPO firms routinely offer larger offerings while speculative firms offer smaller offerings. Consequently, IPO investors nested in nations with a high level of VA will have greater confidence in the quality of prospectuses issued by large IPO firms. This is because investors in such economies trust that managers in well-established IPO firms fear breaking the law, hence, they will not become involved in fraudulent financial reporting. The outcome is less underpricing for large IPO firms offered in high VA countries. For this reason, the relationship between the size of the IPO firm and underpricing becomes stronger in high transparency nations.

The outcomes related to hypotheses 8c, d, and e provide overall significant results giving support for their claims. Table 25 shows that interaction terms RL*LET (0.03; Table 25; Model 3; p<0.01), RQ*LET (0.02; Table 25; Model 4; p<0.01), and CC*LET (0.01; Table 25; Model 5; p<0.05) are positive and significant. These results imply an increase in the level of rule of law, regulatory quality, and control of corruption across the G20 economies by one unit leads to improving the influence of LET and LOP on IPO underpricing by 3%, 2%, and 1%, respectively. Similarly, Table 25 reveals positive and significant coefficients for the interaction terms RL*LOP (0.04; Table 25; Model 3; p<0.01), RQ*LOP (0.02; Table 25; Model 4; p<0.01), and CC*LOP (0.02; Table 29; Model 5; p<0.01). Yet, this research obtains weak support for hypothesis 8b. This is because the interaction term GE*LOP (0.03; Table 29; Model 2; p<0.01) provides a result that is consistent with the hypothesis while GE*LET (0.01; Table 25; Model 2; p>0.10) is insignificant and GE*PMV (0.02; Table 25; Model 2; p<0.01) is contrary to the prediction.

Table 25 documents minor contradictory results in relation to the influence of RL, RQ, and CC on the relationship between PMV and IPO underpricing. This research argues that these unanticipated results are due to the presence of contrary expectations about the influence of pre-IPO market volatility across stock markets with a high level of RL, RQ, and CC. The findings are in line with a similar observation made by Kayo and Kimura (2011). These scholars found that contrary to their expectation, munificence has no influence on the association between growth opportunities and leverage ratio across countries. Generally, the results provide strong support for hypotheses 8a, c, d, and e while weak support is evident for hypothesis 8b.

Overall, Table 25 reveals sufficient evidence permitting this thesis to answer the fourth research question of this chapter: do differences in country-level transparency influence the relationship between *ex-ante* uncertainty surrounding the offering and underpricing across IPO markets? Confidently, the author of this thesis attains evidence that dissimilarities in the formal institutional quality indirectly affect the IPO underpricing's variability from country to country. This novel empirical evidence will certainly improve the comprehension of the intersection of IPO underpricing-transparency literature represented by Boulton et al. (2010), Engelen and van Essen (2010), Banerjee et al. (2011), Hopp and Dreher (2013), Autore et al. (2014), and Hearn (2014). This literature asserts that the variability in formal institutional quality exerts only a direct influence on IPO underpricing across the global IPO market.

This research notes that the results for the direct influences of the five transparency proxies along with the firm-level variables in Panel A in Table 25 exhibit similar findings with Table 24. Across the five models, Table 25 affirms the prior conclusion that VA, GE, RL, RQ, and CC significantly matter in elucidating the variance in IPO underpricing across G20 economies. Table 25 shows that the analysis of the model fit for the five formal institutional proxies disclose that voice and accountability (Deviance 23583; Table 25; Model 1; R^2 between countries 34%; R^2 within countries 8%) demonstrates the largest direct and indirect influence on IPO underpricing. This outcome implies that 34% of variability of underpricing across nations is mainly attributed to dissimilarities in the level of voice and accountability while only 8% is related to determinants of IPO underpricing. The level of government effectiveness appears as a second powerful country-level transparency proxy (Deviance 23666; Table 25; Model 2; R^2 between countries 8%; R^2 within countries 7%) having significantly direct and indirect influence on underpricing. The direct and indirect effects of rule of law (Deviance 23760; Table 25; Model 3; R^2 between countries 9%; R^2 within countries 7%) and regulatory quality (Deviance 23808; Table 25; Model 4; R^2 between countries 11%; R^2 within countries 6%) arise second in elucidating the variance in IPO underpricing across the international IPO market. The level of control of corruption (Deviance 23817; Table 25; Model 5; R^2 between countries 6%; R^2 within countries 6%) comes last in terms of the direct and indirect influences on the worldwide underpricing difference.

3.7.3. Alternative Specifications and Robustness Checks

3.7.3.1. Time-Invariant Country-level Transparency Proxies

In this section, this research seeks to observe if employing time-invariant country-level transparency proxies is econometrically an accurate estimation as employing time-variant ones. Recall that in the literature review, the author argues that the true association between differences in country-level transparency and IPO underpricing across countries continues to be a problem in the law and IPO underpricing literature. Consequently, this thesis made a claim by arguing that using time-invariant country-level transparency proxies instead of time-variant ones led to a lack of understanding in relation to transparency-IPO underpricing relationship. Dollar and Kraay (2003) indicate that ignoring the time-varying characteristics of changes in institutional quality leads to omitted variable bias. Hence, this research reconverts the time-variant country-level transparency measures to time-invariant ones following Engelen and van Essen (2010), in order to retest if not accounting for the time-variance trait of country-level transparency would bias the results.

Table 26 presents the results for five full HLM models using both random intercept and slope coefficients while treating country-level transparency proxies as time-invariant factors. This research does this by using the average score of, for example, the voice and accountability measure for every country over the entire period of the study following Engelen and van Essen (2010). In contrast to the time-variant results in Table 25, the five HLM models in Table 26 document interesting findings. This research discovers that only VA (-0.27; Table 26; Model 1; $p<0.10$) and CC (-0.27; Table 26; Model 5; $p<0.10$) are negative and weakly significant.

Table 26: HLM Analyses on the Effect of Time-Invariant Country-level Transparency on IPO Underpricing of the G20 Countries with Random Intercept and Slop Coefficient Model with Firm-specific Variables

Model 1		Model 2		Model 3		Model 4		Model 5	
				Panel A: Direct Effect					
				Transparency-level variables					
VA	-0.27*	**GE**	-0.23	**RL**	-0.20	**RQ**	-0.23	**CC**	-0.27*
	[-1.45]		[-1.20]		[-1.00]		[-1.19]		[-1.50]
				Firm-level variables					
PR	-0.02***	**PR**	-0.02***	**PR**	-0.02***	**PR**	-0.02***	**PR**	-0.02***
	[-11.50]		[-11.38]		[-11.70]		[-11.40]		[-11.00]
DF	-0.02***	**DF**	-0.02***	**DF**	-0.02***	**DF**	-0.02***	**DF**	-0.02***
	[-15.25]		[-14.72]		[-15.30]		[-14.70]		[-15.00]
UR	-0.01	**UR**	-0.01	**UR**	-0.01	**UR**	-0.01	**UR**	-0.01
	[-0.30]		[-0.24]		[-0.29]		[-0.20]		[-0.22]
PMV	0.01	**PMV**	0.01	**PMV**	0.01*	**PMV**	0.01	**PMV**	0.01
	[1.28]		[1.10]		[1.30]		[1.00]		[1.10]
LET	-0.05**	**LET**	-0.05**	**LET**	-0.05**	**LET**	-0.05**	**LET**	-0.05**
	[-5.65]		[-5.51]		[-5.70]		[-6.00]		[-6.75]
LOP	-0.07***	**LOP**	-0.07***	**LOP**	-0.07***	**LOP**	-0.07***	**LOP**	-0.07***
	[-12.00]		[-11.54]		[-12.10]		[-12.00]		[-11.65]
Dummy Effects	**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**
				Panel B: Indirect Effect "Interaction Variables"					
VA * PR	0.01***	**GE * PR**	0.01***	**RL * PR**	0.01***	**RQ * PR**	0.01***	**CC * PR**	0.01***
	[2.75]		[2.86]		[3.00]		[2.90]		[2.80]
VA * DF	0.01***	**GE * DF**	0.01***	**RL * DF**	0.01***	**RQ * DF**	0.01***	**CC * DF**	0.01***
	[4.92]		[5.00]		[4.95]		[4.95]		[5.00]
VA * UR	-0.07**	**GE * UR**	-0.06*	**RL * UR**	-0.06*	**RQ * UR**	-0.06*	**CC * UR**	-0.06**
	[-1.75]		[-1.60]		[-2.00]		[-1.62]		[-1.70]
VA* PMV	0.04***	**GE* PMV**	0.04***	**RL* PMV**	0.04***	**RQ* PMV**	0.05***	**CC* PMV**	0.04***
	[2.60]		[2.70]		[3.00]		[2.75]		[2.62]
VA * LET	0.05***	**GE * LET**	0.03**	**RL * LET**	0.03**	**RQ * LET**	0.04**	**CC * LET**	0.05***
	[2.56]		[1.90]		[2.00]		[1.95]		[3.00]
VA * LOP	0.08***	**GE * LOP**	0.07***	**RL * LOP**	0.07***	**RQ * LOP**	0.06***	**CC * LOP**	0.08***
	[6.77]		[6.00]		[5.85]		[5.58]		[6.80]
Constant	0.27***		0.30***		0.30***		0.26***		0.27***
	[2.87]		[2.80]		[3.00]		[2.77]		[2.90]
Observations	**10,209**		**10,209**		**10,209**		**10,209**		**10,209**
R^2 within countries	**0.06**		**0.06**		**0.06**		**0.06**		**0.06**
R^2 between countries	**0.09**		**0.07**		**0.06**		**0.07**		**0.09**
				Random-Effect Parameter					
Variance Component for Level 2 Effect, μ_{0j}	0.16744		0.17294		0.17300		0.17294		0.16744
Variance Component for Level 1 Effect, η_{ij}	0.60020		0.60118		0.60120		0.60118		0.60020
Deviance	23839		23856		23860		23856		23839

Note: Country-level transparency and firm-level variables are as defined before in Table 19 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

The remaining three proxies GE, RL, and RQ demonstrate no relationship existing between country-level transparency and IPO underpricing difference across nations. Judging from these outcomes, this research would reach a false conclusion that refutes the direct influence of differences in country-level formal institutional quality on underpricing variance across the global IPO market. These results imply that omitting the time-variant nature of country-level transparency means that this research could have arrived at an erroneous conclusion. Table 26 also shows that disregarding the time-variant nature of country-level characteristics causes no notable impact on firm-level variables in relation to the EWL theory. This is because in Panel A in Table 26, consistent with previous findings, this research continues to observe partial support for two out of the three dimensions of the EWL model: the incentive of IPO issuers and *ex-ante* uncertainty in explaining IPO underpricing variance. This conclusion suggests that IPOs are underpriced differently because owners of IPO firms sell more secondary shares and create more primary shares; this condition is also elucidated by the degree of *ex-ante* uncertainty perceived at the time of offering. The employment of reputable underwriters has no influence on IPO underpricing across nations.

This similarity between the results of firm-level factors in Tables 25 and 26 comes as no surprise. This is because in both tables the author estimates firm-level covariates using the group mean centering approximation. In Panel B, this research notes that the effect of omitting the time-varying nature of country-level transparency only biased the indirect relationship between the pre-IPO stock market volatility and underpricing. By assessing the impact of discounting the time-variant characteristics of country-level transparency on the model fit of the five HLM models, this research notes the following. The R-squared results in Table 26 provide poor quantification of the direct and indirect influences of country-level formal institutional characteristics on IPO underpricing. This is because, for example, the R^2 between (within) nations attributes only 9% (6%) of the variability in IPO underpricing to the time-invariant changes in the level of voice and accountability (firm-level factors) across nations as shown in Model 1 in Table 26. On the contrary, the robust results this research obtains previously (Table 25; Model 1; R^2 between countries 34%; R^2 within countries 8%) document that the time-variant changes in the level of voice and accountability elucidates 32% of underpricing difference while differences in firm-level factors within countries explain 8%.

This thesis attributes this large loss in the R-squared values for 25% between and for 2% within countries in Model 1 in Table 25 compared with Model 1 in Table 26 to omitting the time-variance characteristics of country-level transparency. This loss in R-squared figures is translated into a similar loss in the efficiency of all models in Table 26 compared to Table 25. This is evident in the inefficient outcome of the deviance score test of 23839, for example, in Model 1 in Table 26 compared with the efficient deviance score test of 23583 reported in Model 1 in Table 25. Hence, the results in Table 25 provide a bias-free and efficient conclusion supporting the negative and significant relationship between time-variant difference in country-level transparency and underpricing difference across countries. This finding implies that the conclusions reached by previous IPO underpricing-law literature and in particular Engelen and van Essen (2010) should be treated with caution.

3.7.3.2. Variations in Developed and Developing Countries

There is a strand of research that distinguishes between developed and developing stock markets in relation to the impact of institutional quality on information asymmetry in stock markets. For example, Harvey (1995), Klapper and Love (2004), and Fernandes and Ferreira (2008) document dissimilar effects of country-level institutional quality for developing and developed markets on stock market behaviour. Kayo and Kimura (2011) also acknowledge the impact of differences in information environments between developed and developing stock markets, and their impact on the capital structure of firms. They argue that firms nested within developing stock markets exhibit similar firm-level information characteristics that are not similar to developed ones. Hence, to control for the effect of country-level transparency on IPO underpricing difference in developing and developed IPO market, this research follows Kayo and Kimura (2011) to split the sample between developing and developed countries. In Table 22, this research presented the results of the one-way ANOVA with random effects for 10 developing[35] and 12 developed stock markets to confirm the nesting structure of the IPO data.

[35] See Table 3 for a detailed list of countries.

This research checks if variations in IPO underpricing across the 3,025 developing and 7,188 developed IPO firms are significantly different within each group. The results of the random-effect parameters in Table 22 support the use of HLM technique as they show significant variation within developing and developed G20 countries in underpricing. This research shows that by controlling for the nesting structure of the IPO data, 25% (5%) of the variation in IPO underpricing in developing (developed) G20 countries is related to differences between those countries. To check the direct impact of time-varying changes in transparency within developing and developed G20 countries on underpricing difference in the G20 countries, Tables 27 and 28 separately run the HLM results for IPOs listed in developing and developed stock markets. This research manages to isolate the effect of differences in country-level transparency on IPO underpricing in developing and developed market samples.

Interestingly, across the five models in Table 27, this research finds only a significant impact of time-varying changes in the level of voice and accountability on the underpricing difference within developing G20 countries. Model 1 in Table 27 documents that an increase in the voice and accountability level by one unit leads to a fall in the underpricing level within developing G20 countries by 30% at the 5% level of significance. Hence, the value of R^2 between countries for Model 1 shows that 28% of the variability in underpricing between emerging G20 countries is entirely explained by differences between the level of voice and accountability. The results of Models 2 to 5 in Table 27 show no association between the level of regulatory quality, control of corruption, government effectiveness, and rule of law and underpricing difference in developing countries.

However, how does this research interpret this conflicting result? This research argues that although these five proxies measure overall country-level transparency, VA focuses on measuring the perception of individuals concerning the degree of transparency in their countries. In contrast, the remaining four proxies - RQ, CC, GE, and RL - focus on gauging the status of transparency that is provided by a country's government. This research therefore argues that those individuals in developing countries include investors in the IPO who fear that when the degree of voice and accountability in their countries is in question, their *ex-ante* uncertainty about the credibility of information included in the IPO prospectus is higher.

Table 27: The Effect of Country-level Transparency on IPO Underpricing of Developing G20 Countries with Random Intercept and Slope Coefficient Estimations

Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
				Panel A: Direct Effect					
				Transparency-level variables					
VA	-0.30**	**GE**	0.01	**RL**	0.32	**RQ**	-0.07	**CC**	0.06
	[-1.90]		[0.03]		[1.00]		[-0.75]		[0.20]
				Firm-level variables					
PR	-0.01	**PR**	-0.05***	**PR**	-0.07***	**PR**	-0.05***	**PR**	-0.10***
	[-0.53]		[-4.65]		[-4.24]		[-5.30]		[-6.88]
DF	-0.02	**DF**	-0.05***	**DF**	-0.07***	**DF**	-0.05***	**DF**	-0.10***
	[-1.01]		[-4.70]		[-4.13]		[-5.42]		[-7.01]
UR	0.07	**UR**	0.08**	**UR**	0.11**	**UR**	0.07**	**UR**	0.11**
	[1.12]		[1.72]		[2.30]		[1.83]		[2.73]
PMV	0.02	**PMV**	0.06***	**PMV**	0.06***	**PMV**	0.05***	**PMV**	0.04***
	[0.77]		[3.84]		[3.30]		[3.25]		[2.97]
LET	0.03*	**LET**	0.03**	**LET**	0.05***	**LET**	0.04**	**LET**	0.04**
	[1.60]		[1.65]		[2.43]		[1.97]		[2.18]
LOP	-0.09***	**LOP**	-0.11***	**LOP**	-0.13***	**LOP**	-0.11***	**LOP**	-0.12***
	[-4.90]		[-7.03]		[-7.41]		[-7.50]		[-8.40]
Dummy Effects	**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**
				Panel B: Indirect Effect "Interaction Variables"					
VA * PR	0.05***	**GE * PR**	0.01	**RL * PR**	-0.09***	**RQ * PR**	0.03***	**CC * PR**	-0.03
	[3.13]		[1.10]		[-3.50]		[2.40]		[-0.91]
VA * DF	0.04***	**GE * DF**	0.02	**RL * DF**	-0.10***	**RQ * DF**	0.03***	**CC * DF**	-0.03
	[2.75]		[1.25]		[-3.64]		[2.64]		[-0.89]
VA * UR	-0.01	**GE * UR**	-0.04	**RL * UR**	0.14*	**RQ * UR**	-0.02	**CC * UR**	0.07
	[-0.05]		[-0.71]		[1.40]		[-0.34]		[0.76]
VA* PMV	-0.03*	**GE* PMV**	0.07***	**RL* PMV**	0.05	**RQ* PMV**	0.05***	**CC* PMV**	0.06*
	[-1.50]		[3.02]		[1.10]		[2.68]		[1.43]
VA * LET	0.01	**GE * LET**	-0.06**	**RL * LET**	0.11***	**RQ * LET**	-0.01	**CC * LET**	0.10**
	[0.33]		[-1.96]		[2.73]		[-0.36]		[2.20]
VA * LOP	0.04**	**GE * LOP**	-0.01	**RL * LOP**	-0.08***	**RQ* LOP**	-0.02	**CC * LOP**	-0.05*
	[2.47]		[-0.43]		[-2.45]		[-1.01]		[-1.40]
Constant	1.42***		1.47***		1.39***		1.45***		1.40***
	[7.45]		[6.81]		[6.79]		[6.85]		[6.61]
Observations	**3,021**		**3,021**		**3,021**		**3,021**		**3,021**
R^2 within countries	**0.08**		**0.08**		**0.08**		**0.08**		**0.07**
R^2 between countries	**0.28**		**0.01**		**0.10**		**0.01**		**0.01**
				Random-Effect Parameter					
Variance Component for Level 2 Effect, μ_{0j}	0.23700		0.32495		0.29450		0.32487		0.32400
Variance Component for Level 1 Effect, η_{ij}	0.89580		0.89729		0.89415		0.89739		0.89945
Deviance	8270		8281		8273		8282		8288

Note: Country-level transparency and firm-level variables are as defined before in Table 19 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Table 28: The Effect of Country-level Transparency on IPO Underpricing of Developed G20 Countries with Random Intercept and Slope Coefficient Estimations

Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**	
				Panel A: Direct Effect					
				Transparency-level variables					
VA	-0.22	**GE**	-0.03	**RL**	-0.02	**RQ**	0.01	**CC**	-0.02
	[-1.20]		[-0.43]		[-0.24]		[0.02]		[-0.30]
				Firm-level variables					
PR	-0.02***	**PR**	-0.02***	**PR**	-0.02***	**PR**	-0.01***	**PR**	-0.01***
	[-13.70]		[-12.42]		[-14.09]		[-10.50]		[-13.30]
DF	-0.02***	**DF**	-0.02***	**DF**	-0.02***	**DF**	-0.02***	**DF**	-0.02***
	[-19.53]		[-19.32]		[-21.84]		[-18.51]		[-21.80]
UR	-0.05**	**UR**	-0.04**	**UR**	-0.05***	**UR**	-0.04**	**UR**	-0.05**
	[-2.30]		[-2.19]		[-2.40]		[-1.95]		[-2.20]
PMV	-0.02**	**PMV**	-0.02**	**PMV**	-0.03***	**PMV**	-0.04***	**PMV**	-0.03***
	[-1.75]		[-2.10]		[-2.73]		[-4.21]		[-2.85]
LET	0.03**	**LET**	0.03*	**LET**	0.01	**LET**	-0.01	**LET**	-0.01
	[1.82]		[1.50]		[0.50]		[-0.81]		[-0.40]
LOP	-0.06***	**LOP**	-0.07***	**LOP**	-0.07***	**LOP**	-0.07***	**LOP**	-0.08***
	[-10.80]		[-11.27]		[-11.20]		[-11.30]		[-10.45]
Dummy Effects	**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**
				Panel B: Indirect Effect "Interaction Variables"					
VA * PR	0.02**	**GE * PR**	-0.01***	**RL * PR**	-0.02***	**RQ * PR**	-0.01	**CC * PR**	-0.01***
	[2.13]		[-3.20]		[-4.40]		[-0.40]		[-3.90]
VA * DF	0.03***	**GE * DF**	-0.02*	**RL * DF**	-0.01***	**RQ * DF**	-0.06***	**CC * DF**	-0.01***
	[4.73]		[-1.30]		[-5.20]		[-2.50]		[-4.68]
VA * UR	-0.01	**GE * UR**	0.01	**RL * UR**	0.01	**RQ * UR**	0.01	**CC * UR**	0.01
	[-0.04]		[0.11]		[0.10]		[0.08]		[0.05]
VA* PMV	0.31***	**GE* PMV**	0.21***	**RL* PMV**	0.14**	**RQ* PMV**	0.15***	**CC* PMV**	0.11***
	[8.30]		[8.24]		[2.30]		[8.44]		[4.65]
VA * LET	-0.04***	**GE * LET**	-0.05*	**RL * LET**	-0.08**	**RQ * LET**	-0.02***	**CC * LET**	-0.08***
	[-4.40]		[-1.30]		[-1.97]		[-3.81]		[-3.20]
VA * LOP	0.15***	**GE * LOP**	0.10***	**RL * LOP**	0.11***	**RQ* LOP**	0.08***	**CC * LOP**	0.07***
	[5.80]		[5.20]		[3.98]		[6.42]		[4.50]
Constant	0.01		-0.01		-0.02		0.01		-0.01
	[0.22]		[-0.24]		[-0.10]		[0.15]		[-0.21]
Observations	**7,188**		**7,188**		**7,188**		**7,188**		**7,188**
R^2 within countries	**0.10**		**0.10**		**0.09**		**0.09**		**0.10**
R^2 between countries	**0.04**		**0.11**		**0.12**		**0.05**		**0.12**
				Random-Effect Parameter					
Variance Component for Level 2 Effect, μ_{0j}	0.02408		0.02782		0.02860		0.02636		0.02843
Variance Component for Level 1 Effect, η_{ij}	0.44954		0.45195		0.45327		0.45032		0.45275
Deviance	14679		14719		14740		14693		14732

Note: Country-level transparency and firm-level variables are as defined before in Table 19 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Those investors will pay no attention to changes in the level of regulatory quality, control of corruption, government effectiveness, and rule of law as improvements in their governments' operational and informational efficiency are frequently questioned. Those investors will pay no attention to changes in the level of regulatory quality, control of corruption, government effectiveness, and rule of law as improvements in their governments' operational and informational efficiency are frequently questioned.

Governments in developing economies can make numerous policy changes in their legislation/regulations cosmetically enhance their global transparency ranking but market participants in those countries will discount or disregard those fictitious transparency improvements. Hence, what is really matter in practice in developing IPO markets is the way investors perceive the association between the ability of their voice to make a genuine change and their believe of the genuine accountability of their governments. Investors in such developing equity markets that preserve a sound level of voice and accountability are likely to have a low level of *ex-ante* uncertainty about the freedom of business activities and the reliability of information from influences of government officials, firms, and well-connected citizens, as it affects the credibility of the business environment. When those investors believe that their country has a high level of voice and accountability, then their *ex-ante* uncertainty about the destruction of information in that country will consequently mitigate the information asymmetry problem in their country. The explanation of this effect is intuitively supported by Harris et al. (2009), Knill (2012), Cumming et al. (2014), Autore et al. (2014), and Hearn (2014). These scholars acknowledged the influence of voice and accountability in a country on the information asymmetry problem prevailing in it.

Table 28 presents the results of HLM models for developed G20 countries. Across the five models, this research does not find that time-varying changes in country-level transparency wields a significant impact on the underpricing difference within advanced G20 economies. These results do not come as a surprise for two reasons. Firstly, this research showed previously in Table 4 and Table 20 that although there is a good level of heterogeneity in underpricing and transparency within industrial G20 nations, this heterogeneity is far lower than what is observed in developing stock markets. For example, this research reports in Table 4 (20) that dispersion in the level of IPO underpricing (voice and accountability) in developed countries is 74% (20%) while it is 105%

(92%) within developing economies. This indicates that advanced nations are already reaching a mature level of transparency in their markets where any minor enhancements in governance do not reflect on their stock markets. This should be the opposite for emerging equity markets.

This could possibly imply that institutional quality in developed countries is time-invariant yet time-variant in developing countries. Kayo and Kimura (2011) provide a similar observation when they examine the hierarchical structure of determinants of capital structure between developing and developed stock markets. They state that because their sample includes a heterogeneous set of developing and developed countries, the importance of time increases in the sense that countries with stable institutional and economic quality such as the U.S., changes in firms' financial policy may become time-invariant. On the other hand, Kayo and Kimura (2011) assert that companies in emerging countries are likely to be subject to many changes in their policies arising from institutional instabilities over the course of time. Secondly, this research argues that any changes in government policies that have an effect on stock markets and investors' confidence in developed markets are already incorporated efficiently in stock prices. In fact, there is a strand of literature including Morck et al. (2000), La Porta et al. (2006), Fan et al. (2007), Griffin et al. (2010), and Jamaani and Roca (2015) who argue that information about macroeconomic and institutional changes in advanced economies is efficiently reflected in stock market behaviour. Hence, IPO investors across developed G20 nations have no information advantage compared to their fellow investors in developing G20 economies.

This research now inspects the behaviour of firm-level covariates related to the EWL theory after the author groups the observations based on the level of stock market development. In Panel A in Tables 27 and 28 the results provide overall agreement supporting the negative and significant association between incentive of IPO issuers and IPO underpricing in both developed and developing countries. Both PR and DF are negative and significant in most models. The findings are in line with prior IPO literature including Habib and Ljungqvist (2001) and Jones and Swaleheen (2010). Yet, the PR and DF's outcomes reported in Tables 27 and 28 are in disagreement with Autore et al. (2014). The authors employ OLS-based estimation to find positive and significant relationship between PR and DF and underpricing in both developed and developing country subsamples. This research attributes the difference in results between Autore et al.'s (2014) work and ours to two issues. First, from an econometric perspective, the authors' results could be spuriously positive due to the impact of a large domination in country observations related to the variables PR and DF. For example, 78% of their data is related to only four developing nations, these being China, Taiwan, Malaysia, and South Korea while the remaining 22% is related to 12 developing countries. The problem is that under the simple pooling estimation for the OLS estimation, Li et al. (2013) caution that some covariates could be spuriously significant due to the effect of large sample size at the firm-level. In contrast, the HLM estimation adjusted for this econometric shortfall by estimating regressions where PR and DF observations are group centered by every country in the sample.

Consequently, this research completely eliminates the impact of countries with large PR and DF observations. The second issue is associated with the difference in data size and coverage between Autore et al.'s (2014) work and the study. The data on developed (developing) countries includes 7,160 (3,021) IPO firms ranging from January 1995 to December 2016. Conversely, Autore et al.'s (2014) developed (developing) country data contains 5,490 (1,907) IPO firms listed between 1998 and 2008.

Nevertheless, Tables 27 and 28 report notable differences related to the association between underwriter reputation and IPO underpricing between emerging and industrial economies, respectively. For example, unexpectedly, Table 27 shows that the overall outcomes of the variable UR utilising developing countries sample are positive and significant. The reverse is the case, i.e. negative and insignificant for Autore et al. (2014) who employ and develop a country IPO sample. They also differ from the negative and significant results attained by Habib and Ljungqvist (2001), Chahine (2008), and Jones and Swaleheen (2010) for developed countries. This research explains the difference in the finding as follows. This research contends that underwriters in developing stock markets exploit the existence of a weak legal system in their countries, hence they intentionally underprice IPO firms seeking benefits for themselves and to profit buy-side institutional investors. Hence, this thesis asserts that in such economies with fragile formal institutional environment IPO issuers will not be able to prosecute fraudulent underwriters when intended underpricing is evident.

This implies possible existence of a spinning practice in emerging IPO markets. This practice occurs when issuers bear the expense of hiring high-status underwriters and instead of obtaining lower underpricing, IPOs underwritten by reputable underwriters experience higher underpricing. Liu and Ritter (2010) confirm the existence of spinning behaviour in the IPO market bringing support the argument. The authors found some reputable underwriters exploit their market power to underprice IPO firms seeking side payments from institutional investors. Chen et al. (2017) also lend support to the rationale by arguing that in countries where non-transparent market practices are tolerated, big underwriting banks frequently tend to exploit owners of IPO companies. The authors also discovered IPOs underwritten by high-status underwriters charge with higher underwriting fees compared with low quality underwriting banks for the same service they provide. In contrast, Table 28 shows in the developed G20 stock markets, the relationship between prestigious underwriters and underpricing is negative and significant. This finding means that underwriters in developed economies accomplish their certifying role to quality IPO firms in exchange for higher underwriting fees. The UR outcomes for developed nations are consistent with the endogenous underwriter-IPO underpricing relationship documented by Habib and Ljungqvist (2001) and Jones and Swaleheen (2010). The authors confirm that entrepreneur founders endogenously select prestigious underwriters when they intend to sell a large fraction of their secondary shares. By employing the 2SLS model as opposed to OLS estimation to account for this endogenous effect, the authors report the signage of UR shifts from positive to negative. This explains why Autore et al. (2014) find UR positively impacts on IPO underpricing throughout their sample for developed stock markets. This is indeed due to not accounting for this endogeneity problem. The HLM estimation corrected for this outcome and produced results that are consistent with the 2SLS estimation used by Habib and Ljungqvist (2001) and Jones and Swaleheen (2010).

Tables 27 and 28 also report dissimilarities in the anticipated coefficient sign and significance of *ex-ante* uncertainty proxies including PMV and LET between developed and developing economies. For example, Table 27 documents that PMV provides positive and significant coefficients in four out of five models when this research restricts the sample to developing countries. In contrast, using developed IPO data sample in Table 28 this research finds the variable PMV is significant and negatively related to underpricing in all models. The association between the elapsed time and underpricing is also inconsistent across developed and developing stock markets. The outcomes reported in Table 27 propose that investors in developing countries observe IPO firms that require longer time to be listed as being a risky investment. Consequently, higher underpricing is demanded by IPO investors to reward for this extra *ex-ante* uncertainty. The LET outcomes and explanation for developing economies are in line with comparable arguments and findings achieved by Mok and Hui (1998) and Chan et al. (2004).

Contrariwise, Table 28 shows that, on average, IPO investors in developed nations' stock markets place no significance on the length of time between fixing the offer price and the first trading day. However, this research finds an agreement between developed and developing stock markets in relation to the negative and significant influence of IPO firm size on IPO underpricing. Irrespective of the level of stock market development, larger IPO firms are recognised by IPO investors as low risk investments. This is because large IPO companies are usually well-established, while small IPOs tend to be speculative firms with inadequate market histories. The LOP outcomes are in harmony with Boulton et al. (2010) and Autore et al. (2014).

The interpretations of the interaction terms in Panel B in Tables 27 and 28 exemplify dissimilar effects when this research compares developed to developing countries. For example, the level of VA increases the influence of PR and DF in decreasing IPO underpricing in both developing and developed countries. Yet, the degree of CC decreases the driving influence of PR and DR in easing underpricing in developed stock markets while it exerts influence in developing economies. Similarly, however, within both developing and developed countries, the influence of most transparency proxies on the association between reputable underwriters and IPO underpricing is not significant. When this thesis examines the influence of country-level transparency on the relationship between pre-IPO market volatility and underpricing, this research observes an opposite role for developed economies. Meanwhile in the developing stock markets this research finds contradictory results for the effect of PMV on IPO underpricing. More inconsistent outcomes are reported in relation to the influence of elapsed time on IPO underpricing in developed nations while this research finds consistent results within developing stock markets. This research uncovers a complete agreement in relation to the connection between IPO offer size and IPO underpricing between developed and developing stock markets. Kayo and Kimura (2011) also reported similar contradictory behaviours related to the interaction terms across developed and developing stock markets.

The analysis of the model fit across the two blocks of stock markets reveals the following. Model 1 in Table 27 offers the largest direct and indirect influences of voice and accountability on determinants of IPO underpricing in emerging G20 nations. The variability of voice and accountability in developing G20 economies elucidates 28% of the underpricing variance while firm-level variables elucidate only 8%. In contrast, Model 1 in Table 28 is the most efficient model because it has the lowest deviance score of 14679. This model reveals that dissimilarities in voice and accountability within developed nations explain only 4% of underpricing variance while 10% of this difference is attributed to the firms. On average, the evidence this research discovers here is that characteristics of firms in developed and developing economies elucidate up 10% and 8% of the variability underpricing, respectively. In contrast, up to 28% and 12% of the underpricing variance is explained by the characteristics of formal institutional quality in developing and developed nations, respectively. This finding implies that the characteristics of country-level transparency are more important to the IPO market of developing countries compared to advanced ones.

3.7.3.3. Endogeneity and Omitted Variable Bias

In this section, this research conducts a series of robustness tests in order to maintain the assurance and reliability of the previous outcomes. This includes the following. First, the author checks no biased conclusions are derived from the results that do not account econometrically for a potential endogeneity problem. Second, this thesis incorporates extra firm and country-level covariates. Third, this research conducts a variety of diagnostic tests. Specifically, this research controls econometrically for a potential endogeneity problem between the variable UR and the residual at lower level observations (i.e., firm-level variables). This is done using robust cluster 2SLS models with the aim of checking if the significant findings this research achieved previously were not biased. IPO underpricing literature accentuates that a potential endogeneity problem may occur between the decision to hire a reputable underwriter and the residual of the OLS models (Habib & Ljungqvist 2001; Jones & Swaleheen 2010). This literature argues that ignoring this problem leads to flawed results. The variable UR is employed at the HLM lower level to elucidate the variance of IPO underpricing within nations. Hofmann (1997) and Antonakis et al. (2014) contend that such an endogeneity problem should not influence HLM's lower level model. The reason behind this is that HLM estimation assumes the existence of correlations between lower level observations (Raudenbush & Bryk 2002).

Yet, Essen et al. (2013) and Zattoni et al. (2017) argue that while HLM corrects for correlations in observations within the lower level equation, there is still a chance that complete elimination of this endogeneity problem is not attained. The scholars proposed the employment of 2SLS estimation with a robust instrumental variable to check the reliability of the outcomes provided by HLM estimation. Consequently, this research follows Essen et al. (2013) and Zattoni et al. (2017) by using robust 2SLS models as a sensitivity test to check if the association between dissimilarities in country-level transparency and IPO underpricing will be consistent with the HLM results. However, this research aims to reproduce comparable testing settings to HLM technique that corrects for potential correlations in residuals while shielding against heteroscedasticity and endogeneity. Thus, this research utilises 2SLS estimation with robust standard errors clustered by countries following Zattoni et al. (2017).

Secondly, this thesis incorporates seven additional firm-level and two country-level factors known to influence IPO underpricing. This is done to moderate the possibility that the derived conclusions from all models in Tables 24, 25 and in Model 1 in Table 27 are an artefact of omitted variable bias. This research only focuses here on retesting the robustness of models that provide significant results. Supplementary firm-level covariates contain book-building, technology firms, private firms, integer offer price, underwriter fees, the 1997-98 Asian Financial Crisis and Global Financial Crisis that emerged in 2008. This research also incorporates two country-level proxies to control for differences between countries in relation to the level of financial market development. This includes capturing the level of market sophistication which is gauged by the level of financing through local equity markets and market size, this being determined by the size of domestic markets.

Thirdly, prior IPO literature warns of the impact of outlier on the sensitivity of the results. Consequently, this research follows Zattoni et al. (2017) to protect against the potential influence of outliers. This action seems essential because this research reported in Table 4 some extreme underpricing values of 1680% for developing stock markets. Across all the sample of 10,217 IPOs this research includes in Table 4, the average underpricing level is recorded at 38% of which the average of underpricing for developing countries' IPOs is 51%. Therefore, the existence of extreme underpricing observations is apparent in the data. This alerts the concern about potential biased inference being obtained from the econometric models this research uses. To eliminate this issue, this research utilises an outlier recognition procedure proposed by Rousseeuw and Leroy (2005) to isolate those extreme underpricing observations greater than an underpricing value of 150%. Accordingly, this research disqualified 573 and 185 observations from the sample related to all countries and developing countries, respectively.

Fourthly, a variety of diagnostic tests is used to ensure the trustworthiness of the model estimation. This includes conducting endogeneity, weak instrument, and variance inflation tests. This research follows Habib and Ljungqvist (2001) to employ Housman's (1978) endogeneity test to examine the null hypothesis that the identified regressor (i.e., underwriter reputation) indeed is an exogenous covariate. To perform a trustworthy endogeneity test, Staiger and Stock (1997), Sanderson and Windmeijer (2016), and Jakob and Nam (2017) highlight that it is highly important to use a robust instrumental variable that lacks correlation with the error terms of the model in order to avoid causing further bias. Yet, the authors contend that this instrument should have a good correlation with the endogenous regressor. However, the identification of a perfect instrument to fix this endogeneity problem attracted a lot of debate in the IPO underpricing literature resulting in a lack of consensus. For instance, Habib and Ljungqvist (2001) and Alavi et al. (2008) suggested using earnings per share and return on assets, respectively. In contrast, Chahine (2008) and Jones and Swaleheen (2010) proposed employing gross proceeds and number of IPO firms, respectively. This research failed to attain adequate data related to earnings per share and return on assets for the international data. This thesis also finds that both the gross proceeds and number of IPO firms failed the weak instruments test. Instead, this research employs two instrumental variables defined as the ratio equalling to the average and median amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the average and median number of underwritten IPOs in that country.

This research chooses these two instruments because high-status underwriters have a tendency to underwrite volumes IPOs making them influentially dominant players in the IPO market. The anticipation is that these two instruments could be adequately correlated with the endogenous regressor, UR. At the same time, these two instruments are unlikely to have a strong correlation with the error terms of the model. This research employs a weak instrument test to guard against mistakenly utilising a weak instrument that causes far more biased conclusions[36]. Thus, this thesis employs a weak instrument test developed by Cragg and Donald (1993) following the recommendation of Boulton et al. (2017) and Jakob and Nam (2017). Cragg and Donald's Weak Instrument Test examines the null hypothesis that the utilise d instrument is weak and "not robust". Finally, this research uses the Variance Inflation Factor (VIF) test to become confident about the absence of a multicollinearity problem that could materialise from the presence of collinear relationships between explanatory variables. In doing so, this thesis disregard the presence of the multicollinearity problem when the value of VIF surpasses a threshold value of 5 (Liu et al. 2011). This research incorporates all of the aforementioned extended estimations in Table 29.

In the first five models, this research aims to check if the VA, GE, RL, RQ, and CC variables would sustain their significance reported in Tables 24 and 25. The results reported in Models 1 to 5 in Table 29 reconfirm the strong confidence in the previous findings. This research can reconfirm the significantly direct influence of differences in country-level transparency on underpricing dissimilarity across G20 nations using 2SLS estimation. This thesis further attains supporting outcomes reconfirming the direct influence of voice and accountability in affecting differences in IPO underpricing within developing G20 economies. This of course lends strong support to the previous HLM results (-0.31; Table 27; Model 1; $p<0.05$). This is because Models 6, 7, and 8 in Table 29 show that when the level of voice and accountability across developing stock markets increases by one unit, underpricing reduces by 9% to 10%.

Table 29 also documents that firm-level determinants of IPO underpricing related to the EWL theory show overall results consistent with the prior outcomes. Across the first five models in Table 29, evidence is consistent in showing that the theory partly elucidates underpricing dissimilarity across all G20 countries. This is because this research only finds two dimensions of the theory having a significant relationship with underpricing: incentive of IPO issuers and *ex-ante* uncertainty. The third dimension of the EWL model, UR, demonstrates no significant influence on underpricing across G20 countries as shown in Models 1 to 5 in Table 29. This is regardless of the confirmed endogeneity between underwriter reputation and underpricing as documented by significant results provided by the Housman Endogeneity Test.

[36] Staiger and Stock (1997) and Sanderson and Windmeijer (2016) argue using a weak instrument leads to misleading 2SLS results compared to the OLS estimator and results are likely to suffer from large size distortions.

Table 29: Endogeneity and Omitted Variable Bias

	Model 1 All Sample 2SLS	Model 2 All Sample 2SLS	Model 3 All Sample 2SLS	Model 4 All Sample 2SLS	Model 5 All Sample 2SLS	Model 6 Developing Countries 2SLS	Model 7 Developing Countries 2SLS	Model 8 Developing Countries OLS
				Transparency-level variables				
VA	-0.051***					-0.099***	-0.100**	-0.093***
	[-2.94]					[-5.96]	[-1.75]	[-5.51]
GE		-0.034*						
		[-1.46]						
RL			-0.047***					
			[-2.35]					
RQ				-0.037**				
				[-1.75]				
CC					-0.040**			
					[-2.02]			
				Firm-level variables				
PR	-0.95***	-0.98***	-0.97***	-0.97***	-0.98***	-2.21*	-2.23*	-2.11
	[-5.16]	[-5.53]	[-5.56]	[-5.43]	[-5.59]	[-1.30]	[-1.48]	[-1.17]
DF	-1.03***	-1.07***	-1.06***	-1.07***	-1.07***	-2.37*	-2.39*	-2.27
	[-6.55]	[-6.65]	[-6.75]	[-6.62]	[-6.78]	[-1.34]	[-1.55]	[-1.21]
UR	-0.032	-0.038	-0.035	-0.041	-0.034	-0.055	-0.070	0.036***
	[-0.69]	[-0.79]	[-0.73]	[-0.83]	[-0.71]	[-0.78]	[-0.10]	[4.54]
PMV	0.47	0.81	0.59	0.68	0.65	0.89	0.89	0.85
	[0.46]	[0.75]	[0.58]	[0.67]	[0.62]	[0.77]	[0.63]	[0.71]
LET	-0.023***	-0.025***	-0.025***	-0.026***	-0.025***	-0.0038	-0.0040	-0.0028
	[-2.62]	[-2.72]	[-2.77]	[-2.76]	[-2.74]	[-0.73]	[-0.44]	[-0.56]
LOP	-0.019**	-0.020**	-0.020**	-0.019**	-0.020**	-0.025	-0.024	-0.031**
	[-1.89]	[-1.89]	[-1.91]	[-1.68]	[-1.95]	[-1.26]	[-0.51]	[-1.87]
				Additional firm-level variables				
BBM	-0.0067	-0.015	-0.014	-0.011	-0.014	-0.070**	-0.068	-0.080***
	[-0.34]	[-0.68]	[-0.65]	[-0.53]	[-0.69]	[-2.05]	[-1.12]	[-2.48]
TF	0.042***	0.044***	0.044***	0.043**	0.045***	0.018	0.018	0.019*

	[2.61]	[2.65]	[2.74]	[2.57]	[2.73]	[1.22]	[0.93]	[1.31]
PF	-0.001	0.001	0.001	-0.001	0.001	-0.010	-0.009	-0.008
	[-0.011]	[0.014]	[0.080]	[-0.011]	[0.074]	[-0.53]	[-0.60]	[-0.42]
IOP	0.032	0.031	0.030	0.026	0.026	-0.10***	-0.10*	-0.11***
	[0.64]	[0.58]	[0.57]	[0.49]	[0.50]	[-3.05]	[-1.55]	[-3.51]
UF	-0.002	-0.010	-0.005	-0.010	-0.010	0.067***	0.067***	0.067***
	[-0.11]	[-0.65]	[-0.31]	[-0.60]	[-0.39]	[3.31]	[3.34]	[2.90]
AFC 1997	-0.099**	-0.099**	-0.10***	-0.10***	-0.10***	-0.10	-0.11	-0.069
	[-2.52]	[-2.39]	[-2.59]	[-2.55]	[-2.58]	[-1.03]	[-0.34]	[-0.75]
GFC 2008	-0.043	-0.032	-0.033	-0.030	-0.037	0.014	0.016	0.0027
	[-1.06]	[-0.75]	[-0.78]	[-0.72]	[-0.88]	[0.24]	[0.12]	[0.046]
Additional country-level variables								
FMS	-0.036*	-0.062**	-0.052**	-0.057**	-0.050**	-0.088**	-0.089*	-0.086**
	[-1.53]	[-2.29]	[-2.17]	[-2.23]	[-1.89]	[-2.10]	[-1.61]	[-1.99]
MS	0.18***	0.22***	0.20***	0.22***	0.20***	0.089	0.086	0.10
	[5.77]	[6.10]	[6.66]	[6.37]	[6.65]	[1.06]	[0.56]	[1.12]
Dummy Effects	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**
Constant	0.70***	0.73***	0.73***	0.71***	0.74***	1.30***	1.28*	1.38**
	[3.83]	[4.11]	[4.07]	[3.77]	[4.15]	[2.52]	[1.57]	[2.86]
Observations	9,637	9,637	9,637	9,637	9,637	2,834	2,834	2,834
Adjusted R^2	0.18	0.16	0.17	0.16	0.17	0.15	0.14	0.16
P-value of F-statistic	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Number of Clusters	22	22	22	22	22	10	10	10
Diagnostics								
P-value of Housman Endogeneity Test	0.01	0.01	0.01	0.01	0.01	0.77	0.12	N/A
P-value of Cragg and Donald Weak Instrument Test	0.01	0.01	0.01	0.01	0.01	0.35	0.01	N/A
Mean Value of Variance Inflation Factor	1.57	1.54	1.55	1.55	1.56	3.15	3.15	3.15

Note: Country-level transparency, firm-level, and additional control variables are as defined before in Table 19 and Table 3, respectively. UP is the dependent variable. Robust T and Z-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Similarly, this research discovers consistently weak support for the EWL model using HLM (Table 27; Model 1) and 2SLS (Table 29; Model 6) estimations, when employing the developing countries sample. Table 29 provides results that are consistent with Engelen and van Essen (2010) in relation to the relationship between book-building pricing method and underpricing across countries. This is because Models 1 to 5 in Table 29 show a negative and insignificant relationship between book-building variable and underpricing.

In contrast, this research finds a positive and significant BBM coefficient for developing IPO data as shown in Models 6 to 8 in Table 29. This result implies that the employment of book-building pricing technique rises IPO underpricing in developing stock markets by up 8%. Boulton et al. (2010) and Chang et al. (2017) uncover similar evidence. Ljungqvist et al. (2003) relate the profit-sharing view to the positive effect of book-building on IPO underpricing. This interpretation suggests that in developing G20 countries underwriters assign attractive IPO stocks to institutional investors in exchange for receiving hefty commissions. Subsequently, in developing economies underwriting banks are drawn to offer underpriced IPO firms to institutional investors at the expense of IPO issuers. This is done in order to profit their buy-side investors in exchange for side-payments. The overall evidence this research uncovers from Table 29 shows that the extra firm and country-level factors this research incorporates are relatively in harmony with the previous literature. Most importantly, the inclusion of these additional variables confirms that no change to the previously drawn conclusions in Tables 24, 25 and in Model 1 in Table 27 is occurred. This means that the prior findings are not an artefact of omitted variable bias.

This research now concentrates on checking if the HLM estimation actually captures the endogenous relationship between prestigious underwriters and IPO underpricing within all G20 countries and developing G20 stock markets. In Table 29, this research uncovers evidence showing a negative but insignificant association between high-status underwriters and underpricing between G20 countries after accounting for country-level transparency using HLM technique. Here this research aims to eliminate a likely concern that the significant transparency-based findings in Tables 24 and 25 have been corrupted by not controlling econometrically for a possible endogeneity issue. Models 1 to 5 in Table 29 confidently reconfirm that the prior outcomes reported in Tables 24 and 25 related to the negative but insignificant the coefficient UR. The takeaway message from this is that the VA, GE, RL, RQ, and CC results reported in Tables 24 and 25 are not influenced by a model misspecification. This is because the results provided by the endogeneity, weak instrument, and VIF tests all affirm that the outcomes are vigorous in Models 1 to 5 in Table 29. This research positively ascertains that the endogenous relationship between underwriter reputation and IPO underpricing employing both HLM and 2SLS approaches.

On the contrary, remember that after this research divided the sample into two groups of stock markets, this thesis uncovers evidence showing that UR positively influences IPO underpricing in developing G20 economies[37]. Remarkably, recall that the overall HLM outcomes in Table 27 document that employing high-status underwriters results in greater underpricing within emerging G20 stock markets. Hence, this thesis has a concern about the sensitivity to the negative and significant relationship this research uncovers between VA and IPO underpricing within developing nations using the HLM technique (-0.30; Table 27; Model 1; $p<0.05$). Model 6 in Table 29 shows a negative but insignificant UR coefficient after using robust clustered 2SLS in contrast to the overall findings of Table 27. This research relates these contrary results to the rejection of the null hypothesis that the UR regressor is exogenous in Model 6 in Table 29. This research finds that the reason of this outcome is due to the use of a weak instrument for the sample of developing nations. The results of the weak instrument tests for Models 1 to 5 in Table 29 refute the null hypothesis that this instrument is not robust at the 1% level of significance across the entire sample of 22 countries[38]. Nonetheless, for the developing G20 stock markets sample, this research failed to refute the null hypothesis that this instrument is not a robust instrument as reported in Model 6 in Table 29.

Alternatively, in Model 7 in Table 29, this research uses a ratio equalling to the median amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the median number of underwritten IPOs in that country as the instrumental variable. As reported in Model 7 in Table 29, this research still uncovers a negative and insignificant UR result (-0.070; Table 29;

[37] In un-tabulated results, the author reconfirms that the negative and significant UR outcome achieved for developed nations sample using HLM estimation in Table 28 is also consistent with the unreported 2SLS estimation. The research does not report these results because all country-level transparency results in Table 28 show insignificant outcomes. Hence, the author only focuses on ensuring the significant results the research obtained previously are not the product of not accounting econometrically for the endogeneity problem and an artefact of omitted variable bias.

[38] It should be noted that for the whole sample this thesis employs the ratio equal to the average amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the average number of underwritten IPOs in that country as the choosen instrumental variable.

Model 7; p>0.10) but Housman Endogeneity Test fails to refute the null hypothesis that the UR is exogenous. The output of the Cragg and Donald Weak Instrument Test is significant at the 1% level meaning that the second instrument is robust this time. This finding implies that endogeneity does not exist between high-status underwriters and underpricing in emerging G20 economies. To fix this problem, this research employs OLS estimation in Model 8 by treating the variable UR as an exogenous regressor, as it should be. Remarkably, this research now finds a positive and strongly significant UR coefficient (0.036; Table 29; Model 8; p<0.01) comparable to the significant UR outcomes reported in Table 27 using HLM specification. At the same time, the coefficient VA reveals a negative and significant result for developing stock markets (-0.093; Table 29; Model 8; p<0.01). Hence, this thesis reconfirms the negative and significant association discovered between VA and IPO underpricing within developing economies using the HLM technique (-0.30; Table 27; Model 1; p<0.05). This finding provides confidence in the previously obtained results in Model 1 in Table 27 even after adjusting for the extended econometric estimation and controlling for the extra firm and country characteristics that protected the inference from possible omitted variable bias.

3.8. Concluding Remarks

Despite the fact that empirical evidence on IPO underpricing documents substantial variations across nations, the literature primarily neglects the simultaneous direct and indirect influences of formal institutional quality. Employing a large sample of 10,217 IPO-issuing firms from January 1995 until December 2016 in 22 countries with varying levels of transparency, this chapter contributed to the ongoing debate in the law and IPO underpricing literature explaining differences in underpricing in the global IPO market. Here this research consolidated two conflicting strands of law and IPO underpricing literature. On one hand, the first strand provided fragmented conclusions about the transparency-IPO underpricing relationship across countries. Conversely, the second strand focused on the time-invariant property of a country-level legal system with reference to underpricing variance across stock markets using incomplete HLM models.

Aiming to bridge those two stands of literature, this chapter examined the direct and indirect effects of country-level transparency in elucidating underpricing difference across the G20 economies. This allowed this thesis to simultaneously capture three aspects: firstly, to calculate the relative importance of firm and country-specific characteristics on the variance of IPO underpricing; secondly, to test the direct influence of time-variant variability in country-level transparency on underpricing difference; and thirdly, to examine the indirect influence of inter-temporal changes in country-level transparency on affecting the relationship between firm-level variables and IPO underpricing across nations. This research achieved these goals by employing a full HLM model utilising both random intercept and random slope coefficients in two levels of data. Firm-level determinants related to the EWL theory are the lower level and country-level transparency characteristics are the higher level. This allowed this research to extend the empirical testing of the EWL theory by accounting for the characteristics of formal institutions internationally. This thesis captured the time-variant variability in country-level transparency using the level of voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption across nations.

The author of this thesis uncovered significant economic evidence showing that 22%, 5%, and 25% of the differences in IPO underpricing between stock markets are primarily driven by the dissimilarity in country-level characteristics between all G20, developed, and developing economies, respectively. Remarkably, once this research integrates the characteristics of formal institutional quality along with firm-level determinants of IPO underpricing, this thesis discovered that across countries the characteristics transparency elucidates up to 34% while firm factors only explain up to 8%.

The results on the direct influence of differences in country-level transparency on underpricing difference attributed variations in underpricing across countries to the existence of feeble legal environments. This research found that when the level of voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption in the G20 countries increases by one unit, underpricing significantly decreases by 23%, 13%, 11%, 15%, and 11%, respectively. By decomposing the sample into two blocks of stock markets based on their economic development, this research retrieved significant evidence documenting a reduction in IPO underpricing by 28% when the level of voice and accountability increases by one unit within developing G20 countries. Changes in the level of transparency within developed G20 nations found to have no significant influence on the variability in underpricing. These results confirmed that the existence of weak transparency environments affects the information asymmetry problem among IPO parties. Consequently, this resulted in increased investment uncertainty and higher demand for underpricing to compensate for legal risk across countries. This effect is found to be more pronounced within developing G20 economies compared to developed ones.

The work also uncovered new evidence showing that the improvement of formal institutional quality indirectly influences IPO underpricing in three means: first, by improving the relationship between the incentive of IPO issuers and underpricing by up 1.4%; second, by reducing the link between prestigious underwriters and underpricing by up to 12%; and third, by alleviating the association between *ex-ante* uncertainty surrounding the offering and underpricing by up to 5% for every unit increase in transparency. Those findings are conclusive and original to the study. This is because current law and IPO underpricing literature including Engelen and van Essen (2010) has not yet captured the modifier effect of changes in country-level transparency on the relationship between firm-level variables and IPO underpricing across countries. The results confirm that when the level of transparency in a country is high then the positive relationship of *ex-ante* uncertainty on underpricing decreases, in turn triggering less investor demand for underpricing. Therefore, the high country-level governance acts as a modifier effect in reducing the magnitude of the association between the *ex-ante* uncertainty of IPO investors and underpricing across nations. In such G20 countries with high levels of formal institutional quality, the negative relationship between the incentive of IPO issuers on underpricing becomes higher as those issuers become fearless about their wealth losses caused by underpricing. This occurs because the high level of country-level transparency acts as a moderator in improving the magnitude of the negative relationship between the incentives of IPO issuers and underpricing across the G20 countries.

The findings contend that when the witnessed level of transparency in a G20 country is also high then issuers who wish to sell more secondary shares and create more primary shares need not hire an expensive underwriter with a reputable market position. The additional certification signal that high-status underwriters provide to reduce the uncertainty of IPO investors in order to lower underpricing becomes unnecessary. This is because the availability of a high level of country-level transparency reduces the role of employing reputable underwriters to the extent it becomes marginal. Hence, the availability of a high quality country-level legal system modifies the magnitude of the negative relationship between underwriter reputation and underpricing across the G20 countries.

The findings also demonstrated that the EWL theory partly explains underpricing variance after this research captures the characteristics country-level formal institutional quality from country to country. This research found that only two dimensions of it had a significant association with underpricing, these being the incentive of IPO issuers and *ex-ante* uncertainty. While the results confirmed the endogenous relationship between high-status underwriters and underpricing, the third dimension, underwriter reputation, showed no significance on underpricing across stock markets. This research found a weak support for the *ex-ante* uncertainty dimension of EWL model while the incentive of IPO issuers and high-status underwriters are supported in elucidating underpricing variance within developed G20 economies. This research also found only weak support for the EWL for developing economies. While this research documented a negative and significant relationship between underwriter reputation and underpricing in advanced countries, this research found positive and significant evidence in developing nations. This finding emphasised the inference that underwriting banks in emerging stock markets exploit the existence of weak legal systems in their countries to benefit themselves and their buy-side institutional investors at the expense of IPO firms. The consequence of this poor formal institutional environment is that entrepreneur founders in developing countries incur greater underwriting fees, bear expensive book-building pricing technique, and employ prestigious underwriters who in exchange for their own personal gain underprice them heavily. The results remained qualitatively robust after using alternative specifications and conducting series of robustness checks in order to preserve the confidence and trustworthiness of the outcomes.

Overall, the results documented that the economic significance for companies nested within a weak transparency environment is crucial. The consequence of underpricing is of course more money is apparently ‘‘left on the table” by entrepreneur founders. The implication of the results is that higher level of underpricing causes IPO firms to receive less money from raising equity through the primary market. This inflates the cost of capital of those entrepreneur founders. From an economic perspective, the ongoing realisation of owners of IPO firms that they have to raise equity at a large discount will encourage prospective entrepreneur founders to not consider an IPO due to the high floatation cost they have to incur when going public. Since the characteristics of formal institutional quality directly and indirectly elucidate up to 34% of the variability in underpricing in the global IPO market, this indeed has to have some tangible economic consequences. Entrepreneur founders in stock markets with a weaker transparency environment on average incur a greater level of underpricing. Consequently, they have to tolerate a larger cost of capital, which makes domestic IPO firms nested in such poor transparency nations disadvantaged when compared to their global rivals.

Chapter Four: Hierarchical Explanation of the Direct and Indirect Effects of National Cultures on Underpricing Variance in the Global IPO Market

4.1. Introduction

The flotation of part of a privately held enterprise in a process known as the Initial Public Offerings (IPOs) provides a number of benefits to IPO firms. It is considered to be an ideal way of financing future growth plans for corporations at a low-cost of capital (Brau & Fawcett 2006). It also offers entrepreneur founders the opportunity to liquidate part of their holdings in the company to reap their latent wealth (Lewellyn & Bao 2014). Changing a firm's status to a publicly listed one also improves the legitimacy, visibility, and prestige of the company and this in turn augments the business's long-term success (Luo 2008). However, purchasing shares in a newly listed firm that lacks historical market valuation and records causes prospective IPO investors to be anxious about the anticipated risk and return on investment (Gupta et al. 2018). This makes IPO companies suffer from the syndrome known as "liability of newness" which accentuates the *ex-ante* uncertainty of prospective IPO investors (Zattoni et al. 2017). In turn, it influences the expected level of underpricing to compensate for such uncertainty. However, this *ex-ante* uncertainty can be alleviated or worsened by the prevailing level of informal (i.e., cultural values) institutional environment that a country has. Differences in the quality of informal institution perhaps influence the associated level of *ex-ante* uncertainty in the IPO market, which consequently affects the perceived level of IPO underpricing across different cultural backgrounds (Chourou et al. 2018).

Throughout the global IPO market, 1,974 firms floated in 2017 amassing US$338.4 billion of which countries in the Europe, Asia-Pacific, Middle East, and Africa accounted for approximately 82% of these IPOs (EY Global IPO 2017). The money left on the table by these IPO firms takes the form of easy gains cashed out by investors and accounted for billions of U.S. dollars (EY Global IPO 2017). These nations represent varying levels of underpricing and cultural dissimilarities. For example, Loughran et al. (1994) provided an updated international insight dated January 9, 2018, documenting average country-level underpricing that ranged from 3.3% to 270.1% across 54 national cultures since 1990. Average underpricing for some of those national cultures who share, for example, a high power distance characteristic[39] such as Japan, Saudi Arabia, China, and India is 44.7%, 239.8%, 145.4%, and 88%, respectively. In contrast, average recorded underpricing for other nations characterised with low power distance values[40] such as Denmark, Australia, Canada, and Germany is 7.4%, 21.8%, 6.5%, and 23.0%, respectively.

Hence, the critical question is: how do differences in national cultures cause a significant average underpricing variance to be as low as 3.3% and as high as 270.1% across national cultures? Why there is a tendency for some IPO issuers who are domiciled in high power distance cultures to accept a high level of underpricing when they sell part of their holdings compared to firms nested in low power distance nations? How can this considerable underpricing variance across different cultural backgrounds be fully elucidated?

Culture and finance literature argues that an environment of asymmetric information that influences the *ex-ante* uncertainty of IPO investors may evolve in some cultures more naturally than in others (Costa et al. 2013; Gupta et al. 2018). This is because the manifestation of culturally accepted social values can lead to the evolution of an uncertain and untrustworthy market atmosphere amongst market participants (Kang & Kim 2010; Li et al. 2013). For illustration, Hofstede (2001) argues that in countries where there is high power distance amongst their society's members, a lack of social equality will be prevalent causing an overall cultural acceptance of inequality throughout that society. In this regard, Lewellyn and Bao (2014) relate a deterioration in social trust between citizens in a society to an escalation of conflicts of interest and evolution of an asymmetric information environment between market participants. For this reason, an examination of the full effects of differences in national cultures on IPO underpricing difference for IPOs nested within

[39] Hofstede (2011) scores Japan, Saudi Arabia, China, and India as having 54, 95, 80, and 77 out of a scale of 100 points, respectively, in relation to the expected level of cultural value of power distance perceived in their societies.

[40] Hofstede (2011) scores Denmark, Australia, Canada, and Germany as having 18, 36, 39, and 35 out of a scale of 100 points, respectively, in relation to the expected level of cultural value of power distance perceived in their communities.

different country cultures is an important research objective given that empirical investigation of it is currently lacking (Engelen & van Essen 2010)[41].

This chapter investigates deeply the influence of levels of firm-level and country-level national cultural determinants of IPO underpricing difference in the global IPO market. This research employs Hierarchical Linear Modelling (HLM) to capture the nesting nature of these covariates using maximum likelihood estimation. This is done to simultaneously quantify the relevance of every level to the underpricing variance. The IPO underpricing covariates can experience a nesting structure in at least two levels: level 1 (firm characteristics) and level 2 (country interactions). Contextually, this thesis adopts a well-accepted assumption that characteristics of the lower level are probably influenced by the characteristics of the higher level (Kayo & Kimura 2011; Li et al. 2013; Tennant & Sutherland 2014). The rationale here, for instance, is that IPO firms (level 1) operating in a given country's culture (level 2) exhibit similar patterns of underpricing behaviour. Consequently, such IPO firms will exhibit a tendency to have a strong within-cluster correlation. However, the underpricing of these IPO companies is likely to differ from other IPO companies of different national cultures, resulting in substantial variations across clusters. Kayo and Kimura (2011) assert that the application of HLM can mitigate such econometric problems pinpointed by Fama and French (2002) with reference to the characteristics of the finance data. The authors caution that employing cross-section models (i.e., capital structure and IPO underpricing regressions) overlooks the existence of unobserved correlations in error terms across firms nested within different countries. This will in turn lead to erroneous conclusions.

In this regard, the objectives of this chapter are three-fold. First, this research examines the relative association of both firm- and country-level national culture characteristics concerning the variance of IPO underpricing. This objective is attained by estimating an empty HLM model (i.e., without firm- and country-level covariates). It is necessary to do this in order to decompose the underpricing variance into what is explained by the lower and upper levels in the hierarchy. Second, this basic HLM model is further extended to incorporate random-intercepts so that the direct effect of national cultures on IPO underpricing variance can be examined. Third, this research advances the previous

[41] Engelen and van Essen (2010) want research in the future to investigate the effect of informal institutional factors, such as variations in national cultures, and differences in IPO underpricing across IPO firms nested within different cultural backgrounds.

estimation to assemble a full HLM model to include both random intercepts and random slopes in order to examine the indirect influence of national cultures on IPO underpricing difference. To address the second and third objectives, while this research controls for traditional factors of IPO underpricing at both company and country levels, this thesis uses Hofstede's (2010) national culture dimensions (i.e., power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence). This research employs the Entrepreneurial Wealth Losses (EWL) theory developed by Habib and Ljungqvist (2001) to capture traditional determining covariates of IPO underpricing. This research makes use of the theoretical explanation offered by the EWL model because it is the only one that solves the problem of information asymmetry between the issuer and investor. At the same time, it accounts for the endogenous relationship between underwriter reputation and IPO underpricing.

Cross-country IPO underpricing studies that capture the nesting structure of the IPO data are scarce and have primarily concentrated on the formal aspect of institutional frameworks. For example, the focus was on the direct effect of formal institutions such as legal systems on underpricing of IPO firms across countries (Engelen & van Essen 2010). In contrast, current IPO underpricing-culture literature neither has consciousness of the nesting structure of the IPO data nor perceives the indirect effect of national cultures on IPO underpricing. In actual fact, as this research discusses later, this literature is underdeveloped, provides contrary results, and may suffer from omitted variable bias (Costa et al. 2013; Chourou et al. 2018). To the best of the knowledge, this chapter offers the first empirically comprehensive examination of the direct and indirect influences of national culture values on IPO underpricing across countries using HLM estimation.

To fulfil the research objectives, this research employs a global dataset of 10,217 IPO-issuing firms listed from January 1995 until December 2016 in 22 different cultures, 12 developed national cultures, and 10 emerging countries. This thesis documents significant direct and indirect roles of culture in affecting the global underpricing difference, even in increasingly globalised stock markets. The main results of this chapter demonstrate that a significant percentage of the underpricing variance – empty HLM model attributes, which are nearly 88%, 95%, and 75% – are related to fundamental characteristics of firms within 22 countries, 12 developed G20 countries, and 10 developing G20 countries, respectively. Second, differences in country-level characteristics account for 22%, 5%, and 25% of the divergences in IPO underpricing between all G20 economies, developed G20, and developing countries, respectively. While the variance attributable to country-level is moderately low, this is not equivalent to claiming that characteristics of countries are trivial. Remarkably, after this research combines country-level culture with firm-level determinants of IPO underpricing for the entire sample of 22 countries, this research uncovers significant evidence to the contrary. This thesis shows that dissimilarities in Hofstede's cultural dimensions elucidate up to 32% of underpricing variance. Yet, firm-level characteristics only explain up to 9%. Further analysis of the variability in national cultural measures within advanced and emerging stock markets shows that up to 40% and 59% of the variability of IPO underpricing is explained, correspondingly. This research finds that only 19% of underpricing variance is attributable to firm-level factors between the two blocks of countries.

The results postulate that national culture exerts its influence on the variability of IPO underpricing across countries through certain psychological and economic channels. Likewise, the findings stipulate a novel sketch of how informal institutions such as culture could directly affect the equilibrium of symmetric information between the principal IPO parties including IPO firms, underwriter, and investors. The results document and enumerate the indirect influences of culture in elucidating the money left on the table by entrepreneur founders across countries. This research produces exclusive evidence showing that culture indirectly influences underpricing variance in three ways: first, by transmogrifying the correlation between the incentive of IPO issuers and underpricing by up 33%; second, by moderating the relationship between underwriter reputation and underpricing by up to 10%; and third, by modifying the association between *ex-ante* uncertainty surrounding the offering and underpricing by up to 30%.

The results show that the EWL theory partially explains underpricing difference across countries when national culture is in effect. While the results confirm the endogenous relationship between prestigious underwriters and underpricing, the effect of reputable underwriters emerges as being insignificant in the global IPO market. Remarkably, when culture is in play, the findings reveal solid support for the three dimensions of the EWL theory in explaining underpricing variance only for developed equity markets. The EWL theory receives only weak support in developing countries when culture is part of the equation. Instead, a shred of evidence documents the existence of spinning behaviour in developing nations when culture is captured. This finding emphasises the perception that reputable underwriters in developing nations exploit IPO managers' cultural lenience so that information and market supremacy are unfairly distributed. Subsequently, the results suggest that prestigious underwriters in developing stock markets recognise the psychological readiness of IPO managers to trade off personal success to accomplish a successful IPO listing with rational investment decisions. The results suggest that the subsequent effect of this cultural influence is that owners of IPO firms in developing countries pay more underwriting fees[42], tolerate expensive book-building pricing methods, and employ prestigious underwriters who, in return, float their firms at a high discount. The confidence in the findings remained steady after conducting a series of robustness tests, incorporating extra nine firm and country-level covariates, and executing several diagnostic tests.

Overall, the findings lend support to an increasing realisation between finance and accounting scholars that even in increasingly globalised stock markets with sophisticated market participants, an impalpable characteristic such as culture largely matters. It directly and indirectly influences global corporate decisions including the international underpricing variance. Taken together, the results contribute to the emergent but underdeveloped literature on the association between differences in country-level informal institution and underpricing difference in the global IPO market. Foundational and important underpricing-culture studies include Costa et al. (2013) and Chourou et al. (2018). This literature shows no awareness of the hierarchical structure of the IPO data and the indirect effect of variances in country-level informal institution on underpricing difference. The findings contribute methodologically to numerous strands of literature. For example, scholars in the field of IPO activity (Gupta et al. 2018), ethical decision-making (Curtis et al. 2012), international stock market movement (Lucey & Zhang 2010), cost of equity capital (Gray et al. 2013), corporate debt maturity (Zheng et al. 2012), dividend payout policies (Fidrmuc & Jacob 2010), and disclosure practices (Hope 2003b; Hooghiemstra et al. 2015) can benefit from the work.

This is due to the fact that these researchers utilise data that is likely to have a nesting structure while investigating the effect of culture on capital market outcomes across countries without proper econometric modification. These scholars can employ the findings to advance their econometric estimations to control for the direct and indirect effects of informal institutions in modifying the

[42] See Footnote 22.

relationship between independent and outcome variables. Moreover, the results may be valuable to owners of IPO firms as well as investors in understanding and enumerating the direct and indirect influences of variations in country-level national cultures on underpricing difference across countries. For example, based on the findings, IPO issuers and investors can become aware of the psychological and economic channels in which their national cultures can affect their investment decisions in the IPO market. Policy-makers in developed and developing countries will find the results beneficial. Stock market regulators are always concerned about increasing their local stock markets' growth in order to boost their domestic economic growth. This is because the IPO market's growth is understood as essential to guarantee continuous stock market growth (Tian 2011; Jamaani & Roca 2015). Thus, officials in the G20 markets will also take advantage of a finer comprehension regarding the extent to which their local cultures can economically influence underpricing in their stock markets. The findings provide them with the opportunity to make the appropriate change to moderate the influence of national cultures on the expected level of underpricing in their stock markets.

The remainder of the chapter is structured as follows. A brief revision of the related literature and development of questions and hypotheses are presented in Sections 2 and 3, respectively. Section 3 describes the data while Section 4 presents the methodology. Section 5 presents results and discussion while providing a number of robustness checks. Section 7 concludes the chapter.

4.2. Review of Literature on the Impact of Country-level National Cultures on IPO Underpricing

To understand the relationship between culture and IPO underpricing, one should first ask the question: what is culture? Culture was defined by Hofstede (1980) as "the collective programming of the mind that distinguishes the members of one group or category of people from another". Similarly, culture can also be comprehended according to Sapienza et al. (2006) as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation". Research on culture has emerged from different roots in the social sciences literature where culture is operationally viewed as the values of a system (Parsons et al. 1965; Rokeach 1973). Thus, in order to thoroughly comprehend a culture, it is important to understand its cultural values. Values of a culture constitute attitudes which, in turn, shape individuals' behaviour in the society and eventually shape the entire social environment of a country (Homer & Kahle 1988). In this conceptualisation, culture is mirrored in how individuals are attached to different aspects of life; the way people look at the world and the role they play in it, and in their values (Chui et al. 2002). That is, cultural values form the basis of what people regard as 'good' and 'bad; in their shared beliefs, what people contemplate as 'right' and 'wrong'; in their imaginative expression, what people contemplate as 'beautiful' and 'ugly', etc. (Brannen & Salk 2000). In this context, values of a culture comprise complex patterns of thinking transferred from parents to children, from teachers to students, from friends to friends, from leaders to followers, from followers to leaders, from leaders to leaders, from organisations to organisations, and across nations (Hofstede et al. 1990; Ungar 2008; Dumay 2009).

Scholars have attempted to develop frameworks to comprehend national cultures, with these frameworks containing a number of dimensions that are employed to elucidate differences in culture across nations (Hofstede 1980; Gray 1988; Schwartz 1994; Hofstede 2001; House et al. 2002; Hofstede 2011). Among these cultural frameworks, Hofstede (2011) provide one of the most commonly used ones (Gupta et al. 2018). Hofstede (2011) introduce six cultural dimensions that measure differences in cultural values across countries, including power distance, uncertainty avoidance, individualism, masculinity, long-term orientation, and the indulgence characteristics of societies. Differences in Hofstede's cultural dimensions have been observed to wield a significant role in shaping variations in economics, business, accounting, and finance activities throughout the world.

In economic research, Kwok and Tadesse (2006) find that in Anglo-Saxon (non-Anglo-Saxon) economies with a lower (higher) level of uncertainty avoidance such as the U.S., the U.K., Australia, and Canada (Europe, Japan, and China), the financial system is dominated by stock markets (bank-based system). In business literature, Taylor and Wilson (2012) detect a positive association between collectivism and national innovation rates in various countries. Across 62 nations, the authors find scholars who reside in collectivist cultures possess a lower rate of innovation because their rate of scientific research publication and technology patenting is significantly lower than their fellow researchers in individualistic cultures. Scholars in accounting literature including Hope (2003b), Han et al. (2010), and Hooghiemstra et al. (2015) document strong evidence of lower earnings discretion practices and superior quality of information disclosure in annual reports produced by managers characterised by individualistic, feminine, and low uncertainty avoidance characteristics.

In finance research, it is generally agreed that Hofstede's cultural dimensions influence debt-taking behaviours, capital structure of firms, dividend policies, and IPO activity. For example, Li et al. (2013) document that executives from high uncertainty avoidance and collectivist countries demonstrate an aversion to corporate risk-taking. Fidrmuc and Jacob (2010) and Zheng et al. (2012) find that lower dividend payouts and over-reliance on long-term compared to short-term debt are widely observed in corporations domiciled in nations characterised by low collectivism, power distance, uncertainty avoidance, and masculinity. Gupta et al. (2018) document high levels of IPO activity as being constantly observed in stock markets located in cultures with a high level of power distance, collectivism, and long-term orientation.

Among these schools of thought there is a common and shared theme. They assert that some nations may possess cultural values that induce an information asymmetry environment to appear, particularly in the IPO market. This could be due to the observed connection between information asymmetry between firms in the IPO market and the asymmetric information environment across different cultures. In this context, Gupta et al. (2018) contend that IPO participants have to navigate between two problematic types of information asymmetry across different cultures. These are: firstly, internal category of information asymmetry related to firm-level characteristics; and secondly, an external category of asymmetric information associated with the characteristics of national cultures.

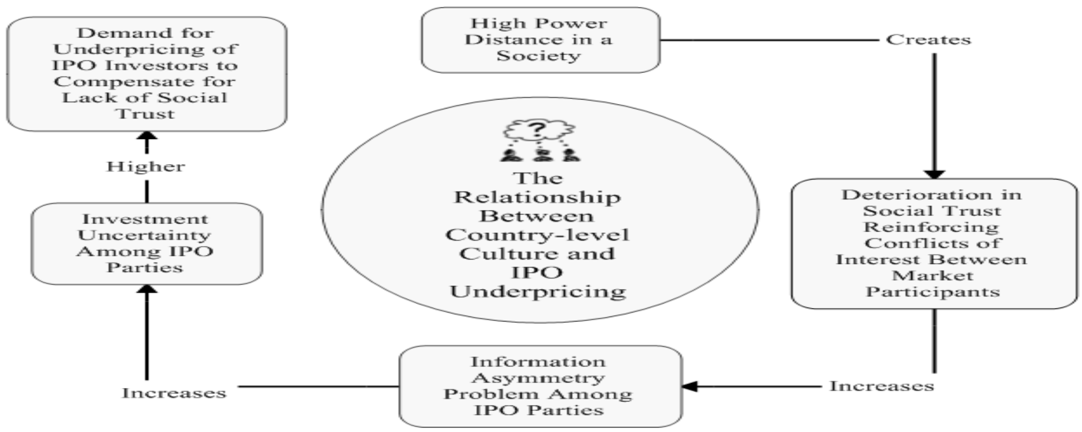
IPO literature reveals that notwithstanding the extensive disclosure requirements for IPO firms, a large fraction of asymmetric information related to firm-level characteristics forms an ongoing uncertain environment amongst market participants (Beatty & Ritter 1986; Ritter & Welch 2002; Ritter 2011). This problem is due to the fact the share prices of IPO firms have never been listed before and furthermore investors and analysts have never observed the performance of IPO firms. Hence, the only information available to investors and analysts in order to assess the quality of accounting information is that contained in the prospectuses organised by the issuers (Hanley & Hoberg 2010). In turn, IPO underpricing is a remedy to compensate for this uncertainty (Ritter &

Welch 2002). There is evidence documenting that IPO firms are predominantly vulnerable to earnings management (Kao et al. 2009). This is because the reported opportunistic disclosure behaviours by IPO issuers in the IPO market is found to positively influence their firms' share valuation (Hanley & Hoberg 2010). Hence, a substantial information uncertainty may continue to dominate the IPO market (Hong et al. 2014).

At the national level, Aggarwal and Goodell (2010) and Gupta et al. (2018) show that an asymmetric information climate may form in some cultures more easily than in others. This is due to the existence of commonly accepted cultural values that ease the establishment of market uncertainty amongst investors (Kang & Kim 2010; Li et al. 2013). For example, Hofstede (2001) argues that higher power distance in a society can result from a lack of social equality which in turn produces inequality throughout society. This low level of societal egalitarianism translates into a low level of social trust. In turn, in such societies it is difficult for socially unconnected individuals to move from a lower to a higher social class or caste. In this context, Bjørnskov (2008), Costa et al. (2013), and Lewellyn and Bao (2014) relate a deterioration in social trust between citizens to a reinforcement of conflicts of interest and development of asymmetric information environment between market participants. Chourou et al. (2018) show that IPO firms listed in high power distance cultures such as in China, India, and Russia, means that a lack of social trust between market participants is likely to form.

Consequently, this poor social trust translates into an information asymmetry problem regardless of firm-level uncertainty characteristics (Gupta et al. 2018). Estrin and Prevezer (2011) contend in high power distant cultures such as China, India, and Russia, the existence of weak country governance practices is associated with the formation of a poor social trust amongst investors. This is because individuals' political power and social strata influence the distribution of market information in those nations. This leads to a rising *ex-ante* uncertainty problem for investors and results in higher demand for underpricing of IPO investors. This is done to compensate for the lack of social trust as shown below in Figure 12 (Costa et al. 2013).

Figure 12: Relationship Between Country-level Power Distance and IPO Underpricing



(Designed by the author of this thesis)

In the U.S. stock market, the observed level of information asymmetry and power distance amongst IPO participants including issuers, underwriters, and investors is low (Cai & Zhu 2015). For example, Ritter (2017) shows that from 1980 to 2016, 8,254 IPO firms went public in that country's IPO market. The author illustrates that "money left on the table" accounted for $155.16 billion representing average underpricing level of 18.5%. There is evidence showing that the level of IPO underpricing seems to follow a consistent pattern across cultures with developed stock markets compared to developing ones. For instance, Costa et al. (2013) report a low level of underpricing for a number of developed IPO markets located in low power distance cultures, reaching 16.9%, 16.3%, 19.8%, and 7.1% in the U.S., the U.K., Australia, and Canada, respectively. In contrast, the authors document a high level of underpricing of 156.1%, 92.7%, 69.6%, and 63.9% in high power distance cultures - China, India, Malaysia, and South Korea - respectively.

This implies that differences in national cultures can cause dissimilar capital market outcomes across different nations. This is because cultural values of countries are likely to intertwine with the way individuals or organisations within every country conduct business and shape their entire business environment. Javidan et al. (2006) and Hofstede (2011) argue that nations tend to form central preferences among their citizens, organisations, and countries. Hence, the variation will be higher between citizens, organisations, and countries of dissimilar cultures than those within the same culture. Consequently, individuals or organisations or IPO firms domiciled or nested within countries or a group of countries that share similar cultural values are likely to exhibit a hierarchical or nesting structure (Li et al. 2013; Tennant & Sutherland 2014). This hierarchical structure can only be econometrically captured using at least two-level hierarchical linear modelling in order to capture information asymmetry related to firm- and country-level characteristics (Kayo & Kimura 2011).

The question here is: what is this hierarchical or nesting structure within cultures and what is the consequence for not observing such an effect from an econometric perspective? To understand this nesting structure within different cultural orientations, for example different power distance cultures, this research provides the following example. For instance, IPOs listed in Russia will share similar high country-level power distance characteristics compared to low country-level power distance characteristics observed in the United States. Econometrically, this infers that error terms between IPOs listed in the United States are likely to correlate because they share a similar level of power distance that permeates the country, and this is equally the case for Russia. Failure to capture the impact of sharing similar country-level power distance characteristics violates the assumption of independence of observations in statistical models, leading to biased results (Steenbergen & Jones 2002). In nesting structure data such as IPO data, the independence assumption is violated, enabling OLS-based models to provide biased standard errors resulting in erroneous conclusions (Twisk 2006; Judge et al. 2014; Hox et al. 2018).

Li et al. (2013) and Tennant and Sutherland (2014) employ a hierarchical linear modelling approach to capture this nesting structure across different cultural backgrounds. The authors confirmed that employing this econometric approach enables empirical testing to avoid reaching biased econometric results. Consequently, the authors managed to reach bias-free understanding of the direct impact of variations in cultural values across countries on capital market outcomes[43]. By employing the HLM approach, the authors also manage to capture the indirect "modifier" effect that differences in cultures can cause when modifying the relationship between the dependent and independent variables. The modifier effect notion postulates that underpricing could be lower (higher) for IPO issuers who employ, for example, reputable underwriter[44] (non-reputable

[43] Li et al. (2013) and Tennant and Sutherland (2014) capture the nesting structure in their data by examining the impact of national culture on corporate risk-taking and banks' ability to make high profits across countries, respectively.

[44] Beatty and Ritter (1986) argue that underwriters are categorized as either prestigious and non-prestigious ones where employing the former usually demands high underwriting fees. The authors argue that IPO firms underwritten by prestigious underwriters are frequently underpriced less compared to IPOs floated by non-reputable underwriters. This

underwriter) and are simultaneously domiciled in a country with a low (high) level of power distance. It is evident that differences between cultures could modify the magnitude or relationship between prestigious underwriters and IPO underpricing.

The current IPO underpricing-culture literature is not aware of the nesting structure of the IPO data and indirect effect of national cultures on IPO underpricing. In fact, this literature is immature, provides inconsistent outcomes, and likely to suffer from omitted variable bias (Costa et al. 2013; Chourou et al. 2018)[45]. For example, Chourou et al. (2018) employs 19,420 IPOs nested in 44 countries from 1980 to 2009 using a simple OLS-based estimation to investigate if differences in national cultures can explain variations in the underpricing in the global IPO market. The author finds that a high level of IPO underpricing is associated with a low level of uncertainty avoidance, high collectivism, high masculinity and high power distance. In contrast, Costa et al. (2013) also employ a simple OLS-based estimation for 28,319 IPOs listed in 39 countries but find no significant association between the cultural characteristics of collectivism, masculinity, and indulgence with a difference in underpricing across countries.

This thesis attributes the conflicting conclusions between Costa et al. (2013) and Chourou et al. (2018) to improper econometric estimation and an omitted variable bias problem that causes their results to be inconsistent. For example, Chourou et al. (2018) treated the decision to employ reputable underwriters by issuers as an exogenous factor in the employed OLS model while it is empirically proven to be an endogenous one (Habib & Ljungqvist 2001; Mantecon & Poon 2009; Jones & Swaleheen 2010). Habib and Ljungqvist (2001) empirically document that issuers are motivated to curtail underpricing, so therefore they endogenously affect underpricing by employing prestigious underwriters. This situation occurs when issuers intend to sell a larger stake in their firms to the public, the implication being there will be a correlation between underwriter

---

is because prestigious underwriters have superior financial knowledge and usually have well-connected links with institutional investors. Consequently, Lewellen (2006) contends that IPOs underwritten by prestigious banks enjoy favourable market evaluations and are regarded as less risky by IPO investors. This leads to less demand for underpricing.

[45] Cai and Zhu (2015) examine the influence of cultural distance on underpricing of 503 foreign IPOs from 27 countries listed on the United States stock market. Foreign IPOs, regardless of how culturally different they are from the U.S., are subject to rigorous listing requirements in the U.S. stock market. Rigid listing regulations in the U.S. stock market could reduce *ex-ante* uncertainty of investors, making the problem with information asymmetry only a minor one. Hence, the authors provide no understanding of the relationship between differences in underpricing across countries and national cultures.

reputation and the OLS model's error term. Not accounting for this unobserved correlation leads to biased results (Habib & Ljungqvist 2001). In contrast, Costa et al. (2013) omitted the use of any firm-specific variables in their OLS estimation.

To the best of the authors's knowledge, Engelen and van Essen (2010) and Zattoni et al. (2017)[46] provide the only empirical work that examines the nesting structure of the IPO data. The former provides an explanation only for the direct relationship between differences in the formal institutional quality (e.g. legal system) and IPO underpricing across countries. The latter focuses on examining the influence of only the power distance dimension on the relationship between board independence and long-term financial performance for 1,024 firms between 2006 and 2008. Engelen and van Essen (2010) demanded that future research investigate the impact of informal institutional factors, such as difference in national cultures, on affecting differences in IPO underpricing across IPO firms nested within different countries.

This thesis observes no awareness in the IPO underpricing-culture literature for the direct effect of differences in national culture on the underpricing difference of IPO firms nested within different countries. This research also realises there is no cognisance for the indirect "modifier" effect of differences in national cultures in modifying the relationship between the IPO underpricing determinants and underpricing in cross-country settings. This motivates the author to investigate the following two questions. Are there direct and indirect relationships between differences in national cultures and IPO underpricing difference across countries once this research control for the nesting structure of the IPO data? Will those effects remain constant across different cultures located in developed and developing countries? Here in this chapter this research aims to address these important questions and fill the research gap in the IPO underpricing-culture literature.

[46] Please see Footnote27.

4.3. Research Questions and Hypothesis Construction

This thesis aims to study the impact of differences in country-level national cultures on causing direct and indirect "modifier" effects on underpricing difference in the global IPO market. For the direct effect, this research employs Hofstede's cultural dimensions to elucidate the underpricing difference in the global IPO market. For the indirect effect, this research also uses Hofstede's cultural dimensions to examine the effect of differences in those dimensions on the relationship between determinants of IPO underpricing and underpricing difference across countries. The empirical examination uses the two-level hierarchical linear modelling. The first level is related to firm-level factors where this thesis employs the EWL theory, which has three testable dimensions in order to control for determinants of IPO underpricing across countries: the incentive of IPO issuers; underwriter reputation; and *ex-ante* uncertainty surrounding the offering. The second level of the HLM model employs Hofstede's cultural dimensions, namely, power distance, uncertainty avoidance, individualism, masculinity, long-term orientation, and the indulgence characteristics of societies. Based on this, this research aims to answer four research questions as follows:

Q1: Do differences in country-level national cultures explain IPO underpricing difference across IPO markets?

Q2: Do differences in country-level national cultures affect the relationship between the incentive of IPO issuers and underpricing across IPO markets?

Q3: Do differences in country-level national cultures affect the relationship between underwriter reputation and underpricing across IPO markets?

Q4: Do differences in country-level national cultures affect the relationship between *ex-ante* uncertainty surrounding the offering and underpricing across IPO markets?

To answer the first research question, this research develops six hypotheses related to Hofstede's cultural dimensions to examine the direct effect of difference in national cultures on underpricing difference across countries. The second, third, and fourth questions all aim to address the indirect effect of dissimilarities in national cultures on the association between determining factors of IPO underpricing and underpricing difference across countries. To answer the second research question, this research proposes six hypotheses to study the effect of variations in Hofstede's cultural dimensions on the relationship between the incentive of IPO issuers and underpricing across countries. To address the third research question, this research constructs six hypotheses to test the effect of variability in Hofstede's cultural dimensions on the relationship between underwriter reputation and underpricing difference across countries. To provide an answer to the fourth question, this research develops six hypotheses to assess the effect of variations in Hofstede's cultural dimensions on the association between *ex-ante* uncertainty surrounding the offering and underpricing difference across countries.

4.3.1. The Direct Effect of Differences in National Cultures on IPO Underpricing Difference

4.3.1.1. Power Distance

Power distance symbolizes the uneven distribution of authority amongst individuals in a specific society. Hofstede (2011) show that when a society accepts the unequal allocation of power amongst its members, this society develops a hierarchy of power. In such a culture, individuals are nested into different clusters of power dividing the society into powerful and less-powerful groups where the former group centralises power and authority (Hofstede et al. 1990). The existence of such a hierarchical structure of power allows people at the top to perfectly control the flow of information (Lucey & Zhang 2010). Consequently, people below them have less power and are not informed about what is going on around them (Jain & Jain 2018). This of course enables those powerful members to effectively preserve authority at the expense of others, by controlling the systematic flow of information (Kanagaretnam et al. 2013). Hooghiemstra et al. (2015) contend that in high power distance cultures, the objective of social and organisational structures is to maintain the unjust dissemination of information. Consequently, the formation of an asymmetric information environment in high power distance cultures is widespread and thus is tolerated by individuals (Gupta et al. 2018; Jain & Jain 2018). This leads to aggregating problems amongst market participants closely connected to adverse selection, information monopoly, and moral hazard resulting in potential market failure (Akdeniz & Talay 2013).

Gray and Vint (1995) find that a poorer quality of information disclosure prevails in high power distance cultures. Managers in such authoritative societies promote secrecy in corporate financial reporting to preserve their authority. Zheng et al. (2012), Gray et al. (2013), and Barkemeyer et al. (2018) also find that lack of transparent financial reporting practices explains the large difference in cost of capital between countries characterised with high power compared to low power distance ones. Furthermore, Chourou et al. (2018) contends that in high power distance cultures, IPO managers are likely to exhibit authoritarian instincts and a high degree of opportunism for serving their personal benefit at the expense of shareholders. IPO investors growing up in high power distance ideologies can perceive the existence of psychological bias over personal gains between the insiders of IPO firms. Such a market atmosphere makes it possible to create an environment where there are trust issues. In high power distance cultures, lack of social trust channels available to market participants causes *ex-ante* uncertainty of IPO investors to be high. The evolution of such an *ex-ante* uncertainty atmosphere prompts high-quality IPO managers working in high-power distance countries to offer their firms a larger discount which signals their quality (Welch 1989; Costa et al. 2013). This action is a necessary strategy used by quality IPO firms to differentiate themselves from low quality IPO firms. Hence, IPO firms nested in high powder distance countries are likely to experience greater underpricing. Based on the above discussion, this research develops the first research hypothesis as follows;

Hypothesis 1:
The underpricing IPO firms that are nested in high power distance societies are expected to be high.

4.3.1.2. Uncertainty Avoidance

This cultural dimension refers to the extent to which a culture influences its members to deal with unstructured situations. Hofstede (1980) asserts that uncertainty avoidance focuses on the degree of tolerance for ambiguity and uncertainty. Hofstede (2001) shows that uncertainty-avoiding cultures strive to reduce sources of this uncertainty by following strict laws and rules. Gupta et al. (2018) contend that in cultures with a high (low) level of uncertainty avoidance, people work hard to avoid (tolerate) uncertainty, insecurity, and unpredictability. Thus in such high (low) uncertainty avoidance countries people are reluctant to accept risks (risk-loving). Lucey and Zhang (2010) assert that uncertainty avoidance can fuel the problem of information asymmetry between market participants in equity markets. This is because in high uncertainty avoidance countries such as Saudi Arabia,[47] Mexico, Poland, and Russia, their stock markets are normally not informationally efficient (Lucey & Zhang 2010; Jamaani & Roca 2015). Consequently, socially unconnected investors and analysts in such cultures have to deal with a larger likelihood that their investment analysis and decisions might be based on incomplete information (Hope 2003a; Lucey & Zhang 2010). Houqe and Monem (2016) provide global empirical evidence from 104 countries showing weak disclosure practices and high corruption levels are observed in high uncertainty avoidance countries. This research postulates that feeble financial disclosure in uncertainty avoidance societies escalates asymmetric information problems amongst IPO parties resulting in higher underpricing. The second research hypothesis is presented below;

Hypothesis 2:
The underpricing IPO firms that are nested in high uncertainty avoidance societies are expected to be high.

4.3.1.3. Individualism Versus Collectivism

Individualism is very different from collectivism, and it reflects the different types and/or levels of integration between people in society or a community. Hofstede (1980) argues that in a collective society, there is strong ties between individuals and they are integrated into cohesive nests with a strong emphasis on family networks. In contrast, Hofstede (2001) shows that in cultures with an individualistic cultural orientation, weak cultural bonds exist between citizens and their group loyalty is much weaker. Lucey and Zhang (2010) contend that in a country like China which is highly collective, managers prioritise their own interests by securing success before focusing on making informed and rational investment decisions when they have to choose between success and failure. Hope (2003b) and Griffin et al. (2009) find that individualism discourages information asymmetry. The authors find that corporate disclosures practices including the availability of reliable financial statement information to users are better in individualistic societies than collectivist ones.

[47] Hofstede (2011) gives Saudi Arabia, Mexico Poland, and Russia scores of 80, 82, 93, and 93 out 100, respectively, with regard to the level of uncertainty avoidance.

Fidrmuc and Jacob (2010) and Cai and Zhu (2015) stress that due to the existence of strong ties between managers and shareholders in collectivist societies, the channelling of insider information between stakeholders becomes easier and a psychologically accepted practice. This is because in such collective societies, security regulations and rules are weakly imposed on connected investors. This results in the asymmetric information problem between connected and unconnected investors (Sapienza et al. 2006; Tsakumis 2007; Jain & Jain 2018). This research contends that in collectivist cultures, investors will be psychologically aware of the existence of insider information channelling, hence, their *ex-ante* uncertainty will be always at a high level when they want to invest in IPO firms. For this reason, Costa et al. (2013) show that underpricing of IPO firms originated from individualistic societies typically having lower underpricing compared to collectivist ones. This research attributes this underpricing difference to the existence of varying levels of *ex-ante* uncertainty between the two cultural groups. Consequently, this difference in *ex-ante* uncertainty causes IPO investors in collectivist societies to seek larger underpricing as a compensation for a higher level of *ex-ante* uncertainty. Based on the above discussion, posited here is the third research hypothesis;

Hypothesis 3:
The underpricing IPO firms that are nested in high individualistic societies are expected to be low.

4.3.1.4. Femininity Versus Masculinity

The femininity dimension, which is clearly the opposite of masculinity, refers to the distribution of cultural factors including accomplishments, financial rewards, and outputs between men and women in society. Hofstede (1980) asserts that in masculine societies such as China the power, control, ambition, and success of males are paramount compared to females. Yet, Hofstede (2001) also finds that in feminine cultures such as Sweden women are expected to have similar if not the same competitive values as men. Lucey and Zhang (2010) argue that in a nation with a high level of femininity, managers do not seek competitive outcomes or a ‘winner takes all’ mentality. Those managers rely less on their own arguments when making investment decisions. Griffin et al. (2009), Aggarwal et al. (2012), and Hooghiemstra et al. (2015) discover that investors and portfolio managers in nations with low femininity tend to illustrate overconfidence and exaggeration when making equity investment decisions. Hope (2003b), Williams (2004), and Callen et al. (2011) note that femininity (masculinity) decreases (increases) information asymmetry. The authors show that information disclosure practices and absence of earning management practices are notably better (worse) in feminine (masculine) societies.

In addition, Chourou et al. (2018) and Gupta et al. (2018) argue that issuers of IPO companies in cultures that are characterised as having high levels of masculinity place a higher value on personal accomplishment. This is done through growing their private wealth when going public. IPO managers in such masculine societies will be psychologically geared to secure successful IPO offerings at any cost. Subsequently, they are driven to endure undue levels of underpricing or even announce rose-coloured information to promote the listing of their IPO firms with the intention of securing their own personal or individual success. Such psychological fervour to achieve self-actualisation exhibited by IPO managers is likely to be channelled into IPO investors. In this context, Costa et al. (2013) confirm that IPO managers in masculine countries are willing to accept excessive underpricing to secure successful listing in order to reflect personal achievement. In turn, IPOs nested in feminine cultures experience lower underpricing compared to masculine societies. Based on the above discussion, this research develops the fourth research hypothesis shown here;

Hypothesis 4:
The underpricing IPO firms that are nested in high femininity societies are expected to be low.

4.3.1.5. Long-term Versus Short-term Orientation

The long-term orientation dimension, which is the opposite of short-term orientation, emphasises pragmatic virtues oriented towards long-term rewards; these are saving money, determination, and adaptability to changing circumstances. Hofstede (2001) describes cultures that are preoccupied with thriftiness and tenacity in accomplishing future results as being long-term oriented cultures. In contrast, Gupta et al. (2018) argue that people in short-term oriented cultures have faith in normative thinking, exhibit lesser propensity for future savings, and concentrate on attaining rapid results and almost immediate outcomes. La Porta et al. (2000) find that investors in long-term oriented countries gravitate less to immediate cash compared to short-term oriented shareholders. The authors find that long-term oriented shareholders accept lower dividend payouts in exchange for higher retained earnings that can be used for future investment activities. Consequently, La

Porta et al. (2000) conclude that in this kind of long-term cultural orientation, firms have more discretionary financial resources and subsequently are able to focus on long-term growth plans.

Costa et al. (2013) argue that long-term orientation behaviour affects two important parties in the IPO process: issuers and investors. They claim that issuers with a long-term orientation accept a low offer price, simply to secure required funds to meet firms' long-term business objectives. Likewise, investors with long-term orientation cultural values tend not to flip their IPO shares for short-term gains (Cai & Zhu 2015). This investment behaviour leads to lower supply and higher demand for a company's shares on the first day of trading. Because of this shortage of supply, Costa et al. (2013) contend that the share price of IPO firms located in long-term orientation countries considerably surges on the first trading day. The end result is high initial market returns. Based on the above discussion, developed and shown here is the fifth research hypothesis;

Hypothesis 5:
The underpricing IPO firms that are nested in long-term oriented societies are expected to be high.

4.3.1.6. Indulgence Versus Restraint

Indulgence is the antonym of restraint, which is the sixth cultural dimension. It refers to values associated with the observed level of subjective happiness and control of life's desires from country to country. Hofstede (2010) describes an indulgent culture as a society that permits the fulfilment of human desires, which essentially means enjoying life and having "fun". Hofstede (2010) then defines a restraint society as one that suppresses and regulates attraction towards human leisure. The author elaborates that in such restraint cultures, people follow strict social norms and are induced to place more significance on the virtue of hard work. Gupta et al. (2018) contend that in cultures where undue indulgence is avoided, individuals' leisure times are utilise d to attain community respect by establishing businesses. The authors find empirical evidence documenting that IPO activity is significantly larger in restraint cultures compared to indulgent ones. In this context, Costa et al. (2013) assert that investors from indulgent cultures tend to flip their IPO shares on the first trading day, seeking the satisfaction of immediate gains.

This research contends that IPO investors in restraint cultures will maintain philosophical investment habits to resist flipping their IPO shares for economically indulgent reasons. This economic behaviour elicited by IPO investors in restraint societies will be channelled to other IPO investors in the secondary market. Consequently, post-IPO investors will react to the actions of pre-IPO investors, generating high demand for newly listed IPO shares in restraint countries. This causes a sudden increase in demand with a very short supply of IPO shares on the secondary market, which positively causes share prices to experience subnational increases. Thus, this research expects high initial returns for IPO shares on the first trading day in restraint cultures. Based on the above discussion, this research proposes the sixth research hypothesis below;

Hypothesis 6:
The underpricing IPO firms that are nested in high indulgence societies are expected to be low.

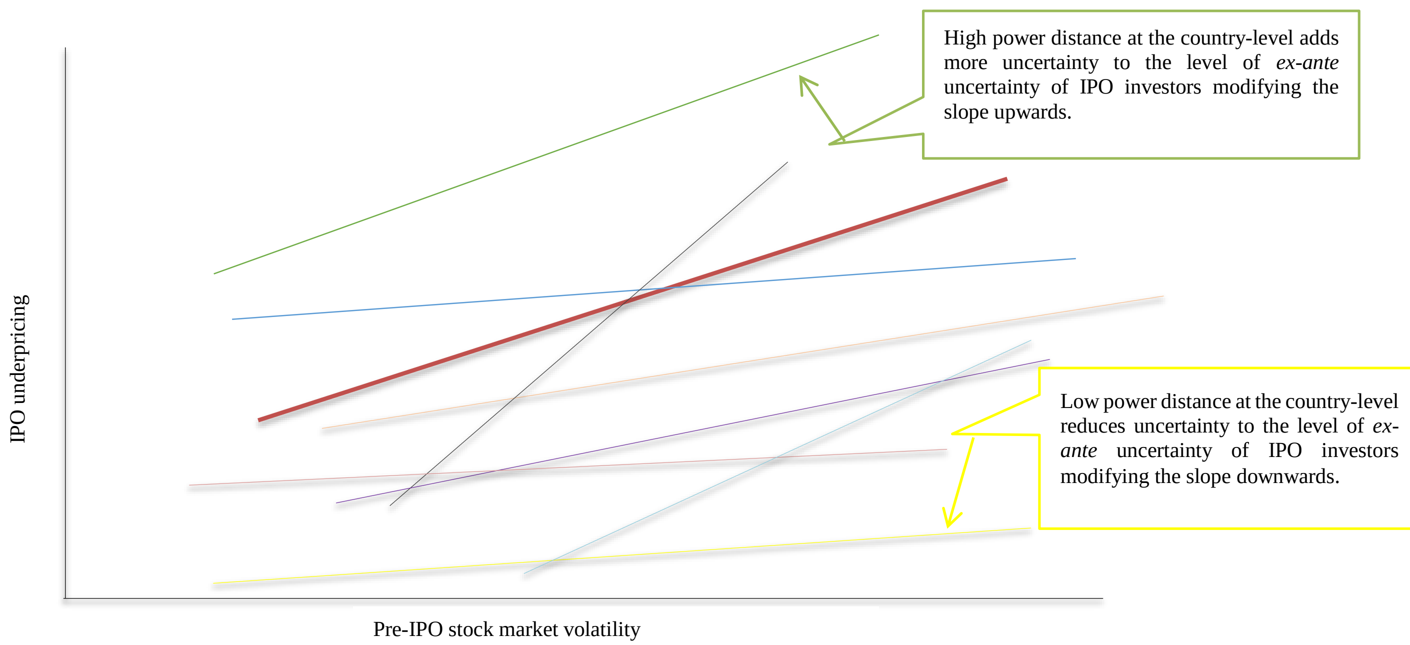
4.3.2. The Indirect Effect of Differences in National Cultures on IPO Underpricing Difference

4.3.2.1. Relationship Between the Incentive of IPO Issuers and Underpricing

There is paucity of research on the indirect effect of cultural values regarding the relationship between IPO underpricing determinants and underpricing difference across countries. Hence, this research builds the hypothesis on capital structure research that employs the application of HLM technique to capture this indirect effect. Kayo and Kimura (2011) find significant evidence documenting that country-level munificence indirectly affects the association between growth opportunities and leverage across 17,061 firms nested in 40 different countries. Li et al. (2013) also employ two-level HLM estimation to examine the direct and indirect effects of national cultures on corporate risk-taking using 7,250 firms nested in 35 countries between 1997 and 2006. At the firm-level, the authors find a positively significant relationship between earning direction and corporate risk-taking measured by the standard deviation of return on assets.

At the country-level, Li et al. (2013) show that managers nested in high uncertainty avoidance nations have a higher tendency to avoid corporate risk-taking. The authors also capture the indirect effect of uncertainty avoidance on corporate risk-taking behaviour. They achieve this by examining the modifier effect of differences in uncertainty avoidance across countries on the relationship between earning discretion practices and corporate risk-taking. The authors employed the HLM method because it can explain two things: the slope coefficient of earning discretion to vary across 35 countries; and its variability by differences in uncertainty avoidance across countries. Li et al. (2013) document strong evidence showing that the relationship between earning discretion and corporate risk-taking is lower in high uncertainty avoidance cultures. To envisage this indirect effect, Figure 13 provides a hypothetical example of the HLM model with random slope coefficients.

Figure 13: Hypothetical Example of HLM Model with Random Intercept and Slope Coefficients



(Designed by the author of this thesis)

In this illustration, every nation exemplifies a slope coefficient regarding the association between an independent variable, for example, pre-IPO stock market volatility and a dependent variable such as IPO underpricing. In this construct, this research follows the IPO underpricing literature to assume a positive association exists between pre-IPO stock market volatility and underpricing across countries. For example, Ljungqvist and Wilhelm Jr (2002) and Chang et al. (2017) find that the level of volatility of a stock reflects its degree of risk perceived by market participants in which more volatility makes pre-market prices to be less informative resulting in higher underpricing. Hence, if the relationship between pre-IPO stock market volatility and IPO underpricing is not equal across countries, then the slope coefficient for every country should be allowed to vary across countries (Kayo & Kimura 2011). This econometric estimation makes it possible to better comprehend the behaviour of every slope coefficient (pre-IPO stock market volatility) on IPO underpricing under different cultural backgrounds (Li et al. 2013).

Figure 13 depicts the positive relationship between pre-IPO stock market volatility and IPO underpricing as not being the same across those countries. This means that a country with a slope coefficient (yellow) has a lower positive coefficient value than a country with a slope coefficient (green). This is because the level of power distance in the country with the green slope coefficient is greater than the yellow one. Consequently, the level of power distance in those countries acts as a modifying effect that alters the strength of the positive relationship between pre-IPO stock market volatility and IPO underpricing. In other words, power distance increases the effect of pre-IPO stock market volatility in driving high underpricing. It does not change the directional relationship. As shown in Figure 13, this research conjectures that the change in the strength of the association happens due to the presence of high power distance level in the country with the green slope coefficient. This research discussed in hypothesis 1 that IPO firms nested in high power distance cultures should expect higher underpricing. This is because market participants in high power distance societies tolerate the existence of information gap amongst them (Gupta et al. 2018; Jain & Jain 2018). Consequently, IPOs nested within high power distance countries should accept an additional level of *ex-ante* uncertainty added to the uncertainty driven by pre-IPO stock market volatility. This means the slope coefficient will have a higher value because the more the *ex-ante* uncertainty there is, the more IPO investors will become anxious about the price volatility of the IPO firm on its first listing data. This in turn will mean much more underpricing.

Following the above discussion, this research conjectures that in a country with high power distance, high uncertainty avoidance, high collectivism, high masculinity, long-term orientation, and low indulgence, the effect of IPO issuers; incentive on underpricing is markedly less. Habib and Ljungqvist (2001) and Jones and Swaleheen (2010) empirically find a negative relationship between both the fraction of secondary shares sold and primary shares created and underpricing.

The authors assert that the larger the proportion of secondary shares sold and primary shares created, the greater the incentives of issuers to curtail underpricing. This research argues that in such cultures with the abovementioned characteristics, the presence of an asymmetric information environment will cause issuers to fear greater wealth losses caused by larger expected underpricing. This anxiety is caused by issuers' perception of culturally accepted non-transparent market practices. Prior studies document that cultures with high power distance, high uncertainty avoidance, high collectivism, high masculinity, long-term orientation, and low indulgence tolerate poor transparency environments (Grimmelikhuijsen et al. 2013; Lewellyn & Bao 2014; Hooghiemstra et al. 2015; Gallego-Álvarez & Ortas 2017; Gupta et al. 2018).

Such a culture is likely to enable key players in the IPO market including connected institutional investors and large underwriting banks to benefit at the expense of owners of IPO firms. For example, Ljungqvist (2007) argues that some underwriters exploit their market power by intentionally underpricing IPO firms for personal gain. Similarly, Liu and Ritter (2010) contend that some underwriters take advantage of their market knowledge and position for their own benefit by receiving side payments from investors. They want this in exchange for a discount offering or large allocation of IPO stocks, a practice known as "spinning". In high power distance cultures that induce the existence of non-transparent market practices, for instance China, Chen et al. (2017) provide recent supporting evidence for the expected abuse of IPO issuers' wealth. The authors show that powerfully connected underwriters charge IPO issuers higher underwriting fees compared to non-connected underwriters. Consequently, higher underwriting fees undermine IPO issuers' wealth. Torstila (2003) perceives this cost as having a similar effect on the financial burden of underpricing. Owners of IPO firms in such poor-transparency welcoming cultures will be less interested in selling more of their shareholdings when they go public. Based on the above discussion, this research develops the following hypotheses:

Hypothesis 7a:

High level of power distance undermines the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 7b:
High level of uncertainty avoidance undermines the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 7c:
High level of individualism increases the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 7d:
High level of femininity increases the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 7e:
High level of short-term orientation increases the relationship between the incentive of IPO issuers and underpricing.

Hypothesis 7f:
High level of indulgence increases the relationship between the incentive of IPO issuers and underpricing.

4.3.2.2. Relationship Between Underwriter Reputation and Underpricing

The conjecture here is that when the witnessed level of information asymmetry in a country is high then issuers who wish to sell more secondary shares and create more primary shares will strive to employ a reputable underwriter. Beatty and Ritter (1986) and Habib and Ljungqvist (2001) assert that employing prestigious underwriters could indeed decrease the *ex-ante* uncertainty about the firm's value. This is because reputable underwriters care more about maintaining good market reputation, have worked with financial and technical advisory teams, and established relationships with local and international investors (Lewellen 2006). Consequently, Jones and Swaleheen (2010) contend that prestigious underwriters can provide comprehensive assessments for IPO firms that separate good quality from bad quality firms so in turn, leading to a successful listing. As a result, IPO investors perceive the presence of reputable underwriters as a certification signal that solves the problem of underpricing (Torstila 2003).

This research postulates that when an IPO is nested in a country with low power distance, low uncertainty avoidance, low collectivism, low masculinity, low long-term orientation, and high indulgence, the relationship between prestigious underwriters and underpricing decreases. This is because in such cultures individuals have shared social virtues for not accepting weak governance practices or allowing the circulation of private information. For example, there is empirical evidence linking the formation of low level of country governance and inefficient stock market information in high power distance, uncertainty avoidance, collectivism, masculinity, long-term orientation, and high restraint cultures (Lucey & Zhang 2010; Houqe & Monem 2016; Jain & Jain 2018). Therefore, in such societies with the above cultural merits, IPO parties will not be able to finalise their investment decisions based on reliable and honest information (Gupta et al. 2018).

The argument this research establishs here is that IPO investors in these sorts of cultures will worry more about the certification role reputable underwriters provide to IPO firms (Hanley & Hoberg 2012). The reason for this is the unavailability of an effective litigation mechanism and high corrupt legal system where investors cannot prosecute both IPO issuers and underwriters when a fraud is evident (Hughes & Thakor 1992; Lowry & Shu 2002; Hanley & Hoberg 2012). For example, previous literature finds that in low (high) power distance countries such the United States (France), the possibility of litigation risk is higher (lower)[48] (Piot & Janin 2007; Lin et al. 2013). Tsakumis (2007) also provides empirical evidence showing that part of the wide difference in the quality of accounting information between Greece[49] and the United States is due to large differences in their culture and litigation risk aspects. This research hypothesises that the existence of this country-level assurance mitigates the importance of employing reputable underwriters. The following hypotheses are based on the above discussion:

[48] Hofstede (2011) gives France (the United States) a score of 68 (40) out 100 in relation to the level of power distance.

[49] Hofstede (2011) gives Greece a score of 60 out 100 in relation to the level of power distance.

Hypothesis 8a:
High level of power distance increases the relationship between underwriter reputation and underpricing.

Hypothesis 8b:
High level of uncertainty avoidance increases the relationship between underwriter reputation and underpricing.

Hypothesis 8c:
High level of individualism undermines the relationship between underwriter reputation and underpricing.

Hypothesis 8d:
High level of femininity undermines the relationship between underwriter reputation and underpricing.

Hypothesis 8e:
High level of short-term orientation undermines the relationship between underwriter reputation and underpricing.

Hypothesis 8f:
High level of indulgence undermines the relationship between underwriter reputation and underpricing.

4.3.2.3. Relationship Between *Ex-ante* Uncertainty and Underpricing

The linkage between national cultures and *ex-ante* uncertainty is established in the literature. The argument is that some countries possess cultural characteristics that make an *ex-ante* uncertainty climate inevitable (Yamin & Golesorkhi 2010; Hooghiemstra et al. 2015; Gupta et al. 2018). For example, Malhotra et al. (2011) find a positive association between the level of power distance and with uncertainty and risk related to international market entry. The authors document there is strong evidence linking difficulty in cross-border acquisitions due to an increase in *ex-ante* uncertainty in high power distance cultures. Hope (2003b) and Hope et al. (2008) show that in societies with a high level of masculinity, power distance, and collectivism such as China, investors and analysts should expect an additional level of *ex-ante* uncertainty triggered by the existence of a weak level of disclosure quality at the country-level. Lucey and Zhang (2010) contend that developing countries' stock markets suffer from more uncertainty compared to developing equity markets. The authors relate the existence of high level of masculinity, power distance, and collectivist traits in developing countries to the unequal distribution of market information between investors. This is what causes a higher level of uncertainty to emerge.

In turn, this makes stock markets in such cultures experience high levels of stock market volatility (Lucey & Zhang 2010). Gray (1988), Gray et al. (2013), and Gallego-Álvarez and Ortas (2017) find poor financial reporting transparency, high cost of capital, and weak disclosure practices in countries characterised by much uncertainty avoidance and minor indulgence. Grimmelikhuijsen et al. (2013) discover that individuals in high power distance and long-term orientated cultures have a low level of trust in the transparency of their governments; for this reason they tend to disregard the virtues of transparency. This research contends that IPOs nested within low power distance, low uncertainty avoidance, low collectivism, low masculinity, low long-term orientation, and high indulgence cultures, have aspects mitigating *ex-ante* uncertainty at the country-level. Consequently, this reduces the impact of firm-level *ex-ante* uncertainty on underpricing. Based on the above discussion, this research develops the following hypotheses:

Hypothesis 9a:

High level of power distance increases the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 9b:

High level of uncertainty avoidance increases the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 9c:

High level of individualism undermines the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 9d:

High level of femininity undermines the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 9e:

High level of short-term orientation undermines the relationship between *ex-ante* uncertainty and underpricing.

Hypothesis 9f:

High level of indulgence undermines the relationship between *ex-ante* uncertainty and underpricing.

4.4. Data Used

To capture the direct and indirect effects of differences in national cultures on underpricing difference across the global IPO market, this chapter employs two-level data. This data ranges from January 1995 until December 2016 and means using 10,217 IPO-issuing firms IPOs in the G20 countries. The first level includes IPO underpricing determinants related to EWL theory. The second level includes country-level national culture data that is time-invariant secondary data sourced from Hofstede (2011). The authors argue that cultures do not change greatly over time and in fact, differences in national cultures are not time-variant. The number of IPO firms incorporated in this chapter is chosen following Ritter and Welch (2002) Boulton et al. (2017) in assembling the sample selection criteria summarised in Table 30.

Table 30: Key Sample Selection Criteria Used for the Empirical Analysis

Selected search criteria	Description	Number of IPOs Matches
Exclusion of Duplicates	This research excludes all duplicate[50] IPOs from this sample from January 1995 to December 2016 (9,548 IPOs are excluded).	**32,585**
Exclusion non-trading IPOs	This research only includes IPO firms that are already traded at the time of inclusion; therefore, all pending, withdrawn, postponed, and rejected IPOs are excluded since they are beyond the research interest of this study (1,450 IPOs are excluded).	**23,037**
Exclusion of non-G20 IPOs	The G20 countries include Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, United Kingdom, and the United States plus the European Union as the 20th country. Within the European Union, Bulgaria, Denmark, Greece, Poland, Slovenia, Spain, Romania, and Sweden are included. Due to IPO data unavailability, Argentina, Slovenia, Spain, and Bulgaria, and Romania were excluded, creating a final sample consisting of 22 countries (5,951 IPOs are excluded).	**21,587**
Exclusion of IPO data with missing values for PR and DF, UR, PMV, LET, and LOP	This research excludes IPOs with missing values needed to calculate all explanatory variables (6,047 IPOs are excluded).	**15,339**
Exclusion of IPO data with missing values for UP	This research excludes IPOs with missing values of the dependent variable (2,045 IPOs are excluded).	**12,886**
Exclusion of Non initial public offering data	This research excludes REITs, ADRs, units offer, close-end-funds, and stock with warrants (2,669 IPOs are excluded).	**10,217**
Exclusion of IPO data with no country-level national culture data	All data is available.	**10,217**

Country-level national culture data includes Hofstede (2011) six cultural dimensions variables: power distance, uncertainty avoidance, individualism, femininity, short-term orientation, and indulgence characteristics. To develop those six cultural measures, Hofstede (1980) received more than 116,000 questionnaire answers from over 60,000 respondents regarding employee values. These were collected by IBM between 1967 and 1973, during which time the first scores covered more than 70 countries. Hofstede first used the 40 largest nations only and afterwards extended the analysis to 70 countries and 3 regions. In the updated editions of Geert Hofstede's work since 2001,

[50] The author follows the cautionary observation of Smart and Zutter (2003), in order to scrutinise the existence of duplicate IPO records and subsequently eliminate them from the sample to avoid double counting.

such as the most recent 3rd edition from 2010, scores are listed for 76 countries and regions. These are partly based on replications and extensions of the original IBM study and utilise d for different international populations.

Since culture changes very slowly, the scores can be considered up-to-date (Hofstede 2011). Hofstede's cultural dimensions have been reliably employed in many academic disciplines, including management, marketing, economic, sociology, and psychology studies (Søndergaard 1994; Smith et al. 1996; Soares et al. 2007; Reuter 2011; Aggarwal et al. 2012; Li & Zahra 2012; Taylor & Wilson 2012; Gupta et al. 2018). This research chooses Hofstede (2011) cultural dimensions over those propounded by Schwartz (1994) because the latter do not rely on factorial analysis, unlike Hofstede. Instead, Schwartz (1994) relied on a theoretically-grounded approach built from social theories that is more subjective and less frequently employed by finance scholars. For example, Reuter (2011) analyses 29 academic papers that investigate the impact of cultural dimensions on corporate finance and finds that 24 of these studies employ Hofstede (2011) rationale, while only five employ that of Schwartz (1994).

4.4.1. Country-level National Culture Data

Country-level national culture data includes Hofstede (2011) six cultural dimensions variables, these being power distance (PD), uncertainty avoidance (UA), individualism (IDV), femininity (FM), short-term orientation (STO), and indulgence (IDV) characteristics of societies. Detailed information including definition of each variable and source of data is provided in Table 31. The outcome variable is IPO underpricing (UP), which is defined as the percentage return from the offer price to the first closing price on its first trading day. Independent variables include two levels of data, specifically country-level national cultures and firm-level data.

Table 31: Country-level National Culture Variables

Variables	Description	Expected Coefficient Sign[51]	Source of data
Power Distance (PD)	This cultural variable is an index that ranges from a value of 0 to 100 scale points, with 50 points as a mid-level. 100 (0) points indicate the highest (lowest) degree of a power distance in a society, where less powerful members of that society (do not) accept and expect that power is distributed unequally. The rule of thumb is that if a score is under 50 the culture scores relatively low on that scale, and if any score is over 50 the culture scores high on that scale.	**Positive**	Hofstede (2011)
Uncertainty Avoidance (UA)	This cultural variable is an index that ranges from a value of 0 to 100 scale points, with 50 points as a mid-level. 100 (0) points indicate the highest (lowest) degree of an uncertainty avoidance in a society where people feel threatened by ambiguous or unknown situations and have created beliefs and institutions that try to avoid them. The rule of thumb is that if a score is under 50 the culture scores relatively low on that scale and if any score is over 50 the culture scores high on that scale.	**Negative**	Hofstede (2011)
Individualism (IDV) Versus Collectivism	This cultural variable is an index that ranges from a value of 0 to 100 scale points, with 50 points as a mid-level. 100 (0) points indicate the highest (lowest) degree of an interdependence a society maintains among its members. The low side (under 50) is considered "Collectivist", and above 50 is considered "Individualist". A country with a score of 43 would be a collectivist one but is less collectivist than one with 28 which is approaching the 0 mark.	**Negative**	Hofstede (2011)
Femininity (FM) Versus Masculinity	This cultural variable is an index that ranges from a value of 0 to 100 scale points, with 50 points as a mid-level. 100 (0) points indicate the highest (lowest) degree of a femininity society. The rule of thumb is that if a score is under 50 the culture scores relatively low on that scale, and if any score is over 50 the culture scores high on that scale.	**Negative**	Hofstede (2011)
Short-term Orientation (STO) Versus Long-term Orientation	This cultural variable is an index that ranges from a value of 0 to 100 scale points, with 50 points as a mid-level. 100 (0) points indicate the highest (lowest) degree of short-term orientation. The rule of thumb is that if a score is under 50 the culture scores relatively low on that scale, and if any score is over 50 the culture scores high on that scale.	**Negative**	Hofstede (2011)
Indulgence (IDG) Versus Restraint	This cultural variable is an index that ranges from a value of 0 to 100 scale points, with 50 points as a mid-level. 100 (0) points indicate the highest (lowest) degree of Indulgence in a society. The rule of thumb is that if a score is under 50 the culture scores relatively low on that scale, and if any score is over 50 the culture scores high on that scale.	**Negative**	Hofstede (2011)

Firm-level data along with control variables this research uses in this chapter are identical to the one utilised in the previous chapter. For a detailed discussion of those firm-level data along with control variables employed, please see Table 3 in Section 2.6.1 on definition of variables.

[51] See Section 4.3.1 for a discussion of the expected hypothesis sign.

4.5. Methodological Framework and Estimation Techniques

4.5.1. HLM Technique

This research identifies the IPO underpricing data to have a multilevel nesting structure following Engelen and van Essen (2010), Li et al. (2013) Judge et al. (2014), and Tennant and Sutherland (2014). At the firm-level, the data contains 10,217 IPO firms. At the country-level, the sample firms are nested within 22 different developed and developing countries. From a modelling standpoint, Li et al. (2013) stress the significance of separating the effects that occur at the firm-level and country-level. This is done in order to comprehend the effect of country-level compared to firm-level determinants so that their interactions can be accurately estimated. This research uses unbalanced cross-sectional hierarchical nested estimation of the general linear modelling to examine the nesting structure of the multilevel data (Raudenbush & Bryk 2002). This thesis employs a full maximum likelihood estimation to control for the nature of the data being unbalanced across countries (Li et al. 2013). In the data, observations related to IPO firms within countries set the base-level while observations related to countries are at the higher-level in the HLM technique.

By employing the application of HLM estimation, this research creates three benefits in the setting. Firstly, this research manages to account econometrically for characteristics (i.e., difference in national cultures) of the higher-level (i.e., countries) data that are possibly to affect the characteristics (determinants of IPO underpricing) of the base-level (i.e., IPO firms). This means that error terms within countries are likely to correlate amongst themselves since they share similar country-level characteristics while across countries they may not correlate (Hofmann 1997). Kayo and Kimura (2011) confirm that discounting this multilevel effect is likely to cause severe violations to a number of statistical assumptions connected with traditional Ordinary Least Squares (OLS) regressions.

Secondly, the HLM framework makes it possible to employ a country mean-centered estimation to firm-level variables (Kreft et al. 1995). This is done to separate accurately the variance in firm-level IPO underpricing into what is attributed to country-level characteristics (i.e., difference in national cultures) versus firm-level characteristics (determinants of IPO underpricing). Li et al.

(2013) show that by centering determinants of corporate risk-taking within-country and also including country-level means to the array of explanatory variables, HLM allowed them to isolate perfectly the covariances within- and between-country. Hence, this decomposition permits this thesis to examine the differential effects of the firm-level characteristics such as pre-IPO stock market volatility at the firm-level and also at the country-level.

Employing the mean-centering approach to the IPO underpricing explanatory variables helps this research to estimate the interaction terms (i.e., culture*pre-IPO stock market volatility) efficiently (Osborne 2000). Li et al. (2013) show that the HLM technique facilitates accurate inclusion of cross-level interactions between the country- and firm-level covariates. The superiority of HLM application in fact derives from its econometric ability to accurately estimate firm-level effects over countries while capturing country-level relationships (Hofmann 1997). This research notes that the model specification includes independent variables that have only firm-level and country-level values such as IPO stock market volatility and cultural values, respectively. The former variables are all country-mean centered while the latter ones are all grand mean-centered. It is then possible to understand well the direct and indirect effects of differences in national on underpricing difference of IPO firms across countries (Raudenbush & Bryk 2002; Li et al. 2013).

Thirdly, Li et al. (2013) contend that the application of HLM rectifies the size distortion by the employment of unbalanced sample sizes, which is a common case in the IPO data. For example, the distribution of IPO data across industries, years, and countries is rarely equal. Under the simple pooling estimation for the OLS framework, Li et al. (2013) argue that the coefficient related to a country-level predictor variable could be spuriously significant due to the influence of large sample size at the firm-level. The existence of this problem may intensify when there are large differences across countries with reference to the number of firms related to every country in the sample. Therefore, HLM corrects this problem by estimating regressions at the country- and firm-level simultaneously, unlike OLS estimation where observations related to firm-level are equally weighted. HLM specification achieves this correction by making country-level regressions weighted by the accuracy of the firm-level data that is in reverse associated within a country's sample size (Li et al. 2013). The empirical testing is a three-stage operation following Kayo and Kimura (2011).

In the first stage, this research commences with what is called the empty HLM model or the HLM null model. This is a necessary step to confirm the existence of the nesting structure in the data in order to justify the employment of HLM estimation. In the second stage, this research employs a number of HLM models with random intercepts in order test the hypotheses related to the direct effect of differences in national cultures on underpricing difference across countries. In the last stage, this research progresses to a complex HLM estimation that allows both the intercept and slope coefficients to be random. This research does this to examine the hypotheses related to the indirect "modifier" effect of variability in national cultures values in affecting relationship between determinants of IPO underpricing and underpricing difference across countries.

4.5.1.1. HLM Null Model

The first step in the HLM testing commences formally by examining the one-way ANOVA. This only includes one fixed term - the grand mean - and then a variance for the base-level (firm-level) and for the higher-level (country-level). This means that this research omits intentionally all independent variables (fixed effects) as the concentration is on random effects. In so doing this research obtains relevant information on the variance decomposition of the outcome variable (IPO underpricing). In other words, this empty HLM model allows this thesis to appropriately estimate the role for the base-level (firm-level) and for the higher-level (country-level) in the variance of the dependent variable (IPO underpricing). The null hypothesis for the empty model is that there is no difference in the mean underpricing across the sample countries. The aim here is to examine if the variations in IPO underpricing (UP) across the G20 countries are significantly different. This step is necessary in order to support the rationale for the hierarchical structure of the IPO data, consequently justifying the use of HLM framework (Engelen & van Essen 2010). Equations (1) and (2) specify the empty model:

$$UP_{ij} = \alpha_{0j} + \eta_{ij} \quad (1)$$

where

$$\alpha_{0j} = \lambda_{00} + \mu_{0j} \quad (2)$$

Equations (1) and (2) present the base-model (firm-level) and the higher-level (country-level), respectively. In the model, this research has firm *i* in country *j* where α_{0j} can be understood as the mean IPO underpricing in country *j*, whereas λ_{00} is the grand mean (i.e., the mean of IPO underpricing across all IPO firms and countries). In Equation (1), η_{ij} represents the error term at the firm-level showing the extant of which a firm's IPO underpricing deviates from the mean of IPO underpricing in the country where this IPO firm operates within its domain. In Equation (2), μ_{0j} indicates the error term at the country-level exhibiting how mean IPO underpricing in country *j* deviates from the grand mean. By estimating Equations (1) and (2), this research can calculate the Intra-Class Correlation (ICC). The ICC assists the author to determine the relative significance of each level in elucidating perceived variations in IPO underpricing across countries (Raudenbush & Bryk 2002). This research computes the ICC estimator $\hat{\rho}$ by employing estimates $Var(\eta_{ij}) = \sigma^2$ and $Var(\mu_{0j}) = \tau_{00}^2$, following the below definition in Equation (3):

$$\hat{\rho} = \frac{\hat{\tau}_{00}^2}{\hat{\tau}_{00}^2 + \hat{\sigma}^2} \tag{3}$$

Goodness of fit

For the purpose of model evaluation, this research follows Tennant and Sutherland (2014), i.e. this research makes use of the information provided by variance components in the random effects ANOVA model (the empty model) to run a comparison with the subsequent estimations. This includes the following fully estimated random intercept and random slope HLM models. It serves to assess the usefulness of the explanatory variables at every level in explaining variability in UP. This research evaluates the explained variability in the variance using Equation (4):

$$R_m^2 = 1 - \frac{Var(m)_{new}}{Var(m)_{ANOVA}} \tag{4}$$

In Equation (4), *m* represents the variations in every level where level 1, for example, captures within-country variance while between-country variance is captured in second level. $Var(m)_{new}$ represents the estimated variance for level *m* in the random-intercept and random slope models. In contrast, $Var(m)_{ANOVA}$ provides the needed information for the one-way ANOVA model (the empty model) related to the estimated variance in level *m*. This research employs those estimates for every new model which this research construct to compute the within-country and between-country R^2. In other words, HLM partitions R^2 to explain differences in underpricing derived from variations within every country and between countries, for example, variations within and between the G20 countries. HLM also provides the deviance score of every model. The deviance score is a measure of lack of fit between model and data (Gelman 2006). In general, the rule of thumb is that the larger the deviance score, the poorer the fit to the data. The deviance is usually not interpreted directly, but rather compared to deviance(s) from other models fitted to the same data (Osborne 2000; Raudenbush & Bryk 2002).

4.5.1.2. Random Intercept HLM Models

Following the assessment of the variance decomposition of UP, this section extends the basic one-way ANOVA model to incorporate covariates for level 1 and level 2. Regression equations represent each level. In Equation (5), this research introduces the intercept (β_{0j}) and allow it to vary across different country-level national culture measures in order to accommodate variations across countries in the baseline UP beyond what is elucidated by X_{qij}. This allows this thesis to provide answers to hypotheses 1 to 6. Therefore, this research specifies the level 1 model as follows:

$$UP_{ij} = \beta_{0j} + \sum_{q=1}^{Q} \gamma_q X_{qij} + \in_{ij} \tag{5}$$

and the level 2 model is specified as in Equation (6),

$$\beta_{0j} = \gamma_{00} + \sum_{r=1}^{R} \pi_r Z_{rj} + \delta_{0j} \tag{6}$$

For the level 1 equation, UP for firm i in country j is defined by a function of firm-specific characteristics, X_{qij} plus the random error term component $\in_{ij}$. For the level 2 equation, the mean of UP in country j, β_{0j} is defined as a linear combination of country-specific characteristics (Z_{rj})

plus interpret γ_{00} and the random error term δ_{0j}. This research consolidates Equations (5) and (6) as able to produce a mixed-effect model which is shown in Equation (7);

$$UP_{ij} = \gamma_{00} + \sum_{q=1}^{Q} \gamma_q X_{qij} + \sum_{r=1}^{R} \pi_r Z_{rj} + \in_{ij} + \delta_{0j} \tag{7}$$

From the testing perspective, the model this research presents in Equation (7) is the formal model for testing the direct effect of Hofstede's six cultural dimensions (Z_{rj}) on underpricing difference across G20 countries. The assumption here is that this model is estimated based on random effects estimation. The interest in developing this random-effects estimation in Equation (7) is connected to its ability to generate equivalent fixed effects coefficients for level 1. This model can produce accurate results since it concurrently incorporates country-specific characteristics (i.e., Hofstede's cultural dimensions) for level 2 when it is appropriately estimated (Rabe-Hesketh & Skrondal 2008).

4.5.1.3. Random Intercept and Slope Coefficient HLM Models

This section extends the empirical testing following Kayo and Kimura (2011) and Tennant and Sutherland (2014) by allowing two things: firstly, the intercept to be random (i.e., as in the previous section); and secondly, the slope coefficients for all of the firm-level variables to be random as well. Doing so permits firm-level variables to be explained by the variability in national culture variables across countries. Consequently, this research can provide answers to the 18 hypotheses related to the impact of the indirect effect of differences in national cultures in modifying the relationship between determinants of IPO underpricing and differences in IPO underpricing across countries. In Equation (8), this research replaces γ_q with β_{qj} as follows:

$$UP_{ij} = \gamma'_{00} + \sum_{q=1}^{Q} \beta_{qj} X_{qij} + \sum_{r=1}^{R} \pi'_r Z_{rj} + \in_{ij} + \delta_{0j} \tag{8}$$

β_{qj} is defined as a constant plus a country-dependent deviation term as shown in Equation (9)

$$\beta_{qj} = \gamma_{q0} + \delta_{qj} \tag{9}$$

then

$$UP_{ij} = \gamma'_{00} + \sum_{q=1}^{Q} \gamma_{q0} X_{qij} + \sum_{q=1}^{Q} \delta_{qj} X_{qij} + \sum_{r=1}^{R} \pi'_r Z_{rj} + \in_{ij} + \delta_{0j} \tag{10}$$

Equation (10) represents the formal random effects model. The function of this model is to examine the indirect effect of Hofstede's cultural dimensions (Z_{rj}) on underpricing difference across the G20 countries. This model is the random coefficient model that has a fixed effects component given as $\gamma'_{00} + \sum \gamma_{q0} X_{qij} + \sum \pi'_r Z_{rj}$. It also has random effects defined as $\sum \delta_{qj} X_{qij} + \in_{ij} + \delta_{0j}$. Employing random slopes implies the relationship between a model's independent variables and the dependent variable will vary across countries (Twisk 2006; Hox et al. 2018). Osborne (2000) argues that such an expectation might enhance the accuracy of the model by revealing the impact of potential unobserved forces that affect the behaviour of the dependent variable. However, Preacher et al. (2006) contend that the increased specification accuracy of modelling random slopes reduces the degree of freedom. Therefore, it should be traded off against the model's overall efficiency. This research follows Kayo and Kimura (2011) to account for this problem by comparing the overall efficiency of the models. This entails comparing the results of fixed slopes with random slopes related to the deviance score that measures the overall fitness of the model.

4.6. Analyses of Empirical Results and key Findings

This section is organised into three subsections. In the first subsection, namely Summary Statistics, this research briefly highlights key observations related to summary statistics for firm-specific variables, for IPO underpricing by year, and for IPO underpricing by industry. In this way repetition is avoided because this research employs the same set of IPO data in this chapter similar to the previous two chapters. This section also presents the summary statistics for country-level national culture variables in the G20 IPO markets. This research also provides brief information about the variance inflation factors for firm- and country-level national culture variables to inspect any potential multicollinearity in the dataset. In the second subsection, namely Results and Discussion, this research presents the results and discussion of: (1) the HLM null model; (2) the direct impact of variations in national cultures on underpricing difference across countries; and (3) the indirect influences of variations in national cultures on underpricing difference across countries. In the third and final subsection, namely Alternative Specifications and Robustness Checks, a variety of sensitivity analysis is provided.

4.6.1. Summary Statistics

4.6.1.1. Summary Statistics for Firm-level Variables[52]

Table 4 presents a range of statistical indications exhibiting that firm-level characteristics across G20 countries are very heterogeneous. It could be inferred from such an observation that this heterogeneity in determinants of IPO underpricing may contribute to explaining the underpricing difference in the G20 countries. This dissimilarity becomes prominent across the two blocks of developing and developed G20 countries. For instance, the mean and median results of UP evidently show that underpricing in developing IPO markets is almost double what is observed in developed markets. This research also finds some observations indicating similar behaviours regarding the degree of variations in underpricing and firm-level factors within developed versus developing G20 countries.

This finding may highlight the existence of a nesting structure in the IPO data, so it suggests that each block of countries may share similar firm-level characteristics. For illustration, this research finds that, on average, underpricing is larger in developing G20 countries because owners of IPO firms sell and create less secondary and primary shares, respectively. This research also discovers some evidence showing that proxies of *ex-ante* uncertainties for IPO firms domiciled in developing G20 countries are greater, on average, when compared to developed markets. Also gathered here are some indications illustrating that developing (developed) IPO issuers, on average, employ more (less) reputable underwriters to provide a certification signal about the quality of their underwritten IPO firms.

[52] For a detailed discussion please see Section 2.8.1.1.

4.6.1.2. Summary Statistics for IPO Underpricing by Year[53]

Table 5 provides yearly-statistical evidence showing that IPO underpricing may follow a pattern across the course of time from January 1995 to December 2016. This research finds that in the 22-year window the author covers in this thesis, underpricing tends to increase rapidly around the financial crisis periods. Consequently, the presence of such year effect provides the necessity to control for this effect. IPO underpricing literature including Loughran and Ritter (2004), Boulton et al. (2010), and Engelen and van Essen (2010) highlight the importance of controlling for year effect when examining the underpricing phenomenon.

4.6.1.3. Summary Statistics for IPO Underpricing by Industry[54]

Table 6 provides a statistical indication where underpricing seems to be persistent, on average, in some industries. This research finds that across the 33 IPO industries this research covers, underpricing is inclined to be larger in certain ones, such as agriculture, insurance, other utilities, and pers/bus/rep svc in the G20 IPO markets. Consequently, the manifestation of this industry effect emphasises the significance of accounting for this particular effect. This observation is consistent with what is reported by Loughran and Ritter (2004), Boulton et al. (2010), and Engelen and van Essen (2010). These authors document the importance of accounting for industry effect when studying the underpricing phenomenon across countries.

4.6.1.4. Summary Statistics for National Cultural Variables

Table 32 presents the mean values of Hofstede's six country-level cultural dimensions of power distance, individualism, femininity, uncertainty avoidance, short-term orientation, and indulgence. Saudi Arabia (Demark) has the highest (lowest) power distance score of the G20 countries of 95 (18) out of 100 points, followed by Mexico and China (Sweden and the United Kingdom) with 81 and 80 (31 and 35), respectively.

[53] For a detailed discussion please see Section 2.8.1.2.

[54] For a detailed discussion please see Section 2.8.1.3.

Table 32: Summary Statistics of Hofstede's Cultural Dimensions of the G20 Countries

		PD	UA	IDV	FM	STO	IDG
Total Sample (Count: 10,217)	Mean	53	57	62	34	45	51
	Median	50	46	71	38	49	59
	Minimum	18	23	14	5	0	20
	Maximum	95	100	91	95	79	97
	Standard Deviation	17	23	30	16	30	19
Developed Countries (Count: 7,191)	Mean	43	59	77	30	55	61
	Median	40	46	90	38	74	68
	Minimum	18	23	35	5	12	30
	Maximum	68	100	91	95	79	78
	Standard Deviation	8	21	20	16	28	12
Developing Countries (Count: 3,01)	Mean	75	50	25	43	20	29
	Median	80	30	20	34	13	24
	Minimum	60	30	14	31	0	20
	Maximum	95	95	60	64	76	97
	Standard Deviation	9	25	11	11	20	10
Australia (Count: 1138)	Mean	36	51	90	39	79	71
Brazil (Count: 88)	Mean	69	76	38	51	56	59
Canada (Count: 193)	Mean	39	48	80	48	64	68
China (Count: 1533)	Mean	80	30	20	34	13	24
Denmark (Count: 26)	Mean	18	23	74	84	65	70
France (Count: 95)	Mean	68	86	71	57	37	48
Germany (Count:35)	Mean	35	65	67	34	17	40

Greece (Count:28)	Mean	60	100	35	43	55	50
India (Count: 363)	Mean	77	40	48	44	49	26
Indonesia (Count: 103)	Mean	78	48	14	54	38	38
Italy (Count: 63)	Mean	50	75	76	30	39	30
Japan (Count: 1913)	Mean	54	92	46	5	12	42
Mexico (Count: 28)	Mean	81	82	30	31	76	97
Poland (Count:64)	Mean	68	93	60	36	62	29
Russia (Count: 31)	Mean	93	95	39	64	19	20
Saudi Arabia (Count: 102)	Mean	95	80	25	40	64	52
South Africa (Count: 29)	Mean	49	49	65	37	66	63
South Korea (Count: 689)	Mean	60	85	18	61	0	29
Sweden (Count: 57)	Mean	31	29	71	95	47	78
Turkey (Count: 24)	Mean	66	85	37	55	54	49
United Kingdom (Count: 404)	Mean	35	35	89	34	49	69
United States (Count: 3211)	Mean	40	46	91	38	74	68

Note: Country-level culture variables are as defined before in Table 31.

Greece (Denmark) ranks highest (lowest) in terms of uncertainty avoidance with a score of 100 (23) out of 100 points, followed by Poland and Japan (Sweden and China) with uncertainty avoidance scores of 93 and 92 (29 and 30), respectively. The United States (Indonesia) is classified as the most (least) individualistic culture in the G20, with a score for this measure of 91 (14) out of 100 points, followed by Australia and the United Kingdom (South Korea and China) with 90 and 89 (18 and 20), respectively.

The most feminine countries in the G20 are Sweden, followed by Denmark, with femininity scores of 95 and 84 out of 100 points, respectively, while the least feminine societies in the G20 are Japan, followed by Italy and Mexico with femininity scores of 5, 30, and 31, respectively. In terms of short-term orientation, South Korean (Australian) culture possesses the lowest (highest) score of 0 (79) out of 100 points, followed by Japan and China (Mexico and the United States) with scores of 12 and 13 (76 and 74), respectively. The highest recorded score for Hofstede's cultural dimension of indulgence refers to Mexico which has 97 out of 100 points, followed by Sweden and Denmark with 78 and 70, respectively, while the least indulgent society in the G20 is Russia, followed by China and India, with indulgence scores of 20, 24, and 26, respectively.

Across all cultures in the G20 the mean score of power distance (individualism) is 53 (62) out of 100, with a standard deviation of 17% (30%). The mean score for the cultural dimension of femininity (uncertainty avoidance) is 34 (57) out of 100, with a dispersion of 16% (23%) from the mean value, while the mean value for short-term orientation (indulgence) in the G20 is 45 (51) out of 100 points, with deviation from the mean value equal to 30% (19%). Table 32 demonstrates that a large heterogeneity in national cultural variables is evident within developed and developing G20 countries. For instance, the table reports a large dispersion from the mean values of individualism, femininity, and short-term orientation within developed (developing) countries. This is because the average level of individualism, femininity, and short-term orientation is 77 (25), 30 (43), and 55 (20) out of 100 points in developed (developing) G20 countries where the standard deviation values for those three dimensions are 2000% (1100%), 1600% (1100%), and 2800% (2000%), respectively.

Finally, the table also reports that average level of power distance and indulgence in developed (developing) countries is 43 (75) and 61 (29) out of 100 points. The deviations from these mean values for developed (developing) countries are 800% (900) and 1200% (1000%), respectively. This implies the possibility of observing differential effect of differences in national culture values within developed compared to developed countries. In other words, it would be not surprising to find only some of those cultural dimensions actually matter in explaining IPO underpricing difference within developed and developing countries.

4.6.1.5. Variance Inflation Factors for Country-level National Cultures, Firm-specific, and Control Variables

The power of HLM technique is that it assumes and corrects for the possibility of having correlations between level 1 covariates, in other words, firm-specific variables (Belsley et al. 2005). In contrast, HLM becomes biased when such a correlation exists between level 2 observations (i.e., country-level national culture variables) (Hofmann 1997; Raudenbush & Bryk 2002). To address this issue, Table 33 below presents seven Variance Inflation Factors (VIF) tests of the country-level national cultures, firm-level, additional firm-level, additional country-level, and dummy effects control variables (Luo 2008). This research follows Liu and Ritter (2011) to reject the existence of a multicollinearity problem when the value of VIF exceeds a threshold value of 5. The table shows that across seven VIF models, the Model 1 values for all country-level national culture proxies are bigger than a value of 5. In contrast, once this thesis employs those measures separately, Table 33 offers VIF values largely below the threshold value of 5. This implies that country-level national culture values do exhibit collinearity.

Table 33: Variance Inflation Factors of Country-level National Cultural, Firm-specific, and Control Variables in the G20 Countries

Variables				**VIF**			
				Country-level culture variable			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
PD	16.17	2.57					
UA	5.50		2.52				
IDV	57.5			2.76			
FM	5.20				1.52		
STO	34.36					2.14	
IDG	20.95						2.39
DS	26.18						
				Firm-level variables			

PR	1.68	1.66	1.66	1.67	1.66	1.66	1.66
DF	3.54	3.43	3.43	3.47	3.42	3.46	3.45
UR	1.22	1.13	1.17	1.15	1.17	1.17	1.14
PMV	1.19	1.17	1.15	1.18	1.15	1.17	1.18
LET	1.38	1.32	1.31	1.33	1.31	1.34	1.32
LOP	1.47	1.40	1.43	1.41	1.41	1.44	1.43
Additional firm-level variables							
BBM	1.27	1.16	1.15	1.18	1.15	1.17	1.16
TF	1.11	1.10	1.10	1.10	1.10	1.08	1.10
PF	1.09	1.08	1.08	1.08	1.08	1.10	1.08
IOP	1.75	1.43	1.55	1.48	1.39	1.43	1.47
UF	1.11	1.09	1.06	1.10	1.06	1.09	1.09
AFC 1997	1.11	1.11	1.11	1.11	1.11	1.11	1.11
GFC 2008	1.15	1.14	1.12	1.13	1.13	1.12	1.13
Additional country-level variables							
RSX	2.98	2.38	2.26	2.42	2.71	2.25	2.33
FMS	2.40	2.13	1.83	2.18	1.88	2.18	2.16
MS	4.76	2.8	3.48	2.73	2.93	2.73	2.75
Dummy Effects							
IE	1.06	1.05	1.05	1.05	1.05	1.04	1.05
YE	1.66	1.5	1.48	1.51	1.54	1.47	1.49
CE	5.34	3.92	3.71	3.78	3.63	3.62	3.75
Mean VIF	7.74	1.73	1.73	1.74	1.67	1.69	1.71

Note: Country-level culture, firm-specific, and control Variables are as defined before in Table 31 and Table 3, respectively.

For this reason, they should not be employed together. Also noticeable is a large collinearity between culture variables and the variable DS. This implies that if this research accounts for the influence of listing an IPO company in a developing stock market when examining the influence of culture, the model is likely to undergo multicollinearity problem. The outcomes of Model 2 to Model 7 dismiss any concern about the existence of multicollinearity in both level 1 and 2 in the HLM models.

4.6.2. Results and Discussion

In this section, this research commences with a basic analysis using a simple random ANOVA model (HLM null model). The subsequent section provides the results of the random intercept models with empty firm-level covariates and the results of the random intercept models with firm-level covariates. The final section includes discussing the results of the full model utilising random intercept and slope models with firm-level covariates. All models utilise heteroscedastic robust standard errors to account for the unequal distribution of the number of IPO firms within the G20 economies. HLM 7 software package is used to produce the results because this relaxes the assumptions of the variance–covariance matrix (Steenbergen & Jones 2002; Twisk 2006; Hox et al. 2018).

4.6.2.1. Results and Discussion of the HLM Null Model

Table 34 reports the results of the analysis of HLM null model across the G20 countries from 1995 to 2016. The results for the adjusted all sample grand mean report IPO underpricing of 30%. The adjusted grand means for IPO underpricing for developed and developing G20 countries are 18% and 47%, respectively. The table also reports the Likelihood Ratio (LR) test statistic for the null hypothesis that τ_{00}^2, which means there is no significant statistical cross-country difference in IPO underpricing. The primary focus of the analysis is to find if there is a significant difference across the G20 countries in IPO underpricing. This research also extends this testing to explore the null hypothesis that no significant cross-developed and cross-developing countries variations in IPO underpricing exist. If this research fails to reject the null hypothesis, then this research arrives at empirical evidence showing that the independence assumption amongst observations is not violated (Raudenbush & Bryk 2002). It is subsequently inferred that the IPO data does not have a nesting structure across all G20 developed and developing countries. Consequently, the results of the random effect component produced by the ANOVA model in Table 34 should be similar to those obtained from an OLS model with a constant only (Tennant & Sutherland 2014).

Table 34: Analysis of HLM Null Model

Fixed-Effects Parameter	**Coefficient**	**Standard Error**				**P-value of LR Test Statistic**
All Sample Grand Mean UP, λ_{00}	**0.30**	**0.09**				**0.00**
Developed Countries Grand Mean UP, λ_{00}	**0.18**	**0.05**				**0.00**
Developing Countries Grand Mean UP, λ_{00}	**0.47**	**0.19**				**0.00**
Random-Effect Parameter	**Variance Component for Level 2 Effect,** μ_{0j}	**Variance Component for Level 1 Effect,** η_{ij}	**ICC**	**Deviance**	**DF**	**Observations**

All Sample	0.18392	0.63905	0.22	24480	21	10,217
Developed Countries	0.02517	0.49966	0.05	15439	11	7,188
Developing Countries	0.32764	0.97105	0.25	8520	9	3,021

Note: All variables are as defined before in Table 3. Robust T-statistics are adjusted for heteroscedasticity for two-tail.

The results for the 1% significance level of LR test statistics for the three subsamples document significant variations exist in IPO underpricing among all G20, developed, and developing nations. The table also shows that $\hat{\tau}_{00}^2$ and $\hat{\sigma}^2$ for all samples, developed, and developing G20 countries are estimated to be 0.18392 and 0.63905, 0.02517 and 0.49966, and 0.32764 and 0.97105, respectively. These figures allow this thesis to compute the ICC for the three groups giving $\hat{\rho}$ results that are 0.22, 0.05, and 0.25. These outcomes imply that 22%, 5%, and 25% of the variations in IPO underpricing across countries are mainly attributed to differences in country-level characteristics between all G20, developed, and developing G20 countries, respectively. In contrast, the results also imply that 88%, 95%, and 75% of differences in IPO underpricing across countries are connected to differences in firm-level characteristics within countries, developed, and developing G20 countries, respectively.

The ICC results contradict the conclusions provided by Kayo and Kimura (2011). The authors find that variations in capital structure in 10,061 firms nested within 40 countries from 1997 to 2007 only explain 3.3% of the variance of firm leverage. Kayo and Kimura (2011) attribute their low ICC result to the close similarly of determinants of capital structure across countries regardless of the existence of large institutional differences among countries. However, the results document the opposite in the IPO market. This research shows that 22% of the variability in IPO underpricing is related to cross-country differences. The finding complements but is more robust than what Engelen and van Essen (2010) found in relation to the variance of IPO underpricing across 2,921 IPOs firms nested within 21 countries from 2000 to 2005. The authors document only 10% of the variations in IPO underpricing is related to institutional differences between countries. The ICC results are almost double what Engelen and van Essen (2010) observed. This research attributes this large difference to the fact that the authors' IPO data is dominated by developed countries[55], spanned only 5 years, and has many country-level observations with very few IPO observations.

[55] Please see Footnote 32 and 33 for a detailed discussion for number of limitations of Engelen and van Essen's (2010) distinguished empirical work.

The ICC results related to the decomposition of the underpricing variance on the two blocks of countries including developed versus developing G20 countries reveal an additional interesting finding. This research shows that the variability in the underpricing variance across countries of 22% is driven by a large (small) variability within developing (developed) countries. This is because the ICC results attribute 25% of underpricing difference to cross-country differences within developing countries compared to only 5% related to developed G20 countries. The implication of this finding notes the importance for accounting for within cluster correlations in error terms within developed versus developing countries in order to better understand the mystifying phenomenon of IPO underpricing from a global perspective. This finding also highlights that differences in country-level institutions may have a differential effect on variations in IPO underpricing across developed and developed countries.

This outcome is at odds with those reported by Booth et al. (2001) and Kayo and Kimura (2011). They assert that the variability of firms leverage policies is not influenced by country-level institutional differences between developed and developing countries. Therefore, the results demonstrate that the variability in country-level institutions within developing (developed) countries matters more (matters less) in causing underpricing difference in the global IPO market. Consequently, this research concludes that the hierarchical structure in finance data may have dissimilar market outcomes when it comes to differences in institutional aspects across countries, specifically across developed versus developing ones.

4.6.2.2. Direct Impact of Variations in National Cultures on Underpricing Difference across Countries

Before commencing hypothesis testing, as a robustness check this chapter investigates the uniformity of the attained coefficients of firm-level variables with previous literature. The objective of this exercise is to explore the validity and extend the empirical testing for the EWL theory. It will help to explain underpricing differences across the G20 market IPOs. This section focuses on examining the direct effect of differences in country-level national cultures on explaining differences in underpricing across the G20 countries. Model 1 to Model 4 in Table 35 deliver identical HLM models containing only firm-level variables differing in the gradual addition of year and industry effects. Model 1 presents firm-level coefficients of the two proxies measuring the incentive of IPO issuers, these being PR and DF. Both coefficients reveal significant results at the 1% level.

These results ratify that the larger the incentive of IPO issuers, the lower is the underpricing in the G20 IPO markets. This result supports the findings of Habib and Ljungqvist (2001), Kennedy et al. (2006), and Chahine (2008). The result for underwriter reputation shows negative coefficient but statistically insignificant. This outcome is in line with the findings of Luo (2008). Model 1 reveals the results of the three measures of *ex-ante* uncertainty of PMV, LET, and LOP. Collectively, they confirm previous literature inferring that when the *ex-ante* uncertainty surrounding an offering is high, underpricing in the G20 countries turns out to be larger. PMV indicates a positively significant coefficient at the 10% level. This outcome suggests that before the listing of an IPO company in the G20 countries, this firm undergoes greater underpricing when stock market volatility is high. This outcome is in line with the result obtained by Ljungqvist and Wilhelm Jr (2002) and Chang et al. (2017). Furthermore, the second proxy of *ex-ante* uncertainty, LET, confirms that the longer the elapsed time between the offer price set up and the first trading date, the lower is the underpricing in the G20 stock markets. This result suggests that when informed investors show high demand for an IPO firm then this IPO requires less time to be fully subscribed to achieve successful subscription. That is, the high demand by informed investors would be interpreted by uninformed investors with low uncertainty about the quality of the IPO.

Table 35: HLM Analyses on the Impact of Firm-specific Variables in G20 Countries with Random Intercept Model

	Model 1	**Model 2**	**Model 3**	**Model 4**
	Culture-level variables			
PD				
UA				
IDV				
FM				
STO				
IDG				
	Firm-level variables			
PR	-0.020***	-0.020***	-0.020***	-0.020***
	[-14.20]	[-14.31]	[-14.25]	[-14.28]
DF	-0.020***	-0.020***	-0.020***	-0.020***
	[-20.20]	[-20.21]	[-20.15]	[-20.17]
UR	-0.010	-0.010	-0.010	-0.010
	[-0.52]	[-0.60]	[-0.57]	[-0.59]

PMV	0.010*	0.010*	0.010*	0.010*
	[1.51]	[1.62]	[1.46]	[1.55]
LET	-0.050***	-0.050***	-0.050***	-0.050***
	[-5.30]	[-5.60]	[-5.31]	[-5.59]
LOP	-0.060***	-0.060***	-0.060***	-0.060***
	[-10.23]	[-10.40]	[-10.17]	[-10.32]
Dummy Effects	**NO**	**YE**	**IE**	**YE & IE**
Constant	1.800***	1.830***	1.780***	1.800***
	[12.29]	[12.32]	[11.90]	[11.91]
Observations	10,209	10,209	10,209	10,209
R^2 within countries	**0.05**	**0.05**	**0.05**	**0.05**
R^2 between countries	**0.00**	**0.00**	**0.00**	**0.00**
	Random-Effect Parameter			
Variance Component for Level 2 Effect, μ_{0j}	0.18419	0.18420	0.18419	0.18420
Variance Component for Level 1 Effect, η_{ij}	0.60550	0.60533	0.60537	0.60519
Deviance	23936	23933	23934	23928

Note: Country-level culture, firm-level, and additional control variables are as defined before in Table 31 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Consequently, lower uncertainty leads to higher demand for the offering on the first trading day, and results in higher underpricing. This finding supports a similar observation documented by Lee et al. (1996) and Ekkayokkaya and Pengniti (2012). Model 1 also exhibits the result of the third proxy of *ex-ante* uncertainty, LOP. This proxy expects that the underpricing of IPO firms with large offer proceeds is lower as these firms tend not to be well-established and non-speculative firms. Therefore, IPO investors regard such firms that have large offer size with lower *ex-ante* uncertainty, subsequently leading to lower underpricing. The results of Model 1 evidently confirm this expectation as the coefficient of LOP is significant at the 1% level. This outcome supports similar evidence reported by Habib and Ljungqvist (2001), Kim et al. (2008), and Boulton et al. (2010). Table 35 also confirms that the results obtained from Model 1 continue to be qualitatively similar after controlling for year effect (YE) and industry effect (IE) in Models 2, 3, and 4.

Overall, the three groups of variables related to the EWL theory have the expected coefficients' sign and statistical significance with the exception of the underwriter reputation variable. This is because this research attains a negative but insignificant coefficient for the variable UR. The results for the UR variable are consistent with Luo (2008) who employed prestigious underwriter explanatory factor in a HLM model to examine the impact of pre-IPO marketing spendings on variation in underpricing across countries. Yet, the UR results disagree with Habib and Ljungqvist (2001), Kennedy et al. (2006), and Chahine (2008) who employ OLS-based modelling documenting a significant effect of reputable underwriters in reducing IPO underpricing. This research attributes this important difference in the UR results to the employment of a country "group" mean-centered estimation to firm-level variables that captures size distortion effect caused by employing unbalanced IPO data (Kreft et al. 1995). This is because OLS-based estimation uses the overall mean of the explanatory variable, UR in the case, which is computed utilising the mean from the full sample ($\bar{X}$).

In contrast, the HLM model employs group mean centering estimation where it subtracts the individual's group "country" mean ($\bar{X}_j$) from the individual's score (Enders & Tofighi 2007). Econometrically, this means that the coefficient of the variable underwriter reputation will be a fair representation of the mean of 22 groups "countries" in the data not the mean of the entire sample of 10,217 IPO firms. Hence, this research contends that previous literature finds a significant association between underwriter reputation and underpricing because the UR variable could be spuriously significant. This is again due to the effect of large sample size for some countries that could have driven the overall T-statistic results towards generating misleadingly significant results (Li et al. 2013). Consequently, the HLM models corrected this econometric shortfall by estimating regressions where UR observations are group centered by every country in the sample, hence eliminating the influence of countries with large UR observations.

Based on the results in Table 35, it can be said that the EWL theory can partially explain underpricing difference across countries. In a cross-country setting, IPO firms are underpriced differently because IPO issuers sell more secondary shares and create more primary shares; this situation is also explained by the level of *ex-ante* uncertainty observed at the time of offering. The employment of reputable underwriters has no effect on variations in IPO underpricing across countries. The findings summarised in Table 35 document a small role played by firm-level characteristics in explaining the variance in IPO underpricing across countries. Hence, differences in country-level characteristics should play a larger role in causing the phenomenon of underpricing difference. This is because the R^2 within countries show a value of 0.05, meaning that only 5% of variations in IPO underpricing across countries are related to the firm-level variables. The values of R^2 within countries are comparable to values reported by IPO underpricing literature. For instance, similar R^2 values documented by Loughran and Ritter (2004) (0.05; Table VII; Model 2), Lowry et al. (2010) (0.03; Table V; Model c), Boulton et al. (2011) (0.07; Table 5; Model 2), Shi et al. (2013) (0.05; Table 6; Model 1), Leitterstorf and Rau (2014) (0.06; Table 2; Model 1), and Chang et al. (2017) (0.03; Table 4; Model 5).

In the next paragraph, this research turns the attention to examining the hypotheses related to the direct effect of national cultures on IPO underpricing difference across countries. This research proceeds by evaluating the empirical results of six HLM models that allow the intercept to be random at level 2 but without controlling for firm-level covariates, as shown in Table 36. The aim here is to isolate the effect of differences in national cultures on underpricing in the G20 countries by not disturbing this effect with the addition of firm-level variables following Costa et al. (2013). Therefore, in these six models, this research allows the intercept of every HLM model to vary across the G20 countries and to test if the variability in national cultures can truly explain the variability in the intercept for every model.

In level 2 of the HLM model, this research has six proxies for national cultures, namely, PA, UA, IDV, FM, STO, and IDG, of which each one is added at the time in order to avoid a multicollinearity problem among level 2 covariates. Subsequently, in Models 7 to 12 in Table 36, this research include all explanatory variables used in Model 4 in Table 35 to examine the direct effect difference of national cultures on IPO underpricing to control for firm-level characteristics. This research chooses Model 4 because it produces the lowest deviance score of 23928, which suggests it is the most efficient model amongst the four models in Table 35.

4.6.2.2.1. Power Distance

This research uses the power distance dimension of Hofstede (1980) to measure the unequal distribution of authority amongst market participants in the G20 countries. It is expected there will be a positive association between the level of power distance and underpricing of IPOs. Table 36 reports supporting results for hypothesis H1. The coefficients for power distance are positive and significant for IPO underpricing under the HLM estimation with only PD variable (0.011; Table 36; Model 1; $p<0.05$) as well as for PD factor plus firm-level variables (0.010; Table 36; Model 7; $p<0.01$). As expected in the theoretical section, in a G20 country with a culture characterised by high power distance, insiders of IPO firms are expected to exhibit a greater propensity to centralise decision-making. They are also expected to illustrate opportunism in focusing on their personal interests than those of the firm.

Table 36: HLM Analyses on the Effect of Hofstede's Cultural Dimensions on IPO Underpricing of the G20 Countries with Random Intercept Model with Firm-specific Variables

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
						Culture-level variables						
PD	0.011**						0.010***					
	[1.80]						[2.80]					
UA		0.003						0.001				
		[1.10]						[0.41]				
IDV			-0.006**						-0.007**			
			[-1.70]						[-2.04]			
FM				-0.005*						-0.006***		
				[-1.30]						[-2.35]		
STO					-0.001						-0.001	
					[-0.39]						[-0.21]	
IDG						-0.005						-0.005***
						[-1.13]						[-2.35]
						Firm-level variables						
PR							-0.020***	-0.020***	-0.020***	-0.020***	-0.020***	-0.020***
							[-14.16]	[-14.18]	[-14.20]	[-14.19]	[-14.18]	[-14.28]
DF							-0.020***	-0.020***	-0.020***	-0.020***	-0.020***	-0.020***
							[-19.65]	[-19.68]	[-19.70]	[-19.69]	[-19.68]	[-20.17]
UR							-0.00	-0.010	-0.010	-0.010	-0.010	-0.010
							[-0.62]	[-0.51]	[-0.52]	[-0.51]	[-0.51]	[-0.59]
PMV							0.010	0.010	0.010	0.010	0.010	0.010
							[1.11]	[1.14]	[1.12]	[1.14]	[1.13]	[1.23]
LET							-0.060***	-0.050***	-0.060***	-0.050***	-0.050***	-0.050***
							[-5.89]	[-5.86]	[-5.90]	[-5.88]	[-5.87]	[-5.59]
LOP							-0.060***	-0.060***	-0.060***	-0.060***	-0.060***	-0.060***
							[-10.40]	[-10.39]	[-10.40]	[-10.39]	[-10.38]	[-10.32]
Dummy Effects							**YE & IE**	**YE & IE**	**YE & IE**	**YE & IE**	**YE & IE**	**YE & IE**
Constant	0.320	0.110***	0.680***	0.550***	0.380***	0.580***	0.960***	1.470***	1.930***	1.940***	1.600***	0.300***
	[1.11]	[0.42]	[2.30]	[3.14]	[3.35]	[5.22]	[3.20]	[4.54]	[6.81]	[5.95]	[5.34]	[3.23]
Observations	10,217	10,217	10,217	10,217	10,217	10,217	10,209	10,209	10,209	10,209	10,209	10,209
R^2 within countries	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**
R^2 between countries	**0.29**	**0.04**	**0.16**	**0.05**	**0.01**	**0.06**	**0.32**	**0.07**	**0.23**	**0.13**	**0.06**	**0.12**
						Random-Effect Parameter						
Variance Component for Level 2 Effect, μ_{0j}	0.13133	0.17616	0.15441	0.17345	0.18137	0.18420	0.12355	0.17060	0.14253	0.15950	0.17171	0.16200
Variance Component for Level 1 Effect, η_{ij}	0.63905	0.63905	0.63905	0.63905	0.63905	0.60519	0.59049	0.59047	0.59048	0.59047	0.59047	0.59047
Deviance	24454	24460	24457	24460	24461	23928	23756	23762	23759	23761	23763	23761

Note: Country-level culture, firm-level, and additional control variables are as defined before in Table 31 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

IPO investors in such cultures can read this psychological bias concerning personal gains between IPO managers and owners; it creates an environment where trust issues abound. Consequently, in high power distance countries, imbalance of social trust in transactions channels into market players making *ex-ante* uncertainty of IPO investors greater. The development of such an *ex-ante* uncertainty environment induces high-quality IPO managers located in high-power distance nations to provide underpricing in exchange for reducing the *ex-ante* uncertainty of investors. This action is necessary for high quality IPO firms to signal how different they are from low quality IPO firms. The result of Model 1 is consistent with a similar one obtained by Costa et al. (2013) confirming the positive effect of power distance in increasing the underpricing of IPO firms. However, the R^2 results provide clearer quantification of the direct effect of country-level characteristics (i.e., differences in power distance between countries) and firm-level characteristics (i.e., differences in determinants of IPO underpricing within countries) on IPO underpricing.

By employing HLM estimation, the R^2 between countries attributes 29% of the variability in IPO underpricing to the variability in power distance across countries as shown in Model 1 in Table 36. In Model 7, this research obtains even greater results for R^2 between countries documenting that the variance in power distance elucidates 32% of underpricing difference. Yet, differences in firm-level factors within countries only explain 8%. This research notices a notable increase of the R^2 within countries from being 5% to 8% for all models in Table 35 compared to all models in Table 36, respectively. This research attributes this difference to allowing the intercept to vary, not alike previous culture-IPO studies, across countries which enhances the association between determinants of IPO underpricing and IPO underpricing.

4.6.2.2.2. Uncertainty Avoidance

The level of uncertainty avoidance provides the second cultural measure which was developed by Hofstede (1980). It focuses on the degree of tolerance for ambiguity and uncertainty accepted by a G20 society's market participants. Hypothesis 2 predicts that underpricing of IPO firms nested in high uncertainty avoidance cultures should be higher than countries with a lower level of uncertainty avoidance. The results in Table 36 do not support hypothesis 2. Although the coefficients of UA are in the expected direction proposed under the two HLM estimations (0.003; Table 36; Model 2) (0.001; Table 36; Model 8), they provide no significance in both instances. The positive and insignificant UA coefficient is very different from the significant and negative coefficient results noted by Costa et al. (2013) using OLS-based estimation.

This research attributes this significant difference in the UA signage between the result and Costa et al.'s (2013) output to capturing the within cluster "country" correlations using HLM estimation in the study. Hofmann (1997), Engelen and van Essen (2010), and Kayo and Kimura (2011) confirm that false coefficient readings may be reached by a failure to observe correlations amongst error terms within countries for nested finance data such as the IPO data. In fact, Tennant and Sutherland (2014) employed HLM specification to capture the multilevel effect in their capital structure data, in order to examine the effect of differences in UA in causing variation in countries' bank fees. The authors found a positive but insignificant coefficient, thereby indicating no relationship between increases in bank fees and uncertainty avoidance characteristics of countries. The conclusion for the UA variable is in harmony with the findings of Tennant and Sutherland (2014). The UA result provides an ideal and empirical illustration of the erroneous conclusions that might be achieved by ignoring the nesting structure of the IPO data.

4.6.2.2.3. Individualism Versus Collectivism

The third proxy to gauge differences in national cultures is the level of individualism compared to collectivism observed in the G20 countries. Hypothesis 3 predicts that the underpricing of IPO firms nested in high individualism cultures will be lower than countries with highly collectivist cultural values. Models 3 and 9 in Table 36 present supporting outcomes for hypothesis 3. The coefficients for individualism are negative and significant for IPO underpricing using HLM approximation with only the IDV variable (-0.006; Table 36; Model 3; $p<0.05$) along with the other extended HLM model containing the IDV variable plus firm-level characteristics (-0.007; Table 36; Model 9; $p<0.05$). Following the projection in the theoretical section, the results confirm that when the level of individualism increases, the level of IPO underpricing declines. These findings support the intuition that in individualistic cultures the transmission of insider information between stakeholders is difficult to attain systematically. The reason behind this expectation is due to the absence of solid social channels between managers and shareholders in individualistic societies. Not only that, in such societies marked by low collectivism, there is a cultural endorsement that enforcement of the law and stock market regulations should be strongly imposed indiscriminately on all investors. Consequently, the asymmetric information problem between connected and unconnected investors in such individualistic cultures becomes a minor one in the IPO market. It is a market environment with symmetric flow of information allowing IPO issuers to attain a fair market price resulting in lower IPO underpricing.

Although the empirical finding is consistent with what was concluded by Costa et al. (2013), the HLM estimation provides further robust understanding. This is because the R-squared outcomes draw an accurate quantification of the direct effect of country-level characteristics (i.e., differences in individualism between countries) and firm-level characteristics (i.e., differences in determinants of IPO underpricing within countries) on IPO underpricing. For example, this research shows that R^2 between countries relates 16% of the variation in IPO underpricing to changes in the level of individualism between countries as shown in Model 3 in Table 36. In Model 9, the HLM model provides larger value for R^2 between countries, verifying that the variability in individualism explains 23% of underpricing variance. Nevertheless, dissimilarities in firm-level characteristics within G20 countries only elucidate 8% of the underpricing difference. Hence, this research provides important empirical evidence reporting that differences in IPO underpricing in the global IPO market are closely related to variations in country-level cultural aspects between countries more than differences in firm-level factors within countries.

4.6.2.2.4. Femininity Versus Masculinity

The fourth hypothesis relates to the direct effect of differences in the witnessed level of femininity between G20 market participants and its implications for IPO underpricing. Hypothesis 4 theorises that the level of underpricing for IPO firms clustered in high femininity civilisations is projected to be lower than countries with high masculinity. Interestingly, when this research ignores firm-level factors, as in Costa et al. (2013), H4 is weakly supported (-0.005; Table 36; Model 4; $p<0.10$). In contrast, the hypothesis is strongly supported (-0.006; Table 36; Model 10; $p<0.01$) once this research controls for firm-level determinants along the variable of interest FM. This finding highlights the sensitivity of the national cultural dimension of femininity across countries to the omission of firm-level factors for IPO firms. Engelen and van Essen (2010) made a similar cautionary note arguing that depending on an elucidation of differences in underpricing across countries without accounting for firm-level variables would be inadequate, as it would omit imperative variables that explain underpricing. The FM results clearly explain why Costa et al. (2013) failed to find support for the link between the level of femininity and IPO underpricing across countries.

As hypothesised in the theoretical section, the results confirm that in countries with a high level of masculine characteristics, insiders in IPO firms focus on their own personal interests; hence, they are psychologically eager to secure a successful IPO listing at any cost. Consequently, they are prepared to tolerate undue levels of underpricing or even disclose overoptimistic information to maintain their individual success by securing a successful listing. Such psychological eagerness for IPO managers to please themselves is likely to be channelled into IPO investors. As a result, the *ex-ante* uncertainty of investors in IPO firms leads to higher demanding and higher underpricing. An assessment of model fit reveals that Model 10 is far more efficient compared to Model 4 in Table 36 since the deviance scores for the former and latter are 23761 and 24460, respectively. R-squared values for Model 10 demonstrate that differences in the level of femininity between the G20 countries explain 13% of the variability in underpricing while firm-level factors only explain 8%.

4.6.2.2.5. Short-term Versus Long-term Orientation

Hypothesis 5 predicts that the level of IPO underpricing will be lower for IPO firms located in societies with low level of long-term orientation. This is because Hofstede (2001) measures cultures as being short-term oriented because they do not value thriftiness or the belief that time is needed to realise future ambitions. This thesis argued that in these kinds of countries, IPO investors have a tendency to flip their IPO shares for short-term gains. Consequently, they generate a high supply of IPO shares on the first trading day. In turn, the share price of IPO firms domiciled in short-term orientation cultures drops quickly and leads to lower underpricing. The results in Table 36 provide no support for hypothesis 5. Although coefficients of STO are in the anticipated direction under the two HLM estimations (-0.001; Table 36; Model 5) (-0.001; Table 36; Model 11), they are insignificant on both occasions. The results for the variable STO are consistent in signage but inconsistent in significance as reported in Costa et al. (2013). Again, similar to the argument raised in Section 4.6.3.2 about the results of the UA variable, this research attributes this inconsistency to accounting for the within cluster "country" correlations estimated by the HLM models. The results emphasise that not all cultural aspects matter in relation to underpricing difference across countries once this research controls for the nesting structure of the IPO data.

4.6.2.2.6. Indulgence Versus Restraint

The sixth hypothesis is associated with testing the direct effect of variances in indulgence between IPO investors and its effect on IPO underpricing in G20 countries. Hypothesis 6 postulates that degree of underpricing for IPO firms nested in high indulgent nations is expected to be lower than cultures with high restraint values. Remarkably, by disregarding the inclusion of firm-level characteristics, as in Costa et al. (2013), H6 is rejected (-0.005; Table 36; Model 6; $p>0.10$). Quite the reverse, the hypothesis is strongly supported (-0.005; Table 36; Model 12; $p<0.01$) after accounting for firm-level variables. Similar to what this research noted in Section 4.6.3.4 on the femininity variable, the IDV results reemphasise the sensitivity of cultural values across countries to the exclusion of firm-level characteristics. The results provided by the IDV variable evidently illustrate the existence of omitted variable bias for the empirical work done by Costa et al. (2013) who find no significant relationship between the level of indulgence and IPO underpricing across countries.

Following the theoretical prediction, the outcomes of the IDV variables confirm that when an IPO firm is listed in a society, which endorses greater priority for leisure, underpricing falls by 0.5% when the indulgence score increases by one unit in the G20 countries. This is because investors born and bred on indulgent philosophies tend to flip their IPO shares on the first trading day to profit immediately. This economic behaviour of IPO investors who subscribe in the IPO offering in such indulgent cultures is timely channelled to other IPO investors in the secondary market. This encourages post-IPO investors to show less demand for newly listed IPO shares in indulgent cultures. Consequently, the flipping behaviour of IPO investors in the primary market causes a sudden increase in supply of IPO shares on the secondary market, which causes prices to fall. This action results in lower initial returns for IPO shares on the first trading day in indulgent countries. Model 12 provides a better efficient estimation compared to Model 6 in Table 36. This is because the deviance scores are 23761 and 23928 for the former and latter, respectively. According to the calculated R-squared values for Model 12, the variability in the level of indulgence in G20 countries directly elucidates 12% of the underpricing fluctuations across countries. In contrast, 8% of underpricing difference is attributed to firm-level characteristics.

Overall, the findings related to the direct effect of differences in national cultures on the variability of IPO underpricing allow the author to answer the first proposed research question: do differences in country-level national cultures explain IPO underpricing difference across IPO markets? The answer is positive; variations in national cultures across countries affect the variability in IPO underpricing in the global IPO market. However, against the shared perception in the intersection of IPO underpricing-culture literature, represented by Costa et al. (2013) and Chourou et al. (2018), not all cultural dimensions matter to the IPO market. This research capitalises on the robust HLM estimation to capture the nesting structure of IPO data to confirm that only differences in the level of power distance, individualism, femininity, and indulgence across countries matter in influencing the global IPO underpricing difference.

4.6.2.3. The Indirect Influences of Variations in National Cultures on Underpricing Difference across Countries

Table 37 summarises the outcomes of random coefficients in the HLM models. Panel A shows the direct effect of country-level national culture variables along with firm-level underpricing determinant variables. Panel B exhibits the estimations of interaction variables illustrating the indirect "modifier" effects of national culture characteristics on IPO underpricing. Hence, the focus is mainly on Panel B while this thesis assesses the consistency of results provided in Panel A with previous direct effects findings summarised in Table 36.

4.6.2.3.1. Impacts of National Culture Characteristics on the Incentive of IPO Issuers-IPO Underpricing Relationship

In this section, this research presents the results of six hypotheses concerning the indirect effects of differences in national culture values on IPO underpricing through the incentive of IPO issuers.

Table 37: HLM Analyses on the Effect of Hofstede's Cultural Dimensions on IPO Underpricing of the G20 Countries with Random Slope Coefficient Model with Firm-specific Variables

Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
					Panel A: Direct Effect						
					Culture-level variables						
PD	0.011***	**UA**	0.003	**IDV**	-0.070**	**FM**	-0.050***	**STO**	-0.010	**IDG**	0.040***
	[2.67]		[0.86]		[-1.91]		[-2.43]		[-0.07]		[-3.97]
					Firm-level variables						
PR	-0.034***	**PR**	-0.024***	**PR**	-0.067***	**PR**	0.012 ***	**PR**	-0.030***	**PR**	-0.024***
	[-12.78]		[-14.25]		[-21.30]		[5.80]		[-17.40]		[-17.39]
DF	-0.030***	**DF**	-0.023***	**DF**	-0.070***	**DF**	0.013***	**DF**	-0.032***	**DF**	-0.026***
	[-14.02]		[-18.50]		[-22.70]		[7.28]		[-20.01]		[-22.30]
UR	-0.010	**UR**	-0.010	**UR**	-0.020	**UR**	0.010	**UR**	-0.020	**UR**	-0.010
	[-0.35]		[-0.51]		[-0.80]		[0.41]		[-0.90]		[-0.71]
PMV	0.010*	**PMV**	-0.012*	**PMV**	0.013**	**PMV**	0.044***	**PMV**	0.017**	**PMV**	0.028***
	[1.40]		[-1.45]		[1.70]		[4.38]		[2.10]		[3.10]
LET	-0.040***	**LET**	0.020**	**LET**	-0.040***	**LET**	-0.030***	**LET**	-0.050***	**LET**	-0.050***
	[-4.45]		[2.03]		[-4.13]		[-2.95]		[-5.41]		[-4.80]
LOP	-0.070***	**LOP**	-0.070***	**LOP**	-0.070***	**LOP**	-0.040**	**LOP**	-0.060***	**LOP**	-0.050***
	[-11.95]		[-12.01]		[-12.00]		[-6.33]		[-10.03]		[-9.14]
Dummy Effects	**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**
					Panel B: Indirect Effect "Interaction Variables"						
PD*PR	-0.100***	**UA*PR**	-0.05***	**IDV*PR**	0.150***	**FM*PR**	0.320***	**STO*PR**	0.070***	**IDG*PR**	0.060***
	[-6.73]		[-5.80]		[17.00]		[16.57]		[9.60]		[8.62]
PD*DF	-0.100***	**UA*DF**	-0.06***	**IDV*DF**	0.160***	**FM*DF**	0.330***	**STO*DF**	0.070***	**IDG*DF**	0.070***
	[-7.40]		[-7.80]		[17.90]		[18.06]		[11.30]		[11.25]
PD*UR	0.010***	**UA*UR**	0.010	**IDV*UR**	-0.010**	**FM*UR**	0.010	**STO*UR**	-0.010	**IDG*UR**	-0.010
	[2.50]		[0.64]		[-1.98]		[1.20]		[-0.57]		[-0.56]
PD*PMV	0.110***	**UA*PMV**	-0.300***	**IDV*PMV**	-0.010	**FM*PMV**	0.210***	**STO*PMV**	0.050**	**IDG*PMV**	0.140***
	[2.40]		[-8.80]		[-0.18]		[4.17]		[2.10]		[4.65]
PD*LET	-0.010***	**UA*LET**	0.010***	**IDV*LET**	0.010***	**FM*LET**	0.010***	**STO*LET**	0.010***	**IDG*LET**	0.010***
	[-2.45]		[9.80]		[2.40]		[2.93]		[5.01]		[4.36]
PD*LOP	-0.010**	**UA*LOP**	-0.010***	**IDV*LOP**	0.010***	**FM*LOP**	0.010***	**STO*LOP**	0.010***	**IDG*LOP**	0.010***
	[-1.80]		[-5.30]		[7.33]		[3.62]		[4.12]		[5.53]
Constant	0.310***		0.300***		0.310***		0.300***		0.300***		0.300***
	[3.75]		[3.30]		[3.51]		[3.30]		[3.23]		[3.32]
Observations	10209		10209		10209		10209		10209		10209
R^2 within countries	**0.06**		**0.08**		**0.09**		**0.09**		**0.07**		**0.07**
R^2 between countries	**0.26**		**0.02**		**0.15**		**0.05**		**0.00**		**0.05**
					Random-Effect Parameter						
Variance Component for Level 2 Effect, μ_{0j}	0.13670		0.18031		0.15674		0.17561		0.18385		0.17540
Variance Component for Level 1 Effect, η_{ij}	0.59895		0.58955		0.58307		0.58247		0.59409		0.59399
Deviance	23513		23616		23534		23542		23716		23658

Note: Country-level culture, firm-level, and additional control variables are as defined before in Table 31 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Hypotheses 7a and 7b expect that high levels of power distance and uncertainty avoidance undermine the relationship between the incentive of IPO issuers and underpricing, respectively. In contrast, hypotheses 7c, d, e, and f conjecture that higher levels of individualism, femininity, short-term orientation, and indulgence improve the association between the incentive of IPO issuers and underpricing. The negative and significant coefficients for the interaction terms PD*PR (-0.100; Table 37; Model 1; $p<0.01$), PD*DF (-0.100; Table 37; Model 1; $p<0.01$), UA*PR (-0.050; Table 37; Model 2; $p<0.01$), and UA*DF (-0.060; Table 37; Model 2; $p<0.01$) provide supporting outcomes for hypotheses 7a and 7b.

These results imply that increasing the level of power distance and uncertainty avoidance in G20 countries by one unit reduces the effects of participation ratio and dilution factor in driving low IPO underpricing in the 5% and 10% range. Moreover, this research obtains significant coefficients at the 1% level for hypotheses 7c, d, e, and f. The largest indirect effect of culture on underpricing is reported for the interaction variables of FM*PR (0.320; Table 37; Model 4; $p<0.01$) and FM*DF (0.330; Table 37; Model 4; $p<0.01$).

Remarkably, the results suggest that the relationships between participation ratio-IPO underpricing and dilution factor-IPO underpricing increase by 32% and 33%, respectively. This increase occurs when the level of femininity increases by one unit in G20 countries. This is followed by the interaction terms of IDV*PR (0.150; Table 37; Model 3; $p<0.01$) and IDV*DF (0.160; Table 37; Model 3; $p<0.01$). The interaction variables of STO*PR (0.070; Table 37; Model 5; $p<0.01$), STO*DF (0.070; Table 37; Model 5; $p<0.01$), IDG*PR (0.060; Table 37; Model 6; $p<0.01$), and IDG*DF (0.070; Table 37; Model 6; $p<0.01$) also report significant results. The anticipation of the hypotheses being correct is fulfilled. The results infer that IPO issuers in high power distance and uncertainty avoidance countries indeed share pre-fixed perceptions of the presence of opaque market practices, unequal distribution of power, and ambiguity when they decide to sell a part or parts of their firms. Conversely, the results suggest that owners of IPO firms located in individualist, feminine, short-term oriented, and indulgent cultures maintain higher levels of cultural confidence that promote fair market practices, identical distribution of information, and accountability.

Consequently, issuers who are nested within high power distance and uncertainty avoidance (individualist, feminine, short-term oriented, and indulgent) countries have less (more) inclination to sell and create more secondary and primary shares, respectively, when they go public. This is because IPO owners in individualist, feminine, short-term oriented, and indulgent nations are not afraid that underwriters and institutional investors will exploit their market power to deliberately underprice their company for personal gain. The results suggest the opposite is likely to occur in power distance and uncertainty avoidance cultures. The findings are consistent with a similar conclusion reached by Li et al. (2013) who contended that national cultural values modify the relationship between firm-level variables and corporate-risk taking decisions across countries.

Overall, the findings associated with the indirect effect of variations in national cultures on IPO underpricing difference permit this thesis to answer the second research question: do differences in country-level national cultures affect the relationship between the incentive of IPO issuers and underpricing across IPO markets? The answer is affirmative. The evidence this research uncovers confirms that differences in cultural values across nations indirectly affect the variability in IPO underpricing in the global IPO market. It occurs through influencing the connection between the incentive of IPO issuers and IPO underpricing. This new empirical evidence is foreign to the intersection of IPO underpricing-culture literature, for example Costa et al. (2013) and Chourou et al. (2018). This literature is not aware that national cultures play a significant modifying effect in shaping the behaviour of IPO issuers in relation to the percentage of shares they intend to sell or create when they go public.

4.6.2.3.2. Effects of National Culture Characteristics on the Underwriter Reputation-IPO Underpricing Relationship

The author proceeds in this section to test the six hypotheses related to the modifier effects of variances in Hofstede's cultural dimensions on IPO underpricing via the decision to employ prestigious underwriters. Hypotheses 8a and 8b assume that in cultures with high levels of power distance and uncertainty avoidance, the relationship between underwriter reputation and underpricing is expected to be stronger. In contrast, hypotheses 8c, d, e, and f predict that higher levels of individualism, femininity, short-term orientation, and indulgence reduce the connection between prestigious underwriters and underpricing.

This research only finds supporting results for hypotheses 8a and 8c. The positive and significant coefficient for the interaction term PD*UR (0.010; Table 44; Model 1; $p<0.01$) shows that the level of power distance in G20 countries increases the effect of underwriter reputation in causing low IPO underpricing. Similarly, the interaction term IDV*UR (-0.010; Table 44; Model 3; $p<0.05$) demonstrates that an increase in the level of individualism for one unit leads to reducing the relationship between prestigious underwriters and underpricing by 1%. The results are in the same category as Li et al. (2013) who found that the level of individualism reduces the association between firm size and corporate risk-taking. The authors measure the level of risk-taking by the level of research and development. Their results suggest that larger firms are already reaching maturity level in terms of research and development, and for this reason managers of large firms engage less in corporate risk-taking. When these managers are located in individualist cultures, their results reveal that the association between firm size and corporate risk-taking declines. The authors attribute this outcome by arguing that managers in individualist countries are frequently constrained by rules that reduce their desire to seek personal achievement by taking riskier corporate decisions.

The results related to the interaction terms PD*UR and IDV*UR provide a similar inference. This research contends that IPO investors in high individualist and low power distance cultures understand the certification role reputable underwriters provide in reducing their *ex-ante* uncertainty. In turn, they demand lower underpricing for IPOs underwritten by prestigious underwriters. However, those IPO investors in stock markets characterised with low collectivism and power distance are likely to have a shared perception that IPO issuers follow rigid rules related to the reliability of financial information contained in the IPO prospectus. Consequently, the existence of this level of social trust between IPO issuers and investors in such cultures reduces the importance of the certification role reputable underwriters provide to IPO investors. The results for the remaining models, Models 2, 4, 5, and 6 in Table 37, are similar to Li et al. (2013) who find that the level of UA across countries does not influence the relationship between earnings discretion and corporate risk-taking.

In general, the conclusions for the indirect effect of differences in national cultures on IPO underpricing variance enable the author to answer the third proposed research question: do differences in country-level national cultures affect the relationship between underwriter reputation and underpricing across IPO markets? This research provides a slightly positive answer to this question. This thesis discovers that dissimilarities in Hofstede's cultural dimensions of individualism and power distance across the G20 countries modify the relationship between the prestigious underwriter and IPO underpricing. The findings are the first in the IPO underpricing-culture literature to show that not all cultural dimensions actually matter when it comes to the relationship between reputable underwriters and IPO underpricing. The prestigious underwriter-IPO underpricing relationship is largely affected only in countries that embrace high individualism and low power distance cultural values.

4.6.2.3.3. Influences of National Culture Characteristics on the *Ex-ante* Uncertainty-IPO Underpricing Relationship

This section provides the final set of hypotheses related to the indirect effect of Hofstede's cultural values on the observed level of IPO underpricing across countries. Hypotheses 9a and 9b suggest that high levels of power distance and uncertainty avoidance improve the relationship between *ex-ante* uncertainty and underpricing, respectively. By contrast, hypotheses 9c, d, e, and f anticipate that higher levels of individualism, femininity, short-term orientation, and indulgence undermine the association between *ex-ante* uncertainty and underpricing. This research obtains supporting results for the three *ex-ante* proxies bringing solid support to H9a. PD*PMV is positive and significant (0.110; Table 37; Model 1; $p<0.01$). The result suggests that when the level of power distance between G20 countries increases by one unit, the effect of pre-IPO stock market volatility increases in IPO underpricing by 11%. As this research hypothesised in the theory section, PD*PMV suggests the following. The presence of a low level of PD characteristics across G20 countries generates a stock market environment that does not suffer from the unequal distribution of market information between investors. Hence, in this kind of market with a low level of PD, IPO participants have a shared belief that they can enjoy equal and timely access to information allowing them to realise informed investment decisions. In turn, this stock market environment reduces the level of *ex-ante* uncertainty amongst IPO parties. This encourages investors in stock markets in such low power distance cultures to react less to changes in pre-IPO stock market volatility.

Likewise, the interaction terms of PD*LET and PD*LOP provide negative and significant (-0.010; Table 37; Model 1; $p<0.01$) and (-0.010; Table 37; Model 1; $p<0.05$) outputs as expected in the theoretical section. They point out that an increase in the level of power distance by one unit between G20 countries leads to reducing the effect of elapsed time and offer size on IPO underpricing by 1% equally. The results document weak support for hypothesis 9b with reference to the impact of UA on the relationship between *ex-ante* uncertainty and underpricing. This is because the interaction terms of UA*PMV and UA*LET provide significantly opposite coefficient signs (-0.30; Table 37; Model 2; $p<0.01$) and (0.010; Table 37; Model 2; $p<0.01$), respectively. Yet, the interaction term of UA*LOP provides negative and significant (-0.010; Table 37; Model 2; $p<0.01$) results that are consistent with the prediction. The author reasons that these unexpected findings are due to the existence of reverse expectations about the effect of pre-IPO market volatility and elapsed time across countries with a high level of uncertainty avoidance. This finding is consistent with a similar observation in the study by Li et al. (2013). They discovered that in contrast to their prediction, UA decreased the association between earnings discretion and corporate risk-taking instead of increasing it.

The results linked to hypotheses 9c, d, e, and f 9b provide overall significant outcomes lending support to their predictions. Due to rounding of coefficient values to the nearest numbers, the results show that an increase in the level of IDV, FM, STO, and IDG across the G20 countries by one unit leads to strengthening the influence of LET and LOP on IPO underpricing by 1%. This research explains these findings by providing the following rationale. Recall that the IPO underpricing literature including Lee et al. (1996) and Ekkayokkaya and Pengniti (2012) measure the level of *ex-ante* uncertainty in the IPO market using the variable elapsed time. The authors confirm that when informed[56] investors have some concerns or are not eager to subscribe in full to some IPO firms, then the length of the elapsed time between the first trading day and fixing of the offer price of the IPO firm increases. The consequence of this is that the low demand by informed

[56] Lee et al. (1996) and Ekkayokkaya and Pengniti (2012) argue that institutional investors can be seen as "informed" investors because they enjoy a high level of financial knowledge and resources. In contrast, the authors see "non-informed" IPO investors as retail investors who have limited financial awareness and capability.

investors would be favoured with high uncertainty about the quality of the IPO by uninformed investors (Lee et al. 2003). Consequently, this translates to less demand for an IPO firm on the first trading day and resulting in lower underpricing. Collectively, when this IPO firm is listed in an IDV, FM, STO, and IDG culture, the effect of LET on UP will increase. This is because uninformed IPO investors in such cultures maintain cultural trust in the investment behaviour of informed investors. In contrast, the impact of LET in reducing IPO underpricing becomes weaker in countries with high levels of collectivism, masculinity, long-term orientation, and restraint. This is because IPO investors nested in such countries have pre-fixed perceptions about the lack of social trust, thereby encouraging them question the moral intentions and investment decisions of informed investors.

Overall, the evidence this research reveals provides a satisfactory answer to the fourth research question of this chapter: do differences in country-level national cultures affect the relationship between *ex-ante* uncertainty surrounding the offering and underpricing across IPO markets? This thesis can confidently affirm that variances in cultural values across nations indirectly influence the variability in IPO underpricing in the global IPO market. This is achieved through increasing the overall country-level *ex-ante* uncertainty amongst IPO parties. Consequently, an upward modification of the strength of the relationship between the degree of *ex-ante* uncertainty surrounding the offering and underpricing across IPO markets occurs in nations characterised with a high level of high power distance, uncertainty avoidance, collectivism, masculinity, long-term orientation, and the restraint. This new empirical finding will surely enhance the understanding of the intersection of IPO underpricing-culture literature represented by Costa et al. (2013) and Chourou et al. (2018). This literature does not fully recognise variability in national cultures and how it indirectly impacts on IPO underpricing across countries.

The results for the direct effect of national cultural proxies along with the firm-level variables in Panel A in Table 37 provide consistent outcomes with Table 36. Across the six models, Table 37 confirms the previous conclusion that only PD, IDV, FM, and IDG cultural measures matter in explaining the variability in IPO underpricing across G20 countries. However, the analysis of the model fit for the six cultural dimensions reveal that power distance (Deviance 23513; Table 37; Model 1; R^2 between countries 26%; R^2 within countries 6%) makes the largest direct and indirect effects on IPO underpricing.

To give this finding a meaningful economic interpretation this research provides the following example. Economically, the results document that an increase in the level of power distance between the G20 countries by one-unit directly increases underpricing by 1.1%. Recall the scale of PD is a 100 point-scale and average level of PD across the sample is 53 as shown previously in Table 32, then an increase (decrease) in PD by 40 (17) points as for Russia[57] (Australia) leads to increasing (reducing) IPO underpricing by 44.4% (18.87%)[58] for average IPO firms listed in Russia (Australia). Indirectly, the interaction term PD*PMV infers that when an IPO firm is listed in a high power distance country, the coefficient PMV will increase by 11% (0.110; Table 37; Model 1; $p<0.10$), so that it is 1.11% for every one unit increase in the level of PD across countries. In other words, Australian and Russian IPO firms, on average, should expect the effect of pre-IPO market volatility to increase their underpricing by 1.444% and 0.811%, respectively, for every unit increase in the standard deviation of their local stock market 15 days before listing. This differential effect of PMV on IPO underpricing in Russia and Australia is entirely driven by the difference in the level of power distance between the two nations.

Individualism emerges as the second influential cultural variable (Deviance 23534; Table 37; Model 3; R^2 between countries 15%; R^2 within countries 9%) that wields significant direct and indirect effects on underpricing. The direct and indirect effects of femininity (Deviance 23542; Table 37; Model 4; R^2 between countries 5%; R^2 within countries 9%) and indulgence (Deviance 23658; Table 37; Model 6; R^2 between countries 5%; R^2 within countries 7%) come second in explaining the variability in IPO underpricing in the global IPO market. Although the difference in UA and STO provide no direct effect on IPO underpricing difference, they contribute indirectly to explaining IPO underpricing as shown in Models 2 and 3 in Table 37, respectively.

[57] Hofstede scores the level of PD in Russia (Australia) as having a high (low) level of power distance of 93 (36). Hence, Russia (Australia) is above the mean of PD by 40 (17) points. See Table 32 for descriptive statistics regarding all cultural measures.

[58] The author attains these figures by multiplying the value of the coefficient PD of 1.1% by the difference of PD measure between the mean value of PD (53) across the entire sample with the value of PD for Australia (36) and Russia (93).

4.6.3. Sensitivity Tests and Robustness Checks

4.6.3.1. Developed and Developing Countries

To further comprehend the effects of differences in national cultures on differences in IPO underpricing, this research repeats the previous tests, differentiating between developed and developing stock markets. Kayo and Kimura (2011) examine a subsample of developed versus developing countries to evaluate the direct and indirect effects of national cultures on the variability in firms' leverage decisions. The authors find different behaviours for both country-level (i.e., national cultures) and firm-level (determinants of capital structure) factors in driving firm leverage choices between developed compared to developing countries. Hence, this research follows Kayo and Kimura (2011) to split the sample between developing and developed countries using the random intercept and slope coefficients in the HLM models. Tables 38 and 39 present the number of full HLM models including random intercept and random slope coefficients estimated for two subsamples including developed and developing[59] countries, respectively.

In this section, this research aims to observe if firm-level and country-level national cultural determinants of IPO underpricing are similar between the two blocks of countries. The covariates related to country-level differences in national culture characteristics in Panel A in Tables 38 and 39 exhibit different outcomes. In the developed G20 countries, this research finds that the level of femininity is the only a direct influencer of IPO underpricing. The coefficient of FM is negative and significant (-0.005; Table 38; Model 4; $p<0.01$). The variability in PD, UA, IDV, STO, and IDG does not directly impact on the variability of underpricing across developed IPO markets. In contrast, the variability of power distance across developing G20 countries is the only prime driver of IPO underpricing. The coefficient of PD is positive and significant (0.033; Table 39; Model 1; $p<0.01$). In developing countries, differences in the degree of UA, IDV, FM, STO, and IDG cultural values have no direct link to underpricing difference.

[59] Please see Table 3 for a list of countries.

Table 38: HLM Analyses on the Effect of Country-level Culture on IPO Underpricing of Developed G20 Countries with Random Intercept and Slope Coefficient Estimations

Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
Panel A: Direct Effect											
Culture-level variables											
PD	0.002	**UA**	0.001	**IDV**	-0.002	**FM**	-0.005***	**STO**	-0.002	**IDG**	-0.001
	[0.56]		[0.85]		[-0.78]		[-3.45]		[-1.03]		[-0.22]
Firm-level variables											
PR	-0.018***	**PR**	-0.019***	**PR**	-0.054***	**PR**	0.030***	**PR**	-0.025***	**PR**	-0.014***
	[-15.16]		[-15.75]		[-22.93]		[14.30]		[-15.75]		[-11.90]
DF	-0.017***	**DF**	-0.021***	**DF**	-0.055***	**DF**	0.028***	**DF**	-0.026***	**DF**	-0.015***
	[-22.05]		[-22.45]		[-25.75]		[16.37]		[-19.84]		[-19.63]
UR	-0.056***	**UR**	-0.060***	**UR**	-0.063***	**UR**	-0.068***	**UR**	-0.062***	**UR**	-0.058***
	[-2.75]		[-2.96]		[-3.27]		[-2.47]		[-3.12]		[-2.95]
PMV	-0.001	**PMV**	-0.001	**PMV**	-0.025***	**PMV**	0.044***	**PMV**	-0.024***	**PMV**	-0.027***
	[-0.47]		[-0.64]		[-2.83]		[3.64]		[-2.68]		[-3.04]
LET	0.002	**LET**	-0.014	**LET**	0.009	**LET**	-0.016	**LET**	0.015	**LET**	0.001
	[0.14]		[-0.98]		[0.39]		[-1.21]		[0.82]		[0.01]
LOP	-0.047***	**LOP**	-0.041***	**LOP**	-0.045***	**LOP**	-0.014**	**LOP**	-0.047***	**LOP**	-0.055***
	[-7.79]		[-6.83]		[-7.45]		[-4.62]		[-7.90]		[-9.01]
Dummy Effects	**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**
Panel B: Indirect Effect "Interaction Variables"											
PD*PR	-0.080***	**UA*PR**	-0.052***	**IDV*PR**	0.226***	**FM*PR**	0.532***	**STO*PR**	0.052***	**IDG*PR**	-0.024***
	[-3.28]		[-6.03]		[19.61]		[25.53]		[7.39]		[-2.52]
PD*DF	-0.11***	**UA*DF**	-0.064***	**IDV*DF**	0.222***	**FM*DF**	0.528***	**STO*DF**	0.057***	**IDG*DF**	-0.001
	[-5.21]		[-9.02]		[17.13]		[27.42]		[9.75]		[-0.17]
PD*UR	-0.003	**UA*UR**	-0.001	**IDV*UR**	-0.001	**FM*UR**	-0.001	**STO*UR**	0.001	**IDG*UR**	0.001
	[-1.05]		[-0.41]		[-0.01]		[-0.08]		[0.28]		[0.63]
PD*PMV	-0.810***	**UA*PMV**	-0.347***	**IDV*PM**	0.318***	**FM*PM**	0.280***	**STO*PMV**	0.256**	**IDG*PMV**	0.577***
	[-7.16]		[-8.50]		[-7.54]		[5.52]		[8.27]		[8.35]
PD*LET	0.004**	**UA*LET**	0.001	**IDV*LET**	0.002*	**FM*LET**	0.001	**STO*LET**	-.002**	**IDG*LET**	-0.001
	[2.20]		[0.70]		[1.32]		[0.64]		[-2.12]		[-1.07]
PD*LOP	-0.004***	**UA*LOP**	-0.002***	**IDV*LOP**	0.002***	**FM*LOP**	0.001***	**STO*LOP**	0.001***	**IDG*LOP**	0.03***
	[-5.32]		[-6.44]		[5.95]		[4.62]		[5.73]		[6.15]
Constant	0.181***		0.182***		0.185***		0.179***		0.183***		0.181***
	[3.60]		[3.72]		[3.77]		[5.02]		[3.82]		[3.58]
Observations	7,160		7,160		7,160		7,160		7,160		7,160
R^2 within countries	**0.11**		**0.12**		**0.16**		**0.19**		**0.13**		**0.11**
R^2 between countries	**0.03**		**0.08**		**0.08**		**0.59**		**0.13**		**0.02**
Random-Effect Parameter											
Variance Component for Level 2 Effect, μ_{0j}	0.02444		0.02306		0.02300		0.01035		0.02195		0.02490
Variance Component for Level 1 Effect, η_{ij}	0.44474		0.43856		0.42005		0.40283		0.43723		0.44343
Deviance	14603		14501		14192		13884		14479		14582

Note: Country-level culture, firm-level, and additional control variables are as defined before in Table 31 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

Table 39: HLM Analyses on the Effect of Country-level Culture on IPO Underpricing of Developing G20 Countries with Random Intercept and Slope Coefficient Estimations

Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Panel A: Direct Effect											
Culture-level variables											
PD	0.033***	**UA**	0.001	**IDV**	-0.010	**FM**	-0.010	**STO**	0.002	**IDG**	-0.002
	[2.47]		[0.05]		[-0.80]		[-0.62]		[0.25]		[-0.20]
Firm-level variables											
PR	-0.079***	**PR**	-0.049***	**PR**	-0.037***	**PR**	-0.066***	**PR**	0.017	**PR**	-0.026 ***
	[-8.54]		[-5.70]		[-3.56]		[-6.84]		[0.48]		[-5.69]
DF	-0.080***	**DF**	-0.048***	**DF**	-0.046***	**DF**	-0.065***	**DF**	0.012	**DF**	-0.027***
	[-8.77		[-5.60]		[-4.85]		[-6.90]		[0.38]		[-5.70]
UR	0.073**	**UR**	0.168***	**UR**	0.120**	**UR**	0.077**	**UR**	0.273***	**UR**	0.243***
	[1.92]		[3.30]		[2.00]		[1.92]		[4.13]		[3.84]
PMV	0.052***	**PMV**	-0.019	**PMV**	0.015	**PMV**	0.019	**PMV**	0.013	**PMV**	0.001
	[3.62]		[-0.81]		[0.73]		[1.05]		[0.52]		[0.17]
LET	0.080***	**LET**	0.116***	**LET**	0.038**	**LET**	0.068***	**LET**	0.113***	**LET**	0.110***
	[4.24]		[4.93]		[1.92]		[3.29]		[5.17]		[4.53]
LOP	-0.115***	**LOP**	-0.123***	**LOP**	-0.106***	**LOP**	-0.110***	**LOP**	-0.169	**LOP**	-0.208***
	[-8.44]		[-6.81]		[-6.39]		[-7.35]		[-8.79]		[-7.84]
Dummy Effects	**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**		**YE & IE**
Panel B: Indirect Effect "Interaction Variables"											
PD*PR	0.306***	**UA*PR**	0.090***	**IDV*PR**	0.364***	**FM*PR**	0.177***	**STO*PR**	0.244**	**IDG*PR**	-1.080***
	[4.57]		[3.03]		[4.18]		[2.76]		[2.12]		[-4.54]
PD*DF	0.369***	**UA*DF**	0.095***	**IDV*DF**	0.305***	**FM*DF**	0.162***	**STO*DF**	0.236**	**IDG*DF**	-1.070***
	[5.42]		[3.26]		[3.56]		[2.58]		[2.07]		[-4.49]
PD*UR	0.003	**UA*UR**	0.04***	**IDV*UR**	0.004	**FM*UR**	0.001	**STO*UR**	0.07***	**IDG*UR**	0.11***
	[0.78]		[2.50]		[0.95]		[0.07]		[3.37]		[3.01]
PD*PMV	0.275*	**UA*PMV**	-0.240***	**IDV*PMV**	-0.294**	**FM*PM**	-0.443***	**STO*PM**	-0.143**	**IDG*PM**	-0.277*
	[1.48]		[-3.59]		[-1.97]		[-2.92]		[-1.72]		[-1.55]
PD*LET	0.011***	**UA*LET**	0.003***	**IDV*LET**	0.001	**FM*LET**	-0.002	**STO*LE**	0.005***	**IDG*LE**	0.006***
	[5.69]		[3.63]		[0.63]		[-1.12]		[6.69]		[4.60]
PD*LOP	-0.011***	**UA*LOP**	-0.001	**IDV*LOP**	0.002*	**FM*LOP**	0.002*	**STO*LO**	-0.003***	**IDG*LO**	-0.007***
	[-7.31]		[-0.58]		[1.47]		[1.63]		[-3.72]		[-4.55]
Constant	0.474***		0.467***		0.466***		0.467***		0.468***		0.466***
	[3.26]		[2.52]		[2.60]		[2.57]		[2.54]		[2.52]
Observations	2,995		2,995		2,995		2,995		2,995		2,995
R^2 within countries	**0.13**		**0.10**		**0.08**		**0.09**		**0.07**		**0.10**
R^2 between countries	**0.40**		**0.00**		**0.06**		**0.04**		**0.01**		**0.01**
Random-Effect Parameter											
Variance Component for Level 2 Effect, μ_{0j}	0.19779		0.32836		0.30795		0.31489		0.32577		0.32679
Variance Component for Level 1 Effect, η_{ij}	0.84633		0.87692		0.89159		0.88515		0.87784		0.87577
Deviance	8101		8212		8262		8240		8216		8209

Note: Country-level culture, firm-level, and additional control variables are as defined before in Table 31 and Table 3, respectively. UP is the dependent variable. Robust T-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

There are signs of different effects of firm-level variables related to the EWL theory contingent on the level of stock market development. This research finds a consensus across all 12 models in Tables 38 and 39 in relation to the relationship between incentive of IPO issuers and IPO underpricing in both developed and developing countries. Both PR and DF are negative and significant in most models. The PR and DF results for advanced and emerging economies are consistent with all sample results shown in previous results in Table 37. Although the findings are consistent with previous IPO literature including Habib and Ljungqvist (2001), Chahine (2008), and Jones and Swaleheen (2010), they are inconsistent with Autore et al. (2014) who found PR and DF to be positively related to underpricing in both industrial and developing countries. The large difference in the data size and coverage could be related to this difference. The data on advanced (developing) countries comprises 7,160 (2,995) IPO firms spanning the years 1995 to 2016. In contrast, Autore et al.'s (2014) advanced (developing) country data includes 5,490 (1,907) IPO firms listed between 1998 and 2008.

Yet, this research discovers a remarkable difference concerning the relationship between employing prestigious underwriters and IPO underpricing emerges between the two blocks of countries. In the developed G20 countries, underwriter reputation is negative and significant at the 1% level to explain firm underpricing as shown in all models in Table 38. This implies that underwriters in advanced stock markets execute their expected role in providing a certification signal to quality issuers in exchange for higher underwriting fees. The UR results for developed countries are in harmony with the endogenous underwriter-IPO underpricing relationship found by Habib and Ljungqvist (2001), Chahine (2008), and Jones and Swaleheen (2010). The authors noted that IPO issuers in industrial nations endogenously choose reputable underwriters when they intend to sell a large percentage of their secondary shares. After controlling for this endogenous effect using the 2SLS model as opposed to OLS estimation, the authors find the signage of UR shifts from being positive to negative. Failure to control for this endogeneity problem might explain why Autore et al. (2014) find UR positively influences IPO underpricing throughout their sample for developed countries.

Conversely, in developing G20 countries the variable UR is significant and positively related to underpricing at the 5% level of significance for all models in Table 39. Remarkably, the results for the variable UR using the developing countries sample disagree with the negative and insignificant sign for Autore et al. (2014) who also employ developing country IPO data. It is also inconsistent with the negative and significant coefficient obtained by Habib and Ljungqvist (2001), Chahine (2008), and Jones and Swaleheen (2010) for developed countries. This research attributes this contradiction to the fact that underwriters in emerging countries take advantage of IPO managers' cultural acceptance that information and market power are distributed unequally. This thesis argues that underwriters in developing nations recognise the willingness of IPO managers to trade rational investment decisions with personal fulfilment so that they can have a successful IPO listing. This is discussed by Lucey and Zhang (2010) who argue that in developing stock markets with highly collectivist cultural values such as China, managers prioritise their own interests by securing personal success before considering informed investment decisions. Liu and Ritter (2010) confirm that some underwriters benefit from their market power by receiving side payments from investors. The authors argue that underwriters are involved in such practices by heavily discounting IPO firms or offering large allocations of IPO stocks. It is a practice known as "spinning". Chen et al. (2017) contend that in high power distance cultures, which is probably a feature of developing stock markets, the acceptance of non-transparent market practices means that some IPO issuers are exploited by large investment banks.

Variations in the expected coefficient sign and significance of *ex-ante* uncertainty proxies including PMV and LET are also reported between developed and developing countries. Table 38 shows that PMV provides negative and significant coefficients in four out of six models when the sample is restricted to developed countries. In contrast, the variable PMV is only significant and positively related to underpricing when the sample is confined to developing countries as shown in Model 1 in Table 39. The relationship between the elapsed time and underpricing is also contradictory across developed and developing countries. The results in Table 38 show that IPO investors in developed countries' stock markets place no importance on the length of time between fixing the offer price and the first trading day. Conversely, the results in Table 39 suggest that investors perceive IPO firms that take more time to be listed from the day the offer price is announced as a risky IPO. In turn, IPO investors demand higher underpricing to compensate for this additional *ex-ante* uncertainty. The LET results and interpretation for developing countries are consistent with similar arguments and results documented in Mok and Hui (1998) and Chan et al. (2004). Yet, there is a complete agreement between developed and developing countries in relation to the negative and significant impact of IPO firm size on IPO underpricing. Regardless of the level of stock market development, investors identify larger offerings as low risk investments. This is because established firms are normally large, while speculative firms with short market histories offer smaller IPOs. The LOP results are in line with Boulton et al. (2010) and Autore et al. (2014).

The readings of the interaction variables illustrate different effects when this research compares developed to developing stock markets. While PD and UA seem to increase the effect of PR and DF in reducing IPO underpricing in developing countries, PD and UA decrease the driving effect of PR and DR in alleviating underpricing in developed stock markets. However, both blocks of countries exhibit similar behaviours in terms of the effect of IDV, FM, STO, and IDG on the relationship between the two proxies of the incentive of IPO issuers and IPO underpricing across countries. However, within the developed countries the effect of all cultural measures on the relationship between underwriter reputation and IPO underpricing is not significant. Nonetheless the interaction terms STO*UR, IDG*UR, and UA*UR are positive and significant. When this research analyses the effect of culture on the relationship between pre-IPO market volatility and underpricing, this thesis notices an inverse role for developed countries. Meanwhile in the developing countries the author finds a high level of individualism, femininity, short-term orientation, and indulgence that reduces the effect of PMV on IPO underpricing. More contradictory results are reported with reference to the effect of elapsed time on IPO underpricing across the two blocks of countries. The results are consistent with the effect of all six cultural proxies on the linkage between IPO offer size and IPO underpricing between developed and developing nations. Overall, the results related to the interaction terms across developed and developing stock markets are consistent with a similar observation made by Kayo and Kimura (2011).

Across the 12 HLM models in Tables 38 and 39, the best model fit is provided in Models 4 and 1, respectively. The former and latter provide the largest direct and indirect effects of femininity and power distance on firm-level determinants of IPO underpricing in developed and developing G20 countries, respectively. The variability of power distance in developing G20 countries explains 40% of the underpricing variance while firm-level variables explain 13%. Remarkably, Model 4 reveals that differences in femininity within developed countries explain 59% of underpricing variance while 19% of this variance is attributed to firm-level characteristics. On average, this research uncovers evidence showing that firm-level variables in developed nations explain from

11% to 19% of the underpricing variability. In contrast, only 8% to 13% of the underpricing variance is explained by firm-level characteristics in developing nations. This implies that determinants of IPO underpricing are more important to developed countries.

4.6.3.2. Examining Endogeneity and Omitted Variable Bias

To increase the confidence in the findings, this research runs a series of robustness tests, adding additional firm and country-level variables, and performing a number of diagnostic tests. Firstly, this research employs robust cluster 2SLS models with the purpose of checking if the significant results this research obtained in Tables 37, 38, and 39 were not undermined by the potential endogeneity problem between the variable UR and the error terms at level 1. IPO underpricing literature argues that a potential endogeneity problem may exist between the decision to employ a prestigious underwriter and the error term of the OLS models (Habib & Ljungqvist 2001; Jones & Swaleheen 2010). The argument is that disregarding this problem results in erroneous results. In the context of the HLM estimation, at the HLM level 1, this research uses the variable underwriter reputation to explain the variability of IPO underpricing across countries. However, Hofmann (1997) and Antonakis et al. (2014) argue that such an endogeneity problem should not have an effect on HLM's level 1 model. This is because HLM estimation assumes the presence of correlations between level 1 observations (Raudenbush & Bryk 2002). However, Essen et al. (2013) and Zattoni et al. (2017) state that although HLM controls for dependence in observations within the level 1 equation, it might not completely eliminate this endogeneity problem. The authors suggested using 2SLS estimation with a robust instrumental variable to check the consistency of the results obtained from HLM technique. This thesis follows Essen et al. (2013) and Zattoni et al. (2017) to employ robust 2SLS models as a sensitivity test to check if the relationship between differences in national cultures and IPO underpricing difference will be consistent with the HLM results. This research imitates a similar testing environment to HLM estimation that accounts for potential correlations in error terms while guarding against heteroscedasticity and endogeneity. This is done by employing 2SLS estimation with robust standard errors clustered by countries following Zattoni et al. (2017).

Secondly, this research includes a number of additional firm-level and country-level variables known to affect IPO underpricing in order to diminish the risk that the findings in Tables 37, 38 and 39 are an artefact of omitted variable bias. Additional firm-level factors include book-building, technology firms, private firms, integer offer price, underwriter fees, the 1997-98 Asian Financial Crisis and Global Financial Crisis that erupted in 2008. This research also includes three country-level measures to capture difference across nations in relation to the development of financial markets. It is measured by the enforcement of regulations concerning securities exchanges, while market sophistication is measured by financing through local equity markets, and market size is measured by the size of domestic markets.

Thirdly, this research follows Zattoni et al. (2017) to guard the results against potential impact of outliers. This is because in Table 4 the largest recorded underpricing of 1680% in the G20 countries is observed in developing G20 countries while the highest underpricing recorded in developed G20 countries was equal to 1350%. Throughout the entire sample of 10,217 IPOs this research includes in Table 4, the mean IPO underpricing is 38% of which the mean of underpricing for developed and developing countries' IPOs is 32% and 51%, respectively. Hence, the presence of extreme underpricing observations is evident in the data, potentially leading to the misleading conclusion based on the econometric models this research employs. The author implements an outlier detection procedure suggested by Rousseeuw and Leroy (2005) to exclude those extreme underpricing values exceeding an underpricing value of 150%. After applying this outlier procedure, this research excluded 573, 388, and 185 observations from sample related to all countries, developed, and developing countries, respectively.

Fourthly, this research performs a number of diagnostic tests in order to confirm the reliability of the model estimation. Apart from employing robust standard errors estimation to account for potential heteroscedasticity, this thesis conducts endogeneity and weak instrument tests. This research follows Habib and Ljungqvist (2001) to use Housman's (1978) endogeneity test to examine the null hypothesis that the identified regressor (i.e., underwriter reputation) indeed is an exogenous variable. In order to obtain a reliable endogeneity test result, this research needs to employ a robust instrumental variable that has no significant correlation with the error term while it has a good correlation with the endogenous variable (Jakob & Nam 2017). Staiger and Stock (1997), Sanderson and Windmeijer (2016), and Jakob and Nam (2017) warn that using a weak instrument can lead to far-reaching biased results. This research observes that there is no consensus in the IPO underpricing literature what the ideal instrument to employ is. For example, while Habib and Ljungqvist (2001) and Alavi et al. (2008) employ earnings per share and return on assets, Chahine (2008) and Jones and Swaleheen (2010) use gross proceeds and number of IPO firms, respectively. The author of this thesis fails to find sufficient data related to earnings per share and return on assets for the global data while gross proceeds and number of IPO firms tested out to weak instruments.

Alternatively, this research employs two instrumental variables defined as the ratio equalling to the average and median amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the average and median number of underwritten IPOs in that country. This research employs these two instruments because reputable underwriters tend to underwrite the large number of IPOs and control a large stake of the IPO market. The author expects these two instruments to be well correlated with the endogenous variable, UR, while it is likely to have a low correlation with the error terms of the model. To guard against employing a weak instrument that can cause erroneous conclusions[60], this research follows Boulton et al. (2017) and Jakob and Nam (2017) to use the Cragg and Donald Weak Instrument Test. This test examines the null hypothesis that the employed instrument is weak.

Table 40 presents eight models that incorporate the above-mentioned robust additions. In Models 1 to 4, this research retests to observe if the PD, IDV, FM, and IDG results reported in Table 37 remain significant after the further robustness testing this research included in Table 40. In Models 1, 2, 3, and 4 in Table 40, this research obtains satisfactory outputs confirming that the significant association between the level of PD, IDV, FM, and IDG and underpricing difference across G20 countries. This research also finds consistent findings for the effect of feminism on underpricing difference within developed G20 countries, thus supporting previous the HLM finding (-0.005; Table 38; Model 4; $p<0.01$). This author reconfirms the negative and significant (-0.004; Table 40; Model 5; $p<0.01$) relationship of FM on the variability of IPO underpricing across developed countries using 2SLS estimation.

[60] Staiger and Stock (1997) and Sanderson and Windmeijer (2016) argue that using a weak instrument leads to misleading 2SLS results compared to the OLS estimator and results are likely to suffer from large size distortions.

Table 40: Endogeneity and Omitted Variable Bias

	Model 1 All Sample 2SLS	Model 2 All Sample 2SLS	Model 3 All Sample 2SLS	Model 4 All Sample 2SLS	Model 5 Developed Countries 2SLS	Model 6 Developing Countries 2SLS	Model 7 Developing Countries 2SLS	Model 8 Developing Countries OLS
Culture-level variables								
PD	0.004***					0.007*	0.007*	0.007*
	[2.81]					[1.35]	[1.48]	[1.45]
IDV		-0.003***						
		[-8.39]						
FM			-0.003***		-0.004***			
			[-2.50]		[-4.13]			
IDG				-0.004***				
				[-4.19]				
Firm-level variables								
PR	-0.010***	-0.010***	-0.010***	-0.010***	-0.090***	-0.017	-0.016	-0.017
	[-5.53]	[-5.10]	[-5.84]	[-5.89]	[-5.15]	[-1.11]	[-0.89]	[-0.90]
DF	-0.011***	-0.010***	-0.011***	-0.011***	-0.010***	-0.020	-0.018	-0.019
	[-6.72]	[-6.75]	[-6.40]	[-7.07]	[-6.07]	[-1.24]	[-1.02]	[-1.01]
UR	-0.025	-0.034	-0.048	-0.034	-0.047*	0.014	0.120*	0.044***
	[-0.53]	[-0.75]	[-1.07]	[-0.73]	[-1.30]	[0.04]	[1.50]	[3.97]
PMV	0.020	-0.001	0.001	0.001	-0.013	0.018*	0.0178**	0.0184**
	[0.16]	[-0.13]	[0.42]	[0.055]	[-0.69]	[1.49]	[1.65]	[1.64]
LET	-0.023***	-0.020**	-0.027***	-0.023***	-0.018*	0.004	0.005	0.004
	[-2.39]	[-2.23]	[-2.46]	[-2.52]	[-1.32]	[0.78]	[0.97]	[0.82]
LOP	-0.021**	-0.018**	-0.019**	-0.017**	-0.023**	-0.027	-0.034***	-0.029*
	[-2.11]	[-1.94]	[-2.10]	[-1.76]	[-2.05]	[-0.87]	[-2.62]	[-1.50]
Additional firm-level variables								
BBM	-0.001	0.005	-0.018	-0.014	-0.009	0.055***	0.055**	0.055**
	[-0.51]	[0.36]	[-0.84]	[-0.69]	[-1.16]	[2.44]	[2.26]	[2.25]
TF	0.047***	0.044***	0.048***	0.043***	0.053***	0.056***	0.055***	0.055***
	[3.02]	[2.75]	[3.19]	[2.73]	[2.84]	[2.69]	[2.82]	[2.47]
PF	0.010	0.010	0.010	0.010	-0.001	0.010	0.010	0.010

	[0.30]	[0.22]	[0.11]	[0.16]	[-0.049]	[0.65]	[0.61]	[0.58]
IOP	0.019	-0.001	0.033	0.011	0.063***	-0.14***	-0.15***	-0.14***
	[0.40]	[-0.031]	[0.74]	[0.24]	[3.67]	[-2.97]	[-4.35]	[-4.22]
UF	0.005	0.016	-0.014	0.007	-0.087***	-0.038	-0.001	-0.027
	[0.46]	[1.18]	[-1.11]	[0.64]	[-2.69]	[-0.28]	[-0.012]	[-0.46]
AFC 1997	-0.100***	-0.099***	-0.100***	-0.100***	-0.100***	-0.035	-0.045	-0.038
	[-2.60]	[-2.70]	[-2.41]	[-2.60]	[-4.27]	[-0.63]	[-1.14]	[-0.97]
GFC 2008	-0.043	-0.049	-0.001	-0.040	-0.009	0.055***	0.055**	0.055**
	[-1.03]	[-1.14]	[-0.014]	[-0.91]	[-1.16]	[2.44]	[2.26]	[2.25]
				Additional country-level variables				
RSX	-0.017	0.0041	-0.093***	-0.017	-0.047**	-0.120***	-0.120***	-0.120***
	[-0.53]	[0.26]	[-3.55]	[-0.74]	[-1.88]	[-5.73]	[-5.67]	[-5.51]
FMS	-0.023	0.003	-0.048**	-0.015	0.057***	-0.072	-0.067	-0.071
	[-1.04]	[0.16]	[-1.92]	[-0.71]	[4.46]	[-1.04]	[-1.17]	[-1.12]
MS	0.170***	0.200***	0.160***	0.180***	0.160***	0.023	0.032	0.026
	[6.16]	[7.98]	[3.92]	[7.80]	[2.92]	[0.21]	[0.37]	[0.27]
Dummy Effects	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**	**YE & IE & CE**
Constant	0.480***	0.780***	0.830***	0.820***	0.690***	0.930	1.05**	0.960**
	[2.62]	[4.99]	[4.98]	[4.76]	[4.27]	[1.15]	[2.28]	[1.80]
Observations	9,644	9,644	9,644	9,644	6,804	2,840	2,840	2,840
Adjusted R^2	0.17	0.18	0.16	0.17	0.21	0.13	0.12	0.13
P-value of F-statistic	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Number of Clusters	22	22	22	22	12	10	10	10
				Diagnostics				
P-value of Housman Endogeneity Test	0.05	0.05	0.01	0.05	0.05	0.92	0.17	N/A
P-value of Cragg and Donald Weak Instrument Test	0.01	0.01	0.01	0.01	0.01	0.20	0.01	N/A
Mean Value of Variance Inflation Factor	1.74	1.75	1.68	1.72	1.90	2.96	2.96	2.96

Note: Country-level culture, firm-level, and additional control variables are as defined before in Table 31 and Table 3, respectively. UP is the dependent variable. Robust T and Z-statistics in brackets are adjusted for heteroscedasticity donate *** p<0.01, ** p<0.05, * p<0.1 for one-tail.

This thesis further obtains supporting results documenting the effect of power distance in influencing variations in IPO underpricing within developing G20 countries, which confirms prior HLM results (0.033; Table 39; Model 1; p<0.01). This is because Models 6, 7, and 8 in Table 40 all document that the higher the level of power distance across developing nations, this increases the underpricing difference by 0.007 at the 10% level of significance.

Firm-level variables related to the EWL theory reported in Table 40 provide overall consistent outcomes to the previous findings. For all G20 countries, the theory again partially explains underpricing difference as only two dimensions of it including the incentive of IPO issuers and *ex-ante* uncertainty are found to have a significant association with underpricing. Although the endogenous relationship between prestigious underwriters and underpricing is confirmed, the third dimension, UR, has no significant effect on underpricing in the global IPO market.

Interestingly, this research also uncovers overall consistent evidence using HLM (Table 38; Model 4) and 2SLS (Table 40; Model 5) estimations. They provide strong support for the three dimensions of the EWL theory in explaining underpricing difference within developed stock markets. In contrast, when using the developing countries sample, this research finds consistently weak support for the EWL model using HLM (Table 39; Model 1) and 2SLS (Table 40; Model 8) estimations. Kayo and Kimura (2011) also uncover similar evidence arguing that theories designed to explain corporate finance behaviours in developed countries are not always applicable to developing countries.

Additional firm-level covariates provide overall consistent results with previous literature. For example, consistent with Engelen and van Essen (2010), the results in Models 1 to 4 in Table 40 document a negative and insignificant association between book-building pricing method and underpricing across countries. Similar to Autore et al. (2014), this thesis obtains a negative and insignificant result using developed IPO data as shown in Model 5 in Table 40. However, when using developing IPO data as shown in Models 6 to 7 in Table 40, this research documents a positive and significant BBM coefficient showing that the use of book-building pricing method increases IPO underpricing in developing countries by 5.5%. This evidence is consistent with Boulton et al. (2010) and Chang et al. (2017). Ljungqvist et al. (2003) attribute the positive effect of BBM on IPO underpricing to the profit-sharing view. This view implies that underwriters in developing G20 countries allocate hot IPO shares to institutional investors in exchange for higher commission business. Consequently, underwriters in developing countries are tempted to offer IPO firms at a considerable discount to investors benefiting themselves and their buy-side investors at the expense of IPO issuers. Overall, additional firm and country-level variables this research includes in Table 40 are in line with prior literature.

The author now assesses if HLM estimation really captures the endogenous relationship between the decision to employ reputable underwriters and IPO underpricing within all G20 countries, developed, and developing G20 countries. Recall in Table 37 this research finds a negative but insignificant relationship between underwriter reputation and underpricing across all samples when this research controlled for Hofstede's cultural dimensions using HLM estimation. Could the significant culture-based results have been distorted by not accounting for this endogeneity problem? The results in Table 40 using the entire sample in Models 1 to 4 confirm the previous findings reported in Table 37 about the negative but insignificant effect of the coefficient UR. This means that the PD, IDV, FM, and IDG results reported in Table 37 are not affected by this endogeneity problem. Outputs from the endogeneity, weak instrument, and VIF tests confirm that the findings are robust. This research confirms the endogenous relationship between the decision to employ prestigious underwriter and IPO underpricing using both HLM and 2SLS estimations.

Conversely, recall that after this research splits the sample into two blocks of countries in Tables 38 and 39, this thesis finds consistently significant evidence showing that UR negatively and positively affects IPO underpricing in developed and developing G20 countries, respectively. This research reconfirms that the negative and significant UR result obtained for developed countries using HLM estimation (-0.068; Table 38; Model 4; $p<0.01$) is also consistent with the 2SLS estimation (-0.047; Table 40 Model 5; $p<0.10$). Interestingly, recall that the previous HLM result revealed that hiring reputable underwriters leads to higher underpricing within emerging G20 economies (0.073; Table 39; Model 1; $p<0.05$). This finding made the author worries about the sensitivity aspects for the positive and significant association between PD and IPO underpricing within developing countries using HLM estimation (0.033; Table 39; Model 1; $p<0.01$). The robust clustered 2SLS result reported in Model 6 in Table 40 documents a positive but insignificant UR coefficient in contrast to the previous HLM model.

This research attributes this result to the failure to reject the null hypothesis that the UR variable is exogenous in Model 6 in Table 40 due to the employment of weak instrument when using the developing countries sample. Note that for the entire sample and developing G20 countries sample, this research uses the ratio equal to the average amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the average number of underwritten IPOs in that country as the instrumental variable. The outputs of the Cragg and Donald Weak Instrument Test for Models 1 to 6 reject the null hypothesis that this instrument is weak at the 1% level of significance.

However, when this research used this instrument for developing the G20 countries sample, this research failed to reject the null hypothesis of using a weak instrument as shown in Model 6 in Table 40. This research employs in Model 7 a ratio equalling to the median amount of proceeds of all underwritten IPOs for every underwriter for every country, divided by the median number of underwritten IPOs in that country as the instrumental variable instead. This research now finds a positive and weakly significant UR result (0.120; Table 40; Model 7; $p<0.10$) but the endogeneity test fails to reject the null hypothesis that the UR is exogenous. This means that UR is not an endogenous factor at all in emerging equity markets. To overcome this erroneous problem, this research treats the variable UR as an exogenous factor, as it should be, using OLS estimation in Model 8. The author now documents a positive and strongly significant UR coefficient (0.044; Table 40; Model 8; $p<0.01$) similar to the significant UR result reported using HLM specification (0.073; Table 39; Model 1; $p<0.05$). This reconfirms that the results remain statistically robust even after controlling for the additional econometric estimation and accounting for the added firm- and country-level variables that guarded the conclusion from potential omitted variable bias.

4.7. Conclusion

In this chapter, the author documents supporting evidence showing the significant role of culture in influencing the global underpricing difference in the IPO market, even in largely globalised equity markets. The objectives of this chapter are as follows. The first is to assess the relative significance of the levels of firm and country on the variance of IPO underpricing. The second examines the direct influence of the characteristics of national cultures on inducing the variability in IPO underpricing across countries. Meanwhile the third objective investigates the indirect effect of national cultures' characteristics in modifying the relationship between firm-level variables and IPO underpricing across nations. This research captures the hierarchical associations between these two levels by employing a hierarchical linear modelling. This is conducted by utilising a global dataset that comprises 10,217 IPO-issuing firms from January 1995 until December 2016 in 22 countries with varying cultural traits.

Not unexpectedly, this research discovers that firm-level determinants of IPO underpricing are the most relevant when it comes to explaining the variations in underpricing across all G20, developed, and developing G20 countries' stock markets. This is because it emerged that 88%, 95%, and 75% of dissimilarities in IPO underpricing across countries are related to firm-level characteristics within G20 countries, developed and developing, respectively. Somewhat unexpectedly, 22%, 5%, and 25% of the deviations in IPO underpricing across countries are mainly driven by the variability in country-level characteristics between all G20, developed, and developing countries, respectively. One may perceive this finding militates against the importance of country-level characteristics as a determining factor of IPO underpricing for being unworthy of further analysis. However, this is not quite the case: once this research incorporates country-level culture covariates along with firm-level determinants of IPO underpricing, substantial shifting roles of all those factors emerge.

Across all G20 countries, this research finds that variations in Hofstede's cultural dimensions explain up to 32% while firm-level factors only explain up to 9% of the variability in IPO underpricing. Further in-depth analysis of the split sample showed that the differences in national cultural values within developing and developing countries explain up to 40% and 59% of underpricing variance, respectively. Firm-level covariates for these two blocks of countries only reveal up to 19% of underpricing variance. Therefore, the author has confidence that the findings will enhance the reliability of the IPO underpricing-culture literature.

This author of this thesis identifies certain psychological and economic channels in which national culture influences the phenomenon of underpricing difference in the global IPO market. Furthermore, this empirical work provides a novel illustration of how informal institutions such as culture could influence the balance of information symmetry between the key players in the IPO market including issuers, underwriter, and investors. This research also captures and quantify both the direct and indirect effects of culture in explaining the money left on the table by IPO issuers across countries.

This research gathered important empirical evidence which allowed the auhtor to positively answer the first proposed research question: do differences in country-level national cultures explain IPO underpricing difference across IPO markets? Contrary to the mutual awareness of scholars who write on IPO underpricing-culture, for example Costa et al. (2013) and Chourou et al. (2018), not all cultural dimensions directly matter to the IPO market. This research benefited from the vigorous HLM technique to account for the hierarchical nature of IPO data. This enabled the author to affirm that only dissimilarities in the level of power distance, individualism, femininity, and indulgence across nations significantly and directly matter in shaping the variability in IPO underpricing internationally. The findings, for example, suggest that, psychologically, IPO managers in masculine societies are frequently zealous about securing a successful IPO listing at any cost. Therefore, the results suggest that managers of IPO firms accept excessive underpricing or are even involved in disclosing unjustifiably optimistic information. It helps to safeguard a successful listing so that their individual interests are maintained. This psychological zeal is also frequently channelled into IPO investors whose *ex-ante* uncertainty reaches an intolerable level. In turn, this research documents higher underpricing is a consequent outcome and form of compensation for increasing *ex-ante* uncertainty for IPO investors in such cultures.

The findings, for instance, also show that when an IPO firm is nested within a culture that deprioritises leisure over hard work, underpricing increases when the level of restraint rises. The rationale is that investors grow up with restraint cultural values and maintain a particular investment predisposition that accords with the level of underpricing. This investment tendency means that they are not keen to flip their IPO shares on the first trading day for the aim of an immediate profit. These IPO investors place a low value on indulgently economic matters. In the secondary market, this economic predisposition of IPO investors who subscribe to the IPO offering in such restraint societies is channelled to other investors. This motivates post-IPO investors to demonstrate greater demand for newly listed IPO shares in stock markets characterised with a high level of restraint. Subsequently, the lack of flipping inclination exhibited by IPO investors in the primary market creates a shortage of IPO shares on the secondary market, which in turn increases prices. The consequence is higher initial returns for IPO shares on the first trading day in countries with a restraint culture.

Moreover, this research finds new evidence that culture indirectly impacts on IPO underpricing in three varied ways: first, through influencing the relationship between the incentive of IPO issuers and underpricing by up 33%; second, through modifying the association between underwriter reputation and underpricing by up to 10%; and third, through affecting the link between *ex-ante* uncertainty surrounding the offering and underpricing by up to 30%. The evidence this research discovers answered the second research question showing that culture influences the association between the incentive of IPO issuers and IPO underpricing. The findings suggest that owners of IPO firms nested within high power distance, high uncertainty avoidance, low individualism, low femininity, low short-term orientation, and low indulgence societies sustain mutual psychological perceptions about the overall information environment in their stock markets. These IPO issuers have a predisposition to tolerate cultural norms that stimulate the acceptance of unfair market practices, unequal distribution of market information, and underwriters' exploitation. Accordingly, the author finds that issuers who are nested within such cultures demonstrate not much preference for selling and creating more secondary and primary shares when they go public. This attitude leads to less wealth being lost because they anticipate they will be deliberately exploited by underwriters and institutional investors. These parties want to underprice their firms for their own personal benefit.

The findings also provide a confirmatory answer to the third research question related to the indirect effect of national cultures on the relationship between underwriter reputation and underpricing. The results suggest that IPO investors in low individualist and high power distance nations recognise the certification role prestigious underwriters provide in alleviating their *ex-ante* uncertainty. Consecutively, they demand higher underpricing for IPOs underwritten by non-reputable underwriters. Nonetheless, those investors in countries characterised with a high level of collectivism and power distance maintain a pre-established consciousness that IPO issuers do not follow firm standards connected with the trustworthiness of accounting information of IPO prospectuses that are primarily orchestrated by IPO issuers. The results suggest that this occurs due to the existence of a low level of social trust between IPO issuers and investors in cultures that indirectly increase the importance of prestigious underwriters' certification role for the benefit of IPO investors.

The findings also contribute affirmatively to answering the fourth research question of this chapter: do differences in country-level national cultures affect the relationship between *ex-ante* uncertainty surrounding the offering and underpricing across IPO markets? The results, for instance, suggest that in nations with a high level of power distance, uncertainty avoidance, collectivism, masculinity, long-term orientation, and the restraint values, IPO investors suffer from inadequate distribution of stock market information. In such cultures, this stock market environment increases the level of *ex-ante* uncertainty amongst IPO parties, thus making IPO investors more sensitive to pre-IPO stock market volatility. Therefore, the results show that in such cultures the relationship between the degree of *ex-ante* uncertainty surrounding the offering and underpricing across IPO markets significantly increases.

After extending the EWL theory by accounting for country-level national cultural and firm-level characteristics, the findings show that the theory partially elucidates underpricing difference across countries. This is because only two dimensions are found to have a significant association with underpricing, these being the incentive of IPO issuers and *ex-ante* uncertainty. Although the endogenous association between reputable underwriters and underpricing is empirically confirmed, the third dimension, UR, turns out to be insignificant in the global IPO market. Remarkably, this research uncovers strong support for the three dimensions of EWL theory in explaining variability in underpricing within developed stock markets. In contrast, when utilising the emerging countries sample, the findings document weak support for the EWL model. This finding reinforces the contention that underwriters in developing countries exploit IPO managers' cultural tolerance for unfairly disseminated information and market power. Consequently, underwriters in developing economies clearly understand the preparedness of IPO managers to trade rational investment decisions with personal self-actualisation to attain a successful IPO listing. The consequence of this cultural trait is that IPO issuers in developing nations pay higher underwriting fees, withstand expensive book-building pricing methods, and hire reputable underwriters who offer them high underpricing in return. This evidence encouraged this thesis to suggest the presence of spinning practice in the IPO market in emerging G20 economies. The confidence in the findings remained qualitatively vigorous after employing alternative specifications and performing a variety of robustness tests.

The finance and accounting community is likely to benefit from the findings. This is because economic and finance theories advocate corporate and investment decisions be determined by profit maximisation and rational investment decisions. In reality, the empirical work demonstrates that national cultural norms influence the way IPO parties around the globe make decisions. Consequently, such decisions are likely to exhibit a systematic and geographical departure from optimal practice in foreseeable ways. This indeed explains a large part of the ongoing existence of IPO underpricing differences in the global IPO market. Finally, the findings support a growing consciousness between finance and accounting researchers that even in progressively globalised equity markets with sophisticated market players, intangible characteristics such as national culture matter directly and indirectly in determining the variability that occurs in IPO underpricing.

Chapter Five: Conclusion

5.1. Recapitulation

Remarkably, the initial public offerings are considered to be an example of exceptional corporate events that have in recent times captured the attention of researchers, the business world, media, and general public. This is because of the large and sporadic but nonetheless extraordinary first-day instantaneous returns "underpricing" achieved by stock prices of newly listed firms. The money left on the table accounts for the losses of billions of US$ from IPO issuers' wealth which in turn offers a lucrative investment opportunity to IPO investors across the global IPO markets. The phenomenon of IPO underpricing is reported virtually in every stock market worldwide. The continued existence of this stock market phenomenon makes it difficult to comprehend why entrepreneur founders want to sell all their own stock to initial IPO investors at a great discount, creating a substantial cost for the wider public community. In reality, what makes it even more mystifying is the existence of considerable heterogeneity in underpricing between countries. For example, in an annually updated global underpricing statistics report reported in January 9, 2018 (Loughran et al. 1994), the authors document average underpricing ranging from 3.3% to 270.1% across 54 economies over the last three decades. Yet, some critical questions arise: how can this underpricing variance across nations be elucidated? What are the roles of the characteristics of firms and countries that contribute to this wide dispersion in IPO underpricing in the global IPO market?

The mutual reasoning is that purchasing stocks in a recently listed firm that lacks sufficient historical market evaluation and records makes participants in the IPO market uncertain about the expected investment risk and return (Gupta et al. 2018). This causes IPO firms to agonise over a stock market syndrome known as "liability of newness" which influences the equilibrium of information asymmetry between IPO parties. Consequently, underpricing is seen as a reasonable remedy paid by issuers to compensate for such liability of newness (Zattoni et al. 2017). However, what makes it challenging to comprehend this underpricing mystery is the fact that IPO parties have to get past two problematical categories of information asymmetry in cross-country settings. These are: firstly, internal type of asymmetric information associated with the characteristics of firms; and secondly, an external type related to the asymmetric information environment of formal and informal institutional characteristics of countries. At the firm-level, Habib and Ljungqvist (2001) contend that the problematic information asymmetry issue that causes underpricing in the primary market is generated by the manifestation of an *ex-ante* uncertainty problem between IPO parties; this can be endogenously influenced by IPO issuers. The authors show that by adjusting firm-level characteristics can be mitigated. This can happen when, for example, hiring a reputable instead of a non-reputable underwriter who endorses the quality of IPO companies particularly when *ex-ante* uncertainty surrounding the IPO firms is high and issuers decide to sell a larger stake of their holdings.

At the country-level, the effect of firms' characteristics on the extent of IPO underpricing may differ based on the predominating level of information asymmetry in the country. In this context, IPO underpricing literature affirms that underpricing can be moderated or extremely compromised by the prevalent formal (i.e., legal, governance, and transparency structures) and informal (i.e., cultural values) institutional environments across economies (Banerjee et al. 2011; Judge et al. 2014; Chourou et al. 2018; Gupta et al. 2018). For example, these scholars contend that an asymmetric information atmosphere affecting the *ex-ante* uncertainty of IPO parties may develop in some legal and cultural environments more naturally than in others. Consequently, the existence of variations in the quality of both formal and informal institutions across stock markets can seriously impact on the perceived level of information asymmetry in the IPO market. This behaviour in turn influences the observed level of IPO underpricing worldwide (Engelen & van Essen 2010). This thesis - based on a theoretical and empirical foundation – aims to solve part of the IPO underpricing difference riddle across nations over three independently interlinked essays.

In the first essay (Chapter Two), this thesis syndicated two broadly disconnected schools of thought. The first school of thought provided fragmented findings about the endogenous underwriter reputation-underpricing relationship. Conversely, the second literature concentrated on perceiving the presence of one- and two-way clustering in error terms amongst IPO observations without appropriate econometric rectification. Piecing together those two schools of thought permitted this thesis to examine imperative issues that could explain aspects of underpricing difference across IPO markets. Therefore, this research provided the first empirical evidence for the simultaneous influence of one-way and two-way clustering on the endogenous underwriter-underpricing relationship in an international setting. More specifically, this research firstly tested if the observed difference in IPO underpricing across countries is attributed to the failure to account for the endogenous influence of prestigious underwriters on underpricing. Secondly, this research examined if this underpricing variance is connected to ignoring the influence of one- and two-way clustering in error terms within years, industries, countries, and developed versus developing countries. Thirdly, this research investigated if underpricing dispersion in the global IPO market is attributed to the simultaneous effect of endogeneity and clustering.

In the second essay (Chapter Three), this thesis consolidated two contradictory strands of law and IPO underpricing literature. While the first strand attained conflicting conclusions about the transparency-IPO underpricing relationship, the second strand concentrated on the time-invariant nature of country-level formal institutional quality with reference to underpricing difference across equity markets employing imperfect HLM estimation. This research combined those two schools of thought by examining the direct and indirect influences of country-level transparency in explaining underpricing variance across economies. In pursing this endeavour, Chapter Three captured three aspects. Firstly, it calculated the relative significance of the characteristics firms and countries on the variance of IPO underpricing. Secondly, it examined the direct effect of time-variant differences in country-level transparency on underpricing variance. Thirdly, it tested the indirect effect of inter-temporal variations in country-level transparency on influencing the link between firm-level covariates and IPO underpricing across equity markets.

In the third essay (Chapter Four), this research capitalised on the lack of awareness of the hierarchical structure of the IPO data and the indirect effect of national cultures on IPO underpricing in the underdeveloped IPO underpricing-culture literature. Hence, Chapter Four offered the first empirically comprehensive investigation of the direct and indirect effects of national culture values on IPO underpricing across stock markets. This is undertaken by accounting for the nesting structure of the IPO data using HLM estimation. Three objectives were attained in this chapter. The first objective assessed the relative importance of the levels of firm and country on the variance of IPO underpricing. The second tested the direct effect of differences in national cultures on the variability in IPO underpricing from country to country. Meanwhile the third objective examined the indirect influence of national culture characteristics in modifying the linkage between firm-level factors and IPO underpricing across stock markets.

Over the three essays, this research employed a large sample of 10,217 IPO-issuing firms from January 1995 until December 2016 in 22 developed and developing countries with varying levels of transparency and cultural traditions. To test this more deeply, the dataset was later divided into three groups containing all G20 (22 countries), developed (12 countries), and developing (10 countries) economies. The three dimensions of the EWL theory were tested and extended to account for differences in the quality of formal and informal institutions across these 22 economies. The dimensions of the EWL theory contained the incentive of IPO issuers, promotion costs, and *ex-ante* uncertainty surrounding the offering. This theory was selected in the present study because it is built on asymmetric information reasoning while capturing the endogenous underwriter reputation-IPO underpricing relationship. To achieve the goals of ***the first essay (Chapter Two)***, this research employed 48 OLS, 2SLS, one-way clustered 2SLS, and two-way clustered 2SLS models. To attain the objectives of ***the second essay (Chapter Three)***, 34 hierarchical linear modelling models were deployed using two levels of data. Firm-level determinants related to the EWL theory were the lower level and country-level transparency characteristics were the higher level. Time-variant differences in country-level transparency were captured using the level of voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption. The aims of ***the third essay (Chapter Four)*** were accomplished using 34 HLM models over two-level of data. In the upper level this research captured differences in national culture using Hofstede's cultural dimensions, namely, power distance, uncertainty avoidance, individualism, femininity, short-term orientation, and the indulgence characteristics of societies. In the lower level this research employed the three dimensions of the EWL model.

The findings of ***the first essay (Chapter Two)*** attributed underpricing variance in the global IPO market to differences in the level of the incentive of IPO issuers, promotion cost, and *ex-ante* uncertainty across the G20 economies. More specifically, this research found that underpricing decreased by 1.4% when the incentive of IPO issuers increased by 1%. Yet, this research found that owners of IPO firms who endogenously select to employ high-status underwriters do well by reducing their underpricing by 12%. This thesis attained evidence showing that when the pre-IPO stock market volatility increased by 1% IPO firms underpriced by 5%. The study also revealed that underpricing decreased by 3.3% when the length of elapsed time between setting the offer price and first trading day increased by one unit. This research also found that underpricing decreased by 2.2% when the size of the IPO company increased by one unit. The results confirmed that underpricing difference across countries was linked to the gap in information asymmetry between developing and developed equity markets. This research found that when IPO companies were listed in an emerging G20 economy this added more uncertainty to the IPO firm due to the presence of a higher asymmetric information problem within emerging compared to advanced economies. Consequently, the author discovered that IPO issuers in developing nations should bear a higher underpricing up to 19% compared to their counterparts in advanced equity markets. This will help to compensate for the gap in information asymmetry.

When the author used a developed G20 data sample, the findings attributed dissimilarities in IPO underpricing to the three dimensions of the EWL model as well. The results documented a reduction in underpricing by up to 1.1% when the incentive of IPO owners increased by 1%. The findings showed that when issuers endogenously select prestigious underwriters they succeeded in reducing their underpricing by 4.2% in advanced stock markets. This research found that when the level of *ex-ante* uncertainty surrounding the IPO firm increased by one unit the money left on the table by IPO firms increased by up to 2.5% in developed IPO markets. Yet, in emerging G20 economies the findings indicated that the EWL theory does not explain much of the underpricing difference. This was because this research found that the endogenous underwriting-underpricing relationship does not exist in emerging IPO markets. Alternatively, this research attained evidence attributing underpricing differences to the spinning behaviour in developing equity markets. Specifically, the evidence this research uncovered shows that reputable underwriters in emerging stock markets charged issuers with large underwriting fees who in turn leave a large amount of money on the table for investors to reap at the expense of issuers. Remarkably, this research found that entrepreneur founders in such emergent economies seemed not to be troubled by this spinning behaviour. This is because issuers simply appeared to care more about attaining a successful listing and not being too bothered about their wealth losses. The attribution of this to issuers' behaviour in developing stock markets was related to the fact they sell 1% and create 10% less secondary and primary shares when they go public compared to their counterparts in advanced economies, respectively. A variety of robustness checks confirmed the findings were not an artefact of omitted variable bias, shared correlations in error terms between industrial and emerging equity markets, and presence of outliers.

The findings of ***the second essay (Chapter Three)*** attributed 88%, 95%, and 75% of underpricing variance across, within advanced, and within emerging, G20 countries to intrinsic characteristics of firms, respectively. The results of this chapter overturned the misperception in the legal and IPO underpricing literature, in that it affirmed the existence of a significant and negative transparency-underpricing relationship across countries. The findings showed that differences in the characteristics of proxies for formal institutional quality directly elucidated up to 34% of in IPO underpricing differences between G20 economies. The characteristics of firms were found to explain only 8% of the underpricing difference within the G20 countries. Remarkably, the findings provided the first empirical evidence supporting that time-variant differences in country-level transparency indirectly impact on underpricing in three ways: first, improving the relationship between underpricing and the incentive of IPO issuers by up 1.4%; second, minimising the association between high-status underwriters and underpricing by up to 12%; and third, diminishing the relationship between underpricing and *ex-ante* uncertainty by up to 5% for every unit increase in the transparency measures. The evidence this research uncovered in this chapter also documented that characteristics of firms in emerging economies only explained up to 8% of the underpricing variance. Conversely, the results documented that up to 28% the underpricing variance is explained by the characteristics of formal institutional quality in developing countries. No significant impact of transparency on IPO underpricing difference found in industrial economies. The implications of these findings showed, in emerging G20 economies, the characteristics of country-level transparency are more important to the IPO market. The inference was that developing stock markets have not reached a mature level of transparency compared to advanced economies' stock markets. Hence, improvements in the formal institutional quality are treated favourably by market participants in alleviating the problem of information asymmetry in emerging nations.

The findings demonstrated that, when time-variant changes in country-level transparency were captured, the EWL theory partially explained IPO underpricing difference between all G20 countries, within developed, and developing G20 economies. While the results affirmed the endogenous underwriters-underpricing relationship between all G20 countries and developed G20 economies, the impact of underwriter reputation on underpricing was only negative and significant within advanced countries. The results documented weak support for the *ex-ante* uncertainty dimension of the EWL model while the incentive of IPO issuers was supported in explaining the underpricing difference within developed G20 countries. Strangely, when country-level transparency was in play, the findings showed that high-status underwriting banks in emerging stock markets indeed exploit the existence of a weak legal system in their markets. Consequently, they intentionally underprice IPO firms and this is done for their own profit and helping their buy-side institutional investors. This was because the results revealed that IPO firms sustain larger underwriting fees, bear expensive book-building pricing methods, and hire reputable underwriters who in exchange for their own advantage underprice them heavily. This outcome accentuated the interpretation of the possible existence of a spinning effect in developing countries. This new finding leads the author to emphasise that in such economies with fragile transparency frameworks, entrepreneur founders of IPO firms are in fact powerless to prosecute fraudulent underwriters when intended underpricing is evident. The main findings continued to be qualitatively robust after employing alternative specifications and conducting a series of robustness checks in order to preserve the assurance and reliability of the results.

The outcomes of ***the third essay (Chapter Four)*** showed that dissimilarities in the characteristics of countries were responsible for 22%, 5%, and 25% of the differences in IPO underpricing between all, advanced, and developing G20 countries, respectively. While the difference attributable to country-level was not very high, this does not mean that the characteristics of nations are unimportant. Remarkably, the author discovered significant evidence to the contrary, after this research included country-level national culture with determinants of IPO underpricing for the entire sample of countries. The results revealed that up to 32% of underpricing variance was explained by dissimilarities in Hofstede's cultural dimensions while firm-level characteristics only explained up to 9%. Further analysis revealed that the differences in national culture within advanced and emerging G20 equity markets were responsible for up to 40% and 59% of IPO underpricing variance, respectively. Only 19% of underpricing difference were attributable to firm-level determinates between the two blocks of economies. The findings confirmed that national culture does affect IPO underpricing difference across countries through certain psychological and economic channels. This chapter produced exclusive evidence documenting that culture indirectly impacts underpricing difference in three ways. The first is by moderating the relationship between

IPO underpricing and the incentive of IPO issuers by up 33%. For the second it means transmogrifying the link between IPO underpricing and high-status underwriters by up to 10%. Regarding the third, it is done by adjusting the relationship between IPO underpricing and *ex-ante* uncertainty surrounding the offering by up to 30%.

This research found that the EWL theory was partially responsible for underpricing variance across countries when national culture is captured. This was because the findings showed that the effect of prestigious underwriters appeared to be insignificant in the global IPO market, although the endogenous relationship between prestigious underwriters and underpricing was confirmed. Remarkably, when culture was part of the equation, the three dimensions of the EWL theory were strongly supported in elucidating underpricing variance for developed stock markets. In contrast, a weak support was lent to the EWL theory in emerging economies when culture was in the scene. Evidence of spinning practice was found in emerging countries when differences in national cultures were captured. This finding stressed out the perception that, in developing economies, prestigious underwriting banks take advantage IPO managers' cultural tolerance that information and market power are unevenly disseminated. Consequently, high-status underwriters in emerging equity markets differentiate the psychological willingness of IPO managers to achieve individual success through attaining successful IPO listing with rational investment decisions. The results thus showed that managers of IPO firms in developing G20 economies pay more underwriting fees, tolerate expensive book-building pricing techniques, and hire reputable underwriters who, in return, float their companies leaving large amounts of money on the table. The main findings proved to be reliable and robust after conducting a series of robustness tests, integrating additional nine firm- and country-level covariates, and performing several diagnostic tests.

Overall, this thesis contributed to improving the understanding of the phenomenon of IPO underpricing variance in the global IPO market. To the best of the knowledge, this thesis documents the first global empirical evidence examining the validity of a theoretical model - the EWL theory - in capturing the simultaneous interactions between the three players in the IPO process: entrepreneur founders of IPO firms, underwriting banks, and IPO investors. In the process of testing this model, the author controlled for the influence of clustering in error terms on the outputs of underpricing regressions. Subsequently, this research extended the empirical testing for the EWL model to account for another methodological estimation. This was materialised by capturing the nesting structure of the IPO data was captured using HLM framework. The aim was to capture the direct and indirect influences of formal and informal institutional quality in influencing the international IPO underpricing variance. The global and large dataset utilise d by this thesis containing heterogonous levels of underpricing, transparency, and cultural characteristics, permitted the auhtor to solve part of the IPO underpricing difference riddle. Therefore, the findings of the three independently interrelated essays will be of great significance to scholars in the literature on cross-country IPO underpricing, law-IPO underpricing, and culture-IPO underpricing. The findings also deliver numerous practical contributions to policy-makers, entrepreneurs and investors.

5.2. Directions for Future Research

There are a number of areas that future research can explore and extend on the topic of IPO underpricing difference. While some researchers examined the suitability of several asymmetric information theories in elucidating the phenomenon of IPO underpricing (Kennedy et al. 2006) and relevance of firm-level factors to underpricing (Colaco et al. 2009), they all had single country perspectives, mainly using U.S. IPO data. The findings the author achieves in the thesis complement the outcomes attained by Kayo and Kimura (2011), arguing that theories and firm-level factors explaining financial market outcomes in developed stock markets do not apply to those operating in developing economies. Hence, future researchers can examine the validity of groups of information asymmetry theoretical models and the relevance of determining firm-level factors in explaining underpricing within developed and emerging economies.

Secondly, a natural line of inquiry would be to capture the joint effect of differences in country-level transparency and national cultures on underpricing difference across countries. Unfortunately, the author could not accomplish this estimation as this research finds a strong correlation existed between the country-level culture and transparency measures exceeding a Pearson correlation coefficient value of 0.75. This of course can cause serious collinearity problems amongst the observations of the HLM estimation. Future research can perhaps use HLM to examine the simultaneous effect of both formal and informal institutional quality on underpricing difference by employing a larger set of countries where correlation between those factors is low.

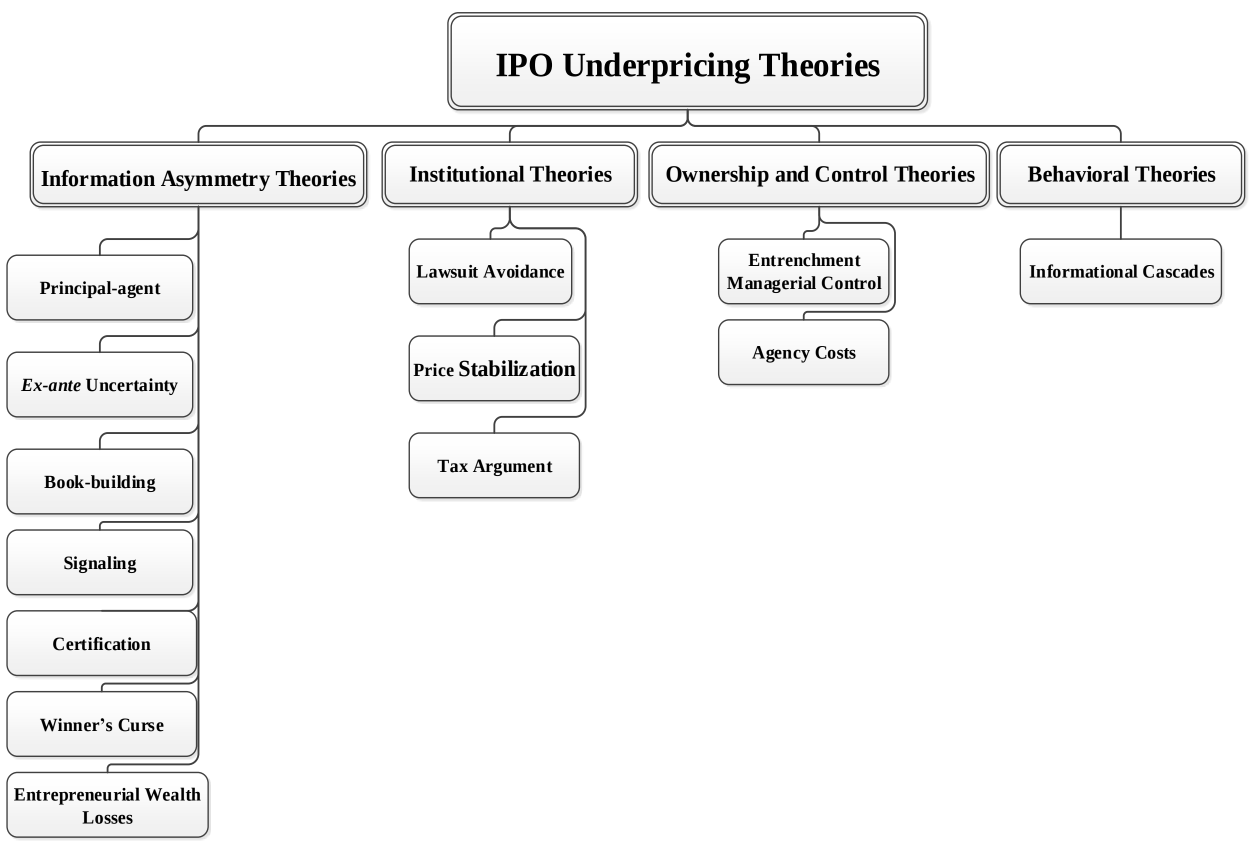
Finally, future research endeavours can also look at the direct and indirect impacts of country-level financial literacy on IPO underpricing difference across countries when data availability improves. Part of the reason why underpricing existed is due to the asymmetric information problem between two groups of market participants in the IPO market. The first group is deemed to be financially literate, namely recognised as informed investors, while the second group is considered to be financially illiterate, known as retail investors. The existence of an information gap between the financially literate and illiterate investors leaves the latter in receipt of full allocations in overpriced offerings; this scenario constitutes an "adverse selection" problem. Rock (1986) therefore contends that to ensure the continued participation of uninformed investors, issuers must provide compensation to them in order to alleviate "adverse selection" by offering underpricing. Hence, the gaps in financial education between investors nested within nations may influence the expected level of underpricing across countries. There is evidence confirming the relationship between financial literacy and stock market participation (Van Rooij et al. 2011). Hence, future research can look into employing the HLM estimation to capture the direct and indirect effects of country-level financial literacy and IPO underpricing difference across countries.

Appendix 1

A. Review of Theoretical Explanations of IPO Underpricing

The presence of vast empirical evidence documenting IPO underpricing has been documented in almost every stock market throughout the world. This has inspired the emergence of a large theoretical literature in the last four decades pursuing rational explanations as to why IPOs are underpriced differently across countries. As shown below in Figure 14, Jenkinson and Ljungqvist (2001), Loughran and Ritter (2002), Ritter and Welch (2002), Daily et al. (2003), Kennedy et al. (2006), Ljungqvist (2007), and Fitza and Dean (2016) have reviewed various IPO underpricing theories based on information asymmetry, institutional explanations, ownership and control reasons, and behavioral explanations.

Figure 14: Dominant IPO Underpricing Theories



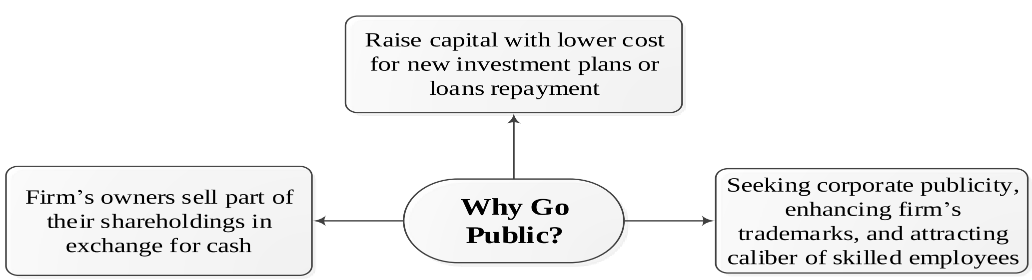
(Designed by the author of this thesis)

This section, first, presents a brief discussion of why IPO companies decide to go public and also presents the key IPO parties in order to understand the mechanism of information asymmetry in the IPO market. Second, this section presents a brief discussion concerning why this thesis discounts employing a number of competing information asymmetry, institutional explanations, ownership and control reasons, and behavioural explanations on top of the failure of those models to capture the endogenous relationship between underwriter reputation and IPO underpricing.

B. Why Do Firms Go Public?

The decision to go public marks a significant landmark in the life of un-listed or private firms. The interesting question is why a privately owned company decides to go public. There are three main reasons explaining why a firm decides to list its shares on a stock market as shown in Figure 15. Firstly, by going public, a firm's owners can sell part of their shareholdings in the company in exchange for cash, enabling them to utilise the proceeds of the sale for other expenditures or to diversify their investments (Loughran & Ritter 2002). Secondly, by going public, a firm can access public equity capital in order to obtain less expensive funding for new investment plans, finance further business expansion, and repay outstanding loans (Ljungqvist 2007). That is, when a private firm reaches a stage where the financial capacity of the current shareholders is limited, and cannot finance further growth plans, entering the equity market provides an alternative financing choice. Thirdly, by going public, firms can reap other indirect benefits, such as increasing corporate publicity, enhancing the promotion or advertising of the firm's trademarks and products, and attracting a different calibre of skilled employees (Demers & Lewellen 2003).

Figure 15: Reasons for IPO Firm to Go Public



(Designed by the author of this thesis)

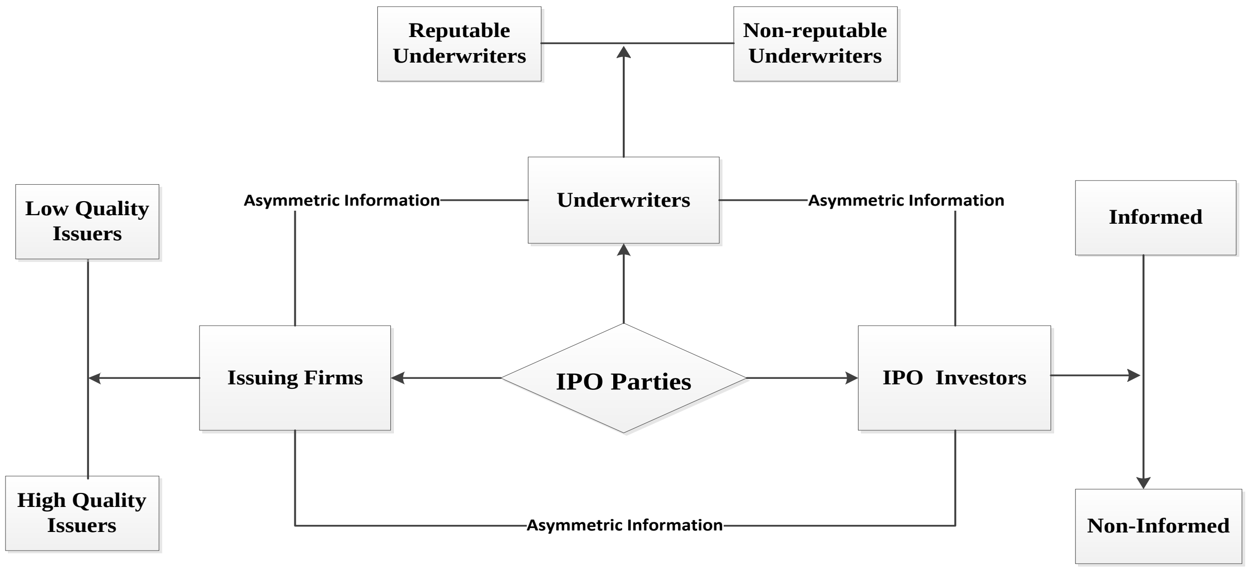
However, as well as certain advantages for going public, there are some disadvantages associated with this decision. For instance, a loss of control by business founders and current shareholders can be an obvious consequence due to public flotation of part of their shareholding (Smart & Zutter 2003). That is, as the shareholding base is widened with public flotation, new shareholders gain voting rights that could dilute the voting rights of the founders and current shareholders (Dolvin & Jordan 2008). In addition, by going public the management of IPO firms take on additional legal and moral obligations in the form of rigid information transparency and disclosure requirements in order to act according to the best interests of the larger group of shareholders (Ritter 1987). Upon public listing, IPO firms might compromise their competitive advantage by being obligated to increase their information disclosure about current operations and expansion plans as required by security exchange commissions (Habib & Ljungqvist 2001).

By going public IPO firms have to bear direct costs of public listing including listing fees, underwriting fees, and brokerage, legal and accounting fees, share registry costs, and also other indirect costs, such as the increased cost of preparing annual financial reports in compliance with disclosure and listing standards and codes (Loughran & Ritter 2002). In summary, Jenkinson and Ljungqvist (2001) argue that despite the associated disadvantages of going public, approaching the equity capital market remains an efficient option for firms to provide sustainable financing sources and quick access to liquidate part of their holdings. Since the advantages of going public outweigh the disadvantages, it is imperative to understand the role of key IPO parties. This is discussed in the next section below.

C. Key IPO Parties

Ljungqvist (2007) states that three important parties are involved in every IPO. These are the issuing firm, the underwriter, and the investor as shown in Figure 16.

Figure 16: Key IPO Parties



(Designed by the author of this thesis)

C.1. The Issuing Firm

The issuer of an IPO firm is the first important part of the IPO market, and it lists part of its holdings in an existing or newly established company for the first time in a stock market. It does this either through selling existing shares or creating new ones where the former and the latter are secondary and primary share offerings, respectively. The offering could either be one of those two methods or a mixture of the two. The main goal of the issuer is to obtain the highest possible offer price for the floated shares. In general, the issuing firm has the absolute discretion to decide how much it needs to float in compliance with the requirements of every stock exchange authority in every country (Loughran & Ritter 2002).

IPO literature including Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989) shows that IPO issuers can be classified as high quality and low quality (see Figure 16). They argue that the former own comprehensive private information about the future cash flows of their operations; hence they know exactly the precise present value of their firms while the latter are unsure about the intrinsic value of their companies. The issuer appoints an underwriter to work as an advisory body setting up a suitable offer price and preparing the necessary documentation in compliance with the stock market listing requirements to ensure successful listing (Adams et al.

2008). Palmiter (1999) and Berglöf and Pajuste (2005) argue that high quality IPO issuers may be reluctant to disclose the true present value of their firms, fearing the loss of competitive advantage if they communicate positive information related to their future investment opportunities directly to the market. Consequently, Welch (1989) argues that by protecting their market competitive advantage, quality IPO issuers create an asymmetric information problem with IPO investors as shown above in Figure 16. Subsequently, those IPO issuers work to solve this problem by offering underpricing as compensation for IPO investors to differentiate themselves from low quality IPO issuers.

In contrast, Benveniste and Spindt (1989) and Benveniste and Wilhelm (1990) argue that information asymmetry exists between the issuer and the underwriter of the IPO firm when IPO issuers are unsure about the present value of their firms; then they refer the decision to the underwriters in order to determine the present value of their firms. Spatt and Srivastava (1991) show that once the underwriters take over then they either employ their advisory team to value the IPO firm or solicit the true value of their firms from institutional investors who are financially able to provide accurate valuation of the firm. This is done in exchange for receiving a reduced share price of the IPO firm as shown in Figure 16. In this way, the underwriter becomes the second most important party in the IPO market.

C.2. The Underwriter

The underwriting bank normally takes the form of a large investment bank or commercial bank that in practice conducts the issuing process on behalf of the issuer. The main function of underwriters is to prepare the IPO firm to go public in exchange for underwriting fees, generally referred to as “underwriting spread” (Chen & Mohan 2002). To do so, the underwriters have to buy the floating stake that the issuers decide to sell to the public and then the underwriter resells it back to the public (Chahine 2008). Hence, underwriters thoroughly evaluate the IPO firms in order to decide the desired offer price and price range that enables the IPO firm to be successfully listed. The level of success of an underwriter largely relies on its financial experience, hence the more IPOs it underwrites, the more it is considered to have a market reputation for successful listing (Kirkulak & Davis 2005).

Beatty and Ritter (1986) and Lewellen (2006) argue that underwriters can be classified into reputable and non-reputable underwriters as shown in Figure 16. The former tend to control a large stake in the IPO market, have superior advisory teams, and tend to have established connections with institutional investors including hedge funds, mutual funds, and pension funds. They can subsequently conduct thorough evaluations for IPO firms. Not unexpectedly, reputable underwriters are expensive to hire in exchange for the premium service they offer. In contrast, Jones and Swaleheen (2010) contend that non-returnable underwriters tend to have small market presentation, small advisory teams, and limited business connections; they tend to charge cheaper underwriting fees for taking the IPO firm public. Lowry and Shu (2002) argue that underwriters sometimes bear the risk of potentially non-full IPO subscription; hence they buy the IPO company at a discount to compensate for this risk. Carter et al. (1998) argue that underwriters have the incentive to underprice the IPO firm in order to attract more IPO investors, reduce marketing efforts, and avoid non-full IPO subscription. Ruud (1993) contends that although IPO issuers may be involved in a restricted number of offerings, underwriters are permanent players in the IPO market. They fear setting a low offer price that could result in upsetting future IPO issuers from taking their firms public at a large discount.

However, Ljungqvist (2007) argues that the asymmetric information problem may exist between underwriters and IPO issuers when the former intentionally underprice the latter for personal gain. Liu and Ritter (2010) contend that some underwriters take advantage of their market knowledge and position for their own benefit by receiving side payments from investors. They want this in exchange for a discount offering or large allocation of IPO stocks, a practice that is known as "spinning". Lowry and Shu (2002) argue that underwriters also fear setting the offer price of IPO firms too high because this could result in upsetting or even being sued by angry IPO investors on the grounds the underwriter overpriced the IPO. Ljungqvist (2007), however, asserts the asymmetric information problem may occur between underwriters and IPO investors when the former deliberately overprice the IPO company, thus benefiting the issuer and themselves at the expense of investors. Now that this research understands the role of the issuer and the underwriter, the role of the third part of the IPO party, the investor, is discussed below.

C.3. The Investor

The investor of an IPO firm constitutes the third important part of the IPO parties. IPO investors tend to be either short-term or long-term investors of which the latter subscribe to the IPO offering and hold shares for a long investment horizon (Jenkinson & Ljungqvist 2001). The former, on the other hand, “flip” shares on the first listing day of the IPO firm seeking a quick return (Ljungqvist 2007). IPO literature frequently differentiates between two types of IPO investors including retail and institutional investors (Ling & Ryngaert 1997; Hopp & Dreher 2013; Autore et al. 2014). Retail investors tend to be individual or private investors and frequently claimed to have limited financial capacity and in-depth knowledge when it comes to analysing the IPO prospectus (Chen & Kao 2006; Dorn 2009).

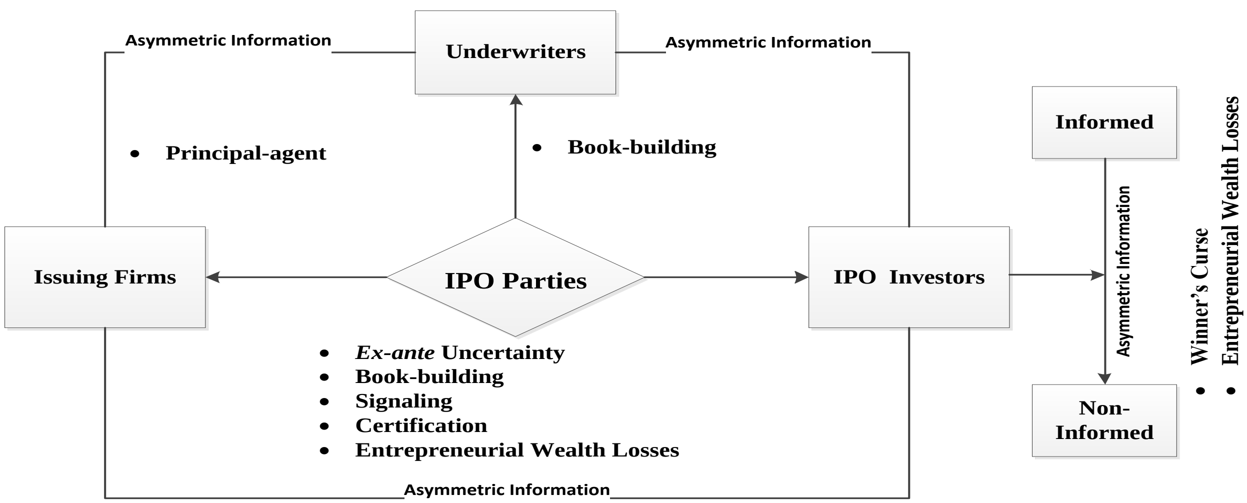
On the other hand, institutional investors tend to be financially sophisticated and understand the workings of mutual funds, pension funds, investment banks, and hedge funds. They know that these institutions have huge access to large pools of financial resources (Cornelli et al. 2006). Sullivan and Unite (2001) and Fitza and Dean (2016) argue that due to their large financial knowledge and capability, institutional investors can be repeat customers to underwriters and they have a mutual interest and business relationship in which both parties hope to maintain. This relationship allows the latter to have informational advantages in terms of accessing private information about IPO firms and receiving higher share allocations compared to retail investors. Acknowledging this information gap between retail and institutional investors, Beatty and Ritter (1986), Rock (1986), Michaely and Shaw (1994), and Brau and Fawcett (2006) argue that retail investors can be seen as non-informed investors compared to institutional investors who can be viewed as informed investors in the IPO market (see Figure 16).

In sum, depending on the status of the IPO issuers, underwriters, and investors, an asymmetric information environment tends to exist between those IPO parties and causes IPO underpricing. In response to the mechanism of this asymmetric information environment between the IPO parties, Jenkinson and Ljungqvist (2001), Kennedy et al. (2006), and Ljungqvist (2007) argue that several information asymmetry theories have been developed to explain the phenomenon of IPO underpricing. Their rationale depends on the nature of the information asymmetry that exists between IPO parties.

D. Information Asymmetry Theories

This section presents a number of competing information asymmetry models based on the asymmetric information problem between issuing firms and underwriters, investors and underwriters, issuers and investors, and informed and uninformed investors. These include the Principal-agent, *Ex-ante* uncertainty, Book-building, Signalling, Winner's Curse, and Certification theories as shown below in Figure 17.

Figure 17: Classification of Information Asymmetry Theories

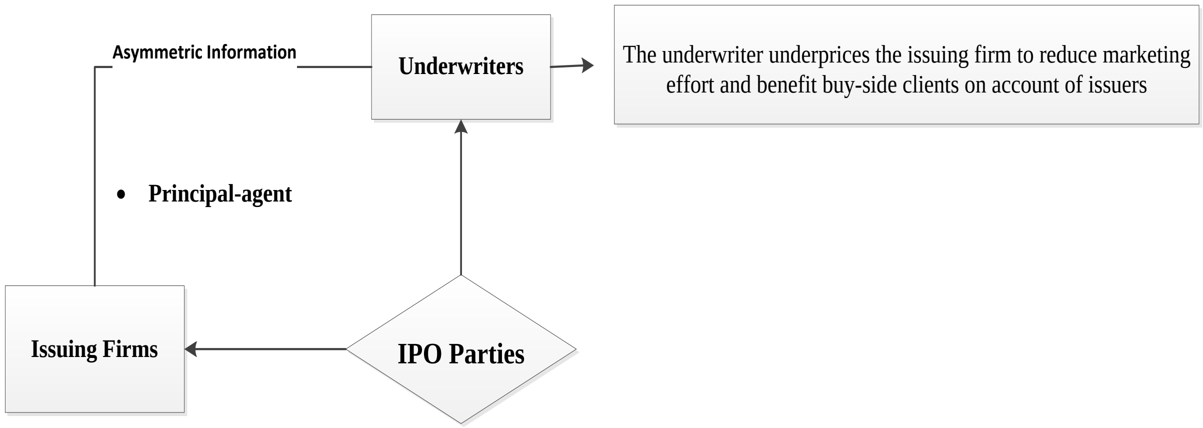


(Designed by the author of this thesis)

D.1. Principal-agent

Baron and Holmström (1980) and Baron (1982) introduced a "principal-agent" model theorising the cause of IPOs underpricing as a response to information asymmetry between two IPO parties including IPO issuers and underwriters as shown in Figure 18. The authors argue that the latter underprice the former by employing their superior market knowledge, reducing marketing effort, and benefiting buy-side clients and themselves on account of issuers.

Figure 18: Information Asymmetry Based on Principal-agent Rationale



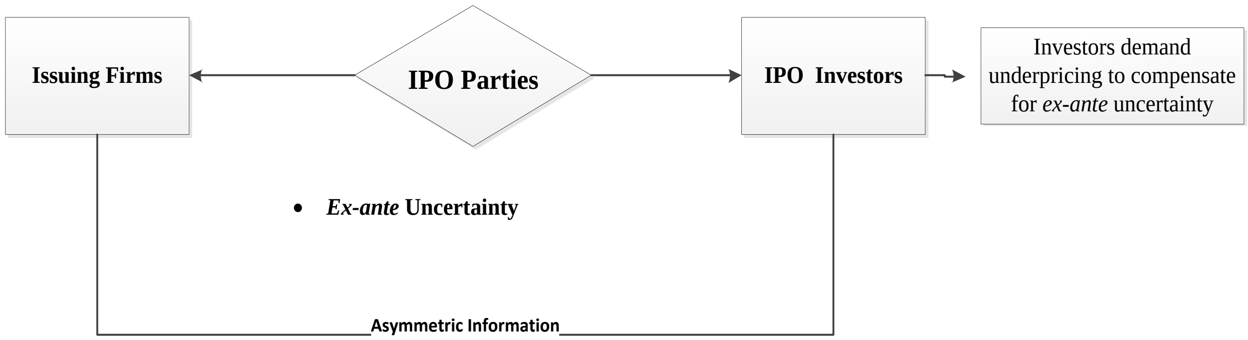
(Designed by the author of this thesis)

Loughran and Ritter (2004) also argue for the presence of a 'dark side' of underwriters by stressing the possibility of agency problems occurring between underwriters and IPO issuers. This could well explain the phenomenon of IPO underpricing. Confirming the presence of the agency problem between IPO issuing firms and their underwriters, Loughran and Ritter (2002) argue that Credit Suisse First Boston was fined $100 million in 2002 due to receiving side payments for causing deliberate underpricing of underwritten offerings. Conceptually, Habib and Ljungqvist (2001) argue that the "principal-agent" model can be refuted if underpricing exists for firms underwriting their own offerings, since there is no conflict of interest and no asymmetric information to be concerned about. Muscarella and Vetsuypens (1989) examine the "principal-agent" model and find no underpricing difference between self-underwritten IPOs and non-self-underwritten IPOs, thus questioning the validity of the principal-agent model. Finally, the principal-agent model only captures the problem of information asymmetry between underwriters and IPO issuers. Yet it is silent on the problem of information asymmetry between investors and underwriters, issuers and investors, and informed and uninformed investors.

D.2. *Ex-ante* Uncertainty

Beatty and Ritter (1986) argue that underpricing of IPO firms should increase in response to an increase of "*ex-ante* uncertainty" related to the issuing firm as shown in Figure 19.

Figure 19: Information Asymmetry Based on *Ex-ante* Uncertainty Rationale



(Designed by the author of this thesis)

Jenkinson and Ljungqvist (2001) demonstrate that *ex-ante* uncertainty of the issuing firm with investors can, for example, include matters related to the age, size, use of IPO proceeds, and type of IPO firm. Ritter (1984) and Rock (1986) found that the degree of *ex-ante* uncertainty is a decreasing function of the age of the IPO firm. Engelen and van Essen (2010) discovered that younger firms create more *ex-ante* uncertainty about the value of the company; in turn investors demand higher underpricing for younger companies. Beatty and Ritter (1986) used IPO size to proxy for *ex-ante* uncertainty, where they empirically documented that larger offerings are normally offered by established firms, while smaller offerings are offered by speculative firms, naming this phenomenon "empirical regularity". Banerjee et al. (2011), Autore et al. (2014), and Butler et al. (2014) empirically documented the presence of a negative association between the size of the proceeds of IPO firms and the amount of underpricing investors seek to compensate for this risk.

Beatty and Ritter (1986) and Rock (1986) argued that information related to the use of IPO proceeds is useful in reducing *ex-ante* uncertainty because investors would be better informed about a firm's reasons for going public. Leone et al. (2007) found that disclosure of proceeds used for debt repayment purposes, as compared to non-debt repayment uses[61], increases *ex-ante* uncertainty regarding the true value of the firm. Prior literature discriminated between two types

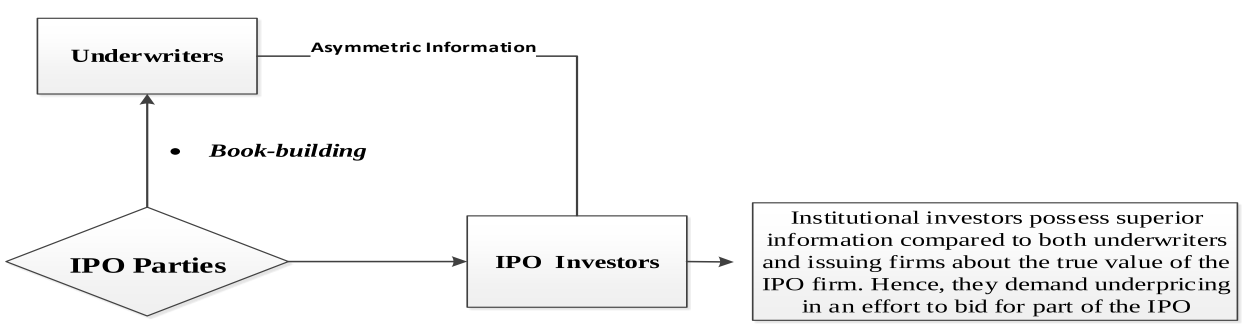
[61] Leone et al. (2007) classified non-debt repayment into using proceeds designated for expansion or acquisitions, research and development or product development, distribution to pre-IPO shareholders, advertising, marketing, promotion, or sales, etc.

of IPO firms, i.e. Privatisation and private companies (Ball et al. 2003; Darmadi & Gunawan 2013). Privatisation company IPOs often involve older firms and well known as relatively government regulated and well established industries, while private firm IPOs tend to be young, small, and relatively unknown (Jones et al. 1999). Fan et al. (2007) found that the *ex-ante* uncertainty of investors is higher for private firm IPOs than for Privatised IPOs. Although the "*ex-ante* uncertainty" hypothesis is empirically supported by Michaely and Shaw (1994), Mok and Hui (1998), and Brau and Fawcett (2006), it cannot explain the substantial underpricing that exists in some countries, particularly in developing markets (Loughran & Ritter 2002). Finally, the *ex-ante* uncertainty only captures the problem of information asymmetry between IPO issuers and investors. It does not capture the problem of information asymmetry between investors and underwriters, issuers and investors, and informed and uninformed investors.

D.3. Book-building

The book-building theories of Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), and Spatt and Srivastava (1991) collectively argue for the presence of asymmetric information between IPO issuers and institutional investors, assuming that institutional investors possess superior information than both underwriters and issuing firms as shown in Figure 20. Hence, the process of book-building reveals valuable information about an issuer by institutional investors. Underwriters compensate truth-telling institutional investors who bid aggressively, in turn, revealing favourable information with larger allocations of shares.

Figure 20: Information Asymmetry Based on Book-building Rationale



(Designed by the author of this thesis)

In contrast, underwriters compensate truth-conservative institutional investors who bid conservatively, in turn, revealing no information with smaller allocations of shares. Loughran and Ritter (2002) support the usefulness of the book-building theory for divulging valuation information about the issuer, but argue that the book-building theory only explains a small percentage of IPO discounts. It does not explain the enormous underpricing that occurs in other markets, including developing markets. Brau and Fawcett (2006) survey 336 U.S. chief financial officers (CFOs) to seek their explanations for IPO underpricing and find that CFOs provide little support for the book-building explanation of underpricing. This subsequently leads to questioning the validity of the model in explaining underpricing across countries.

Degeorge et al. (2007) argue that the book-building model used to be popular during the 1990s when IPO issuers had the option to choose between different selling methods including auctioning[62], fixed offer[63], book-building[64] best offer, and book-building firm commitment. For example, in France in the 1990s, for example, Degeorge et al. (2007) show that the IPO market was approximately divided between auctioned and book-built IPOs, while during the 2000s the auctions method becomes virtually extinct. In Japan, Kutsuna and Smith (2003) show that auctions rapidly disappeared after book-building was introduced in the Japanese IPO market. Ljungqvist et al. (2003) also document that nearly all countries' pre-existing IPO pricing mechanisms have vanished or lost significant market share when book-building entered the scene. Finally, the book-building model only captures the problem of information asymmetry between IPO issuers and investors and investors and underwriters. As well, the model does not capture the problem of information asymmetry between: firstly, issuers and investors; and secondly, informed and uninformed investors.

---

[62] According to Ljungqvist et al. (2003), the auction price method is defined as an offer price that is set in accordance with either discretionary or mandatory clearing rules. However, the allocations to bidders are not discretionary.

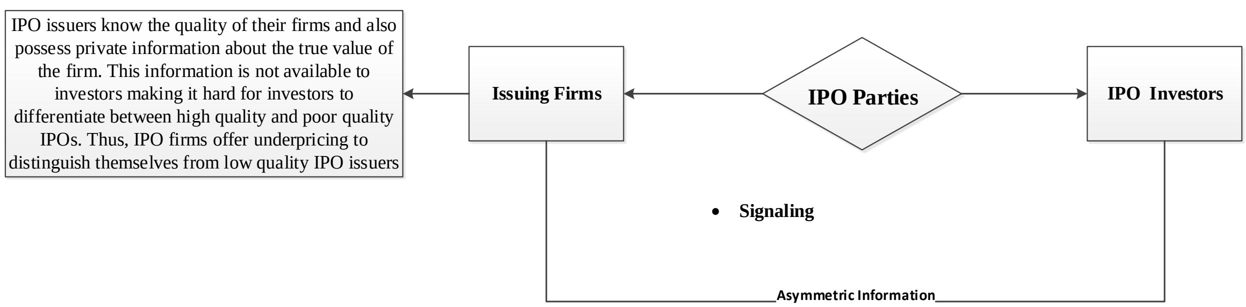
[63] Ljungqvist et al. (2003) defined the IPO fixed price method as an offer price that is set prior to the marketing of the offer to investors where the allocation decisions are not discretionary.

[64] Ljungqvist et al. (2003) also define the IPO book-building price method as an offer price that is set after the showcase conducted by an underwriter finishes, by soliciting indications of interest from investors and where the underwriter may have a full discretion over the allocation of shares. When an underwriter provides her or his commitment to the issuer to guarantee a successful offering, it is then obligated to sell all outstanding shares or buy them instead. In contrast, the book-building best effort method frees the underwriter from this obligation offering only his or her best intention to work diligently to provide a successful offering.

D.4. Signalling

The signalling models[65] of Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989) mutually assert that IPO firms' motivation to underprice is to "leave a good taste in investors' mouths", where these models infer that IPO firms possess private information related to their future cash flows and are aware of their present value, with such private information not made available to investors. Hence, the asymmetric information problem exists between the issuers and investors requiring issuers to offer their firms at a discount to investors as shown in Figure 21.

Figure 21: Information Asymmetry Based on Signalling Rationale



(Designed by the author of this thesis)

The intuition behind these signalling models is that low quality issuers will be unwilling to tolerate the cost of the signal in order to mimic high quality issuers, meaning that after an IPO takes place the type of issuer is revealed exogenously (Ljungqvist 2007). By bearing the high cost of the signal, high quality issuers are expected to make subsequent aftermarket decisions, including issuing seasoned equity offerings (SEOs), which should be received favourably by investors. This will enable them to recoup their losses from underpricing by an increase in the firm's market value (Jenkinson & Ljungqvist 2001). Opposed to the premise of "signalling" models, Spiess and Pettway (1997) Gale and Stiglitz (1989), Garfinkel (1993), Leleux and Muzyka (1997), Espenlaub and Tonks (1998), and Kennedy et al. (2006) provide empirical evidence that IPO companies do not recover underpricing costs after their first seasoned equity offering.

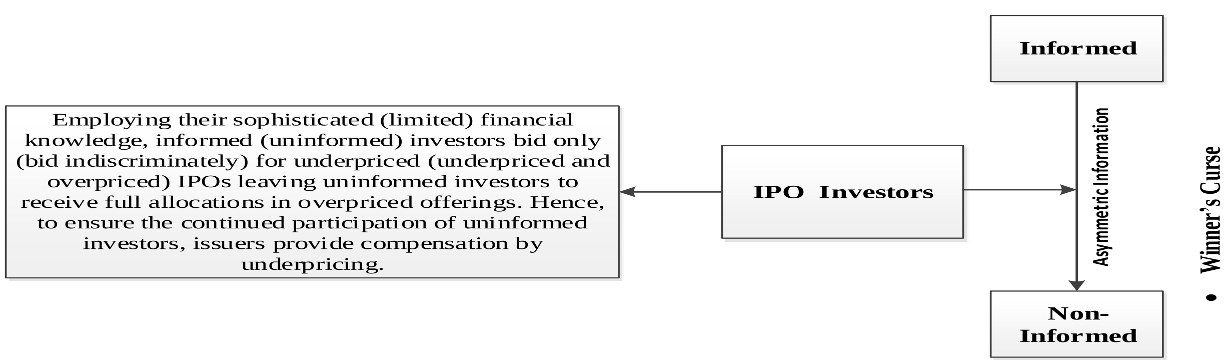
[65] Both Allen and Faulhaber (1989) and Welch (1989) employ underpricing as a quality "signal", while Grinblatt and Hwang (1989) employ both underpricing and ownership retention rate as a quality "signal".

The practicality of “signalling” models is also questioned by Ritter (2011), who describes them as “silly academic theories”, arguing that “it is unclear why underpricing is a more efficient signal than, say, committing to spend money on charitable donations or advertising”. Finally, the signalling model only captures the problem of information asymmetry between IPO issuers and investors while the model does not offer a remedy to the problem of information asymmetry between issuing firms and underwriters, investors and underwriters, and informed and uninformed investors.

D.5. Winner’s Curse

Rock (1986) introduces the “winner’s curse” hypothesis in response to asymmetric information between uninformed and informed investors, asserting that neither the issuer nor the underwriter are well informed compared to institutional investors, who are better informed about the true value of an IPO firm as shown in Figure 22.

Figure 22: Information Asymmetry Based on Winner’s Curse Rationale



(Designed by the author of this thesis)

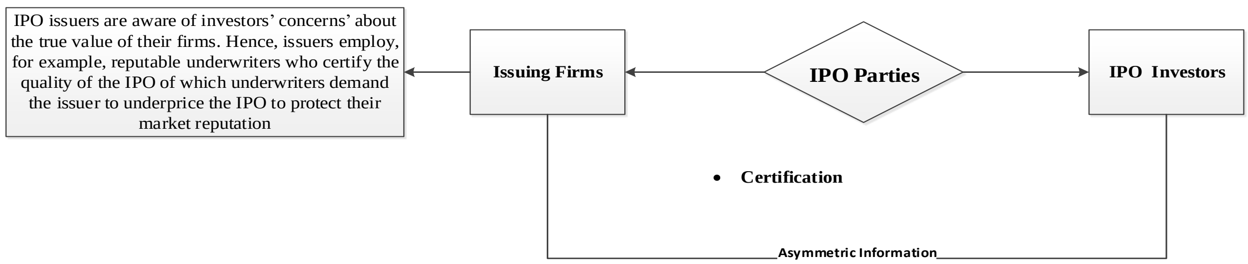
The author argues that institutional investors are indeed informed investors because they can employ their sophisticated financial knowledge to bid only for underpriced IPOs while uninformed investors employ their limited financial knowledge by biding indiscriminately for underpriced and overpriced IPOs. This information gap between informed and uninformed investors enables the latter to receive full allocations in overpriced offerings and create an “adverse selection” problem. Rock (1986) therefore argues that to ensure the perpetual participation of uninformed investors, issuers must provide compensation to alleviate "adverse selection" by underpricing. The winner's curse argument has enjoyed consistent empirical support as documented by Carter and Manaster (1990), Megginson and Weiss (1991), Michaely and Shaw (1994), Banu Durukan (2002), and Brau and Fawcett (2006). It is, however, questioned by Beatty and Welch (1996), Lam and Yap (1998), Loughran and Ritter (2002) and Liu and Ritter (2011) as not having enough power to explain the high degree of underpricing, for instance, in developing markets.

Additionally, Habib and Ljungqvist (2001) state that the winners' curse model assumes that the percentage of uninformed and informed investors are exogenously fixed. They argue that participation of uninformed investors can be determined endogenously by incurring promotion costs in order to reduce the "adverse selection" problem faced by these investors, thus leading to lower underpricing. Finally, the winners' curse model only captures the problem of information asymmetry between informed and uninformed investors. It does not provide an understanding of the problem of information asymmetry between issuing firms and underwriters, investors and underwriters, and IPO issuers and investors.

D.6. Certification

Booth and Smith (1986) develop a model based on the assumption of asymmetric information between insiders who are shareholders and outsiders who are prospective subscribers to new issues as shown in Figure 23. They suggest that issuing firms may be viewed as effectively "leasing" the brand name of an underwriter to certify that the issue price reflects available inside information. Consistent with this, Carter and Manaster (1990) show that the issuer's choice of underwriter reputation is inversely related to underpricing of IPOs.

Figure 23: Information Asymmetry Based on Certification Rationale



(Designed by the author of this thesis)

Hence, the certification hypothesis argues that underwriters, particularly reputable ones can effectively certify the fair valuation of the offer price of the IPO firm, in turn providing investors with a third party guarantee (Lee et al. 1996). In line with the certification hypothesis, Lee and Wahal (2004) argue that this third party can include certifying the quality of the IPO firm by associating the offering with underwriters, auditors, lawyers, and venture capitalists with established market reputation. The function of this third party is to provide extra quality certification to the issuers in exchange for reducing information asymmetry between the issuing firm and investors. The certification hypothesis receives favourable supporting evidence by Affleck-Graves et al. (1993), Chishty et al. (1996), Lin (1996), and Hamao et al. (2000). However, Tomczyk (1996) and Rasheed et al. (1997) reject it with evidence concerning the prediction of the certification hypothesis.

Marisetty and Subrahmanyam (2010) argue that the certification hypothesis does not provide an adequate explanation of the extreme underpricing in developing countries as most developing IPOs in those countries employ reputable underwriters. Yet they still suffer from large underpricing compared to the underpricing of IPO firms associated with non-reputable underwriters. Finally, the certification hypothesis only captures the problem of information asymmetry between issuers and investors. It does not provide an explanation concerning the problem of information asymmetry between issuing firms and underwriters, investors and underwriters, and informed and uninformed investors.

E. Institutional Explanations

The consideration of institutional explanations for IPO underpricing in the U.S. stock market has inspired the emergence of three dominant institutional-based theories, including lawsuit avoidance, price stabilization, and tax advantages hypotheses.

E.1. Lawsuit Avoidance

The existence of litigious characteristics of American investors has motivated the emergence of the lawsuit avoidance hypothesis. The likelihood of a linkage between IPO underpricing and litigation risk goes back to Logue (1973) and Ibbotson (1975), who propose that U.S. IPO issuers deliberately underprice the value of their firms at the time of offering to avoid potential litigation risk from disappointed investors due to poor post-IPO performance. That is, the consequence of a lawsuit not only directly inflicts damages on the defendants including financial damages resulting from incurred legal fees and diversion of management time, it also extends to indirect damage including loss of reputation, capital and the likelihood of incurring higher costs of raising capital in the future (Jenkinson & Ljungqvist 2001). This lawsuit avoidance rationale is further extended and theoretically modelled by other researchers including Tinic (1988), Hughes and Thakor (1992), and Hensler (1995). The empirical validity of the lawsuit avoidance hypothesis is tested by Lowry and Shu (2002) showing that approximately six percent of IPO firms in the U.S. were sued, with damages to plaintiffs averaging 13.3% of the proceeds of IPOs from 1988 and 1995.

The empirical validity of the lawsuit avoidance hypothesis is questioned by the contention that it is a U.S.-centric model, while the phenomenon of IPOs underpricing is global. This argument implies that the existence of a litigious culture among American investors may not exist in global settings, so this theoretical explanation may fail to explain underpricing around the world. Empirical evidence refuting the litigious effect of the lawsuit avoidance hypothesis on explaining IPO underpricing shows the absence this hypothesis having any economic significance in the U.K. (Jenkinson 1990), Japan (Beller et al. 1992),Finland (Keloharju 1993), Switzerland (Kunz & Aggarwal 1994), Sweden (Loughran et al. 1994), and Australia (Lee et al. 1996).

E.2. Price Stabilization

The price stabilization hypothesis arises as a second institutional explanation of IPO underpricing. The basic notion of this hypothesis relates to the price support service that IPO underwriters offer in relation to post-IPO price stabilization, whereby underwriters intervene in the aftermarket to reduce potential price drops for a few days or weeks. The theoretical concept of price stabilization was originally devised by Booth and Smith (1986), formalized by Benveniste et al. (1996), and proved its statistical validity in the U.S. market due to the empirical work carried out by Ruud (1993) and Ellis et al. (2000). However, the price stabilization rationale is criticised for being unobservable by investors, although it can be observed by market regulators. In other words, it is difficult to empirically know which IPO firms receive price support by underwriters and the magnitude and nature of this support is unknown to market participants (Jenkinson & Ljungqvist 2001). The lack of availability of such an exclusive dataset makes it a challenging task to examine the validity of the price stabilization hypothesis, especially in cross-country settings.

E.3. Tax Argument

The third institutional-based explanation for IPO underpricing is inspired by the trade-off between tax benefits and underpricing of IPO firms. Rydqvist (1997) empirically explores this tax benefit-based rationale in the Swedish IPO market and finds that before 1990, the Swedish tax system imposed a higher tax rate on employment income than capital gains. This created an inducement to pay employees by allocating appreciating assets in exchange for wages, and the offering of underpriced shares was a form of appreciating assets. Once the Swedish tax system was changed in 1990 to remove the higher tax on underpricing-related gains, thus removing management inducement to allocate underpriced shares to employees, the degree of IPO underpricing dropped from 41% in 1980-1989 to eight percent in 1990-1994. Similar evidence was documented in the U.S. IPO market by Guenther and Willenborg (1999) and Taranto (2003). However, this tax benefits argument for underpricing may not be useful in explaining the high degree of IPO underpricing observed in tax-free countries, such as the oil- and gas-rich countries[66] where average IPO underpricing is around 250.17%, making the tax hypothesis questionable (Uddin & Raj 2012).

[66] Underpricing figure is average underpricing for the six Arabian Gulf countries, i.e. Saudi Arabia, United Arab Emirates (UAE), Kuwait, Qatar, Bahrain, and Oman.

F. Ownership and Control Reasons

Ownership and control theories contend that IPO underpricing works as an effective mechanism in shaping the shareholder base in order to deter outside investors from intervening in managing their firms once they are publicly listed. In addition, the existence of the agency problem due to the separation of ownership and control, means that misalignment could exist between managing and non-managing shareholders (Jensen & Meckling 1976). The outcome, for example, of this misalignment is that managers can exploit their controlling authority to maximise their expected private benefits at the expense of outside shareholders. Based on the above rationale, two main hypotheses emerged to explain the underpricing phenomenon, namely, the entrenchment of managerial control and agency costs hypotheses.

F.1. Entrenchment Managerial Control

The entrenchment of managerial control hypothesis is that owners or managers of IPO firms employ underpricing as a tool to maximise their control over the management of their firms by ensuring greater ownership dispersion (Shleifer & Vishny 1989). This hypothesis is empirically examined by Brennan and Franks (1997), who conclude that managers of U.K. IPO firms protect their private benefits by strategically allocating underpriced shares to small outside investors. The authors interpret this opportunistic behaviour as a strategy those managers tactically adopt when they fear the consequence of close internal monitoring resulting from involving large block investors in the decision-making of their firms. That is, the presence of a widely fragmented post-IPO ownership offers reduced external monitoring, allowing insiders, such as managing owners and managers to have entrenched control over the company's management (Booth & Chua 1996). Therefore, underpricing works to create excess demand enabling self-driven managers to ration share allocation in order to ensure wider ownership dispersion, leading to greater control of management operations.

Although the validity of the entrenchment of managerial control hypothesis has been empirically proven by Mikkelson et al. (1997) and Pagano and Panetta (1998), it has been criticised for not being an efficient way to protect private benefits of control. Engelen and van Essen (2010) argue against the managerial control explanation. They contend that this mechanism might provide a rational elucidation for underpricing in the U.K. and U.S., but not in many continental European and developing countries as IPO issuers in those nations normally sell a small portion of their secondary shares after going public, hence they need not underprice to retain control over the firm[67]. Khurshed and Chahine (2007) provided support for the argument raised by Engelen and van Essen (2010), i.e. the rationale of the managerial control explanation weakly explains whether block-holder ownership verifies the difference between family and non-family IPOs in France. Moreover, Wang (2005) rejected the rationale of the managerial control hypothesis in explaining IPO underpricing in China.

Authors criticised the managerial control explanation for not being an efficient way to protect private benefits of control. For example, Field and Karpoff (2002) argue that instead of ensuring fragmented post-IPO ownership through the offering of underpriced shares, IPO firms can protect their private benefit of control by issuing non-voting shares when they go public. Conceptually, if the degree of underpricing of IPOs with voting shares is higher than IPOs with non-voting shares then it can be said that the managerial control hypothesis is a good theoretical candidate to explain the phenomenon of IPO underpricing (Jenkinson & Ljungqvist 2001). Smart and Zutter (2003) empirically find the degree of underpricing of U.S. IPO firms that issue voting shares is higher than IPO firms that issue non-voting stocks. Field and Sheehan (2004) empirically detect no significant relationship between IPO underpricing and the creation of post-IPO shareholding domination. Finally, the managerial control hypothesis treats the employment of reputable underwriters by the issuers of IPO firms as an exogenous decision ignoring the choice of the underwriter as decided by the issuers. This happens when issuers intend to sell part of their holding before going public, and ignoring this endogeneity leads to omitted variable bias as argued by Habib and Ljungqvist (2001), Chen and Mohan (2002), Chahine (2008) Mantecon and Poon (2009), and Jones and Swaleheen (2010). In this way, the validity of the entrenchment managerial control hypothesis is questionable.

[67] The results of the mean and median equality tests of the unequal variance are documented in Table 7 in relation to the average of the proportion of secondary and primary shares sold in developing countries. They show developing IPO issuers compared to developed ones sell and create fewer shares and the difference is significant at the 1% level, thus providing strong support for Engelen and van Essen’s (2010) argument.

F.2. Agency Costs

The prediction of the agency costs hypothesis is contrary to the prediction of the entrenchment of managerial control hypothesis of IPO underpricing proposed by Brennan and Franks (1997). The agency costs hypothesis proposes that due to a separation of ownership and control, misalignment might exist between non-managing shareholders and managers. Thus, Stoughton and Zechner (1998) argue that owners of IPO firms underprice their firms when they go public, aiming to attract large block-holders who might work as an internal monitoring agent of their firms to minimise agency problems between managers and shareholders. This in turn leads to maximising the value of their firms post-offering. However, Field and Sheehan (2004) empirically find no supporting evidence of the relationship between IPO underpricing and the creation of post-IPO shareholding, thus questioning the rationale of the agency costs hypothesis.

G. Behavioural Explanation

Ljungqvist (2007) argues that the substantial amount of money left on the table by U.S. IPO issuers accounted for approximately $62 billion in 1999 and 2000, and that such substantial losses of issuer wealth has induced researchers to turn to behavioural explanations for IPO underpricing. In this section, the presence of informational cascades as a behavioural explanation is discussed where the central argument is that the IPO market is prone to the presence of ‘irrational’ investors who bid up the price of IPO shares beyond their true value.

G.1. Informational Cascades

Welch (1992) develops a model showing that ‘informational cascades’ can occur amongst IPO investors in an attempt to explain the presence of IPO underpricing based on the irrational investor argument. The author contends that IPO investors formulate their investment actions sequentially, whereby the bids of later investors are conditioned on the bids of earlier investors, irrationally ignoring their own information. When latter investors observe the presence of a number of successful initial sales by earlier investors, then later investors reach an understanding that earlier investors possess some form of favourable information. Subsequently, later investors disregard their own information and invest in whatever earlier investors invest in (Jegadeesh et al. 1993). In contrast, when later investors observe the presence of a number of unsuccessful initial sales by earlier investors, then later investors withdraw their intention to invest irrespective of their own information. Due to the presence of this irrational investment behaviour, demand can be either low or, alternatively, snowballs over time (Pollock et al. 2008).

Welch (1992) argues that the likelihood of cascades provides early investors with power to 'demand' further underpricing in order to commit to purchasing IPO shares, thus ensuring continuity of a positive cascade. Hence, the presence of informational cascades among IPO investors can explain IPO underpricing. However, the possibility of empirically examining the presence of informational cascades among IPO investors requires the availability of exclusive information that shows bid patterns of IPO shares on the first trading day, something that might only be available in advanced countries where sophisticated and transparent trading systems are available. However, the empirical validity of the informational cascades hypothesis is proven amongst Israeli IPO investors (Amihud et al. 2003) and also amongst U.S. IPO investors (Pollock et al. 2008). However, employing the informational cascades hypothesis to explain differences in IPO underpricing across stock markets may be difficult due to the unavailability of exclusive information that shows the bid patterns of IPO shares on the first trading day in cross-country settings.

References

Abdi, M & Aulakh, PS 2012, 'Do country-level institutional frameworks and interfirm governance arrangements substitute or complement in international business relationships?', *Journal of International Business Studies*, vol. 43, no. 5, pp. 477-97.

Abrahamson, M, Jenkinson, T & Jones, H 2011, 'Why don't US issuers demand European fees for IPOs?', *The Journal of Finance*, vol. 66, no. 6, pp. 2055-82.

Acharya, V, Amihud, Y & Litov, L 2011, 'Creditor rights and corporate risk-taking', *Journal of Financial Economics*, vol. 102, no. 1, pp. 150-66.

Adams, M, Thornton, B & Hall, G 2008, 'IPO pricing phenomena: empirical evidence of behavioral biases', *Journal of Business & Economics Research*, vol. 6, no. 4, pp. 67-74.

Affleck-Graves, J, Hegde, SP, Miller, RE & Reilly, FK 1993, 'The effect of the trading system on the underpricing of initial public offerings', *Financial Management*, vol. 22, no. 1, pp. 99-108.

Aggarwal, R & Goodell, JW 2010, 'Financial markets versus institutions in European countries: Influence of culture and other national characteristics', *International Business Review*, vol. 19, no. 5, pp. 502-20.

Aggarwal, R, Kearney, C & Lucey, B 2012, 'Gravity and culture in foreign portfolio investment', *Journal of Banking & Finance*, vol. 36, no. 2, pp. 525-38.

Aguilera, RV 2005, 'Corporate governance and director accountability: An institutional comparative perspective', *British Journal of Management*, vol. 16, no. s1, pp. S39-S53.

Akdeniz, MB & Talay, MB 2013, 'Cultural variations in the use of marketing signals: A multilevel analysis of the motion picture industry', *Journal of the Academy of Marketing Science*, vol. 41, no. 5, pp. 601-24.

Akkus, O, Cookson, JA & Hortacsu, A 2016, *Assortative matching and reputation in the market for first issues*, <**https://mays.tamu.edu/department-of-finance/wp-content/uploads/sites/2/2016/03/IPOUnderpricing_YS.pdf**>.

Alavi, A, Pham, PK & Pham, TM 2008, 'Pre-IPO ownership structure and its impact on the IPO process', *Journal of Banking & Finance*, vol. 32, no. 11, pp. 2361-75.

Allen, F & Faulhaber, GR 1989, 'Signalling by underpricing in the IPO market', *Journal of Financial Economics*, vol. 23, no. 2, pp. 303-23.

Altı, A 2005, 'IPO market timing', *The Review of Financial Studies*, vol. 18, no. 3, pp. 1105-38.

Amihud, Y, Hauser, S & Kirsh, A 2003, 'Allocations, adverse selection, and cascades in IPOs: Evidence from the Tel Aviv Stock Exchange', *Journal of Financial Economics*, vol. 68, no. 1, pp. 137-58.

Anginer, D, Demirguc-Kunt, A, Huizinga, H & Ma, K 2016, 'Corporate governance and bank capitalization strategies', *Journal of Financial Intermediation*, vol. 26, no. 1, pp. 1-27.

—— 2018, 'Corporate governance of banks and financial stability', *Journal of Financial Economics*, vol. 130, no. 2, pp. 327-46.

Anokhin, S & Schulze, WS 2009, 'Entrepreneurship, innovation, and corruption', *Journal of Business Venturing*, vol. 24, no. 5, pp. 465-76.

Antonakis, J, Bendahan, S, Jacquart, P & Lalive, R 2014, 'Causality and endogeneity: Problems and solutions', in The Oxford Handbook of Leadership and Organizations, New York: Oxford University Press, pp. 93-117.

Ashbaugh-Skaife, H, Collins, DW & LaFond, R 2006, 'The effects of corporate governance on firms' credit ratings', *Journal of Accounting and Economics*, vol. 42, no. 1, pp. 203-43.

Asongu, SA 2012, 'Government quality determinants of stock market performance in African countries', *Journal of African Business*, vol. 13, no. 3, pp. 183-99.

Autore, D, Smart, SB, Boulton, TJ & Zutter, CJ 2014, 'The impact of institutional quality on initial public offerings', *Journal of Economics and Business*, vol. 73, no. 1, pp. 65-96.

Bae, KH, Lim, C & Wei, KJ 2006, 'Corporate governance and conditional skewness in the world's stock markets', *The Journal of Business*, vol. 79, no. 6, pp. 2999-3028.

Ball, R, Robin, A & Wu, JS 2003, 'Incentives versus standards: properties of accounting income in four East Asian countries', *Journal of Accounting and Economics*, vol. 36, no. 1, pp. 235-70.

Banerjee, S, Dai, L & Shrestha, K 2011, 'Cross-country IPOs: What explains differences in underpricing?', *Journal of Corporate Finance*, vol. 17, no. 5, pp. 1289-305.

Banu Durukan, M 2002, 'The relationship between IPO returns and factors influencing IPO performance: Case of Istanbul Stock Exchange', *Managerial Finance*, vol. 28, no. 2, pp. 18-38.

Barkemeyer, R, Preuss, L & Ohana, M 2018, 'Developing country firms and the challenge of corruption: Do company commitments mirror the quality of national-level institutions?', *Journal of Business Research*, vol. 90, no. 1, pp. 26-39.

Baron, DP 1982, 'A model of the demand for investment banking advising and distribution services for new issues', *The Journal of Finance*, vol. 37, no. 4, pp. 955-76.

Baron, DP & Holmström, B 1980, 'The investment banking contract for new issues under asymmetric information: Delegation and the incentive problem', *The Journal of Finance*, vol. 35, no. 5, pp. 1115-38.

Baschieri, G, Carosi, A & Mengoli, S 2015, 'Local IPOs, local delistings, and the firm location premium', *Journal of Banking & Finance*, vol. 53, no. 1, pp. 67-83.

Baum, CF, Schaffer, ME & Stillman, S 2007, 'Enhanced routines for instrumental variables/GMM estimation and testing', *Stata Journal*, vol. 7, no. 4, pp. 465-506.

Beatty, RP & Ritter, JR 1986, 'Investment banking, reputation, and the underpricing of initial public offerings', *Journal of Financial Economics*, vol. 15, no. 1, pp. 213-32.

Beatty, RP & Welch, I 1996, 'Issuer expenses and legal liability in initial public offerings', *The Journal of Law and Economics*, vol. 39, no. 2, pp. 545-602.

Beck, T, Demirgüç-Kunt, A & Maksimovic, V 2004, 'Bank competition and access to finance: International evidence', *Journal of Money, Credit and Banking*, vol. 36, no. 3, pp. 627-48.

Beller, AL, Terai, T & Levine, RM 1992, 'Looks can be deceiving: a comparison of initial public offering procedures under Japanese and US securities laws', *Law and Contemporary Problems*, vol. 55, no. 4, pp. 77-118.

Belsley, DA, Kuh, E & Welsch, RE 2005, *Regression diagnostics: Identifying influential data and sources of collinearity*, John Wiley & Sons, USA, New York.

Bénassy-Quéré, A, Coupet, M & Mayer, T 2007, 'Institutional determinants of foreign direct investment', *The World Economy*, vol. 30, no. 5, pp. 764-82.

Benninga, S, Helmantel, M & Sarig, O 2005, 'The timing of initial public offerings', *Journal of Financial Economics*, vol. 75, no. 1, pp. 115-32.

Benveniste, LM, Busaba, WY & Wilhelm, WJ 1996, 'Price stabilization as a bonding mechanism in new equity issues', *Journal of Financial Economics*, vol. 42, no. 2, pp. 223-55.

—— 2002, 'Information externalities and the role of underwriters in primary equity markets', *Journal of Financial Intermediation*, vol. 11, no. 1, pp. 61-86.

Benveniste, LM, Ljungqvist, A, Wilhelm, WJ & Yu, X 2003, 'Evidence of information spillovers in the production of investment banking services', *The Journal of Finance*, vol. 58, no. 2, pp. 577-608.

Benveniste, LM & Spindt, PA 1989, 'How investment bankers determine the offer price and allocation of new issues', *Journal of Financial Economics*, vol. 24, no. 2, pp. 343-61.

Benveniste, LM & Wilhelm, WJ 1990, 'A comparative analysis of IPO proceeds under alternative regulatory environments', *Journal of Financial Economics*, vol. 28, no. 1, pp. 173-207.

Berglöf, E & Pajuste, A 2005, 'What do firms disclose and why? Enforcing corporate governance and transparency in Central and Eastern Europe', *Oxford Review of Economic Policy*, vol. 21, no. 2, pp. 178-97.

Bhagat, S & Bolton, B 2008, 'Corporate governance and firm performance', *Journal of Corporate Finance*, vol. 14, no. 3, pp. 257-73.

Bhattacharya, U, Daouk, H & Welker, M 2003, 'The world price of earnings opacity', *The Accounting Review*, vol. 78, no. 3, pp. 641-78.

Bhojraj, S & Sengupta, P 2003, 'Effect of corporate governance on bond ratings and yields: The role of institutional investors and outside directors*', *The Journal of Business*, vol. 76, no. 3, pp. 455-75.

Biddle, GC & Hilary, G 2006, 'Accounting quality and firm-level capital investment', *The Accounting Review*, vol. 81, no. 5, pp. 963-82.

Bjørnskov, C 2008, 'Social trust and fractionalization: A possible reinterpretation', *European Sociological Review*, vol. 24, no. 3, pp. 271-83.

Black, BS 2001, 'The legal and institutional preconditions for strong securities markets', vol. 48, pp. 781-855.

Boolaky, PK & Cooper, BJ 2015, 'Comparing the strength of auditing and reporting standards and investigating their predictors in Europe and Asia', *Australian Accounting Review*, vol. 25, no. 3, pp. 292-308.

Booth, JR & Chua, L 1996, 'Ownership dispersion, costly information, and IPO underpricing', *Journal of Financial Economics*, vol. 41, no. 2, pp. 291-310.

Booth, JR & Smith , RL 1986, 'Capital raising, underwriting and the certification hypothesis', *Journal of Financial Economics*, vol. 15, no. 1, pp. 261-81.

Booth, L, Aivazian, V, Demirguc-Kunt, A & Maksimovic, V 2001, 'Capital structures in developing countries', *The Journal of Finance*, vol. 56, no. 1, pp. 87-130.

Boulton, TJ, Smart, SB & Zutter, CJ 2010, 'IPO underpricing and international corporate governance', *Journal of International Business Studies*, vol. 41, no. 2, pp. 206-22.

—— 2011, 'Earnings quality and international IPO underpricing', *The Accounting Review*, vol. 86, no. 2, pp. 483-505.

—— 2017, 'Conservatism and international IPO underpricing', *Journal of International Business Studies*, vol. 48, no. 6, pp. 763-85.

Bradley, D, Pantzalis, C & Yuan, X 2016, 'The influence of political bias in state pension funds', *Journal of Financial Economics*, vol. 119, no. 1, pp. 69-91.

Bradley, DJ, Cooney, JW, Jordan, BD & Singh, AK 2004, 'Negotiation and the IPO offer price: A comparison of integer vs. non-integer IPOs', *Journal of Financial and Quantitative Analysis*, vol. 39, no. 3, pp. 517-40.

Brannen, MY & Salk, JE 2000, 'Partnering across borders: Negotiating organizational culture in a German-Japanese joint venture', *Human Relations*, vol. 53, no. 4, pp. 451-87.

Brau, JC & Fawcett, SE 2006, 'Initial public offerings: An analysis of theory and practice', *The Journal of Finance*, vol. 61, no. 1, pp. 399-436.

Brennan, MJ & Franks, J 1997, 'Underpricing, ownership and control in initial public offerings of equity securities in the UK', *Journal of Financial Economics*, vol. 45, no. 3, pp. 391-413.

Bris, A, Brisley, N & Cabolis, C 2008, 'Adopting better corporate governance: Evidence from cross-border mergers', *Journal of Corporate Finance*, vol. 14, no. 3, pp. 224-40.

Brockman, P & Chung, DY 2003, 'Investor protection and firm liquidity', *The Journal of Finance*, vol. 58, no. 2, pp. 921-38.

Bruton, GD, Filatotchev, I, Chahine, S & Wright, M 2010, 'Governance, ownership structure, and performance of IPO firms: The impact of different types of private equity investors and institutional environments', *Strategic Management Journal*, vol. 31, no. 5, pp. 491-509.

Buchanan, BG, Le, QV & Rishi, M 2012, 'Foreign direct investment and institutional quality: Some empirical evidence', *International Review of Financial Analysis*, vol. 21, no. 1, pp. 81-9.

Butler, AW, Keefe, MOC & Kieschnick, R 2014, 'Robust determinants of IPO underpricing and their implications for IPO research', *Journal of Corporate Finance*, vol. 27, no. 1, pp. 367-83.

Cai, K & Zhu, H 2015, 'Cultural distance and foreign IPO underpricing variations', *Journal of Multinational Financial Management*, vol. 29, pp. 99-114.

Callen, JL, Morel, M & Richardson, G 2011, 'Do culture and religion mitigate earnings management? Evidence from a cross-country analysis', *International Journal of Disclosure and Governance*, vol. 8, no. 2, pp. 103-21.

Cameron, AC & Miller, DL 2015, 'A practitioner’s guide to cluster-robust inference', *Journal of Human Resources*, vol. 50, no. 2, pp. 317-72.

Cao, M & Shi, S 2006, 'Signaling in the Internet craze of initial public offerings', *Journal of Corporate Finance*, vol. 12, no. 4, pp. 818-33.

Carter, R & Manaster, S 1990, 'Initial public offerings and underwriter reputation', *The Journal of Finance*, vol. 45, no. 4, pp. 1045-67.

Carter, RB, Dark, FH & Singh, AK 1998, 'Underwriter reputation, initial returns, and the long-run performance of IPO stocks', *The Journal of Finance*, vol. 53, no. 1, pp. 285-311.

Chahine, S 2008, 'Underpricing versus gross spread: New evidence on the effect of sold shares at the time of IPOs', *Journal of Multinational Financial Management*, vol. 18, no. 2, pp. 180-96.

Chahine, S, Filatotchev, I & Wright, M 2007, 'Venture capitalists, business angels, and performance of entrepreneurial IPOs in the UK and France', *Journal of Business Finance & Accounting*, vol. 34, no. 3-4, pp. 505-28.

Chan, K, Wang, J & Wei, KJ 2004, 'Underpricing and long-term performance of IPOs in China', *Journal of Corporate Finance*, vol. 10, no. 3, pp. 409-30.

Chang, C, Chiang, Y-M, Qian, Y & Ritter, JR 2017, 'Pre-market trading and IPO pricing', *The Review of Financial Studies*, vol. 30, no. 3, pp. 835-65.

Chen, A & Kao, L 2006, 'The benefit of excluding institutional investors from fixed-price IPOs: Evidence from Taiwan', *Emerging Markets Finance and Trade*, vol. 42, no. 6, pp. 5-24.

Chen, CR & Mohan, NJ 2002, 'Underwriter spread, underwriter reputation, and IPO underpricing: A simultaneous equation analysis', *Journal of Business Finance & Accounting*, vol. 29, no. 3-4, pp. 521-40.

Chen, D, Guan, Y, Zhang, T & Zhao, G 2017, 'Political connection of financial intermediaries: Evidence from China's IPO market', *Journal of Banking & Finance*, vol. 76, no. 1, pp. 15-31.

Chen, KC, Chen, Z & Wei, KJ 2009, 'Legal protection of investors, corporate governance, and the cost of equity capital', *Journal of Corporate Finance*, vol. 15, no. 3, pp. 273-89.

Chen, S, Sun, Z, Tang, S & Wu, D 2011, 'Government intervention and investment efficiency: Evidence from China', *Journal of Corporate Finance*, vol. 17, no. 2, pp. 259-71.

Chishty, MR, Hasan, I & Smith, SD 1996, 'A note on underwriter competition and initial public offerings', *Journal of Business Finance & Accounting*, vol. 23, no. 5-6, pp. 905-14.

Chourou, L, Saadi, S & Hui, Z 2018, 'How does national culture influence IPO underpricing?', *Pacific-Basin Finance Journal*, vol. 51, no. 1, pp. 318-41.

Chowdhry, B & Sherman, A 1996, 'International differences in oversubscription and underpricing of IPOs', *Journal of Corporate Finance*, vol. 2, no. 4, pp. 359-81.

Christiansen, C, Ranaldo, A & Söderlind, P 2011, 'The time-varying systematic risk of carry trade strategies', *Journal of Financial and Quantitative Analysis*, vol. 46, no. 4, pp. 1107-25.

Chui, AC, Lloyd, AE & Kwok, CC 2002, 'The determination of capital structure: is national culture a missing piece to the puzzle?', *Journal of International Business Studies*, vol. 33, no. 1, pp. 99-127.

Colaco, HM, Ghosh, C, Knopf, JD & Teall, JL 2009, 'IPOs, clustering, indirect learning and filing independently', *Journal of Banking & Finance*, vol. 33, no. 11, pp. 2070-9.

Core, JE, Guay, WR & Rusticus, TO 2006, 'Does weak governance cause weak stock returns? An examination of firm operating performance and investors' expectations', *The Journal of Finance*, vol. 61, no. 2, pp. 655-87.

Cornelli, F, Goldreich, D & Ljungqvist, A 2006, 'Investor sentiment and pre-IPO markets', *The Journal of Finance*, vol. 61, no. 3, pp. 1187-216.

Costa, BA, Crawford, A & Jakob, K 2013, 'Does culture influence IPO underpricing?', *Journal of Multinational Financial Management*, vol. 23, no. 1, pp. 113-23.

Cragg, JG & Donald, SG 1993, 'Testing identifiability and specification in instrumental variable models', *Econometric Theory*, vol. 9, no. 2, pp. 222-40.

Cumming, D, Hou, W & Lee, E 2014, 'Sustainable and ethical entrepreneurship, corporate finance and governance, and institutional reform in China', *Journal of Business Ethics*, vol. 134, no. 4, pp. 505-8.

Curtis, MB, Conover, TL & Chui, LC 2012, 'A cross-cultural study of the influence of country of origin, justice, power distance, and gender on ethical decision making', *Journal of International Accounting Research*, vol. 11, no. 1, pp. 5-34.

Daily, CM, Certo, ST, Dalton, DR & Roengpitya, R 2003, 'IPO underpricing: A meta-analysis and research synthesis', *Entrepreneurship Theory and Practice*, vol. 27, no. 3, pp. 271-95.

Dang, M, Henry, D, Yin, X & Vo, TA 2018, 'Target corporate governance, acquirers' location choices, and partial acquisitions', *Pacific-Basin Finance Journal*, vol. 50, no. 1, pp. 82-104.

Daouk, H, Lee, C & Ng, D 2006, 'Capital market governance: How do security laws affect market performance?', *Journal of Corporate Finance*, vol. 12, no. 3, pp. 560-93.

Darmadi, S & Gunawan, R 2013, 'Underpricing, board structure, and ownership: An empirical examination of Indonesian IPO firms', *Managerial Finance*, vol. 39, no. 2, pp. 181-200.

De la Croix, D & Gobbi, PE 2017, 'Population Density, Fertility, and Demographic Convergence in Developing Countries', *Journal of Development Economics*, vol. 127, no. 1, pp. 13-24.

De la Torre, A, Gozzi, JC & Schmukler, SL 2007, 'Stock market development under globalization: Whither the gains from reforms?', *Journal of Banking & Finance*, vol. 31, no. 6, pp. 1731-54.

Degeorge, F, Derrien, F & Womack, KL 2007, 'Analyst hype in IPOs: explaining the popularity of bookbuilding', *The Review of Financial Studies*, vol. 20, no. 4, pp. 1021-58.

Demers, E & Lewellen, K 2003, 'The marketing role of IPOs: evidence from internet stocks', *Journal of Financial Economics*, vol. 68, no. 3, pp. 413-37.

Dewandaru, G, Rizvi, SAR, Bacha, OI & Masih, M 2014, 'What factors explain stock market retardation in Islamic Countries', *Emerging Markets Review*, vol. 19, no. 1, pp. 106-27.

Dewenter, KL & Malatesta, PH 1997, 'Public offerings of state-owned and privately-owned enterprises: An international comparison', *The Journal of Finance*, vol. 52, no. 4, pp. 1659-79.

Dollar, D & Kraay, A 2003, 'Institutions, trade, and growth', *Journal of Monetary Economics*, vol. 50, no. 1, pp. 133-62.

Dolvin, SD & Jordan, BD 2008, 'Underpricing, overhang, and the cost of going public to preexisting shareholders', *Journal of Business Finance & Accounting*, vol. 35, no. 3-4, pp. 434-58.

Dorn, D 2009, 'Does sentiment drive the retail demand for IPOs?', *Journal of Financial and Quantitative Analysis*, vol. 44, no. 1, pp. 85-108.

Drobetz, W, Grüninger, MC & Hirschvogl, S 2010, 'Information asymmetry and the value of cash', *Journal of Banking & Finance*, vol. 34, no. 9, pp. 2168-84.

Dumay, X 2009, 'Origins and consequences of schools’ organizational culture for student achievement', *Educational Administration Quarterly*, vol. 45, no. 4, pp. 523-55.

Easley, D & O'hara, M 2004, 'Information and the cost of capital', *The Journal of Finance*, vol. 59, no. 4, pp. 1553-83.

Ekkayokkaya, M & Pengniti, T 2012, 'Governance reform and IPO underpricing', *Journal of Corporate Finance*, vol. 18, no. 2, pp. 238-53.

Ellis, K, Michaely, R & O'hara, M 2000, 'When the underwriter is the market maker: An examination of trading in the IPO aftermarket', *The Journal of Finance*, vol. 55, no. 3, pp. 1039-74.

Enders, CK & Tofighi, D 2007, 'Centering predictor variables in cross-sectional multilevel models: A new look at an old issue', *Psychological Methods*, vol. 12, no. 2, p. 121.

Engelen, P-J & van Essen, M 2010, 'Underpricing of IPOs: Firm-, issue-and country-specific characteristics', *Journal of Banking & Finance*, vol. 34, no. 8, pp. 1958-69.

Espenlaub, S & Tonks, I 1998, 'Post-IPO directors’ sales and reissuing activity: An empirical test of IPO signalling models', *Journal of Business Finance & Accounting*, vol. 25, no. 9-10, pp. 1037-79.

Essen, M, Engelen, PJ & Carney, M 2013, 'Does “good” corporate governance help in a crisis? The impact of country-and firm-level governance mechanisms in the European financial crisis', *Corporate Governance: An International Review*, vol. 21, no. 3, pp. 201-24.

Estrin, S & Prevezer, M 2011, 'The role of informal institutions in corporate governance: Brazil, Russia, India, and China compared', *Asia Pacific Journal of Management*, vol. 28, no. 1, pp. 41-67.

EY Global IPO 2017, *Global IPO trends: Q4 2017*, Ernst and Young, <**https://www.ey.com/Publication/vwLUAssets/ey-global-ipo-trends-q4-2017/$FILE/ey-global-ipo-trends-q4-2017.pdf**>.

Fama, EF & French, KR 2002, 'Testing trade-off and pecking order predictions about dividends and debt', *The Review of Financial Studies*, vol. 15, no. 1, pp. 1-33.

Fan, JP & Wong, TJ 2005, 'Do external auditors perform a corporate governance role in emerging markets? Evidence from East Asia', *Journal of Accounting Research*, vol. 43, no. 1, pp. 35-72.

Fan, JP, Wong, TJ & Zhang, T 2007, 'Politically connected CEOs, corporate governance, and Post-IPO performance of China's newly partially privatized firms', *Journal of Financial Economics*, vol. 84, no. 2, pp. 330-57.

Fang, LH 2005, 'Investment bank reputation and the price and quality of underwriting services', *The Journal of Finance*, vol. 60, no. 6, pp. 2729-61.

Fauver, L, Loureiro, G & Taboada, AG 2017, 'The impact of regulation on information quality and performance around seasoned equity offerings: International evidence', *Journal of Corporate Finance*, vol. 44, no. 1, pp. 73-98.

Fernandes, N & Ferreira, MA 2008, 'Does international cross-listing improve the information environment', *Journal of Financial Economics*, vol. 88, no. 2, pp. 216-44.

—— 2009, 'Insider trading laws and stock price informativeness', *The Review of Financial Studies*, vol. 22, no. 5, pp. 1845-87.

Fidrmuc, JP & Jacob, M 2010, 'Culture, agency costs, and dividends', *Journal of Comparative Economics*, vol. 38, no. 3, pp. 321-39.

Field, LC & Karpoff, JM 2002, 'Takeover defenses of IPO firms', *The Journal of Finance*, vol. 57, no. 5, pp. 1857-89.

Field, LC & Sheehan, DP 2004, 'IPO underpricing and outside blockholdings', *Journal of Corporate Finance*, vol. 10, no. 2, pp. 263-80.

Fitza, M & Dean, TJ 2016, 'How much do VCS and underwriters matter? A comparative investigation of venture capitalist and underwriter effects on IPO underpricing', *Venture Capital*, vol. 18, no. 2, pp. 95-114.

Franzke, SA 2003, 'Underpricing of venture-backed and non venture-backed IPOs: Germany’s Neuer markt', *Advances in Financial Economics*, vol. 10, no. 1, pp. 201 - 30.

Fratzscher, M & Imbs, J 2009, 'Risk sharing, finance, and institutions in international portfolios', *Journal of Financial Economics*, vol. 94, no. 3, pp. 428-47.

G20 Turkey 2015, *The G20 and the World* viewed 2015 20 June, <**http://g20.org.tr/about-g20/g20-members/g20-world/**>.

Gale, I & Stiglitz, JE 1989, 'The informational content of initial public offerings', *The Journal of Finance*, vol. 44, no. 2, pp. 469-77.

Gallego-Álvarez, I & Ortas, E 2017, 'Corporate environmental sustainability reporting in the context of national cultures: A quantile regression approach', *International Business Review*, vol. 26, no. 2, pp. 337-53.

Garfinkel, JA 1993, 'IPO underpricing, insider selling and subsequent equity offerings: Is underpricing a signal of quality?', *Financial Management*, vol. 22, no. 1, pp. 74-83.

Geiger, M & van der Laan Smith, J 2010, 'The effect of institutional and cultural factors on the perceptions of earnings management', *Journal of International Accounting Research*, vol. 9, no. 2, pp. 21-43.

Gelman, A 2006, 'Multilevel (hierarchical) modeling: What it can and cannot do', *Technometrics*, vol. 48, no. 3, pp. 432-5.

Gelos, RG & Wei, S-J 2002, *Transparency and international investor behavior*, NBER Working Paper No. 9260

—— 2005, 'Transparency and international portfolio holdings', *The Journal of Finance*, vol. 60, no. 6, pp. 2987-3020.

Globerman, S & Shapiro, D 2003, 'Governance infrastructure and US foreign direct investment', *Journal of International Business Studies*, vol. 34, no. 1, pp. 19-39.

Goergen, M, Khurshed, A & Renneboog, L 2009, 'Why are the French so different from the Germans? Underpricing of IPOs on the Euro New Markets', *International Review of Law and Economics*, vol. 29, no. 3, pp. 260-71.

Gray, SJ 1988, 'Towards a theory of cultural influence on the development of accounting systems internationally', *Abacus*, vol. 24, no. 1, pp. 1-15.

Gray, SJ, Kang, T & Yoo, YK 2013, 'National culture and international differences in the cost of equity capital', *Management International Review*, vol. 53, no. 6, pp. 899-916.

Gray, SJ & Vint, HM 1995, 'The impact of culture on accounting disclosures: some international evidence', *Asia-Pacific Journal of Accounting*, vol. 2, no. 1, pp. 33-43.

Griffin, D, Li, K, Yue, H & Zhao, L 2009, *Cultural values and corporate risk-taking*, University of British Columbia Working Paper, <**http://cn.ckgsb.com/frsc2009/files/glyz_risktaking.pdf**>.

Griffin, JM, Kelly, PJ & Nardari, F 2010, 'Do market efficiency measures yield correct inferences? A comparison of developed and emerging markets', *The Review of Financial Studies*, vol. 23, no. 8, pp. 3225-77.

Grimmelikhuijsen, S, Porumbescu, G, Hong, B & Im, T 2013, 'The effect of transparency on trust in government: A cross-national comparative experiment', *Public Administration Review*, vol. 73, no. 4, pp. 575-86.

Grinblatt, M & Hwang, CY 1989, 'Signalling and the pricing of new issues', *The Journal of Finance*, vol. 44, no. 2, pp. 393-420.

Güçbilmez, U 2015, 'IPO waves in China and Hong Kong', *International Review of Financial Analysis*, vol. 40, no. 1, pp. 14-26.

Guenther, DA & Willenborg, M 1999, 'Capital gains tax rates and the cost of capital for small business: evidence from the IPO market', *Journal of Financial Economics*, vol. 53, no. 3, pp. 385-408.

Gupta, DR, Veliyath, R & George, R 2018, 'Influence of national culture on IPO activity', *Journal of Business Research*, vol. 90, no. 1, pp. 226-46.

Gupta, M, Prakash, P & Rangan, NK 2013, 'Equity issue-specific versus broad regulatory protections against expropriation risk: International evidence from SEOs', *Journal of International Money and Finance*, vol. 35, no. 1, pp. 146-66.

Habib, MA & Ljungqvist, AP 2001, 'Underpricing and entrepreneurial wealth losses in IPOs: Theory and evidence', *The Review of Financial Studies*, vol. 14, no. 2, pp. 433-58.

Hamao, Y, Packer, F & Ritter, JR 2000, 'Institutional affiliation and the role of venture capital: Evidence from initial public offerings in Japan', *Pacific-Basin Finance Journal*, vol. 8, no. 5, pp. 529-58.

Han, S, Kang, T, Salter, S & Yoo, YK 2010, 'A cross-country study on the effects of national culture on earnings management', *Journal of International Business Studies*, vol. 41, no. 1, pp. 123-41.

Hanley, KW & Hoberg, G 2010, 'The information content of IPO prospectuses', *The Review of Financial Studies*, vol. 23, no. 7, pp. 2821-64.

—— 2012, 'Litigation risk, strategic disclosure and the underpricing of initial public offerings', *Journal of Financial Economics*, vol. 103, no. 2, pp. 235-54.

Hansen, RS 2001, 'Do investment banks compete in IPOs?: The advent of the “7% plus contract”', *Journal of Financial Economics*, vol. 59, no. 3, pp. 313-46.

Harford, J 2005, 'What drives merger waves?', *Journal of Financial Economics*, vol. 77, no. 3, pp. 529-60.

Harris, JD, Sapienza, HJ & Bowie, NE 2009, 'Ethics and entrepreneurship', *Journal of Business Venturing*, vol. 24, no. 5, pp. 407-18.

Harvey, CR 1995, 'Predictable risk and returns in emerging markets', *The Review of Financial Studies*, vol. 8, no. 3, pp. 773-816.

Hausman, JA 1978, 'Specification tests in econometrics', *Econometrica*, vol. 46, no. 6, pp. 1251-71.

Hearn, B 2011, 'The impact of corporate governance measures on the performance of West African IPO firms', *Emerging Markets Review*, vol. 12, no. 2, pp. 130-51.

—— 2012, 'The contrasting effects of board composition and structure on IPO firm underpricing in a developing context', *International Review of Financial Analysis*, vol. 21, no. 1, pp. 33-44.

—— 2014, 'The impact of institutions, ownership structure, business angels, venture capital and lead managers on IPO firm underpricing across North Africa', *Journal of Multinational Financial Management*, vol. 24, no. 1, pp. 19-42.

Helmke, G & Rosenbluth, F 2009, 'Regimes and the rule of law: Judicial independence in comparative perspective', *Annual Review of Political Science*, vol. 12, no. 1, pp. 345-66.

Helwege, J & Liang, N 2004, 'Initial public offerings in hot and cold markets', *Journal of Financial and Quantitative Analysis*, vol. 39, no. 3, pp. 541-69.

Hensler, DA 1995, 'Litigation costs and the underpricing of initial public offerings', *Managerial and Decision Economics*, vol. 16, no. 2, pp. 111-28.

Hoffmann-Burchardi, U 2001, 'Clustering of initial public offerings, information revelation and underpricing', *European Economic Review*, vol. 45, no. 2, pp. 353-83.

Hofmann, DA 1997, 'An overview of the logic and rationale of hierarchical linear models', *The Journal of Management*, vol. 23, no. 6, pp. 723-44.

Hofstede, G 1980, *Culture's consequences: International differences in work-related values*, Cross-cultural Research, Sage Publications USA, Beverly Hills.

—— 2010, 'Geert hofstede', *National cultural dimensions*.

—— 2011, 'Dimensionalizing cultures: The Hofstede model in context', *Online Readings in Psychology and Culture*, vol. 2, no. 1, pp. 1-26.

Hofstede, G, Neuijen, B, Ohayv, DD & Sanders, G 1990, 'Measuring organizational cultures: A qualitative and quantitative study across twenty cases', *Administrative Science Quarterly*, vol. 35, no. 2, pp. 286-316.

Hofstede, GH 2001, *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*, Sage.

Homer, PM & Kahle, LR 1988, 'A structural equation test of the value-attitude-behavior hierarchy', *Journal of Personality and Social Psychology*, vol. 54, no. 4, pp. 638-46.

Hong, HA, Hung, M & Lobo, GJ 2014, 'The impact of mandatory IFRS adoption on IPOs in global capital markets', *The Accounting Review*, vol. 89, no. 4, pp. 1365-97.

Hooghiemstra, R, Hermes, N & Emanuels, J 2015, 'National culture and internal control disclosures: A cross-country analysis', *Corporate Governance: An International Review*, vol. 23, no. 4, pp. 357-77.

Hope, O-K, Kang, T, Thomas, W & Yoo, YK 2008, 'Culture and auditor choice: A test of the secrecy hypothesis', *Journal of Accounting and Public Policy*, vol. 27, no. 5, pp. 357-73.

Hope, OK 2003a, 'Disclosure practices, enforcement of accounting standards, and analysts' forecast accuracy: An international study', *Journal of Accounting Research*, vol. 41, no. 2, pp. 235-72.

—— 2003b, 'Firm-level disclosures and the relative roles of culture and legal origin', *Journal of International Financial Management & Accounting*, vol. 14, no. 3, pp. 218-48.

Hopp, C & Dreher, A 2013, 'Do differences in institutional and legal environments explain cross-country variations in IPO underpricing?', *Applied Economics*, vol. 45, no. 4, pp. 435-54.

Houqe, MN & Monem, RM 2016, 'IFRS adoption, extent of disclosure, and perceived corruption: a cross-country study', *The International Journal of Accounting*, vol. 51, no. 3, pp. 363-78.

Houqe, MN, Monem, RM & Van Zijl, T 2012a, 'Government quality, auditor choice and adoption of IFRS: A cross country analysis', *Advances in Accounting*, vol. 28, no. 2, pp. 307-16.

Houqe, MN, Van Zijl, T, Dunstan, K & Karim, AW 2012b, 'The effect of IFRS adoption and investor protection on earnings quality around the world', *The International Journal of Accounting*, vol. 47, no. 3, pp. 333-55.

House, R, Javidan, M, Hanges, P & Dorfman, P 2002, 'Understanding cultures and implicit leadership theories across the globe: An introduction to project GLOBE', *Journal of World Business*, vol. 37, no. 1, pp. 3-10.

Houston, JF, Lin, C, Lin, P & Ma, Y 2010, 'Creditor rights, information sharing, and bank risk taking', *Journal of Financial Economics*, vol. 96, no. 3, pp. 485-512.

Hox, JJ, Moerbeek, M & Van de Schoot, R 2018, *Multilevel analysis: Techniques and applications*, 3rd edn, New York: Routledge.

Huang, Q & Levich, RM 2003, 'Underpricing of new equity offerings by privatized firms: An international test', *International Journal of Theoretical and Applied Finance*, vol. 6, no. 1, pp. 1-30.

Hughes, PJ & Thakor, AV 1992, 'Litigation risk, intermediation, and the underpricing of initial public offerings', *The Review of Financial Studies*, vol. 5, no. 4, pp. 709-42.

Ibbotson, RG 1975, 'Price performance of common stock new issues', *Journal of Financial Economics*, vol. 2, no. 3, pp. 235-72.

Isshaq, Z & Faff, R 2016, 'Does the uncertainty of firm-level fundamentals help explain cross-sectional differences in liquidity commonality?', *Journal of Banking & Finance*, vol. 68, no. 1, pp. 153-61.

Jain, BA & Kini, O 2006, 'Industry clustering of initial public offerings', *Managerial and Decision Economics*, vol. 27, no. 1, pp. 1-20.

Jain, SS & Jain, SP 2018, 'Power distance belief and preference for transparency', *Journal of Business Research*, vol. 89, no. 1, pp. 135-42.

Jakob, K & Nam, Y 2017, 'Do cultures influence abnormal market reactions before official sovereign debt rating downgrade announcements?', *Journal of International Financial Markets, Institutions and Money*, vol. 47, no. 1, pp. 65-75.

Jamaani, F & Roca, E 2015, 'Are the regional Gulf stock markets weak-form efficient as single stock markets and as a regional stock market?', *Research in International Business and Finance*, vol. 33, no. 1, pp. 221-46.

Javidan, M, House, RJ, Dorfman, PW, Hanges, PJ & De Luque, MS 2006, 'Conceptualizing and measuring cultures and their consequences: A comparative review of GLOBE's and Hofstede's approaches', *Journal of International Business Studies*, vol. 37, no. 6, pp. 897-914.

Jegadeesh, N, Weinstein, M & Welch, I 1993, 'An empirical investigation of IPO returns and subsequent equity offerings', *Journal of Financial Economics*, vol. 34, no. 2, pp. 153-75.

Jenkinson, T & Ljungqvist, A 2001, *Going public: The theory and evidence on how companies raise equity finance*, 2nd edn, Oxford University Press, USA, New York.

Jenkinson, TJ 1990, 'Initial public offerings in the United Kingdom, the United States, and Japan', *Journal of the Japanese and International Economies*, vol. 4, no. 4, pp. 428-49.

Jensen, MC & Meckling, WH 1976, 'Theory of the firm: Managerial behavior, agency costs and ownership structure', *Journal of Financial Economics*, vol. 3, no. 4, pp. 305-60.

Johannesen, N & Zucman, G 2014, 'The end of bank secrecy? An evaluation of the G20 tax haven crackdown', *American Economic Journal: Economic Policy*, vol. 6, no. 1, pp. 65-91.

John, K, Litov, L & Yeung, B 2008, 'Corporate governance and risk-taking', *The Journal of Finance*, vol. 63, no. 4, pp. 1679-728.

Johnson, S, Boone, P, Breach, A & Friedman, E 2000, 'Corporate governance in the Asian Financial Crisis', *Journal of Financial Economics,* vol. 58, no. 1, pp. 141-86.

Jones, SL, Megginson, WL, Nash, RC & Netter, JM 1999, 'Share issue privatizations as financial means to political and economic ends', *Journal of Financial Economics*, vol. 53, no. 2, pp. 217-53.

Jones, TL & Swaleheen, M 2010, 'Endogenous examination of underwriter reputation and IPO returns', *Managerial Finance*, vol. 36, no. 4, pp. 284-93.

Judge, WQ, Witt, MA, Zattoni, A, Talaulicar, T, Chen, JJ, Lewellyn, K, Hu, HW, Shukla, D, Gabrielsson, J & Lopez, F 2014, 'Corporate governance and IPO underpricing in a cross-national sample: A multilevel knowledge-based view', *Strategic Management Journal*, vol. 36, no. 8, pp. 1174-85.

Kanagaretnam, K, Lim, CY & Lobo, GJ 2013, 'Influence of national culture on accounting conservatism and risk-taking in the banking industry', *The Accounting Review*, vol. 89, no. 3, pp. 1115-49.

Kang, J-K & Kim, J-M 2010, 'Do foreign investors exhibit a corporate governance disadvantage? An information asymmetry perspective', *Journal of International Business Studies*, vol. 41, no. 8, pp. 1415-38.

Kao, JL, Wu, D & Yang, Z 2009, 'Regulations, earnings management, and post-IPO performance: The Chinese evidence', *Journal of Banking & Finance*, vol. 33, no. 1, pp. 63-76.

Kaufmann, D, Kraay, A & Mastruzzi, M 2017, *Worldwide governance indicators*, The World Bank Group, viewed 10 March 2017, <**http://info.worldbank.org/governance/wgi/index.aspx#home**>.

Kayo, EK & Kimura, H 2011, 'Hierarchical determinants of capital structure', *Journal of Banking & Finance*, vol. 35, no. 2, pp. 358-71.

Kelly, B, Pástor, Ľ & Veronesi, P 2016, 'The price of political uncertainty: Theory and evidence from the option market', *The Journal of Finance*, vol. 71, no. 5, pp. 2417-80.

Keloharju, M 1993, 'The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland', *Journal of Financial Economics*, vol. 34, no. 2, pp. 251-77.

Kennedy, DB, Sivakumar, R & Vetzal, KR 2006, 'The implications of IPO underpricing for the firm and insiders: Tests of asymmetric information theories', *Journal of Empirical Finance*, vol. 13, no. 1, pp. 49-78.

Khurana, IK & Raman, K 2004, 'Litigation risk and the financial reporting credibility of Big 4 versus non-Big 4 audits: Evidence from Anglo-American countries', *The Accounting Review*, vol. 79, no. 2, pp. 473-95.

Khurshed, A & Chahine, S 2007, 'Block-holder ownership, family control and post-listing performance of French IPOs', *Managerial Finance*, vol. 33, no. 6, pp. 388-400.

Kim, J, Pukthuanthong-Le, K & Walker, T 2008, 'Leverage and IPO under-pricing: High-tech versus low-tech IPOs', *Management Decision*, vol. 46, no. 1, pp. 106-30.

Kim, KA, Kitsabunnarat, P & Nofsinger, JR 2004, 'Ownership and operating performance in an emerging market: Evidence from Thai IPO firms', *Journal of Corporate Finance*, vol. 10, no. 3, pp. 355-81.

Kirkulak, B & Davis, C 2005, 'Underwriter reputation and underpricing: Evidence from the Japanese IPO market', *Pacific-Basin Finance Journal*, vol. 13, no. 4, pp. 451-70.

Klapper, LF & Love, I 2004, 'Corporate governance, investor protection, and performance in emerging markets', *Journal of Corporate Finance*, vol. 10, no. 5, pp. 703-28.

Knill, A 2012, 'The value of country-level perceived ethics to entrepreneurs around the world', *The European Journal of Finance*, vol. 18, no. 3, pp. 209-37.

Kreft, IG, De Leeuw, J & Aiken, LS 1995, 'The effect of different forms of centering in hierarchical linear models', *Multivariate Behavioral Research*, vol. 30, no. 1, pp. 1-21.

Kunz, RM & Aggarwal, R 1994, 'Why initial public offerings are underpriced: Evidence from Switzerland', *Journal of Banking & Finance*, vol. 18, no. 4, pp. 705-23.

Kutsuna, K & Smith, R 2003, 'Why does book building drive out auction methods of IPO issuance? Evidence from Japan', *The Review of Financial Studies*, vol. 17, no. 4, pp. 1129-66.

Kwok, CC & Tadesse, S 2006, 'National culture and financial systems', *Journal of International Business Studies*, vol. 37, no. 2, pp. 227-47.

La Porta, R, Lopez-de-Silanes, F & Shleifer, A 2008, 'The economic consequences of legal origins', *Journal of Economic Literature*, vol. 46, no. 2, pp. 285-332.

La Porta, R, Lopez-de-Silanes, F, Shleifer, A & Vishny, R 2002, 'Investor protection and corporate valuation', *The Journal of Finance*, vol. 57, no. 3, pp. 1147-70.

La Porta, R, Lopez-de-Silanes, F, Shleifer, A & Vishny, RW 1997, 'Legal determinants of external finance', *The Journal of Finance*, vol. 52, no. 3, pp. 1131-50.

La Porta, R, Lopez-de-Silanes, F & Shleifer, A 2006, 'What works in securities laws?', *The Journal of Finance*, vol. 61, no. 1, pp. 1-32.

La Porta, R, Lopez-de-Silanes, F, Shleifer, A & Vishny, RW 2000, 'Agency problems and dividend policies around the world', *The Journal of Finance*, vol. 55, no. 1, pp. 1-33.

Lam, S-S & Yap, W 1998, 'Pricing system and the initial public offerings market: A case of Singapore', *International Review of Economics & Finance*, vol. 7, no. 3, pp. 297-313.

Lee, M, Lee, P & Taylor, S 2003, 'Unit initial public offerings: Staged equity or signaling mechanism?', *Accounting & Finance*, vol. 43, no. 1, pp. 63-85.

Lee, PJ, Taylor, SL & Walter, TS 1996, 'Australian IPO pricing in the short and long run', *Journal of Banking & Finance*, vol. 20, no. 7, pp. 1189-210.

Lee, PM & Wahal, S 2004, 'Grandstanding, certification and the underpricing of venture capital backed IPOs', *Journal of Financial Economics*, vol. 73, no. 2, pp. 375-407.

Leitterstorf, MP & Rau, SB 2014, 'Socioemotional wealth and IPO underpricing of family firms', *Strategic Management Journal*, vol. 35, no. 5, pp. 751-60.

Leleux, BF & Muzyka, DF 1997, 'European IPO markets: The post-issue performance imperative', *Entrepreneurship: Theory and Practice*, vol. 21, no. 4, pp. 111-9.

Leone, AJ, Rock, S & Willenborg, M 2007, 'Disclosure of intended use of proceeds and underpricing in initial public offerings', *Journal of Accounting Research*, vol. 45, no. 1, pp. 111-53.

Levie, J & Autio, E 2011, 'Regulatory burden, rule of law, and entry of strategic entrepreneurs: An international panel study', *Journal of Management Studies*, vol. 48, no. 6, pp. 1392-419.

Lewellen, K 2006, 'Risk, reputation, and IPO price support', *The Journal of Finance*, vol. 61, no. 2, pp. 613-53.

Lewellyn, KB & Bao, SR 2014, 'A cross-national investigation of IPO activity: The role of formal institutions and national culture', *International Business Review* vol. 23, no. 6, pp. 1167-78.

Li, K, Griffin, D, Yue, H & Zhao, L 2013, 'How does culture influence corporate risk-taking?', *Journal of Corporate Finance*, vol. 23, no. 1, pp. 1-22.

Li, S & Filer, L 2007, 'The effects of the governance environment on the choice of investment mode and the strategic implications', *Journal of World Business*, vol. 42, no. 1, pp. 80-98.

Li, Y & Zahra, SA 2012, 'Formal institutions, culture, and venture capital activity: A cross-country analysis', *Journal of Business Venturing*, vol. 27, no. 1, pp. 95-111.

Lin, HL, Pukthuanthong, K & Walker, TJ 2013, 'An international look at the lawsuit avoidance hypothesis of IPO underpricing', *Journal of Corporate Finance*, vol. 19, no. 1, pp. 56-77.

Lin, TH 1996, 'The certification role of large block shareholders in initial public offerings: The case of venture capitalists', *Quarterly Journal of Business and Economics*, vol. 35, no. 2, pp. 55-65.

Ling, DC & Ryngaert, M 1997, 'Valuation uncertainty, institutional involvement, and the underpricing of IPOs: the case of REITs', *Journal of Financial Economics*, vol. 43, no. 3, pp. 433-56.

Liu, C, Yao, LJ, Hu, N & Liu, L 2011, 'The impact of IFRS on accounting quality in a regulated market: An empirical study of China', *Journal of Accounting, Auditing & Finance*, vol. 26, no. 4, pp. 659–76.

Liu, X & Ritter, JR 2010, 'The economic consequences of IPO spinning', *The Review of Financial Studies*, vol. 23, no. 5, pp. 2024-59.

—— 2011, 'Local underwriter oligopolies and IPO underpricing', *Journal of Financial Economics*, vol. 102, no. 3, pp. 579-601.

Ljungqvist, A 2007, 'IPO underpricing ', in BE Eckbo (ed.), *Handbook of Corporate Finance: Emprical Corporate Finance*, First edition edn, Elsevier B.V, The Netherlands, vol. 1, p. 559.

Ljungqvist, A & Wilhelm Jr, WJ 2003, 'IPO pricing in the dot-com bubble', *The Journal of Finance*, vol. 58, no. 2, pp. 723-52.

Ljungqvist, AP, Jenkinson, T & Wilhelm Jr, WJ 2003, 'Global integration in primary equity markets: The role of US banks and US investors', *The Review of Financial Studies*, vol. 16, no. 1, pp. 63-99.

Ljungqvist, AP & Wilhelm Jr, WJ 2002, 'IPO allocations: discriminatory or discretionary?', *Journal of Financial Economics*, vol. 65, no. 2, pp. 167-201.

Logue, DE 1973, 'On the pricing of unseasoned equity issues: 1965–1969', *Journal of Financial and Quantitative Analysis*, vol. 8, no. 01, pp. 91-103.

Logue, DE, Rogalski, RJ, Seward, JK & Foster-Johnson, L 2002, 'What is special about the roles of underwriter reputation and market activities in initial public offerings?', *The Journal of Business*, vol. 75, no. 2, pp. 213-43.

Loughran, T & Ritter, JR 2002, 'Why don't issuers get upset about leaving money on the table in IPOs?', *The Review of Financial Studies*, vol. 15, no. 2, pp. 413-44.

—— 2004, 'Why has IPO underpricing changed over time?', *Financial Management*, vol. 33, no. 3, pp. 5-37.

Loughran, T, Ritter, JR & Rydqvist, K 1994, 'Initial public offerings: International insights', *Pacific-Basin Finance Journal*, vol. 2, no. 2-3, pp. 165-99.

Lowry, M 2003, 'Why does IPO volume fluctuate so much?', *Journal of Financial Economics*, vol. 67, no. 1, pp. 3-40.

Lowry, M, Officer, MS & Schwert, GW 2010, 'The variability of IPO initial returns', *The Journal of Finance*, vol. 65, no. 2, pp. 425-65.

Lowry, M & Schwert, GW 2002, 'IPO market cycles: Bubbles or sequential learning?', *The Journal of Finance*, vol. 57, no. 3, pp. 1171-200.

Lowry, M & Shu, S 2002, 'Litigation risk and IPO underpricing', *Journal of Financial Economics*, vol. 65, no. 3, pp. 309-35.

Lucey, BM & Zhang, Q 2010, 'Does cultural distance matter in international stock market comovement? Evidence from emerging economies around the world', *Emerging Markets Review*, vol. 11, no. 1, pp. 62-78.

Luo, X 2008, 'When marketing strategy first meets Wall Street: Marketing spendings and firms' initial public offerings', *The Journal of Marketing*, vol. 72, no. 5, pp. 98-109.

Maddala, GS & Lahiri, K 2009, *Introduction to econometrics*, 4th edn, Wiley, New York.

Malhotra, S, Sivakumar, K & Zhu, P 2011, 'Curvilinear relationship between cultural distance and equity participation: An empirical analysis of cross-border acquisitions', *Journal of International Management*, vol. 17, no. 4, pp. 316-32.

Mantecon, T & Poon, P 2009, 'An analysis of the liquidity benefits provided by secondary markets', *Journal of Banking & Finance*, vol. 33, no. 2, pp. 335-46.

Marisetty, VB & Subrahmanyam, MG 2010, 'Group affiliation and the performance of IPOs in the Indian stock market', *Journal of Financial Markets*, vol. 13, no. 1, pp. 196-223.

Megginson, WL & Weiss, KA 1991, 'Venture capitalist certification in initial public offerings', *The Journal of Finance*, vol. 46, no. 3, pp. 879-903.

Michaely, R & Shaw, WH 1994, 'The pricing of initial public offerings: Tests of adverse-selection and signaling theories', *The Review of Financial Studies*, vol. 7, no. 2, pp. 279-319.

Migliorati, K, Meoli, M, Paleari, S & Vismara, S 2012, 'The cost of going public: A European perspective', *International Journal of Economics and Management Engineering*, vol. 2, no. 2, pp. 63-72.

Mikkelson, WH, Partch, MM & Shah, K 1997, 'Ownership and operating performance of companies that go public', *Journal of Financial Economics*, vol. 44, no. 3, pp. 281-307.

Mitton, T 2002, 'A cross-firm analysis of the impact of corporate governance on the East Asian financial crisis', *Journal of Financial Economics*, vol. 64, no. 2, pp. 215-41.

Mok, HM & Hui, Y 1998, 'Underpricing and aftermarket performance of IPOs in Shanghai, China', *Pacific-Basin Finance Journal*, vol. 6, no. 5, pp. 453-74.

Mola, S & Loughran, T 2004, 'Discounting and clustering in seasoned equity offering prices', *Journal of Financial and Quantitative Analysis*, vol. 39, no. 1, pp. 1-23.

Morck, R, Yeung, B & Yu, W 2000, 'The information content of stock markets: why do emerging markets have synchronous stock price movements?', *Journal of Financial Economics*, vol. 58, no. 1-2, pp. 215-60.

Moulton, BR 1990, 'An illustration of a pitfall in estimating the effects of aggregate variables on micro units', *The Eeview of Economics and Statistics*, vol. 72, no. 2, pp. 334-8.

Muscarella, CJ & Vetsuypens, MR 1989, 'A simple test of Baron's model of IPO underpricing', *Journal of Financial Economics*, vol. 24, no. 1, pp. 125-35.

Netter, J, Stegemoller, M & Wintoki, MB 2011, 'Implications of data screens on merger and acquisition analysis: A large sample study of mergers and acquisitions from 1992 to 2009', *The Review of Financial Studies*, vol. 24, no. 7, pp. 2316-57.

Neupane, S & Thapa, C 2013, 'Underwriter reputation and the underwriter–investor relationship in IPO markets', *Journal of International Financial Markets, Institutions and Money*, vol. 24, no. 1, pp. 105-26.

Onali, E, Ginesti, G & Vasilakis, C 2017, 'How should we estimate value-relevance models? Insights from European data', *The British Accounting Review*, vol. 49, no. 5, pp. 460-73.

Osborne, JW 2000, 'Advantages of hierarchical linear modeling', *Practical Assessment, Research & Evaluation*, vol. 7, no. 1, pp. 1-4.

Pagano, M & Panetta, F 1998, 'Why do companies go public? An empirical analysis', *The Journal of Finance*, vol. 53, no. 1, pp. 27-64.

Pagano, M & Volpin, P 2001, 'The Political Economy of Finance', *Oxford Review of Economic Policy*, vol. 17, no. 4, pp. 502-19.

—— 2012, 'Securitization, transparency, and liquidity', *The Review of Financial Studies*, vol. 25, no. 8, pp. 2417-53.

Palmiter, AR 1999, 'Toward disclosure choice in securities offerings', *Columbia Business Law Review*, vol. 1, no. 1, pp. 86-91

Parsons, T, Shils, EA & Smelser, NJ 1965, *Toward a general theory of action: Theoretical foundations for the social sciences*, Transaction Publishers.

Petersen, MA 2009, 'Estimating standard errors in finance panel data sets: Comparing approaches', *The Review of Financial Studies*, vol. 22, no. 1, pp. 435-80.

Piot, C & Janin, R 2007, 'External auditors, audit committees and earnings management in France', *European Accounting Review*, vol. 16, no. 2, pp. 429-54.

Pollock, TG, Rindova, VP & Maggitti, PG 2008, 'Market watch: Information and availability cascades among the media and investors in the US IPO market', *Academy of Management Journal*, vol. 51, no. 2, pp. 335-58.

Preacher, KJ, Curran, PJ & Bauer, DJ 2006, 'Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis', *Journal of Educational and Behavioral Statistics*, vol. 31, no. 4, pp. 437-48.

Rabe-Hesketh, S & Skrondal, A 2008, *Multilevel and longitudinal modeling using Stata*, 2nd edn, Stata Press.

Rasheed, AM, Datta, DK & Chinta, RR 1997, 'Determinants of price premiums: A study of initial public offerings in the medical diagnostics and devices industry', *Journal of Small Business Management*, vol. 35, no. 4, pp. 11-23.

Raudenbush, SW & Bryk, AS 2002, *Hierarchical linear models: Applications and data analysis methods*, 1st edn, Sage Publications USA, Thousand Oaks.

Razin, A & Sadka, E 2007, 'Corporate transparency, cream-skimming and FDI', *European Economic Review*, vol. 51, no. 5, pp. 1263-76.

Reinhardt, D & Riddiough, SJ 2015, 'The two faces of cross-border banking flows', *IMF Economic Review*, vol. 63, no. 4, pp. 751-91.

Reuter, CH 2011, 'A survey of culture and finance', *Finance*, vol. 32, no. 1, pp. 76-152.

Ritter, J 1984, 'The" hot issue" market of 1980', *The Journal of Business*, vol. 57, no. 2, pp. 215-40.

—— 2011, 'Equilibrium in the initial public offerings market', *Annual Review of Financial Economics*, vol. 3, no. 1, pp. 347-74.

Ritter, J 2017, *Initial public offerings: Underpricing* University of Florida, Jay Ritter Website <**https://site.warrington.ufl.edu/ritter/files/2017/05/IPOs2016Underpricing.pdf**>.

—— 2018, *Initial public offerings: Underpricing*, University of Florida, <**https://site.warrington.ufl.edu/ritter/files/2018/07/IPOs2017Underpricing.pdf**>.

Ritter, JR 1987, 'The costs of going public', *Journal of Financial Economics*, vol. 19, no. 2, pp. 269-81.

—— 2003, 'Differences between European and American IPO markets', *European Financial Management*, vol. 9, no. 4, pp. 421-34.

Ritter, JR & Welch, I 2002, 'A review of IPO activity, pricing, and allocations', *The Journal of Finance*, vol. 57, no. 4, pp. 1795-828.

Rock, K 1986, 'Why new issues are underpriced', *Journal of Financial Economics*, vol. 15, no. 1, pp. 187-212.

Rogers, W 1994, 'Regression standard errors in clustered samples', *Stata Technical Bulletin*, vol. 3, no. 13, pp. 19-23.

Rokeach, M 1973, *The nature of human values*, Free Press New York.

Rousseeuw, PJ & Leroy, AM 2005, *Robust regression and outlier detection*, vol. Volume 589 of Wiley Series in Probability and Statistics, John Wiley & Sons, USA, Hoboken.

Rust, RT, Lemon, KN & Zeithaml, VA 2004, 'Return on marketing: Using customer equity to focus marketing strategy', *The Journal of Marketing*, vol. 68, no. 1, pp. 109-27.

Ruud, JS 1993, 'Underwriter price support and the IPO underpricing puzzle', *Journal of Financial Economics*, vol. 34, no. 2, pp. 135-51.

Rydqvist, K 1997, 'IPO underpricing as tax-efficient compensation', *Journal of Banking & Finance*, vol. 21, no. 3, pp. 295-313.

Sanderson, E & Windmeijer, F 2016, 'A weak instrument F-test in linear IV models with multiple endogenous variables', *Journal of Econometrics*, vol. 190, no. 2, pp. 212-21.

Sapienza, P, Zingales, L & Guiso, L 2006, 'Does culture affect economic outcomes?', *Journal of Economic Perspectives*, vol. 20, no. 2, pp. 23-48.

Schultz, P 2003, 'Pseudo market timing and the long-run underperformance of IPOs', *The Journal of Finance*, vol. 58, no. 2, pp. 483-517.

Schwartz, SH 1994, *Beyond individualism/collectivism: New cultural dimensions of values. In: Individualism and collectivism: Theory, method, and applications*, Sage Publications, USA, Thousand Oaks.

Sherman, AE 2005, 'Global trends in IPO methods: Book building versus auctions with endogenous entry', *Journal of Financial Economics*, vol. 78, no. 3, pp. 615-49.

Shi, C, Pukthuanthong, K & Walker, T 2013, 'Does disclosure regulation work? Evidence from international IPO markets', *Contemporary Accounting Research*, vol. 30, no. 1, pp. 356-87.

Shleifer, A & Vishny, RW 1989, 'Management entrenchment: The case of manager-specific investments', *Journal of Financial Economics*, vol. 25, no. 1, pp. 123-39.

Slangen, AH & Van Tulder, RJ 2009, 'Cultural distance, political risk, or governance quality? Towards a more accurate conceptualization and measurement of external uncertainty in foreign entry mode research', *International Business Review*, vol. 18, no. 3, pp. 276-91.

Smart, F 2017, *Cluster analysis*, Econometrics By Simulation viewed 1/1/2018, <**http://www.econometricsbysimulation.com/2013/09/cluster-analysis.html**>.

Smart, SB & Zutter, CJ 2003, 'Control as a motivation for underpricing: a comparison of dual and single-class IPOs', *Journal of Financial Economics*, vol. 69, no. 1, pp. 85-110.

Smith, JD 2016, 'US political corruption and firm financial policies', *Journal of Financial Economics*, vol. 121, no. 2, pp. 350-67.

Smith, PB, Dugan, S & Trompenaars, F 1996, 'National culture and the values of organizational employees a dimensional analysis across 43 nations', *Journal of Cross-Cultural Psychology*, vol. 27, no. 2, pp. 231-64.

Soares, AM, Farhangmehr, M & Shoham, A 2007, 'Hofstede's dimensions of culture in international marketing studies', *Journal of Business Research*, vol. 60, no. 3, pp. 277-84.

Søndergaard, M 1994, 'Research note: Hofstede's consequences: a study of reviews, citations and replications', *Organization Studies*, vol. 15, no. 3, pp. 447-56.

Sorokina, N & Thornton, JH 2016, 'Reactions of equity markets to recent financial reforms', *Journal of Economics and Business*, vol. 87, no. 1, pp. 50-69.

Spatt, C & Srivastava, S 1991, 'Preplay communication, participation restrictions, and efficiency in initial public offerings', *The Review of Financial Studies*, vol. 4, no. 4, pp. 709-26.

Spiess, KD & Pettway, RH 1997, 'The IPO and first seasoned equity sale: Issue proceeds, owner/managers' wealth, and the underpricing signal', *Journal of Banking & Finance*, vol. 21, no. 7, pp. 967-88.

Srivastava, RK, Shervani, TA & Fahey, L 1998, 'Market-based assets and shareholder value: A framework for analysis', *The Journal of Marketing*, vol. 62, no. 1, pp. 2-18.

Staiger, DO & Stock, JH 1997, 'Instrumental variables regression with weak instruments', *Econometrica*, vol. 65, no. 1, pp. 557-86.

Steenbergen, MR & Jones, BS 2002, 'Modeling multilevel data structures', *American Journal of Political Science*, vol. 46, no. 1, pp. 218-37.

Stoughton, NM & Zechner, J 1998, 'IPO-mechanisms, monitoring and ownership structure', *Journal of Financial Economics*, vol. 49, no. 1, pp. 45-77.

Sullivan, MJ & Unite, AA 2001, 'The influence of group affiliation and the underwriting process on emerging market IPOs: The case of the Philippines', *Pacific-Basin Finance Journal*, vol. 9, no. 5, pp. 487-512.

Taranto, MA 2003, *Employee stock options and the underpricing of initial public offerings*, Working Paper, University of Pennsylvania, <**http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.197.3092&rep=rep1&type=pdf**>.

Taylor, MZ & Wilson, S 2012, 'Does culture still matter?: The effects of individualism on national innovation rates', *Journal of Business Venturing*, vol. 27, no. 2, pp. 234-47.

Tennant, D & Sutherland, R 2014, 'What types of banks profit most from fees charged? A cross-country examination of bank-specific and country-level determinants', *Journal of Banking & Finance*, vol. 49, no. 1, pp. 178-90.

Teoh, SH, Welch, I & Wong, TJ 1998, 'Earnings management and the long-run market performance of initial public offerings', *The Journal of Finance*, vol. 53, no. 6, pp. 1935-74.

The G20 China 2016, *About the G20*, viewed 1/2/2016 2016, <**http://www.g20.org/English/aboutg20/AboutG20/201511/t20151127_1609.html**>.

The World Bank Group 2015, *World development indicators*, The World Bank Group, 10/10/2015, <**https://data.worldbank.org/products/wdi**>.

Thompson, SB 2011, 'Simple formulas for standard errors that cluster by both firm and time', *Journal of Financial Economics*, vol. 99, no. 1, pp. 1-10.

Tian, L 2011, 'Regulatory underpricing: Determinants of Chinese extreme IPO returns', *Journal of Empirical Finance*, vol. 18, no. 1, pp. 78-90.

Tinic, SM 1988, 'Anatomy of initial public offerings of common stock', *The Journal of Finance*, vol. 43, no. 4, pp. 789-822.

Tomczyk, S 1996, 'Auditor reputation and initial public offerings by foreign companies', *Journal of International Accounting, Auditing and Taxation*, vol. 5, no. 2, pp. 249-62.

Torstila, S 2003, 'The clustering of IPO gross spreads: International evidence', *Journal of Financial and Quantitative Analysis*, vol. 38, no. 3, pp. 673-94.

Tsakumis, GT 2007, 'The influence of culture on accountants' application of financial reporting rules', *Abacus*, vol. 43, no. 1, pp. 27-48.

Twisk, J 2006, *Applied multilevel analysis: a practical guide*, Cambridge University Press, USA, New York.

Uddin, M & Raj, M 2012, 'Aftermarket risk and underpricing of initial public offers in the Arabian Gulf countries: An empirical analysis', *The International Journal of Business and Finance Research*, vol. 6, no. 3, pp. 123-38.

Ungar, M 2008, 'Resilience across cultures', *British Journal of Social Work*, vol. 38, no. 2, pp. 218-35.

Van Rooij, M, Lusardi, A & Alessie, R 2011, 'Financial literacy and stock market participation', *Journal of Financial Economics*, vol. 101, no. 2, pp. 449-72.

Vella, F & Verbeek, M 1999, 'Two-step estimation of panel data models with censored endogenous variables and selection bias', *Journal of Econometrics*, vol. 90, no. 2, pp. 239-63.

Wang, C 2005, 'Ownership and operating performance of Chinese IPOs', *Journal of Banking & Finance*, vol. 29, no. 7, pp. 1835-56.

Wei, S-J & Shleifer, A 2000, 'Local corruption and global capital flows', *Brookings Papers on Economic Activity*, vol. 2, no. 1, pp. 303-46.

Welch, I 1989, 'Seasoned offerings, imitation costs, and the underpricing of initial public offerings', *The Journal of Finance*, vol. 44, no. 2, pp. 421-49.

—— 1992, 'Sequential sales, learning, and cascades', *The Journal of Finance*, vol. 47, no. 2, pp. 695-732.

White, H 1980, 'A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity', *Econometrica*, vol. 48, no. 4, pp. 817-38.

Williams, A 2015, 'A global index of information transparency and accountability', *Journal of Comparative Economics*, vol. 43, no. 3, pp. 804-24.

Williams, SM 2004, 'An international investigation of associations between societal variables and the amount of disclosure on information technology and communication problems: The case of Y2K', *The International Journal of Accounting*, vol. 39, no. 1, pp. 71-92.

World Economic Forum 2017, *The global competitiveness report*, World Economic Forum, <**https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018**>.

Yamin, M & Golesorkhi, S 2010, 'Cultural distance and the pattern of equity ownership structure in international joint ventures', *International Business Review*, vol. 19, no. 5, pp. 457-67.

Yung, C, Çolak, G & Wang, W 2008, 'Cycles in the IPO market', *Journal of Financial Economics*, vol. 89, no. 1, pp. 192-208.

Zattoni, A, Witt, MA, Judge, WQ, Talaulicar, T, Chen, JJ, Lewellyn, K, Hu, HW, Gabrielsson, J, Rivas, JL & Puffer, S 2017, 'Does board independence influence financial performance in IPO firms? The moderating role of the national business system', *Journal of World Business*, vol. 52, no. 5, pp. 628-39.

Zheng, X, El Ghoul, S, Guedhami, O & Kwok, CC 2012, 'National culture and corporate debt maturity', *Journal of Banking & Finance*, vol. 36, no. 2, pp. 468-88.

Zhou, RT & Lai, RN 2009, 'Herding and information based trading', *Journal of Empirical Finance*, vol. 16, no. 3, pp. 388-93.