ESSAYS ON FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

A thesis submitted for the Degree of Doctor of Philosophy

By

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ABSTRACT

This thesis is based on three empirical essays in financial development and economic growth. The first essay, investigated in the third chapter, the effect of financial development on economic growth in the context of Saudi Arabia, an oil-rich economy. In doing so, the study distinguishes between the effects of financial development on the oil and non-oil sectors of the economy. The Autoregressive Distributed Lag (ARDL) bounds test methodology is applied to yearly data over the period 1968 to 2010. The finding of this study is that financial development has a positive impact on the growth of the non-oil sector. In contrast, its impact on the oil-sector growth and total GDP growth is either negative or insignificant. This suggests that the relationship between financial development and growth may be fundamentally different in resource-dominated economies.

The second essay revisited, in the fourth chapter, the relationship between financial development and economic growth in a panel of 52 middle-income countries over the 1980-2008 period. Using pooled mean group estimations in a dynamic heterogeneous panel setting, we show that there is an inverted U-shaped relationship between finance and growth in the long-run. In the short run, the relationship is insignificant. This suggests that too much finance can exert a negative influence on growth in middle-income countries. The finding of a non-monotonic effect of financial development on growth is confirmed by estimating a dynamic panel threshold model.

The third essay empirically explores cross-country evidence of the effects of financial development shocks on economic growth. It employs a Global Vector Autoregressive (GVAR) model, which allows us to capture the dynamics of this relationship in a multi-country setting, and connects countries through bilateral international trade. Given the progressive role that Brazil, Russia, India, China and South Africa (BRICS) play in the world economic arena, this essay focuses on whether financial development in one BRICS member state affects economic growth in the other BRICS. To this end, the study finds empirical evidence that credit to the private sector has a positive spillover effect on growth in some of the BRICS countries. However, the results imply that the current level of financial integration among the BRICS countries is still not mature enough to spur economic growth for all the BRICS members.

Dedicated to My Family

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Nahla Samargandi

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DECLARATION

I hereby declare that this thesis has not previously been accepted for any degree, award, or qualification by any other university or institution of academic learning, and is not concurrently submitted for any degree other than that of the PhD, being studied at Brunel University. I also certify that this thesis has been written by me and it is entirely the result of my own investigations except where otherwise identified by references and that I have not plagiarised another's work.

The final versions of Chapters 3 and 4 were edited by, and incorporate feedback from, my supervisors, Prof. Sugata Ghosh and Dr. Jan Fidrmuc. Thereafter, these two papers have been circulated as joint working papers. Chapter 3 has already been published in Economic Modelling in 2014 and Chapter 4 has been published in World Development in 2015.

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PUBLICATIONS, CONFERENCES AND AWARDS

I have presented material from **Chapter 3** titled ‘‘Financial development and economic growth in an oil-rich economy: The case of Saudi Arabia*’’* at *PhD Conference on International Development*, 18-19 September 2012, Ruhr - University Bochum, Germany, and at *the 7th Saudi Students Conference* (in a poster session), 1-2 February 2014, University of Edinburgh, UK. Furthermore, the poster drawn from chapter 3 has won the first prize at a poster competition at the *7th Saudi Students Conference*. A journal paper is drawn from the chapter and is published in *Economic Modelling* with the following details: Samargandi, N., Fidrmuc, J. and Ghosh, S. 2014. Financial development and economic growth in an oil-rich economy: The case of Saudi Arabia. *Economic Modelling*, 43, PP. 267–278.

I have presented **Chapter 4** titled ‘‘is the Relationship between Financial Development and Economic Growth Monotonic? Evidence from a Sample of Middle Income Countries’’ at the *75th International Atlantic Economic Conference*, 3-6 April 2013, University of Vienna, Austria, and at *the International Conference of the Financial Engineering and Banking Society (FEBS)*,21-23 June 2014, University of Surrey, UK. A paper drawn from the chapter is published in *World Development* with the following details: Samargandi, N., Fidrmuc, J. and Ghosh, S. 2015. Is the Relationship Between Financial Development and Economic Growth Monotonic? Evidence from a Sample of Middle-Income Countries. *World Development*, 68, PP. 66-81.

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CHAPTER ONE

INTRODUCTION

The fundamental aim of studies on economic growth is to determine the factors that boost economic activity, which in turn raises the prosperity for a nation. In this context, over the past several decades, economists have reached a general consensus on the significant link between financial development and economic growth. For example, Schumpeter, 1934; Gurley and Shaw, 1955; Goldsmith, 1969; King and Levine, 1993; Greenwood and Smith, 1997; among others, argued that a well-developed financial system stimulates growth by channelling savings to the most productive investment projects. Some recent empirical studies, however, come up with contradictory findings about the link between financial development and economic growth. They find that the relationship has either been weakened or it has vanished. In explaining the ambiguity involved in the relationship, Nili and Rastad (2007), and Beck (2011) are among the few authors who attribute the weaker or negative effect of financial development on economic growth to the possible existence of a natural resource curse in oil-exporting countries. In addition, Loayza and Ranciere (2006) attempt to distinguish between the short and long-run impact of financial development on growth. They find a significant and positive long-run relationship between financial intermediaries and economic growth that is consistent with the earlier findings on the topic, while the short-run impact is significant and negative. They explain the negative short–run effect in terms of higher volatility or business cycle issues. The relationship between financial development and growth has been further explored by Deidda and Fattouh (2002). They suggest a non-linear, and possibly non-monotonic, relationship. They argue that financial depth does not affect economic growth in the same way in countries with different income levels. Rioja and Valev (2004), among others, come up with similar findings. Furthermore, Arcand et al. (2012) find the economy being adversely affected due to "too much finance". This negative relationship occurs once financial development exceeds a certain threshold point in high-income countries.

Other contributions to the recent empirical work highlight the role of interactions among countries and their integration into the global economic arena which enhances growth. In fact, the growing trade and financial interconnectedness among economies raises the important issue of growth spillover. Some studies analyse the effect of financial integration on economic growth. For example, Mishkin, 2006; Prasad et al., 2003; Kose et al., 2006, among others, suggest that a country would benefit from the financial integration in lowering the volatility of macroeconomic fluctuations and contributing to international risk-sharing. Samake and Yang (2014) apply a global vector autoregressive model (GVAR) and refer to the significant growth spillovers from Brazil, Russia, India, China and South Africa (BRICS) to the low-income countries. Moreover, they point to the important role of trade and financial integration in helping to moderate the impact of financial crises on these economies.

With this backdrop, the theoretical and empirical research on this topic has remained very much work in progress. Consequently, a number of central questions have remained to be answered in the financial development and growth linkage literature, such as: What impact does financial development have on long- and short-run economic growth? Under what conditions does it have a positive impact on growth? Does financial development affect economic growth in the same way for countries at different levels of economic development or does its effect depend on their endowment with natural resources? What are the channels through which shocks to financial development in a country/region are transmitted across country borders?

Accordingly, this thesis aims to re-examine the different aspects of the relationship between financial development and economic growth and to answer some of the above-mentioned questions that have not been dealt with adequately in the financial development and growth literature and to explore different aspects of this relationship using advanced econometric techniques. This thesis consists of three essays in the field of financial development and economic growth. Specifically, the first two essays focus on the effect of financial development on growth in two different samples of countries and apply several econometric techniques. In the first essay, the Autoregressive Distributed Lag (ARDL) model is utilized on time series data for Saudi Arabia. In the second essay, based on a sample of 52 Middle Income Countries (MIC), a dynamic panel heterogeneity model is employed. In addition, two different approaches are applied for testing the existence of a non-monotonic relationship between financial development and economic growth: the quadratic polynomials approach and the dynamic panel threshold model. Finally, the third essay concentrates on the finance and growth linkage in a global framework. A Global Vector Autoregressive (GVAR) model is employed to investigate whether or not financial development can have a spillover effect on economic growth across the BRICS countries (Brazil, Russia, India, China and South Africa). Below, an outline of the thesis is provided.

Chapter 2 surveys some of the influential theoretical work that links financial development and economic growth. Specifically, it reviews the earlier literature on the Keynesian Model, Neoclassical Model, and the McKinnon-Shaw Model. The chapter also examines endogenous growth models with financial development, whereby finance affects economic growth via the productivity of capital and its volume.

Chapter 3 investigates the effect of financial development on economic growth in the context of an oil-rich economy, Saudi Arabia. It is well-known that economic growth in Saudi Arabia is heavily reliant on the revenue from oil exports. As this country struggles to diversify and broaden its income sources, the purpose of this chapter is to empirically investigate if financial development has any role to play in stimulating and accelerating the growth of the production sectors as a whole, and also to examine the long-run impact that it has on oil and non-oil segments of GDP in Saudi Arabia. To accomplish this task, the ARDL Bounds test technique is employed using time series data over the period, 1968-2010. The findings of this study confirm that financial development may have a positive impact on the growth of the non-oil sector in the long-run but this impact is either negative or disappears when considering the economy as a whole. This finding suggests that resource-driven economies do not necessarily follow the same patterns of development as manufacturing economies. Thus, the finance-growth nexus may be fundamentally different in resource-dominated economies.

Chapter 4 revisits the relationship between financial development and economic growth in a panel of 52 middle-income countries over the 1980-2008 period. The earlier and well-established literature based on cross-sectional data, and using standard OLS estimation methods confirmed the positive correlation between financial development and economic growth (for instance, Goldsmith, 1969; King and Levine, 1993a, 1993b). Recent studies, however, find that the relationship has either weakened or turned negative (Rousseau and Wachtel, 2011). Loayza and Ranciere (2006) attempt to explain the puzzle as regards the effect of financial development on growth by distinguishing between the short- and long-run impact. Other studies, such as Deidda and Fattouh (2002) and Arcand et al. (2011), highlight the importance of considering the non-monotonicity in the relationship between finance and growth. Consequently, Chapter 3 analyses the apparent contradiction between these two strands of the literature. To achieve this task, the dynamic panel heterogeneity analysis based on the technique introduced by Pesaran et al. (1999) is adopted. More specifically, the estimations are carried out by three different estimators: the pooled mean group (PMG), mean group (MG), and the dynamic fixed effect (DFE) estimators in order to examine both the long- and short-term effects of financial intermediation on growth and to take into account country-specific heterogeneity in the sample. In addition, two different econometric approaches are employed to investigate the non-monotonicity within the finance and growth nexus: (i) We insert a quadratic term in the relationship between financial development and growth, and then test for the robustness of these results by applying the Lind and Mehlum (2010) U-test. (ii) We also apply the newly-developed dynamic panel threshold estimator following Bick (2010) and Kremer et al. (2013). The results of this chapter confirm that there is an inverted U-shaped relationship between finance and growth in the long-run. In the short-run, the relationship is insignificant. This suggests that there exists a threshold beyond which financial development can exert a negative influence on growth in middle-income countries.

Chapter 5 contributes to the financial development and growth literature by focusing on the issue of the interdependencies among countries and examines the finance-growth linkage in a global framework. Despite the crucial importance of the issue, much less is known about how financial development spreads across countries. Given the growing role that the BRICS countries play in the world economic arena, three issues are taken into account in this chapter. First, the impact of domestic shocks to financial development on economic growth in each individual member of the BRICS is examined in a global framework. This study considers three financial development indicators, namely credit to the private sector, money supply, and equity price. Second, the potential existence of a spillover effect of financial development shocks in one

BRICS country on economic growth in another country is investigated. Third, treating the BRICS as a single economy, this chapter examines whether financial development shocks in the region can enhance economic growth within the BRICS region as a whole. For this purpose, a Global Vector Autoregressive (GVAR) model, introduced by Pesaran, Schuermann and Weiner (2004) and later advanced by Dees, Mauro, Pesaran and Smith (2007), is employed, based on quarterly data from 1989Q1 to 2012Q4 for 34 countries. The advantages of using this model are that it helps to investigate cross-country interdependency in a global framework. Also, it captures the main channels through which financial development shocks can be transmitted across a country's border. To the best of the author's knowledge, this is the first empirical study that utilizes the GVAR model in the financial development and economic growth context. The results from the GVAR model based on generalized impulse response functions, show that shocks to credit to the private sector have a significant and positive spillover effect on growth across all the BRICS economies, while the impact of other financial development indicators on economic growth is mixed or none.

In sum, the results of this chapter confirm that credit to the private sector is the main channel through which financial shocks spillover internationally. The findings of this chapter, however, also imply that the current level of financial integration among BRICS countries is still not sufficient to spur economic growth for all BRICS members.

Finally, **Chapter 6** summarises the main findings of this thesis, and presents the major conclusions from the present research. It also offers some recommendations and suggestions regarding policy implications, and identifies and discusses the main limitations of this thesis. It ends with suggestions for future research that are beyond the scope of this thesis.

CHAPTER TWO

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: THEORETICAL BACKGROUND

2.1. THEORETICAL FRAMEWORK

This chapter develops a framework highlighting the possible channels through which financial development can affect economic growth. Primary, financial development can affect growth through two different channels: the capital accumulation channel and the total factor productivity (TFP) channel. The capital accumulation channel is also referred to as quantitative channel, and is derived from the "debt-accumulation" hypothesis of Gurley and Shaw (1955). Specifically, growth is generated when individuals save from their disposable income and use these savings for capital accumulation. Financial development helps to channel these savings to the productive sector as investment. Thus, it helps augment capital accumulation and increase output.

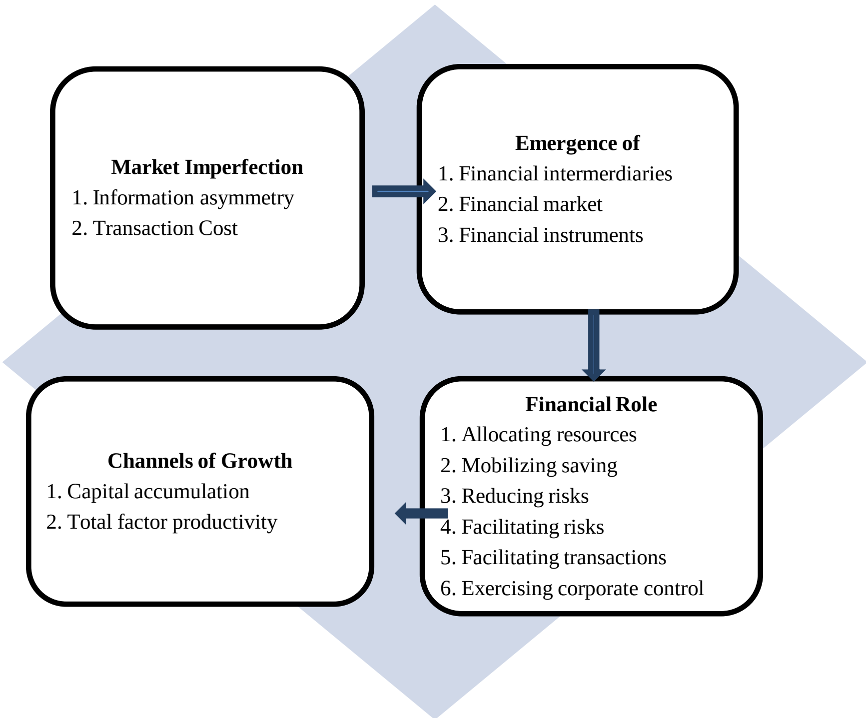
The TFP channel focuses on the qualitative part of financial development: it emphasizes the role of innovation of financial technologies in decreasing the asymmetric information that obstructs the efficient allocation of financial resources and monitoring investment project. A sound financial system also promotes the adoption of new technologies that bring the efficiency. Economists have been pondering over the relationship between financial development and economic growth. The groundwork on the relationship between financial development and economic growth goes back to Schumpeter (1934), McKinnon (1973), Shaw (1973), and has more recently been developed by King and Levine (1993). They emphasized the importance of the financial system, in its role in improving the efficiency of intermediation by reducing transaction cost, information asymmetries and monitoring cost, which leads to higher economic growth. Schumpeter (1934) put forward pioneering work explaining the relationship between the bankers and entrepreneurs, and illustrates the importance of adopting new technologies by the financial institutions to boost economic growth. He points out that a well-functioning financial system gives rise to technological innovations which subsequently induce economic growth. Following that, McKinnon and Shaw (1973) assert that capital markets that do not face constrains imposed by excessive regulation would encourage savings, thus raising the quality and quantity of investment, which in turn leads to higher economic growth.

Moreover, in accordance with Creane *et al.* (2003), the contemporary and dynamic financial system, through its various functions, such as channeling savings from the surplus units, boosting investment and managing risk, does contribute to economic growth. Levine (1997) primarily analyzes the relationship between efficiency of the financial sector of the economy, quality of financial intermediation and economic growth. The general idea by Levine relates in major part to the so-called functional approach. The relationship between the quality of functions carried out by financial sector and economic growth is the focal point of this approach. On the empirical side, Goldsmith (1969) is the first person to investigate the relationship between financial development and economic growth. He infers a strong and positive relationship between the two.

A skeptical view concerning the role of financial development in economic growth is put forward by Robinson (1952), who argues that financial development follows growth, and articulates this causality argument by suggesting that "where enterprise leads finance follows". However, the market is not perfect and there are bound to be market frictions such as information costs as well as transaction costs.

The Figure 2.1 below best illustrates the theoretical framework of how finance is linked to economic growth (Levine, 1997).

Figure 0.1. A functional approach to finance and growth.



2.2. MODELS OF FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

In this section, we discuss the theoretical framework underlying the various models of financial development and economic growth.

2.2.1. Keynesian Model

Keynes (1936) investigated the determinants of holding money in a situation of unemployment and price rigidity. Keynes (1936) argues that individuals hold money for mainly three reasons: transaction, precautionary and speculative motive. Speculative motive for holding money refers to the individual's decision between holding money and holding bonds, which is based on the return or interest rate on bonds, and the opportunity cost of holding money. If the yield of bonds is lower, individuals prefer to hold money balances speculatively. According to Keynesian theory, the money demand function can be shown as

$$(M/P)^D = \alpha + \frac{\beta}{i - \tilde{\imath}}, \alpha > 0, \beta > 0,$$

where i indicates the market interest rate, and $\tilde{\imath}$ indicates the liquidity trap interest rate, which is assumed to be such that $i > \tilde{\imath}$. Hence, the market interest rate and the demand for real balance are negatively associated with each other. Here, liquidity trap refers to a situation where the interest rate fails to decrease any further despite higher domestic credit creation, pointing to the ineffectiveness of expansionary monetary policy. In this framework, interest rate is the only determinant of planned investment. At the liquidity trap rate of interest, planned investment will be less than planned saving, leading to an unintended inventory accumulation. Aggregate output must fall to restore the equilibrium. In sum, this theory implies that a high interest rate depresses growth, and the interest rate cannot be decreased sufficiently to raise investment, output and employment.

2.2.2. Neoclassical Model

The neoclassical model is based on two strong assumptions: the capital market operates costlessly and perfectly. The primary function of money is to satisfy the transactions motive, but has no direct function to accumulate capital. As such, it is not important to differentiate between currency and deposits, as money in this case is regarded as outside fiat money. The notion of money demand in the neoclassical framework can be expressed as

$$(M/P)^D = f\left(Y, R_{capital}, R_{money}\right);\ f_y > 0, f_{R_{captial}} < 0, f_{R_{money}} > 0$$

In the above equation, money demand and real income are shown as $(M/P)^D$and Y respectively. In addition, the real rate of return on capital and the real return on money are expressed as $R_{captial\ and}$ R_{money} respectively. The equation reveals that income is positively associated with $(M/P)^D$ due to the transactions demand for money. However, one of the fundamental assumptions of this model is that money and capital are substitutes of each other. Therefore, an increase in the real rate of return reduces the demand for physical capital. Conversely, holding large real cash balances will diminish the accumulation of capital. This implies that $R_{capital}$ is inversely related with M/P, whereas R_{money} is positively associated with $(M/P)^D$. Hence, to foster economic growth an optimum interest rate is necessary for achieving the highest rate of return from both capital and money. Therefore, an increase in the real rate of return reduces the demand for physical capital. Conversely, holding large real cash balances will diminish the accumulation of capital. This implies that $R_{capital}$ is inversely related with M/P, whereas R_{money} is positively associated with $(M/P)^D$. Hence, to foster economic growth an optimum interest rate is necessary for achieving the highest rate of return from both capital and money. Liquid liabilities or money supply is considered as an important element for financial development, thus, money supply should be optimum it is negatively and positively associated with capital and money return respectively.

2.2.3. The McKinnon-Shaw Model

McKinnon (1973) and Shaw (1973) develop two financial liberalization models highlighting different aspects of the impact of raising interest rates. McKinnon's model is based on the possible linkages between the deposit rate and investment rate, whereas Shaw's model is based on functional relationships between lending and borrowing activities. The main distinction between the two models is with regard to the channels through which finance is raised. McKinnon developed outside money model, where he assumes that all finance is raised internally, in contrast Shaw developed inside money model that where, he considers finance is augmented externally (Ang, 2008). Therefore, the two models should be integrated as most projects are financed by internal and external sources jointly, hence the two models actually complement each other (Molho, 1986). The implications of McKinnon-Shaw model is rigorous for financial development. It provides an essence of an unrestricted real interest which adjusts in accordance of market mechanisms. Nevertheless, interest as a prime indicator of financial development is overwhelmingly criticized as De Gregorio and Guidotti (1995) argue that high interest rates may reveal a lack of confidence in economic policy and the banking system, and the adoption of more risky behavior in investment undertakings. The McKinnon (1973) model argues that the Keynesian and neoclassical models are implausible due to restrictive assumptions, such as that the capital markets work competitively with a single rate of interest. Moreover, both models fail to explain the functioning of capital markets in less developed countries, where the rates of interest are multiple. Further, McKinnon (1973) adds that money and capital can be complements for each other in less developed countries where financial systems do not function efficiently. The theory is derived from an outside money model where it is considered that all economic units are restricted to self-finance and money is fundamentally the fiat currency issued by the public sector. McKinnon and Shaw (1973) asserted that the process of financial development is the process of interest rate liberalization. If the gap between the interest on loan and the interest on savings reduces with the mechanism of financial deepening, this will result in more savings and push up investment as well. Moreover, by utilizing the complementarity hypothesis as the basis, McKinnon (1973) develops a different monetary model that can define the association between the monetary process and capital accumulation in less developed economies. The complementarity hypothesis is a combined hypothesis, where the demand for real money balances $(M/P)^D$ is determined positively with the real average return on capital ($R_{captial}$), and the investment ratio (I/Y) is augmented with the real deposit rate of interest (R_{money}). This combined hypothesis suggests that both $(M/P)^D$ and I/Y respond positively to a increase in $R_{captial}$ and R_{money}.

2.2.4. Endogenous Finance and Growth Models

The origins of the new growth theory were partly due to the predictive failure of the neoclassical growth model. Principally developed by Romer (1986), it is an endogenous growth model, with emphasis on the theory is that economic growth is mainly caused by long-run creativity rather than capital accumulation theory as inferred by previous theories. The endogenous growth theory primarily highlights that capital grows due to a higher savings rate, which promotes growth. However, to attain higher long-run growth, an economy needs continuous technological progress. Endogenous growth theory argues that human capital and institutions spur technical innovations and enhance living standards. This thought was further developed through the seminal work of Lucas (1988). As mentioned earlier, a sound financial system can promote economic growth through technological progress, where the developed financial system spurs innovative projects to be undertaken. As technological innovation is regarded as an exogenous factor in the neoclassical model, financial development is invalid in long-run growth. Whereas, the endogenous growth models are models in which long-run growth is an endogenous variable. These models offer a theoretical framework, suggesting that financial intermediation can have both growth and level effects.

The endogenous growth model is further developed by Pagano (1993) to focus on the significance of the financial system in the course of economic growth. Pagano adopts a simple endogenous growth setting, i.e., the AK model of Rebelo (1991). It is assumed that the production process only requires capital (K_t), where the production function exhibits constant returns to scale. The model of Pagano further assumes that capital depreciates at rate of δ and there is no population growth, hence capital formation function is expressed as $K_{t+1} = I_t + (1-\delta)K_t$. It is also considered that during the process of financial intermediation a certain proportion of saving, the size of $(1-\phi)$, is wasted. However, the portion (ϕ) of total saving is channeled to investment. The loss of a saving during financial intermediation is regarded as an inefficiency in the financial system. Thus, the saving-investment relationship is expressed as $I_t = \phi S_t$, and the steady state growth rate (g) is expressed as

$$g = \frac{K_{t+1} - K_t}{K_t} = \frac{I_t + (1-\delta)K_t - K_t}{K_t} = \frac{\phi S_t}{K_t} - \delta = A\phi s_t - \delta$$

Where $s_t = \frac{S_t}{Y_t} = \frac{S_t}{AK_t}$.

The above equation highlights that financial development can influence growth through three distinct ways:

- Augmenting the marginal productivity of capital (A);
- Increasing the fraction of saving channelled to investments (ϕ); and

- Influencing the savings rate (s)

After this review of the main theoretical framework on the relationship between financial development and economic growth, in the following chapters three empirical exercises have been conducted and will be linked together with the theoretical models discussed in this chapter in order to rationale for the three empirical exercises are laid out.

CHAPTER THREE

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN AN OIL-RICH ECONOMY: THE CASE OF SAUDI ARABIA

3.1. INTRODUCTION

In this chapter, the link between financial development and economic growth in an oil-rich economy, Saudi Arabia is explored. To the best of the author's knowledge, this study is one of the first studies to specifically consider the role that financial development plays in a resource-dependent economy, and the potentially different effects that it may have on the resource-extraction and conventional sectors of such an economy. Countries whose economies are dominated by oil or other natural resources possess specific features not shared by either industrialized or developing economies. A large fraction, often a lion's share, of economic activity is represented by resource extraction, characterized by low added value and often by a high degree of state regulation. Economic performance is predominantly driven by the prices of natural resources that are determined in world markers rather than by domestic economic developments.

The literature on the relationship between financial development and economic growth is voluminous. There is, however, no consensus view yet on either the nature of this relationship or the direction of causality. Four different hypotheses have been proposed.

The first view is that financial development is supply–leading, in the sense that it fosters economic growth by acting as a productive input. This view has been supported theoretically and empirically by a large number of studies. One of the earliest contributions is by Schumpeter (1934) who argues that the services provided by financial intermediaries encourage technical innovation and economic growth. McKinnon (1973) and Shaw (1973) were the first to highlight the importance of having a banking system free from financial restrictions such as interest rate ceilings, high reserve requirements and directed credit programs. Such policies tend to be prevalent in all countries, but are especially common in developing ones. According to their argument, financial repression disrupts both savings and investment. In contrast, the liberalization of the financial system allows financial deepening and increases the competition in the financial sector, which in turn promotes economic growth. Similar ideas are put forward by, among others, Galbis (1977), Fry (1978), Goldsmith (1969), Greenwood and Jovanovic (1990), Thakor (1996), and Hicks (1969). They view financial development as a vital determinant of economic growth, which increases savings and facilitates capital accumulation and thereby leads to greater investment and growth.

Empirically, several studies support the supply–leading view. A prominent contribution is by King and Levine (1993). They study 80 countries by means of a simple cross-country OLS regression. Their findings imply that financial development is indeed an important determinant of economic growth. Similar results have been found by Chistopoulos and Tsionas (2004), who examine the long-run relationship between bank development and economic growth for 10 developing countries. They utilize panel cointegration techniques and find a uni-directional relationship going from financial development to economic growth. Atje and Jovanovic (1993) assess the role of the stock market on economic growth and find that the volume of transactions in the stock market has a fundamental effect on economic growth. Subsequent studies confirm these results by focusing on both market-based and bank-based measures of financial development (see for example, Levine and Zervos, 1998, and Demirguc-Kunt and Maksimovic, 1998).

The second view is demand-following. In contrast to the previous position, Robinson (1952) argues that financial development follows economic growth, which implies that as an economy develops the demand for financial services increases and as a result more financial institutions, financial instruments and services appear in the market. A similar view is expressed by Kuznets (1955), who suggests that as the real side of the economy expands and approaches the intermediate stage of growth, the demand for financial services begins to increase. Hence, financial development depends on the level of economic development rather than the other way around. This view has also been empirically confirmed by several studies such as Al-Yousif (2002) and Ang and McKibbin (2007).

The third view is one of the bidirectional causalities. Accordingly, there is a mutual or two-way causal relationship between financial development and economic growth. This argument was first put forward by Patrick (1966) who posits that the development of the financial sector (financial deepening) is as an outcome of economic growth, which in turn feeds back as a factor of growth. Similarly, a number of endogenous growth models such as Greenwood and Jovanovic (1990); Greenwood and Bruce (1997); and Berthelemy and Varoudakis (1997) posit a two-way relationship between financial development and economic growth. Additional support for this view can be found in the empirical study by Demetriades and Hussein (1996), who studied 16 countries and found very strong evidence supporting bidirectional causality.

Finally, the fourth view states that financial development and economic growth are not causally related. Based on this view, financial development does not cause growth or vice versa. This view was initially put forward by Lucas (1988) who states that "economists badly overstress the role of financial factors in economic growth". His view is also supported by Stern (1989).

In addition, some empirical studies of the effects of financial development on economic growth highlight the potential negative association between finance and growth. For example, De Gregorio and Guidotti (1995) find a negative impact of financial development on growth in some Latin American countries. Van Wijnbergen (1983) and Buffie (1984) also point out the potentially negative impact of finance on growth. They argue that the high level of liberalization of the financial sector (financial deepening) results in decreasing the total real credit to domestic firms, and thereby lowers investment and slows economic growth. Al-Malikawi et al (2012), who examine the short- and long-run relationship between financial development and economic growth in the United Arab Emirates (UAE), suggest that the relationship between them is negative. They attribute this result to the transition phase of the UAE financial system during the period of study, as well as to the weak regulatory environment of the financial intermediaries.

To the best of the author's knowledge, only few studies attempt to investigate the relationship between financial development and economic growth in the context of a natural-resource dominated economy.[1] Nili and Rastad (2007), and Beck (2011), are among the few authors who consider how the abundance of oil can affect the relationship between financial development and economic growth, and whether there is

[1] A number of studies provide evidence that countries endowed with natural resources have a tendency to grow more slowly than less resource-abundant countries. This phenomenon is known as resource curse thesis (see Sachs and Warner, 2001; Nankani, 1979). Resource curse refers to the negative externalities stemming from the abundance of natural resources to the rest of the economy. See van der Ploeg (2011) for a recent survey on the curse of natural resource abundance.

any indication of a natural resource curse in the relationship between financial development and economic growth. Nili and Rastad (2007) examine the role that financial development plays in oil-rich economies. They find that financial development has a weaker effect in oil-exporting countries than in oil-importing countries. They suggest that this result is not only due to the high dependence on oil in the former but also due to the general inefficiency of financial institutions in oil-dependent countries. Beck (2011), in turn, argues that the ambiguity in the relationship between financial development and economic growth in oil-rich (or natural-resource-rich) countries in the previous literature reflects the fact that economic growth is driven by different forces in these countries, and that the financial sector has a different structure and plays a different role there. Nevertheless, his findings indicate, contrary to Nili and Rastad (2007), that there is in fact no significant difference in the impact of financial development on economic growth between resource-based countries and non-resource based countries. However, when he assesses the level of countries' reliance on natural resources, he finds that countries that depend more on exports of natural resources tend to have underdeveloped financial systems. This is despite the fact that banks in resource-based economies tend to display higher profitability and are more liquid and better capitalized. However, they offer less credit to the private sector, which he attributes to the incidence of financial repression in resource-based countries. Therefore, he concludes that resource-based countries can be subject to the natural resource curse in financial development.

We seek to contribute to this debate by considering the case of a resource-dominated country: Saudi Arabia.[2] The economy of Saudi Arabia is heavily dependent

[2] Substantial literature focuses on single country studies, e.g., Murinde and Eng (1994) for Singapore; Abu-Bader and Abu-Qarn (2008) for Egypt; Lyons and Murinde (1994) for Ghana; Odedokun (1989) for Nigeria; Agung and Ford (1998) for Indonesia; Wood (1993) for Barbados; Khan, et al (2005) for Pakistan; Hondroyiannis , et al. (2005) for Greece; Ang and McKibbin (2007) for Malaysia; Majid (2007)

on oil revenue. Recently, however, the government has been promoting diversification toward the non-oil sector and reducing the country's dependence on the petroleum sector. Since the implementation of the fourth development plan (1985-1990), in particular, significant priority has been given to the financial sector. We investigate, therefore, the role that the financial sector plays in this country's economy, and whether this role differs between the traditional sector (petroleum) and the emerging non-oil sector.

To this effect, we collect time-series data from 1968 to 2010 and apply an ARDL bound test approach to cointegration to examine the long and short-run impact of the financial sector on economic growth. There are various methods for examining the existence of a long-run relationship between the variables of interest: Engle and Granger (1988) and Johansen (1988, 1991, 1995) are the most widely adopted approaches. We, however, follow the ARDL bound test approach for testing the finance and growth nexus due to the favorable features of this technique compared to the other conventional approaches, as discussed in more detail in the methodology section. Furthermore, we deviate from the usual approach by using principal component analysis (PCA) to build a single composite indicator of financial development.

The findings of this study indicate that financial development has a statistically significant and positive effect on the non-oil sector only. In contrast, the effect on overall GDP is either not statically significant or negative and significant. We consider this an important result, not only from the perspective of an oil-rich economy, but also in the general context of the financial development-growth debate.

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for Thailand; Mohamad (2008) for Sudan; Singh (2008) for India; Safdari et al. (2011) for Iran; Thangavelu and Ang (2004) for Australia; Muhsin and Eric (2000) for Turkey; Liang and Teng (2006) for China; Ghatak (1997) for Sri Lanka and Al-Malikawi et al. (2012) for UAE.

The remainder of this chapter is organized as follows. Section 3.2 provides a brief overview of the Saudi economy and discusses the key characteristics of its financial sectors. Section 3.3 describes the data and the construction of the measures of financial development used in the empirical analysis. Section 3.4 explains the methodology and the econometric model used in our study. Section 3.5 reports the empirical results. Section 3.6 presents the robustness checks of the empirical analysis. Finally, section 3.7 concludes, and provides some policy implications.

3.2. OVERVIEW OF THE SAUDI ECONOMY AND ITS FINANCIAL SECTORS

Saudi Arabia's economy depends heavily on the oil sector. The country is the world's leading exporter of petroleum and a very prominent member of the OPEC. The oil sector accounts for about 45 % of the total GDP and 90 % of the total export earnings. In order to reduce the dependence on the oil sector, the government has, over the last couple of decades, been trying to diversify the economy by promoting the non-oil sector. Efforts have been made to diversify into power generation, telecommunications, natural gas exploration, and petrochemical sectors. What is more, in order to foster economic growth, the government has recognized the important role of the financial sector in mobilizing savings and channeling funds to economic activities. To this effect, it has been promoting the development of an efficient banking system, well-developed financial markets and comprehensive and competitive insurance services.

There have been several signs that the economy has been switching from the oil to the non-oil sector over the last four decades.[3] During the 1970s, the share of the non-oil sector in overall GDP was very low, from 30% to 37%. However, at the beginning of the 1980s, the Saudi economy experienced a rapid shift in favor of the non-oil sector at the expense of the oil sector. In 1985, the non-oil output peaked at 77% of GDP. Thereafter, its share fluctuated between 60% and 72% during the following period (1986-2010).

Choudhury and Al-Sahlawi (2000) see this significant growth of the non-oil sector as a success of the emphasis on diversification made in the fourth development plan (1985-90) and all the subsequent plans. On the other hand, Al-Hassan et al. (2010) argue that these increases in the non-oil sector are merely the result of the fluctuation in the world's oil demand that reflects swings in world oil prices.

Although the financial sector in Saudi Arabia comprises both banks and non-bank financial institutions, it is dominated by the banking sector. This is because all other financial intermediaries and non-bank financial institutions, such as the stock market, Sukuk (Islamic bonds) and insurance companies, are either newly-established or underdeveloped. For example, the Saudi stock market was officially established only in 1984; until then it was just an informal market. Moreover, the number of listed companies was small: just 72 companies up to 2008.[4]

Although the Saudi insurance industry is the largest insurance market among the Gulf Cooperation Council (GCC) countries, the regulation of this sector by the Saudi

[3] The oil sector refers to the production activity relating to the extraction and supply of crude oil. The non-oil activities include finance, trade, government services, construction, utilities, natural gas and petroleum-processing industries.

[4] However, the Saudi stock market has experienced tremendous development in the last five years due to the new rules allowing non-Saudi citizens to participate in shares trading in the stock market which used to be restricted only to Saudi citizens before 2008. As a result, more companies were encouraged to seek finance from the stock market and the number of listed companies increased to 172 companies in 2013.

Arabian Monetary Agency (SAMA) only began in 2003 (The Saudi Insurance Market Report, 2009). In 2004, there was only one insurance company, but by the first half of 2008, the Council of Ministers approved the licensing of 22 insurance companies. As regards the Islamic Banking and Sukuk (Islamic bonds) sector, there are four Islamic banks in Saudi Arabia; in addition to them, there are Islamic windows in the conventional banks. According to a report issued by the World Islamic Banking Conference on the competitiveness of Islamic banks, Saudi Arabia ranks first, as measured by the earnings of Islamic Banks over the period 2000–2006. However, no data on this sector are publicly available.

The banking sector has fared well during the last four decades, no doubt favorably affected by the oil boom phase. Several Saudi commercial banks were established and the number of commercial banks has risen to 12. Out of those, five are entirely owned by Saudi shareholders while the rest are owned by a mix of Saudi and foreign shareholders (Ariss, et al., 2007). Table 3.1 shows some selected indicators of the banking sector. The ratio of liquid liabilities to GDP (M3/GDP) has increased moderately from 2005 to 2010, though it has fallen somewhat in 2008 and 2010 compared to the previous years. A higher liquidity ratio means that the banking system has grown in size. The ratio of the private sector credit to GDP has followed the same trend as the liquid liabilities to GDP ratio. Table 3.1 also shows that total bank assets have been increasing constantly over the years.

The Saudi commercial banks have expanded the amount of investment and consumer lending. The private sector in Saudi Arabia remains relatively small, possibly because it is constrained by the limited credit disbursement by the commercial banks to the private sector. However, more commercial banks entered into the money market and expanded their loans to the private sector from 1999 onwards so that the loan disbursements have increased sharply. Table 3.2 also shows that the total credit disbursement of commercial banks has increased moderately from 2006 to 2010, but has fallen slightly in 2009 as compared to the previous year.

Table 3.1. Selected Indicators of Banking Sector.

Year	M3/GDP	PRIVATE/GDP	Total Bank Asset
2005	46.8218	36.8644469	759075
2006	49.4604	35.64138057	861088
2007	54.7463	40.05913986	1075221
2008	52.0185	41.12532216	1302271
2009	72.8406	52.53976349	1370258
2010	64.3419	47.59243453	1415267

Sources: SAMA 48th Annual Report.

Table 3.2. Bank Credit to the Private Sector by economic Activity (In Million Riyals)[5].

	2006		2007		2008		2009		2010	
	Amount	% Share	Amount	% Share	Amount	% Share	Amount	% Share	Amount	% Share
Agriculture & Fishing	6802	1.5	8636	1.5	10980	1.5	8731	1.2	10269	1.4
Manufacturing & Processing	37566	8.1	54339	9.7	79333	11.1	75044	10.6	90082	12.1
Mining & Qurrying	1802	0.4	3897	0.7	4265	0.6	5337	0.8	5818	0.8
Electricity, Water & Gas	3598	0.8	5878	1.1	10629	1.5	13365	1.9	19243	2.6
Building & Construction	37845	8.2	43421	7.8	54371	7.6	44741	6.3	55644	7.5
Commerce	111511	24.1	127473	22.9	176858	24.8	169220	23.9	181132	24.4
Transport & Communication	6875	1.5	20989	3.8	37814	5.3	38415	5.4	42992	5.8
Finance	61828	13.4	62632	11.2	16812	2.4	21258	3.0	17756	2.4
Services	16735	3.6	28286	5.1	32324	4.5	46123	6.5	35660	4.8
Miscellaneous	177539	38.4	201854	36.2	289351	40.6	286536	40.4	284461	38.3
Total	462,103	100	557,405	100	712,737	100	708,769	100	743,057	100

5 Sources: SAMA 48th Annual Report.

3.3. DATA AND THE CONSTRUCTION OF FINANCIAL DEVELOPMENT VARIABLES

3.3.1 Data description

We use annual data for Saudi Arabia covering the period from 1968 to 2010. The data was collected from the World Development Indicators (WDI) dataset and the 47th annual report of the Saudi Arabian Monetary Agency (SAMA). The variables of interest include real gross domestic product per capita (GDP) as the dependent variable and potentially important determinants of economic growth as explanatory variables. We initially collected data on government expenditure (as a percentage of GDP), investment share in GDP, oil price, inflation, openness to trade and various measures of financial development (discussed in greater detail below).[6] However, when including all variables in the regression, several turned out to be insignificant. We, therefore, proceeded to omit the insignificant explanatory variables, one by one, until we were left with a model that contained only significant variables: the oil price (OILP), trade openness (TRD) and financial development (FD).[7] The fact that investment dropped out is particularly puzzling: it is typically a robust determinant of economic growth in most studies. The fact that it fails to feature significantly as a determinant of Saudi growth may be due to the overwhelming dominance of the oil sector in this country. It may also reflect the fact that a large fraction of investment in Saudi Arabia is related to oil exploration and thus may affect growth only with a substantial lag, likely to be several years.

We, therefore, estimate a model that includes only a relatively narrow set of core variables alongside our main variable of interest: financial development. This is in line

[6] We also sought to include some measure of human capital but were unable to do so because of a large number of missing values.
[7] This approach is equivalent to implementing the general-to-specific procedure.

with the literature arguing against controlling for a relatively extensive list of explanatory variables: the resulting coefficients then often depend crucially on the set of specific remaining variables included (see the discussion in, among others, Levine and Renelt, 1992, and Woo, 2009).

3.3.2. Construction of financial development variables: Principal component analysis (PCA)

We collected information on the following three indicators of financial development:

1. The ratio of broad money (M2)[8] to nominal GDP.
2. The ratio of liquid liabilities (M3)[9] to nominal GDP.
3. The ratio of credit to private sector to nominal GDP.

We follow Ang and McKibbin (2007) in constructing a single measure of financial development by using principal component analysis. The justification for doing this is two-fold. First, it addresses the problem of multicollinearity, or the high correlation between the various financial development indicators. Second, there is no general consensus as to which measure of financial development is most appropriate. Therefore, having a summary measure of financial development that includes all the relevant financial proxies (data permitting) to capture several aspects of the financial sector at the same time, such as directed credit programs and liquidity, will provide better information on financial deepening.

Table 3.3 presents the results of principal component analysis with the logarithms of the three measures of financial development listed above. The eigenvalue associated

[8] M2 = M1 (currency outside banks + demand deposits) + time and saving deposits.
[9] M3= M2 + other quasi monetary deposits.

with the first component is significantly larger than one. The first principal component explains approximately 97.3% of the standardized variance, the second principal component explains another 2.0%, and the last principal component accounts for only 0.5% of the variation. Clearly, the first principal component is the best measure of financial development in this case. Below, we denote this summary indicator of financial development as FD.

Table 3.3. Principal Component Analysis.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.912	2.840	0.971	0.971
Comp2	0.072	0.0569	0.024	0.995
Comp3	0.015	.	0.005	1.000

Number of Obs = 41, Number of comp= 3

3.4. METHODOLGY AND MODEL SPECIFICATION

*3.4.1. **Methodology***

The two commonly used techniques to test for cointegration between variables are the Engle and Granger method and the Johansen technique. The Engle and Granger method is a single-equation technique and as such it can lead to contradictory results, especially when there are more than two cointegrated variables under consideration (see, Asteriou and Hall , 2011; Ang 2010). Another shortcoming of this method is in its implementation: in order to obtain the long-run equilibrium relationship, we need to estimate the Ordinary Least Squares (OLS) regression as a first step. This procedure, as pointed out by Banerjee et al. (1986), may generate a substantial bias owing to the omission of dynamics and this can undermine the performance of the estimator. Also, the two-step residual-based procedure uses the generated residual series in the first step to estimate a new regression model in the second stage, in order to see whether the residual series is stationary or not. Hence, the error introduced in the first step is carried forward into the second step (Enders, 2004; Asteriou and Hall, 2011).

The Johansen method, which is known as a system-based approach to cointegration, is considered to be a superior method over the Engle and Granger method, and offers a solution in the case of having more than two variables and multiple cointegration vectors that might exist between the variables. Furthermore, the Johansen approach mitigates the omitted lagged variable bias that affects the Engle and Granger approach by the inclusion of lags in the estimation. Even so, the Johansen method can be subject to criticism. The first drawback is the sensitiveness of the results to the optimal number of lags included in the test (Gonzalo, 1994). The second is that if there are more than one cointegrating vectors, it is often hard to interpret each implied economic relationship and to find the most appropriate vector for the subsequent test (Ang, 2010).

Both the Engle-Granger and Johansen techniques are criticized on the grounds that the validity of these methods requires that all the variables be integrated of order one, I(1). They cannot be employed, therefore, if we have a mixture of I(0) and I(1) variables, as in our case (see below).

In this study, we use the autoregressive distributed lag or Bounds testing approach to cointegration (ARDL) technique of Pesaran et al. (2001). This method has been used as an alternative cointegration test that examines the long-run relationships and dynamic interactions among the variables and as such addresses the above issues. This approach has several desirable statistical features. First, the cointegrating relationship can be estimated easily using OLS after selecting the lags order of the model. Second, it allows testing simultaneously for the long and short–-run relationships between the variables in a time series model. Third, in contrast to the Engle-Granger and Johansen methods, this test procedure is valid irrespective of whether the variables are I(0) or I(1) or mutually co-integrated, which means that no unit root test is required. However, this test procedure will not be applicable if an I(2) series exists in the model. Fourth, in spite of the possible presence of endogeneity, ARDL model provides unbiased coefficients of explanatory variables along with valid t-statistics. In addition, ARDL model corrects the omitted lagged variable bias (Inder, 1993). Furthermore, Jalil and Ma (2008) and Ang (2010) argue that the ARDL framework includes sufficient numbers of lags to capture the data generating process in general to specific modeling approach of Hendry (1995). Finally, this test is very efficient and consistent in small and finite sample sizes.

3.4.2. Model Specification

Following Ang and McKibbin (2007), Khan et al (2005) and Fosu and Magnus (2006), the ARDL version of the vector error correction model (VECM) can be specified as:

$$\Delta \ln Y_t = \beta_0 + \beta_1 \ln Y_{t-1} + \beta_2 \ln X_{1\,t-1} + \beta_3 \ln X_{2t-1} + \beta_4 \ln X_{3t-1} + \sum_{i=1}^{p} \gamma_i \Delta \ln Y_{t-i} + \sum_{j=0}^{q1} \delta_j \Delta \ln X_{1t-j} + \sum_{l=0}^{q2} \varphi_l \Delta \ln X_{2t-l} + \sum_{m=0}^{q3} \eta_m \ln X_{3t-m} + \varepsilon_t. \quad (3.1)$$

In equation (3.1), Y is the real gross domestic product per capita, X1 stands for the financial development, X2 is the oil price, X3 is the trade openness, and ε is the error term.

Using the ARDL approach we estimate three models with the dependent variable being real GDP per capita (GDP), real GDP per capita of Non-Oil Sector (GDPN) and real GDP per capita of Oil-Sector (GDPO). Each of these is regressed on Financial Development (FD), Oil Price (OILP), and Trade Openness (TRD).

3.4.3. Estimation procedure

We first estimate equation (3.1) using OLS and then conduct the Wald Test or F-test for joint significance of the coefficients of lagged variables for the purpose of examining the existence of a long-run relationship among the variables. We test the null hypothesis, (H_0): $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$, that there is no cointegration among the variables, against the alternative hypothesis (H_a): $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$. The F-statistics is then to be compared with the critical value (upper and lower bound) given by Pesaran et al. (2001). If the F-statistic is above the upper critical value, the null hypothesis of no cointegration is rejected which indicates that long-run relationship exists among the variables. Conversely, if the F-statistic is less than the lower critical value the null hypothesis cannot be rejected, implying no cointegration among the variables. However, if the F-statistic lies between lower and upper critical values, the test is inconclusive.

In the second step, after testing the relationship among the variables, the long-run coefficients of the ARDL model can be estimated:

$$\begin{aligned} \ln \mathrm{Y_t} = \beta_0 + \sum_{i=1}^{p} \gamma_i \ln Y_{t-i} \sum_{j=0}^{q1} \delta_j \ln X_{1t-l} + \sum_{l=0}^{q2} \varphi_l \ln X_{2t-l} \\ + \sum_{m=0}^{q3} \eta_m \ln X_{3t-m} + \varepsilon_t. \end{aligned} \tag{3.2}$$

In this process, we use the SIC criteria for selecting the appropriate lag length of the ARDL model for all four variables under study. Finally, we use the error correction model to estimate the short run dynamics:

$$\Delta \ln \mathrm{Y_t} = \beta_0 + \sum_{i=1}^{p} \gamma_i \Delta \ln Y_{1t-i} \sum_{j=0}^{q1} \delta_j \Delta \ln X_{1t-l} + \sum_{l=0}^{q2} \varphi_l \Delta \ln X_{2t-l}$$
$$+ \sum_{m=0}^{q3} \eta_m \Delta \ln X_{3t-m} + \vartheta ecm_{t-1} + \varepsilon_{t.} \tag{3.3}$$

3.4.4. CUSUM and CUSUMSQ test (stability tests)

We perform two tests of stability of the long-run coefficients together with the short run dynamics, following Pesaran (1997), after estimating the error correction model: the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests.

3.5. **RESULTS AND DISCUSSION**

3.5.1. Unit-root test

Prior to testing for cointegration, we conduct a test of the order of integration for each variable using the Augmented Dickey-Fuller test (Table 3.4). Even though the ARDL framework does not require the pre-testing of variables, the unit root test could indicate whether or not the ARDL model should be used. As can be seen from Table 3.4, only some of the variables, in particular real GDP per capita in the non-oil sector (GDPN), real GDP per capita in the oil sector (GDPO) and the oil price (OILP), are stationary at the 5 % or 10 % significance level, whereas all variables are stationary after first differencing. Hence, the results of the unit root test demonstrate that the ARDL model is more appropriate to analyze the data than the Johansen cointegration model.

Table 3.4. Unitroot Test.

Variables	ADF test		ADF test	
	In level I(0)		First difference I(1)	
	Intercept	Intercept & trend	Intercept	Intercept &trend
GDP	-2.598	-3.078*	-2.997**	-3.463*
GDPN	-3.15**	-3.371*	-2.47	-2.82
GDPO	-2.659*	-3.450*	-5.335***	-5.394***
FD	-0.250	-2.621	-6.999***	-7.004***
OILP	-2.631*	-2.401	-6.028***	-6.022***
TRD	-1.555	-1.491	-9.097***	-9.001***

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.

3.5.2. Cointegration test

The calculated *F*-statistics for the cointegration test are displayed in Tables 3.5, 3.9 and 3.13. The *F*-statistic for the first model (7.5803, Table 3.5) is higher than the upper bound critical value at the 1 % level of significance, using restricted intercept and no trend. This implies that the null hypothesis of no cointegration cannot be accepted, therefore there is a cointegrating relationship among the variables. Through normalization process we find that there is cointegration at 5% when financial development and the oil price are the dependent variables but not when we consider openness to trade. The same procedure has been applied to analyze the other two models (for the oil and non-oil sectors). The results suggest the presence of cointegration between GDPN and all explanatory variables, and also cointegration between GDPO and the explanatory variables.

3.5.3. Long- run impact

The empirical results are reported in Tables 3.6, 3.10 and 3.14. They show that trade openness has a positive and significant effect on overall economic growth as well as on the growth of both oil and non-oil sectors. This result is consistent with theoretical and empirical predictions. In addition, the oil price has a positive and significant impact on overall GDP growth but an insignificant impact on the non-oil sector in the long-run.

Financial development has a negative but insignificant impact on economic growth, indicating that the Saudi economy has not benefitted from financial development. This finding can be explained by two prime views: a theoretical view and a pragmatic view. According to all financial development theories, the measures of financial development adopted in this study should have a positive and significant impact on economic growth. However, it is difficult to comprehend which growth theory fits in with the features of the Saudi economy. The economy of Saudi Arabia is characterized by high resource abundance, where the state takes major economic decisions. Though, due to a high oil rent, although the per capita income is moderately high, the economy does experience high unemployment. Therefore, this economic scenario can be explained partially by the Keynesian school of thought. However, this thought is worthless due to the violation of the strong assumption ofthe speculative motive of economic which occurs due to asymmetric information and underdeveloped capital market. Thus, private sector becomes unable to flourish due to the lack of credit availability in the money and capital market. Moreover, Neoclassical thought also unable to explain the findings as it assumes to operate capital market incurs no cost and it operates perfectly. According to the exogenous growth theory, capital accumulation takes place due to higher saving ratio, changes of which can give only temporary boost to economic growth. However, in order to attain a higher long run growth, an economy requires continuous technological progress. Endogenous growth theory argues that human capital and institutions spur technical innovation and enhance living standards. In the context of the Saudi economy, poor financial market hinders the savings to be channelled to investment process to increase capital-labour ratio. Endogenous growth theory further claims that due to financial development, research and development increases, which leads to higher productivity of labour, hence growth takes place. However, as we found positive and significant effect of trade, we can claim that technological diffusion took place through trade in Saudi economy, rather than the local growth of Research and Development (R&D) process. Nevertheless, this diffusion of technology through trade can be made through either public sector or private sector, where the role of financial development is irrelevant.

The pragmatic view is that despite the plausible role of financial development, the poor quality of governance may impede the true potential of financial development in the process of market clearing, reducing information asymmetry etc. Our result is in line with many empirical studies. It is in line with Barajas et al (2013), who find that financial development has lower if not negative effect on economic growth in oil-rich and Middle Eastern and North African (MENA) countries. This finding may be attributed to the fact that during the period under analysis, the financial sector was still relatively under-developed, and below a certain threshold, beyond which it would be capable of promoting economic growth (Al-Malkawi et al., 2012). Ram (1999) also found a negligible or weak negative impact of financial development on economic growth. Jalil and Ma (2008), similarly, argue that inefficient allocation of resources by banks coupled with the absence of favorable investment environment in the private sector slow the overall economic growth in China. The findings of Jalil and Ma would be applicable to Saudi Arabia where, as in China, most economic decisions are directed by the government. Barajas et al. (2013) argue that the impact of financial deepening on economic growth disappears in the case of an oil-based economy like Saudi Arabia. Our findings are in line also with Ang and McKibbin (2007) who find no evidence of economic improvement due to the expansion of the financial sector in Malaysia. Ang and McKibbin suggest that the returns from financial development depend on the mobilization of savings and allocation of funds to productive investment projects. However, due to information gaps, high transaction costs and improper allocation of resources, the interaction between savings and investment and its link with economic growth is not strong in developing countries. According to Beck (2011), the existence of natural resource curse in financial development might be another reason for this insignificant impact of financial development on growth in oil-rich economies.

In contrast, the effect of financial development (FD) on the non oil sector in Saudi Arabia is positive and statistically significant at 10%. The magnitude of this impact is not sufficient to ensure a positive relationship for the overall economy since the non-oil sector constitutes only a relatively small part of the Saudi economy. This finding is consistent with Nili and Rastad, (2007) who find that financial markets in resource-rich countries are relatively weak. They attribute their results to three reasons, a possible natural resource curse in financial development, the dominant role of government in total investment and the poor performance of the private sector in these countries.

In contrast, the third model shows that FD does not have any impact on the oil sector of Saudi Arabia. Since the oil sector is exclusively controlled by the government, it is not surprising that financial development does not significantly contribute toward its growth.

3.5.4. Short run impact and adjustment

The coefficients of the error correction model for all three specifications are presented in Tables 3.7, 3.11 and 3.15. The negative signs of each coefficient of the ECM variable reveal that short-run adjustment, which occurs at a high speed in the negative direction, is statistically significant. Moreover, this is an indication of cointegration relationship among GDP (both oil and non-oil), financial development, oil price, and trade openness. The values of ECM coefficients strongly suggest that the disequilibrium caused by the previous year's shocks dissipates and the economy converges back to the long-run equilibrium in the current year (see Dara and Sovannroeun, 2008; and Hossein, 2007).

3.5.5. Diagnostic test

The overall goodness of fit of the estimated models shown in Tables 3.8, 3.12 and 3.16 is quite high, with R^2 values of 96%, 99% and 77% for the first, second and third model, respectively. This is not surprising, given that the ARDL model includes the lagged dependent variable. We applied a number of diagnostic tests to the ARDL model. We found no evidence of serial correlation, multicollinerarity, and error in the functional form, but found heteroscedasticity in model 2 and model 3 (Tables 3.12 and 3.16). However, as Shrestha and Chowdhury (2005) and Fosu and Magnus (2006) point out, it is natural to detect heteroscedasticity in the ADRL approach, since the model mixes time series data integrated of order I(0) and I(1). Figures 3.1, 3.2 and 3.3 show the CUSUM and the CUSUMSQ stability test results to the residuals of equation (3.1): the CUSUM and CUSUMSQ remain within the critical boundaries for the 5% significance level. These statistics confirm that the long-run coefficients and all short-run coefficients in the error correction model are stable and affect growth.

Table 3.5. Result from Bounds test.

Dep. Var.	SIC Lag	F-statistic	Probability	Outcome
F_{GDP}(GDP|FD, OILP, TRD)	1	7.580	0.000***	Cointegration
F_{FD}(FD|GDP, OILP, TRD)	1	3.636	0.015**	Cointegration
F_{OILP}(OILP| FD, GDP, TRD)	1	3.355	0.021**	Cointegration
F_{TRD}(TRD| FD, GDP, OILP)	1	1.254	0.308	No Cointegration

Notes: *** and ** indicate significance at 1% and 5 %, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=4 (Pesaran et al (2001) p.300).

Table 3.6. Estimated Long Run Coefficients using the ARDL Approach.

ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion, dependent variable is GDP

Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	- 6.950	12.390	- 0.560	0.579
FD	- 0.033	0.035	- 0.962	0.342
OILP	0.133***	0.023	5.690	0.000
TRD	2.140***	0.088	24.310	0.000

Note: *** indicate significance at 1%.

Table 3.7. Error Correction Representation for the Selected ARDL Model

ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDP

Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	1.750**	0.805	2.173	0.037
ΔFD	-0.004	0.004	-0.993	0.327
ΔOILP	0.001	0.004	0.252	0.802
ΔTRD	0.118*	0.058	1.74	0.089
ecm(-1)	-0.128***	0.023	-5.47	0.000

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.

Table 3.8. ARDL-VECM Model Diagnostic Tests

R^2=0.96, Adjusted R^2=0.95

Serial Correlation $\mathcal{X}^2(1)$=0.001[0.972]	Normality $\mathcal{X}^2(2)$=1.687[0.43]
Functional Form $\mathcal{X}^2(1)$= 0.559[0.454]	Heteroscedasticy $\mathcal{X}^2(1)$=1.640[0.199]

Figure 3.1. Plot of CUSUM and CUSUMQ for coefficient stability for ECM model (1)

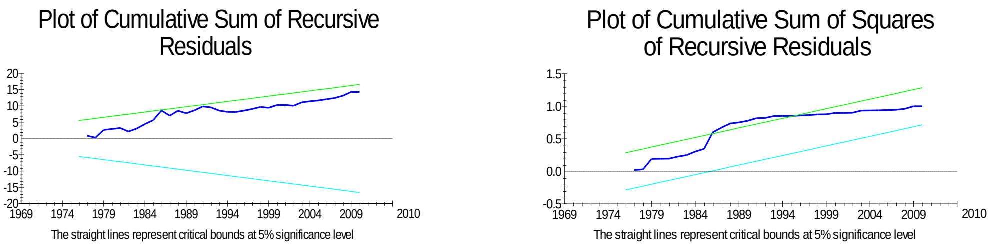


Table 3.9. Result from Bounds test.

Dep. Var.	SIC Lag	F-statistic	Probability	Outcome
F_{GDPN} (GDPN| FD, OILP, TRD)	2	10.381	0.000***	Cointegration
F_{FD} (FD| GDPN, OILP, TRD)	1	4.199	0.007***	Cointegration
F_{OILP}(OILP| FD, GDPN, TRD)	1	5.996	0.001***	Cointegration
F_{TRD}(TRD| FD, GDPN, OILP)	1	2.770	0.042**	Cointegration

Notes: **, and *** indicate significance at - 5 % and 1%, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=4 (Pesaran et al (2001) p.300).

Table 3.10. Estimated Long Run Coefficients using the ARDL Approach.

ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion, Dependent variable is GDPN				
Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	1.25**	0.600	2.070	0.040
FD	0.184*	0.106	1.730	0.091
OILP	0.078	0.046	1.660	0.104
TRD	2.14***	0.088	24.310	0.000

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.

Table 3.11. Error Correction Representation for the Selected ARDL Model.

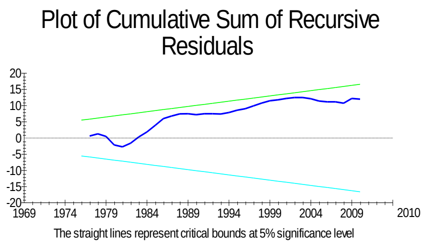
ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion, dependent variable is ΔGDPN				
Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	1.918***	0.702	2.729	0.010
ΔFD	0.111	0.008	1.390	0.172
ΔOILP	0.110***	0.004	2.570	0.014
ΔTRD	0.061	0.062	0.980	0.333
ECM (-1)	-0.06***	0.174	-3.450	0.001

Notes: *** indicate significance at 1%.

Table 3.12. ARDL-VECM Model Diagnostic Tests.

R^2=0.99, Adjusted R^2=0.98	
Serial Correlation $\chi^2(1)$=.010[0.91]	Normality $\chi^2(2)$=0.053[0.97]
Functional Form $\chi^2(1)$= .016[0.89]	Heteroscedasticy $\chi^2(1)$=4.65[0.031]

Figure 3.2. Plot of CUSUM and CUSUMQ for coefficient stability for ECM model (2)



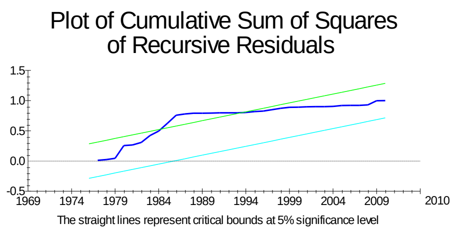


Table 3.13. Result from Bounds test.

Dep. Var.	SIC Lag	F-statistic	Probability	Outcome
F_{GDPO}(GDPO|FD, OILP, TRD)	1	3.840	0.017**	Cointegration
F_{FD}(FD|GDPO, OILP, TRD)	1	1.313	0.297	No Cointegration
F_{OILP}(OILP| FD, GDPO, TRD)	1	2.504	0.068	Inconclusive
F_{TRD}(TRD| FD, GDPO, OILP)	1	1.959	0.138	No Cointegration

Notes: ** indicate significance at 5 %.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=4 (Pesaran et al (2001) p.300).

Table 3.14. Estimated Long Run Coefficients using the ARDL Approach.

ARDL(1,1,0,0) selected based on Schwarz Bayesian Criterion, dependent variable is GDPO				
Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	4.100	6.060	.676	0.504
FD	0.170	.123	1.44	0.157
OILP	0.193**	.082	2.35	0.025
TRD	3.140***	.158	19.87	0.000

Notes: ** and *** indicate significance at 5 % and 1%, respectively.

Table 3.15. Error Correction Representation for the Selected ARDL Model.

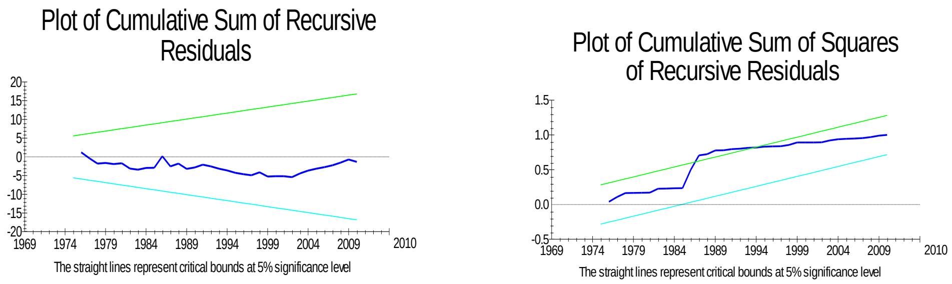
ARDL (1,1,0,0) selected based on Schwarz Bayesian Criterion, dependent variable is ΔGDPO				
Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	3.584**	1.744	2.054	0.048
ΔFD	-0.088**	0.044	-2.004	0.053
ΔOILP	0.021***	0.007	2.954	0.006
ΔTRD	0.349**	0.149	2.340	0.025
ECM (-1)	-0.111**	0.051	-2.155	0.038

Notes: ** and *** indicate significance at 5 % and 1%, respectively.

Table 3.16. ARDL-VECM model diagnostic tests.

R^2=0.77, Adjusted R^2=0.73	
Serial Correlation $\chi^2(1)$=2.049[0.152]	Normality $\chi^2(2)$=.0211[0.989]
Functional Form $\chi^2(1)$= 2.291[0.130]	Heteroscedasticy $\chi^2(1)$=14.860[0.00]

Figure 3.3. Plot of CUSUM and CUSUMQ for coefficient stability for ECM model (3)



3.6. ROBUSTNESS CHECKS

Although the three previous models have passed all diagnostic and stability tests successfully, we also carry out a number of robustness checks in order to examine the sensitivity of our findings to alternative model specifications. In this section, we report the core results of these robustness checks.

First, we re-estimate all models with the individual measures of financial development variables (M2, M3 and credit to the private sector, all as fractions of GDP) individually rather than as a composite index. The results are similar to those reported above in that the effect of the financial development variable on growth is either negative and significant or insignificant. Most notable result with the separate measures of financial development is that the impact of claims on the private sector to GDP always appears to have a negative and significant effect on economic growth. This finding suggests that there are fundamental problems of credit allocation in the Saudi financial sector, due to the inefficient financial regulation and supervision in the banking sector in Saudi Arabia, along with the lack of an appropriate investment climate required to foster private investment and promote economic growth in the long-run. Using (M3/GDP) and (M2/GDP) each in separate models along with claims on private sector and other controls, we obtained positive and significant coefficients in the long-run only for the growth of non-oil GDP model. To save space, we have omitted them from the main text and report them in appendix A3.I (Table A3.1 to Table A3.24).

As a second robustness exercise, we consider another (non-money stock) variable used in the literature as measure of financial development: total banks assets to GDP ratio. This variable is a comprehensive measure of the size of the financial sector relative to the size of the economy as whole (Levine and Beck, 1999). The total banks assets include claims on the government, the public enterprises and the private sector. Since we use claims on the private sector as another measure of financial development, we exclude this variable from the total banks assets. We denote the resulting measure as TBA.

We use TBA to replace M2/GDP. As discussed before, monetary aggregates such as M2 and M3 as ratios of nominal GDP are the two most commonly used measures to capture the depth of the financial sector, as used in the empirical literature. The reason for dropping M2/GDP is that it has been argued in the literature that M2/GDP might not be that good a proxy for financial development in the case of developing countries (e.g., Demetriades and Hussein, 1996; and Luintel and Khan, 1999) because currency held outside the banking system is a large component of the broad money stock (M2) in these countries. If this is the case, an increase in the ratio of broad money to GDP may reflect more extensive use of currency rather than an increase in the volume of bank deposits. As a result, M2 mostly represents the ability of the financial systems to provide transaction services rather than their ability to link up surplus and deficit agents in the economy. Therefore, we omit M2/GDP and replace it with TBA/GDP.

3.6.1. Robustness checks using FD2 index.[10]

We apply the same principal component analysis procedure as before to construct a new aggregate index of financial development. We denote this new summary indicator as FD2. Hence, we aggregate the following three different measures of financial development into a single index:

1- The ratio of liquid liabilities (M3) to nominal GDP.
2- The ratio of credit to private sector to nominal GDP.
3- The ratio of the total banks assets to nominal GDP.

Table 3.17 presents the results obtained from principal component analysis of the three measures of financial development listed above. The first component explains 96% of the variance in the data and its eigenvalue is larger than one. The second and the third principal component each explain only a negligible share of the variation. As

[10] We also carry out separate analyses using each of the original financial development indicators. The results are similar to those in Tables 3.18 to 3.29. In order to conserve space, we drop them from the main text and report them in appendix A3.II (Table A3.25 to Table A3.36).

before, we therefore, use only the first principal component as a measure of financial development.

Table 3.17. Principal Components Analysis.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.907	2.853	0.969	0.969
Comp2	0.539	0.015	0.018	0.987
Comp3	0.038	.	0.012	1.000

Number of Obs = 41, Number of comp = 3.

3.6.2. Cointegration test

The F-statistics for the cointegration tests are presented in tables 3.18, 3.22 and 3.26. The F-statistic of the models estimated with GDP, GDPN and GDPO are 6.763, 7.4093 and 4.837, respectively, greater than the upper bound Pesaran critical value (4.37) at the 1 % significance level for the overall GDP and the non-oil sector and at 5 % significance level for the oil sector, using restricted intercept and no trend. This suggests that there is a long-run relationship among the total GDP and the two sub-components of the total GDP; GDPN and GDPO with the financial development index and the other two control variables: oil price and trade. Thus, the results imply that there is a unique cointegrating relationship among the three dependant variables; GDP, GDPN, GDPO, and the explanatory variables.

3.6.3. Long- run impact

The existence of a long run relationship among GDP (both oil and non-oil) and the explanatory variables allows the estimation of long run coefficients and short run dynamic parameters. The empirical results of the long-run impact are presented in Tables 3.19, 3.23 and 3.27. The results for the control variables, oil price and trade confirm our previous findings. The new financial development index displays a negative impact on long-run overall growth and the growth of the oil sector, but this is now statistically significant. This finding is in line with Mahran (2012), who finds a negative impact of the banking sector on the overall GDP growth. In contrast, financial intermediation positively affects the growth rate of the non-oil sector.

3.6.4. Short-run impact and adjustment

The results of the short-run and the lagged error correction term (ECM) are reported in tables 3.20, 3.24 and 3.28. The coefficients of the ECM for GDP and GDPN models; -0.164 and -0.366, respectively, are negative and statistically significant at the 1 % level. The coefficient for GDPN is also negative but significant at 10% only. The significant negative signs of all ECM coefficients are an indication of a cointegrating relationship among real GDP (both GDPN and GDPO) and financial development, oil price and trade and any disequilibrium caused by the previous year's shocks converges back to the long-run equilibrium in the current year for all models.

3.6.5. Diagnostic tests

Tables 3.21, 3.25 and 3.29 display the diagnostic test results for the underlying ARDL equation. The results suggest again that all models pass the diagnostic tests against serial correlation, functional form misspecification and non-normal errors. However, the GDPN and GDPO models fail the heteroscedasticity test at 5%. As discussed earlier, it is natural to detect heteroscedasticity when we have mixed time series data integrated of order I(0) and I(1). The plot of the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares recursive residuals (CUSUMQ) for the three robustness models presented in Figs. 3.4, 3.5 and 3.6 also indicate stability in the coefficients over the sample period as they fall within the critical bounds.

As discussed before, financial systems in Saudi Arabia can be broadly classified as bank-dominated. However, following the preceding robustness checks, we investigate how our benchmark results change when we consider not only bank sector effects but also stock market effects in our models. We carried out these estimations on a shorter time span (1985-2010) as this is the period for which the data on the stock market are available. We add the market value of shares/GDP as a stock market variable measuring the development in the financial sector along with the other financial development variables used in the main analysis. The results show that the inclusion of stock market development does not remarkably change our results. This indicates that financial development has a positive short-run impact on the growth of the non-oil sector in Saudi Arabia. However, this impact disappears in the long-run. In contrast, the impact of financial development on total GDP growth and oil-sector growth is negative but insignificant. The control variables have the expected sign with more or less minor changes.[11]

In summary, we confirm that our previous results are robust to alternative model specification. Moreover, we can conclude that financial development has a positive impact on the growth of the non-oil sector in Saudi Arabia. In contrast, its impact on the oil sector and overall GDP growth is negative and significant.

Table 3.18. Results from Bounds test.

Dep. Var.	SIC Lag	F-statistic	Probability	Outcome
F_{GDP}(GDP|FD2, OILP, TRD)	1	6.763	0.000***	Cointegration
F_{FD2}(FD2|GDP, OILP, TRD)	1	1.825	0.148	No Cointegration
F_{OILP}(OILP| FD2, GDP, TRD)	1	3.861	0.011**	Cointegration
F_{TRD}(TRD| FD2, GDPO, OILP)	1	2.924	0.304	Inconclusive

Notes: ** and *** indicate significance at 5 % and 1%, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=4 (Pesaran et al (2001) p.300).

Table 3.19: Estimated Long Run Coefficients using the ARDL Approach.

ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion, dependent variable is GDP

[11] The results on bank and market sectors can be obtained from the author upon request.

Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	4.588	3.334	1.375	0.178
FD2	-0.399**	0.172	- 2.313	0.027
OILP	0.053**	0.023	2.326	0.026
TRD	0.028**	0.013	2.205	0.035

Note: ** indicate significance at 5 %.

Table 3.20: Error Correction Representation for the Selected ARDL Model.

ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDP

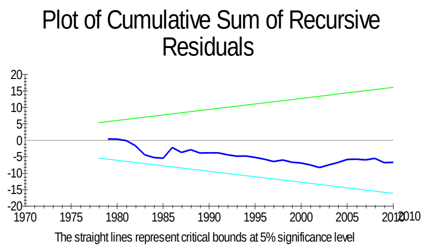
Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	0.752	0.762	0.986	0.331
ΔFD2	- 0.094 *	0.052	-1.796	0.082
ΔOILP	0.007**	0.003	1.994	0.054
ΔTRD	0.004**	0.002	2.305	0.027
ecm(-1)	-0.164***	0.053	-3.085	0.004

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.

Table 3.21: ARDL-VECM Model Diagnostic Tests.

R^2 =0.97, Adjusted R^2 =0.96	
A:Serial Correlation χ^2 (1)= 0.128[0.720]	C:Normality χ^2 (2)= 0.894[0.639]
B:Functional Form χ^2 (1)= 2.526[0.112]	D:Heteroscedasticity χ^2 (1)= 0.135[0.712]

Figure 3.4. Plot of CUSUM and CUSUMQ for coefficient stability for ECM-Robustness model. (1)



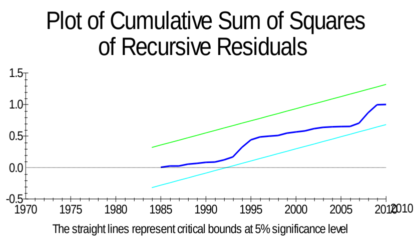


Table 3.22: Results of Bounds test.

Dep. Var.	SIC LaG	F-stat.	Probability	Outcome
F_{GDPN}(GDPN|FD2,OILP, TRD)	2	7.409	0.001***	Cointegration
F_{FD}(FD2|GDPN, OILP, TRD)	2	3.084	0.030	No Cointegration
F_{OILP}(OILP|GDPN, FD2, TRD)	2	3.322	0.022	No Cointegration
F_{TRD}(TRD|GDPN, FD2, OILP)	2	5.835	0.001***	Cointegration

Notes: *** indicate significance at 1%.

Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=4 (Pesaran et al (2001) p.300).

Table 3.23: Estimated Long Run Coefficients using the ARDL Approach.

ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion, dependent variable is GDPN

Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	0.492***	0.122	4.049	0.000
FD2	0.014*	0.007	1.879	0.077
OILP	0.010	0.082	0.121	0.904
TRD	0.015***	0.003	4.592	0.000

Notes: * and *** indicate significance at 10 % and 1%, respectively.

Table 3.24: Error Correction Representation for the Selected ARDL Model.

ARDL(2,0,1,1) selected based on Schwarz Bayesian Criterion, dependent variable is ΔGDP

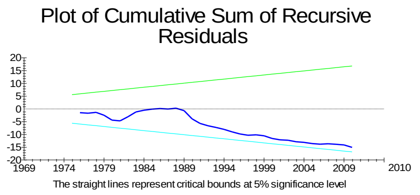
Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	0.535	0.577	0.928	0.359
ΔFD2	0.106***	0.024	4.296	0.000
ΔOILP	0.101*	0.056	1.790	0.082
ΔTRD	0.010***	0.002	3.897	0.000
ECM (-1)	-0.066*	0.037	-1.768	0.086

Notes: * and *** indicate significance at 10 % and 1%, respectively.

Table 3.25: ARDL-VECM Model Diagnostic Tests.

R^2=0.99, Adjusted R^2=0.98	
Serial Correlation χ^2(1)= 0.454 [0.50]	Normality χ^2 (2)= 0.972[0.97]
Functional Form χ^2(1)= 0.972 [0.61]	Heteroscedasticity χ^2 (1)= 3.203[0.07]

Figure 3.5. Plot of CUSUM and CUSUMQ for coefficient stability for ECM-Robustness model (2).



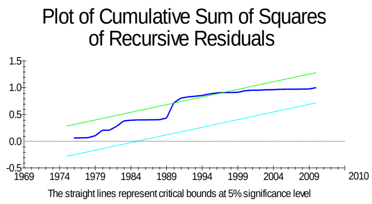


Table 3.26: Results of Bounds test.

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDPO}(GDPO|FD2, OILP, TRD)	2	4.837	0.007**	Cointegration
F_{FD2}(FD2|GDPO, OILP, TRD)	2	2.266	0.084	No Cointegration
F_{OILP}(OILP|GDPO, FD2, TRD)	2	3.467	0.018	No Cointegration
F_{TRD}(TRD|GDPO, FD2, OILP)	2	0.764	0.556	No Cointegration

Notes: **indicate significance at 5 %.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=4 (Pesaran et al (2001) p.300).

Table 3.27: Estimated Long Run Coefficients using the ARDL Approach.

ARDL(1,1,0,0) selected based on Schwarz Bayesian Criterion, dependent variable is GDPO

Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	9.587***	1.882	5.093	0.000
FD2	- 0.435***	0.128	- 3.400	0.002
OILP	0.053**	0.028	1.875	0.069
TRD	0.060***	0.014	4.172	0.000

Notes: ** and *** indicate significance at 5 % and 1%, respectively.

Table 3.28: Error Correction Representation for the Selected ARDL Model.

ARDL (1,1,0,0) selected based on Schwarz Bayesian Criterion, dependent variable is ΔGDPO

Regressor	Coefficient	Standard Error	T-Ratio	Probability
C	3.515**	1.411	2.490	0.018
ΔFD2	-0.159***	0.057	-2.770	0.009
ΔOILP	0.019**	0.007	2.584	0.014
ΔTRD	0.022***	0.007	3.086	0.004
ECM (-1)	-0.366***	0.106	-3.455	0.001

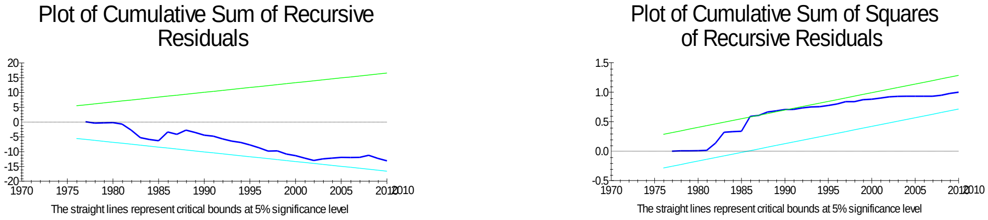
Notes: ** and *** indicate significance at 5 % and 1%, respectively.

Table 3.29: ARDL-VECM Model Diagnostic Tests.

R^2=0.84, Adjusted R^2=0.81

Serial Correlation χ^2 (1)= 0.638[1.00]	Normality χ^2 (2)= 0.233[0.890]
Functional Form χ^2 (1)= 0.130[0.718]	Heteroscedasticity χ^2 (1)= 7.605[0.006]

Figure 3.6. Plot of CUSUM and CUSUMQ for coefficient stability for ECM-Robustness model (3)



3.7. **CONCLUSIONS**

This chapter contributes to the literature on financial development and growth by focusing on the financial sector of an oil-rich economy, Saudi Arabia, which has not been studied extensively thus far. The results of this empirical study, based on the ARDL approach, suggest that financial development has a positive impact on economic growth of the Saudi non-oil sector in the long-run. In contrast, we find a negative or insignificant impact of financial development on the economy as a whole, and on the oil sector, which we believe is a significant finding.

These results can be interpreted from two angles. First, they reflect the inherent economic nature of Saudi Arabia, which is predominantly an oil-dominated economy. Second, they could be indicative of relative under-development of the Saudi banking system, which could lead to imbalances between saving and investment and may distort investment decisions. This is in line with Malkawi et al. (2012), who argue that the financial sector in Saudi Arabia is still in the transition stage. Hence, it needs to go beyond a certain threshold before it can be instrumental in promoting economic growth.

These findings also highlight the specific nature of oil and resource-rich economies like Saudi Arabia. Resource-driven economies do not necessarily follow the same patterns of development as manufacturing economies. The economy crucially depends on price fluctuations and foreign markets, as documented by the strong role played in our analysis by the oil price and openness to trade. Financial development does not play as prominent a role as in industrialized economies, or may not even play any role at all. The two arguments mentioned in the preceding paragraph may therefore be related: the fact that the Saudi banking sector is underdeveloped may itself be due to the dominant role of oil in the economy. Banking plays an important role in industrialized and agricultural economies alike, in that it improves allocation of resources to firms and helps these firms stay afloat until their goods are sold. This role is less important when the economy is dominated by the extraction of a highly liquid (in financial sense) and easily marketable commodity.

These results suggest, nevertheless, that the Saudi non-oil sector is favorably affected by financial development. Hence, from a policy perspective, it is useful to further develop the Saudi banking system with a view to aiding the growth of the non-oil sector, given that the impact of financial development on the latter is positive and significant. In that way, and if the diversification of the Saudi economy continues, we can anticipate that financial development will play a more prominent role in the country's overall economic performance in the future.

APPENDIX A3

The objective of this section is to confirm the robustness of our results on the effect of financial development on economic growth. To this end, we repeat all empirical exercises presented in chapter two with the individual measures of financial development instead of the aggregate financial development index.

The first set of robustness check is to re-estimate the first three models; GDP, GDPN and GDPO presented in chapter two with the separate financial development indicators. Tables (A3.1 to A3.24) display those results.

As second robustness exercise we also re-estimate all the models presented in the robustness check section of the chapter two, again with the individual measures of financial development instead of the summary index measure. See tables A3.25 to A3.36.

The results remain the same: the individual FD variables either have a negative and significant or no impact on growth. Therefore, we omit them from the main text and make them available in this supplementary appendix.

Most notable result with the separate measures of financial development is that the fact that the impact of claims to private sector to GDP always appears significant with a negative sign in its association with economic growth. It can be concluded from these results that an increase in credit to the private sector in Saudi Arabia does not contribute to economic growth. This finding might suggest that there are fundamental problems of credit allocation in Saudi financial sector. Using (M3/GDP) and (M2/GDP) each on separate model along with claim on private sector and other controls, we obtained positive and significant coefficients in the long-run only in the growth of non-oil GDP model.

A3.I. Estimate ARDL model with individual measures of FD.

Model (1): Total GDP with M3/GDP (M3) and Claim to privet sector/GDP(P).

GDP= *f* (M3, P, OILP, TRD)

Table A3.1. Results from Bound test.

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDP}(GDP|M3, P, OILP, TRD)	1	5.987	0.001***	Cointegration
F_{M3}(M3|GDP, P, OILP, TRD)	1	2.068	0.098	No Cointegration
F_{P}(P|GDP, P, M3, OILP, TRD)	1	8.430	0.000***	Cointegration
F_{OILP}(OILP|GDP, M3, P,TRD)	1	6.074	0.001***	Cointegration
F_{TRD}(TRD|GDP, M3, P, OILP)	1	0.996	0.437	No Cointegration

Notes: *** indicates the significance level at1%.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=5 (Pesaran et al (2001) p.300).

Table A3.2. Estimated long run coefficients using the ARDL approach.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is GDP

Regressor	Coefficient	Standard Error	T-ratio	Probability
M3	-0.021	0.018	-1.187	0.243
P	-0.662***	0.084	-7.880	0.000
OILP	0.211***	0.026	8.092	0.000
TRD	0.140***	0.047	2.976	0.005
C	10.964***	0.709	15.443	0.000

Note: *** indicates the significance level at1%.

Table A3.3. Error correction representation for the selected ARDL model.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDP

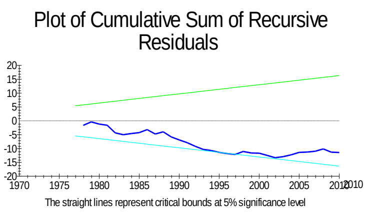
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM3	-0.007	0.006	-1.224	0.229
ΔP	-0.230***	0.031	-7.333	0.000
ΔOILP	0.001	0.003	0.326	0.746
ΔTRD	0.010***	0.001	5.891	0.000
C	3.816***	0.673	5.665	0.000
ecm(-1)	-0.348***	0.051	-6.703	0.000

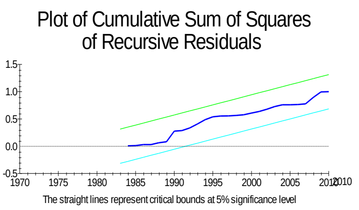
Note: *** indicates the significance level at1%.

Table A3.4. ARDL-VECM model diagnostic tests.

R^2 =0.954, Adjusted R^{2}= 0.943	
Serial Correlation χ^2(1)= 0.22091[0.638]	Normality χ^2(2) =3.0672[0.216]
Functional Form χ^2 (1)= 0.67778[0.410]	Heteroscedasticity χ^2 (1)= 1.88[0.18]

Figure B3-1. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (1)





Model (2); Non-oil sector GDP with M3/GDP (M3) and Claim to privet sector/GDP (P).
GDPN= *ƒ* (M3, P, OILP, TRD)

Table A3.5. Results of Bound test.

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDPN}(GDPN|M3, P, OILP, TRD)	1	6.534	0.005***	Cointegration
F_{M3}(M3|GDPN, P, OILP, TRD)	1	8.161	0.015***	Cointegration
F_{P}(P|GDPN, P, M3, OILP, TRD)	1	3.413	0.020*	No Cointegration
F_{OILP}(OILP|GDPN, M3, P, TRD)	1	1.512	0.001	No Cointegration
F_{TRD}(TRD|GDPN, M3, P, OILP)	1	2.996	0.437*	Cointegration

Notes: *** and *show the significance at1% and 10%, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=5 (Pesaran et al (2001) p.300).

Table A3.6. Estimated long run coefficients using the ARDL approach.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is GDPN

Regressor	Coefficient	Standard Error	T-ratio	Probability
M3	0.363**	0.152	2.383	0.025
P	-1.141***	0.150	-7.591	0.000
OILP	0.084***	0.010	8.057	0.000
TRD	0.636***	0.199	3.196	0.003
C	6.801***	1.256	5.413	0.000

Note: ***, ** and *indicate the significance at1%, 5% and 10%, respectively.

Table A3.7. Error correction representation for the selected ARDL model.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDPN

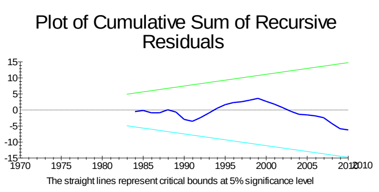
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM3	-0.008	0.010	-.813	0.422
ΔP	-0.154***	0.054	-2.833	0.008
ΔOILP	0.013***	0.004	2.866	0.007
ΔTRD	0.165**	0.063	2.592	0.014
C	1.763***	0.494	3.562	0.001
ecm(-1)	-0.229***	0.046	-5.528	0.000

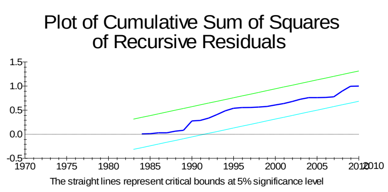
Note: ***, ** and *indicate the significance at1%, 5% and 10%, respectively.

Table A3.8. ARDL-VECM model diagnostic tests.

R^2 =0.996, Adjusted R^{2}= 0.995	
Serial Correlation χ^2 (1)= 0.55 [0.57]	Normality χ^2 (2)= 0.638[0.727]
Functional Form χ^2 (1)= 0.2034 [0.654]	Heteroscedasticity χ^2 (1)= 5.065[0.024]

Figure B3-2. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (2)





Model (3): GDP oil sector with M3/GDP (M3) and Claim to privet sector/GDP (P).
GDPO= *f* (**M3, P**, OILP, TRD).

Table A3.9. Results of Bound test.

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDPO}(GDPO|M3, P, OILP, TRD)	1	5.783	0.005***	Cointegration
F_{M3}(M3|GDPO, P, OILP, TRD)	1	1.305	0.015	No Cointegration
F_{P}(P|GDPO, P, M3, OILP, TRD)	1	3.555	0.020**	Cointegration
F_{OILP}(OILP|GDPO, M3, P, TRD)	1	2.010	0.001	inconclusive
F_{TRD}(TRD|GDPO, M3, P, TA, OILP)	1	0.996	0.437	No Cointegration

Notes: *** and ** indicate the significance at1% and 5%, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=5 (Pesaran et al (2001) p.300).

Table A3.10. Estimated long run coefficients using the ARDL approach.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is GDPO				
Regressor	Coefficient	Standard Error	T-ratio	Probability
M3	0.003	0.040	0.091	0.927
P	-0.789***	0.164	-4.809	0.000
OILP	0.033*	0.020	1.649	0.108
TRD	0.062***	.0108	5.792	0.000
C	11.133***	1.589	7.005	0.000

Note: *** and *indicate the significance at 1% and 10%, respectively.

Table A3.11. Error correction representation for the selected ARDL model.

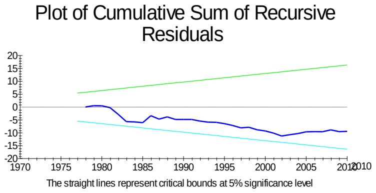
ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDPO				
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM3	0.001	0.018	0.091	0.927
ΔP	-0.370***	0.107	-3.452	0.002
ΔOILP	0.015**	0.007	2.075	0.046
ΔTRD	0.029***	0.007	3.733	0.001
C	5.217**	1.620	3.219	0.003
ecm(-1)	0.268***	0.115	-4.072	0.000

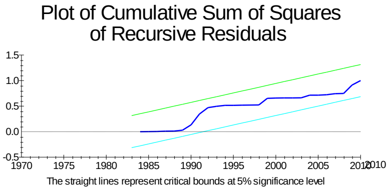
Note:*** and ** indicate the significance at1% and 5%, respectively.

Table A3.12. ARDL-VECM model diagnostic tests.

R^2 =0.855, Adjusted $R^{2=}$ 0.830	
Serial Correlation χ^2 (1)= .043274[0.835]	Normality χ^2 (2)= .044984[0.978]
Functional Form χ^2 (1)= .6402E-3[0.980]	Heteroscedasticityχ^2 (1)= 3.8179[0.051]

Figure B3-3. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (2)





Model (1)**:** Total GDP with M2/GDP (M2) and Claim to privet sector/GDP (P).
GDP= *f* (M2, P, OILP, TRD).

Table A3.13. Results of Bound test.

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDP}(GDP|M2, P, OILP, TRD)	1	7.153	0.000***	Cointegration
F_{M2}(M2|GDP, P, OILP, TRD)	1	9.245	0.000***	Cointegration
F_{P}(P|GDP, P, M2, OILP, TRD)	1	7.638	0.000***	Cointegration
F_{OILP}(OILP|GDP, M2, P,TRD)	1	7.090	0.000***	Cointegration
F_{TRD}(TRD|GDP, M2, P, OILP)	1	1.291	0.294	No Cointegration

Notes:*** indicate the significance at1%.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=5 (Pesaran et al (2001) p.300).

Table A3.14. Estimated long run coefficients using the ARDL approach.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is GDP

Regressor	Coefficient	Standard Error	T-ratio	Probability
M2	-0.267	0.207	-1.288	0.207
P	-0.604**	0.180	-3.345	0.002
OILP	0.038***	0.010	3.605	0.001
TRD	0.729*	0.417	1.745	0.090
C	9.226**	1.509	6.113	0.000

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%, respectively.

Table A3.15. Error correction representation for the selected ARDL model.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDP

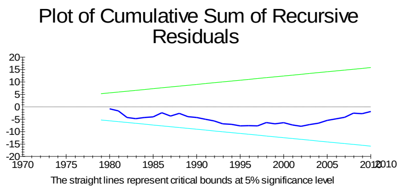
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM2	-0.217***	0.056	-3.870	0.000
ΔP	-0.117**	0.050	-2.310	0.027
ΔOILP	0.014***	0.005	2.845	0.007
ΔTRD	0.141***	0.049	2.855	0.007
C	1.788**	0.808	2.211	0.034
ecm(-1)	-0.193***	0.063	-3.069	0.004

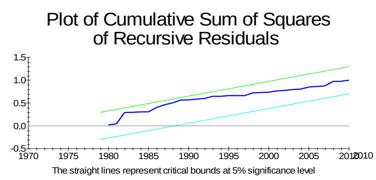
Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%, respectively.

Table A3.16. ARDL-VECM model diagnostic tests.

R^2 = 0.982, Adjusted R^{2}= 0.977
Serial Correlation χ^2 (1)= 0.020[0.887]   Normality χ^2 (2)= 1.166[0.558]
Functional Form χ^2 (1)= 0.005 [0.942]   Heteroscedasticity χ^2 (1)= 1.046[0.306]

Figure B3-4. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (1)





Model (2)**:** Non-oil sector GDP with M2/GDP (M2) and Claim to privet sector/GDP (P).
GDPN= *f* (M2, P, OILP, TRD).

Table A3.17. Results of Bound test.

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDPN}(GDPN|M2, P, OILP, TRD)	1	5.778	0.003***	Cointegration
F_{M2}(M2|GDPN, P, OILP, TRD)	1	4.201	0.000**	Cointegration
F_{P}(P|GDPN, P, M2, OILP, TRD)	1	6.157	0.000***	Cointegration
F_{OILP}(OILP|GDPN, M2, P, TRD)	1	3.874	0.000**	Cointegration
F_{TRD}(TRD|GDPN, M2, P, OILP)	1	1.461	0.294	No Cointegration

Notes: *** and ** indicate the significance at1% and 5%, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=5 (Pesaran et al (2001) p.300).

Table A3.18. Estimated long run coefficients using the ARDL Approach.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is GDPN

Regressor	Coefficient	Standard Error	T-ratio	Probability
M2	1.565***	0.288	5.435	0.000
P	-1.164***	0.187	-6.201	0.000
OILP	0.123***	0.025	4.799	0.000
TRD	2.255***	0.586	3.843	0.001
C	14.159***	2.302	6.150	0.000

Note: *** indicate significance at *** at 1%.

Table A3.19. Error correction representation for the selected ARDL model.

ARDL(1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDPN

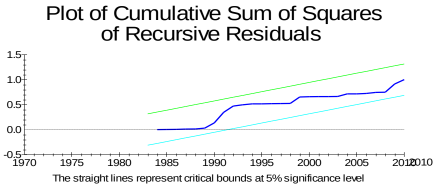
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM2	0.348***	0.097	3.575	0.001
ΔP	0.097	0.075	1.283	0.209
ΔOILP	0.015*	0.008	1.873	0.070
ΔTRD	0.190**	0.071	2.653	0.012
C	3.154***	1.065	2.960	0.006
ecm(-1)	-0.222**	0.083	2.667	0.012

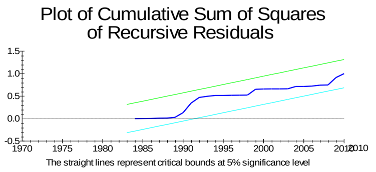
Note: ***, ** and * indicate the significance level at1%, 5% and 10%, respectively.

Table A3.20. ARDL-VECM model diagnostic tests.

R^2 =0.996, Adjusted $R^{2=}$ 0.985	
Serial Correlation χ^2 (1)= 3.108[0.211]	Normality χ^2 (2)= 0.115[0.944]
Functional Form χ^2 (1)= 0.3951 [0.531]	Heteroscedasticity χ^2 (1)= 1.673[0.196]

Figure B3-5. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (2)





Model (3)**:** GDP oil sector with M2/GDP (M2) and Claim to privet sector/GDP (P).
GDPO= *ƒ* (M2, P, OILP, TRD).

Table A3.21. Results of Bound test.

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDPO}(GDPO|M2, P, OILP, TRD)	1	6.157	0.000***	Cointegration
F_{M2}(M2|GDPO, P, OILP, TRD)	1	4.177	0.006**	Cointegration
F_{P}(P|GDPO, P, M2, OILP, TRD)	1	2.623	0.045	No Cointegration
F_{OILP}(OILP|GDPO, M2, P, TRD)	1	2.528	0.051	No Cointegration
F_{TRD}(TRD|GDPO, M2, P, OILP)	1	1.325	0.281	No Cointegration

Notes: *** and ** indicate the significance at1% and 5%, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=5 (Pesaran et al (2001) p.300).

Table A3.22. Estimated long run coefficients using the ARDL Approach.

ARDL (1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependant variable GDPO

Regressor	Coefficient	Standard Error	T-ratio	Probability
M2	0.130	0.271	0.482	0.633
P	-0.812**	0.307	-2.644	0.012
OILP	0.058***	0.013	4.520	0.000
TRD	0.155**	0.721	2.158	0.037
C	9.520***	2.238	4.253	0.000

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%, respectively.

Table A3.23. Error Correction Representation for the Selected ARDL Model.

Approach (1,1,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable ΔGDPO

Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM2	-0.184	0.110	-1.677	0.103
ΔP	-0.303**	0.139	-2.180	0.036
ΔOILP	0.016**	0.007	2.334	0.026
ΔTRD	0.289**	0.147	1.957	0.059
C	3.559**	1.686	2.111	0.042
ecm(-1)	-0.373***	0.114	-3.257	0.003

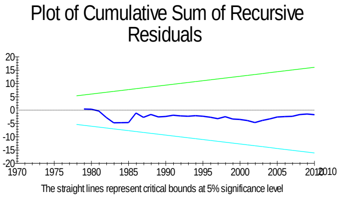
Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%, respectively.

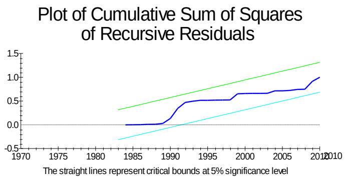
Table A3.24. ARDL-VECM model diagnostic tests.

R^2 =0.876, Adjusted $R^{2=}$ 0.850

Serial Correlation χ^2 (1)= 0.77698[0.378]	Normality χ^2 (2)= 0.90327[0.637]
Functional Form χ^2 (1)= .60886[0.435]	Heteroscedasticity χ^2 (1)= 8.5645[0.003]

Figure B3-6. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (3)





Appendix A3.

A3.II. Robustness check – individual variables

Model (1)

GDP= f (M3/GDP, P/GDP, **(TBA-P)/GDP,** OILP, TRD)

Table A3.25. Results of Bound test

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDP}(GDP|M3, P,TA, OILP, TRD)	1	6.285	0.000***	Cointegration
F_{M3}(M3|GDP, P, TA, OILP, TRD)	1	2.465	0.055**	Cointegration
F_{P}(P|GDP, M3, TA, OILP, TRD)	1	2.125	0.090	No Cointegration
F_{TA}(TA|GDP, P, M3, OILP, TRD)	1	1.288	0.293	No Cointegration
F_{OILP}(OILP|GDP, M3, P, TA,TRD)	1	3.454	0.014**	Cointegration
F_{TRD}(TRD|GDP, M3, P, TA, OILP)	1	1.457	0.233	No Cointegration

Notes: *** and ** indicate the significance at1% and 5%, respectively.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=6 (Pesaran et al (2001) p.300).

Table A3.26. Estimated long run coefficients using the ARDL Approach.

ARDL (1,1,0,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is GDP.

Regressor	Coefficient	Standard Error	T-ratio	Probability
M3	-0.021	0.019	-1.109	0.275
P	-0.657***	0.087	-7.520	0.000
TA	0.151	0.368	0.410	0.684
OILP	0.006**	0.003	1.972	0.057
TRD	0.030***	0.006	4.758	0.000
C	8.094***	0.797	13.906	0.000

Note: *** and ** indicate the significance at1% and 5%, respectively.

Table A3.27. Error Correction Representation for the Selected ARDL Model.

ARDL(1,1,0,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDP

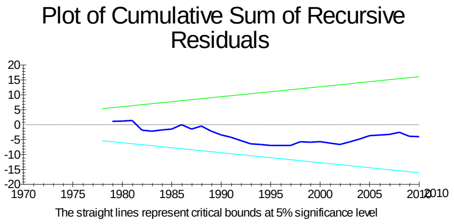
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM3	-0.007	0.006	-1.133	0.265
ΔP	-0.223***	0.036	-6.201	0.000
ΔTA	0.051	0.121	.421	0.676
ΔOILP	0.010***	0.001	5.810	0.000
ΔTRD	0.051	0.058	.882	0.384
C	3.767***	0.692	5.443	0.000
ecm(-1)	-0.339***	0.056	-6.024	0.000

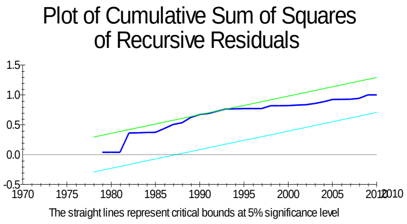
Note: *** indicate significance at 1%.

Table A3.28. ARDL-VECM model diagnostic tests.

R^2 =0.974, Adjusted $R^{2=}$ 0.968	
Serial Correlation χ^2 (1) = 0.218[0.640]	Normality χ^2 (2) = 2.771[0.250]
Functional Form χ^2 (1) = 0.745[0.388]	Heteroscedasticity χ^2 (1) =2.974[0.085]

Figure B3-7. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (1)





Model (2)

GDPN= *f* (M3/GDP, P/GDP, (TBA-P)/GDP, OILP, TRD)

Table A3.29. Results of Bound test

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDPN}(GDPN|M3, P, TA, OILP, TRD)	2	7.110	0.000***	Cointegration
F_{M3}(M3|GDPN, P, TA, OILP, TRD)	2	2.912	0.029	No Cointegration
F_{P}(P|GDPN, M3, TA, OILP, TRD)	2	2.000	0.107	No Cointegration
F_{TA}(TA|GDPN, P, M3, OILP, TRD)	2	2.707	0.033	No Cointegration
F_{OILP}(OILP|GDPN, M3, P, TA, TRD)	2	5.696	0.001**	Cointegration
F_{TRD}(TRD|GDPN, M3, P, TA, OILP)	2	1.092	0.385	No Cointegration

Notes: **, and *** indicate significance at 5 % and at 1%.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=6 (Pesaran et al (2001) p.300).

Table A3.30. Estimated Long Run Coefficients using the ARDL Approach.

ARDL(1,1,0,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is GDPN.

Regressor	Coefficient	Standard Error	T-ratio	Probability
M3	0.995***	0.260	3.829	0.001
P	-1.137***	0.174	-6.536	0.000
TA	0.043*	0.026	1.649	0.105
OILP	0.084***	0.010	7.907	0.000
TRD	0.632***	0.222	2.8446	0.008
C	6.824***	1.355	5.0350	[0.000]

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.

Table A3.31. Error Correction Representation for the Selected ARDL Model.

ARDL (1,1,0,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDPN

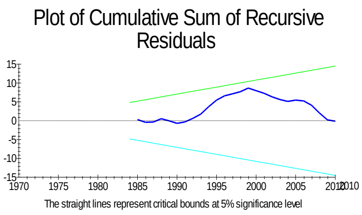
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM3	0.236***	0.054	4.395	0.000
ΔP	-0.154***	0.058	-2.666	0.012
ΔTA	0.379**	0.190	1.990	0.055
ΔOILP	0.014**	0.007	1.984	0.056
ΔTRD	0.165***	0.065	2.515	0.017
C	1.777***	0.579	3.069	0.005
ecm(-1)	-0.260***	0.053	-4.872	0.000

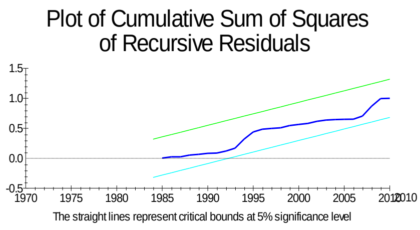
Note: **, and *** indicate significance at 5 % and at 1%.

Table A3.32. ARDL-VECM model diagnostic tests.

R^2 =0.98, Adjusted $R^{2=}$ 0.97	
Serial Correlation χ^2 (1)= 9.941[0.002]	Normality χ^2 (2)= 0.654 [0.721]
Functional Form χ^2 (1)= 0.3951 [0.531]	Heteroscedasticity χ^2 (1)= 4.984[0.026]

Figure B3-8. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (2)





Model (3)

GDPO= f (M3/GDP, P/GDP, **(TBA-P)/GDP,** OILP, TRD)

Table A3.33. Results of Bound test

Dep. Var.	SIC Lag	F-stat.	Probability	Outcome
F_{GDPO}(GDPO|M3,P,TA, OILP, TRD)	2	4.920	0.008***	Cointegration
F_{M3}(M3|GDPO, P, TA, OILP, TRD)	2	1.192	0.337	No Cointegration
F_P(P|GDPO, M3, TA, OILP, TRD)	2	2.014	0.105	No Cointegration
F_{TA}(TA|GDPO, P, M3,OILP, TRD)	2	2.707	0.033	No Cointegration
F_{OILP}(OILP|GDPO,M3, P, TA, TRD)	2	4.049	0.006**	Cointegration
F_{TRD}(TRD|GDPO, M3, P, TA, OILP)	2	1.875	0.128	No Cointegration

Notes: *, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.
Asymptotic critical value bounds are obtained from Table F-Statistic in appendix CI, Case II: intercept and no trend for k=6 (Pesaran et al (2001) p.300).

Table A3.34. Estimated Long Run Coefficients using the ARDL Approach,

ARDL (1,1,0,0,0,0) selected based on Schwarz Bayesian Criterion.Dependent variable is GDPO

Regressor	Coefficient	Standard Error	T-ratio	Probability
M3	-0.003	0.041	-0.075	0.940
P	-0.794***	0.173	-4.576	0.000
TA	0.288*	0.151	1.905	0.066
OILP	0.032	0.021	1.485	0.147
TRD	0.062***	0.011	5.430	0.000
C	11.067***	1.757	6.296	0.000

Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.

Table A3.35. Error Correction Representation for the Selected ARDL Model.

ARDL (1,1,0,0,0,0) selected based on Schwarz Bayesian Criterion. Dependent variable is ΔGDPO

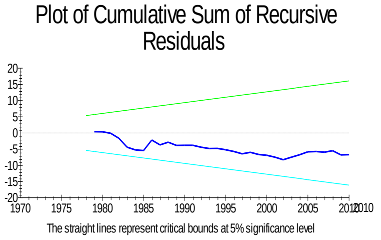
Regressor	Coefficient	Standard Error	T-ratio	Probability
ΔM3	0.001	0.019	0.075	0.940
ΔP	-0.374***	0.117	-3.187	0.003
ΔTA	0.032	0.353	0.092	0.927
ΔOILP	0.015*	0.008	1.860	0.072
ΔTRD	0.029***	0.008	3.677	0.001
C	5.212***	1.645	3.167	0.003
ecm(-1)	-0.376***	0.120	-3.112	0.004

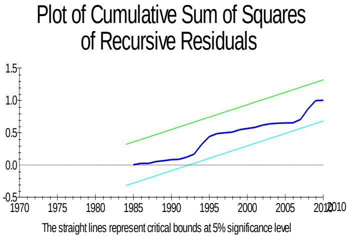
Note:*, **, and *** indicate significance at* 10 %, ** at 5 % and *** at 1%.

Table A3.36. ARDL-VECM model diagnostic tests.

R^2 =0.8550 Adjusted $R^{2=}$ 0.825	
A:Serial Correlation χ^2 (1)= 0.039[0.843]	Normality χ^2 (2)= 0.044[0.978]
B:Functional Form χ^2 (1)= 0.007[0.932]	Heteroscedasticity χ^2 (1)= 3.761[0.052]

Figure B3-9. Plot of CUSUM and CUSUMQ for coefficients stability for ECM Model (3)





CHAPTER FOUR

IS THE RELATIONSHIP BETWEEN FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH MONOTONICS? EVIDENCE FROM A SAMPLE OF MIDDLE-INCOME COUNTRIESE

4.1. INTRODUCTION

The relationship between financial development and economic growth is important and intriguing at the same time. The earliest known proponents of the notion that finance could be an engine of growth are Schumpeter and Opie (1934); their view was later endorsed by Gurley and Shaw (1955), McKinnon (1973) and Shaw (1973), among others. There is, however, another strand of the literature that dates back to Robinson (1952), arguing that economic growth drives the demand for financial services rather than the other way round. Finally, some economists, like Lucas (1988), discount altogether the possibility that the financial sector has any impact on growth. The importance of financial deepening in channeling savings to the most productive investments and shaping the growth process has received renewed attention as the endogenous growth literature evolved from the 1980s onwards (see Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; King and Levine, 1993a; etc.).

Besides the aforementioned direct role of financial development, institutional quality may affect the true impact of financial development in the process of market clearing, reducing information asymmetry etc. Hence, it could be argued that the impact of financial development on economic growth depends on institutional quality, market perfection, and level of corruption in the society etc. (Demetriades and Law, 2006). As the potential outcome of financial development considerably depends on the institutional quality, a cloud of doubt remains about the impact of financial development on growth in middle income countries, where the institutional quality lag behinds the OECD countries.

The strength of the finance-growth relationship can perhaps be regarded as ultimately an empirical matter (King and Levine, 1993b; Levine, 2005), and much of the subsequent literature has focused attention on the empirical aspects of this relationship by considering various data-sets, country groupings, time periods, etc., and different indicators of financial development, and using a whole host of econometric techniques.[12]

With this backdrop, this study attempts to contribute to the finance and growth literature by studying this relationship for a group of middle-income countries, using advanced econometric techniques. In doing so, we explore the nature of the relationship between financial development and economic growth, and especially consider whether it may in fact be non-monotonic. Indeed, much of the current literature suggests that the impact of financial deepening on growth becomes negative once a certain threshold is reached (Arcand et al., 2012; Cecchetti and Kharroubi, 2012), or that this impact seems to have evaporated in recent data (Rousseau and Wachtel, 2011).

In the light of the on-going debate on the impact of financial development on economic growth, we seek to contribute to the literature – from an empirical perspective –in the following ways. First, we adopt the recently developed dynamic panel

[12] A comprehensive literature survey on the topic is provided in section 4.2 of the chapter.

heterogeneity analysis introduced by Pesaran et al. (1999) and applied to the financial development and growth nexus by Loayza and Ranciere (2006). Specifically, we use the autoregressive distributed lag (ARDL) model, where the estimations are carried out by three different estimators: the pooled mean group (PMG), mean group (MG), and the dynamic fixed effect (DFE), in order to examine both the long- and short-term effects of financial intermediation on growth. The use of these techniques allows us to take into account country-specific heterogeneity. Second, we consider 52 middle-income countries.[13] Although there is a large body of literature that investigates the linkage between financial development and economic growth in advanced countries, far less is known about this relationship in developing countries. The focus on advanced countries is particularly due to the nature of their financial markets. Financial systems in advanced countries can efficiently facilitate the mobilization of capital between surplus and deficit agents, which eventually leads to economic growth. Developing countries, on the other hand, were traditionally characterized by less developed and less efficient financial systems with lower levels of banking intermediation. However, from the 1980s onwards, developing countries have improved the efficiency of their financial markets. Nonetheless, previous studies argue that the relationship between financial development and economic growth in developing countries is inconclusive (Kar et al, 2011). Third, given that financial development can be captured by several possible indicators, we use the principal components analysis (PCA) to construct an indicator of financial development that is as broad as possible and captures various dimensions of the financial sector. Finally, in contrast to Loayza and Ranciere (2006), we allow for the existence of a non-linear relationship between financial development and economic growth in order to investigate the possibility of the economy being adversely affected

[13] The World Bank classification in 2010 is considered here.

due to “too much” finance. Specifically, we apply two approaches: we introduce a quadratic polynomial of financial development as a determinant of growth, and estimate a threshold model. In the former, we test the robustness of our results by following the recent study by Lind and Mehlum (2010), which proposes tests for the existence of U or inverted U-shaped relationships. By applying this test, both necessary and sufficient conditions for the existence of an inverted U-shaped pattern can be verified.[14] As regards the second approach, we follow Bick (2010) and Kremer et al. (2013) and estimate a dynamic panel threshold model that accounts for sharp discrete shifts to investigate the potential existence of a threshold level in the linkage between financial development and economic growth. To our knowledge, this is the first study that combines these two different approaches to investigate the non-linearity within the finance and growth nexus.

Our findings - suggest that the relationship between financial development and economic growth need not be linear, either in the long or short-run. Rather, the two different techniques used confirm that financial deepening might have a negative effect on growth beyond a certain threshold, which is different from the predominant view that financial development and economic growth are positively linked.

The remainder of this paper is organized as follows: Section 4.2 conducts an extensive survey of the literature on finance and growth to put our study in context. Section 4.3 discusses the data and describes the construction of the financial development indicator. Section 4.4 explains the econometric methodology used to analyze the impact of financial development on economic growth. The empirical results of the paper are discussed in section 4.5. Finally, Section 4.6 concludes the paper.

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[14] An inverted U-shaped test by Lind and Mehlum (2010) will be discussed in detail in the results and discussion section.

4.2. LITERATURE REVIEW

In this section, we review the extensive literature on the relationship between finance and growth, which can be traced back to the early twentieth century. Among the initial influential contributions in this area is the work of Schumpeter and Opie (1934), who highlighted the role of financial institutions in funding productive investments and encouraging innovation, both of which foster growth. Patrick (1966) develops the ideas of 'supply-leading' and 'demand-following' aspects of financial development. The supply-leading role of financial institutions is to act as productive inputs in the production process and to transfer resources from traditional to modern sectors. This is echoed by Gurley and Shaw (1955) and Goldsmith (1969), who argue that more developed financial markets promote economic growth by mobilizing savings to finance the most productive investments. In a more recent study, Xu (2000) finds strong evidence that financial development, primarily via the investment channel, affects growth positively.

The demand-following role is about growth being spurred by the real side of the economy, which generates the demand for financial services so that financial institutions and instruments emerge to follow the lead taken by the real sector.[15] More rigorous theoretical underpinnings to the finance–growth relationship were provided by McKinnon (1973) and Shaw (1973), who observed that pervasive financial regulations involving interest rate ceilings and reserve requirements, especially in developing countries, impede saving-investment decisions and stressed the importance of financial

[15] The demand-following role of the financial sector is emphasised also by Robinson (1952) and Kuznets (1955). This view has also been endorsed by the empirical studies of Al-Yousif (2002) and Ang and McKibbin (2007), while Xu (2000) rejects this hypothesis.

liberalisation via a deregulation of interest rates which would lead to an increase in loanable funds as well as to a more efficient allocation of funds.[16]

With the emergence of endogenous growth theory (Romer, 1986; Lucas, 1988), there has been renewed interest in the role of financial development in driving economic growth. This literature highlights the positive role played by the financial sector in bolstering growth, in particular, by mobilizing savings, allocating resources to the most productive investments, reducing information, transaction and monitoring costs, diversifying risks and facilitating the exchange of goods and services. This results in a more efficient allocation of resources, a more rapid accumulation of physical and human capital, and faster technological progress. For instance, the theoretical work of Greenwood and Jovanovic (1990) shows that financial intermediaries promote investment and growth by enabling a higher rate of return to be earned on capital, while the growth itself spurs the expansion of financial institutions, implying a two-way relationship between financial intermediation and economic growth. Likewise, in Bencivenga and Smith (1991), financial intermediaries allow agents to channel savings into investments with high return which boosts growth, but here the intermediaries also allow individuals to hold diversified portfolios to mitigate risks associated with their liquidity needs. Roubini and Sala-i-Martin (1992) show that in a situation where it is difficult to raise revenue via income taxation, governments may resort to financial repression to raise the inflation tax base to finance public expenditures, and the resulting higher inflation dampens productivity and growth[17]

[16] Calderon and Liu (2003) test the direction of causality between financial development and growth for a pooled dataset of 109 countries for 1960 to 1994 and find evidence of bi-directional causality between those variables using the Geweke decomposition test. Some evidence of bi-directional causality is also found by Luintel and Khan (1999) in a VAR analysis of 10 developing countries.

[17] For similar considerations, see also King and Levine, 1993a; Greenwood and Smith, 1997; Levine, 1997; Levine, 2005).

Some recent studies on the finance–growth nexus posit that the relation between finance and growth is non-monotonic. This result is obtained by Cecchetti and Kharroubi (2012), who find that as bank credit to private sector exceeds 90% of GDP, finance becomes a drag on growth. Strikingly, a faster rate of growth of the financial sector may be detrimental to the growth of the economy because the financial sector competes for resources with the rest of the economy.[18] Such a non-monotonic effect is observed also by Arcand et al. (2012), who utilize different types of datasets at the country level and industry level and find that the negative finance–growth relationship occurs once the ratio of private credit to GDP exceeds a threshold of about 110% for high-income countries. This result is consistent across different types of estimators, including simple cross-section OLS regression, semi-parametric estimations and system-GMM.[19]

A more general finding, that the finance–growth relationship varies with the stage of development in a non-linear fashion, is put forward by Deidda and Fattouh (2002), who consider a cross-section of 119 (developed and developing) countries. They apply threshold regressions to - high- income and low- income countries and find that finance is a significant (insignificant) determinant of growth for high- (low-) income countries. Likewise, Rioja and Valev (2004a,b), working with panel data for the 1961-95 period for 74 (developed and developing) countries find that the effect is positive and significant in countries with high- and intermediate- income levels, but the effect is

[18] They also study this relationship by considering the share of financial sector employment to total employment and find that the turning point is 3.9% beyond which the GDP growth per worker becomes negative.

[19] On a related theme, Easterly et al. (2000), studying the link between the financial system and growth volatility, observe that greater credit or a deeper financial system is significantly associated with less volatility, but the relationship appears to be nonlinear. While developed financial systems offer opportunities for stabilization, they also may imply higher leverage of firms, which implies more risk and lower stability. The consumption and production smoothing possibilities provided by the existence of a deep financial system might reduce growth volatility, particularly when shocks are small, on average, but up to a limit. As the financial system becomes larger relative to GDP, the increase in risk become relatively more important, and acts to reduce stability.

insignificant in low-income countries.[20] Threshold regressions with high- and low-income countries are performed also by Huang and Lin (2009), who consider a sample of 71 countries, but use a cross-section (where they consider an average from 1960 to 1995). The link between finance and growth via their IV threshold method is positive, but non-linear; however, in contrast to Deidda and Fattouh (2002) and Rioja and Valev (2004a,b), the effect is more pronounced for the low-income countries. An earlier paper by De Gregorio and Guidotti (1995) obtains a similar result of a weak relationship in high- income countries: they attribute this to the fact that financial development in such countries occurs mainly outside of the banking system, while their proxy for financial development is bank credit to the private sector as a proportion of GDP.

As regards the mechanism through which financial development affects growth, Rioja and Valev (2004a,b) find that in high- (and also middle-) income countries, this happens mainly by enhancing productivity, while in low-income countries it occurs predominantly through capital accumulation: so a country has to reach a certain income level for financial development to contribute to productivity growth. On a similar theme, Calderon and Liu (2003) find that financial deepening propels growth through both capital accumulation and productivity growth, especially the latter. Rousseau and Wachtel (2002) identify the inflation channel as providing the link between financial development and growth, and find that growth is not affected when annual inflation exceeds 13%.

Law and Singh (2014) explore whether finance promotes economic growth after a country's financial development exceeds a certain threshold level. Using dynamic panel threshold methods, they consider a panel of 87 (developed and developing) countries

[20] Some earlier literature has also suggested that the effect of finance on growth is stronger for more developed countries: see for example, Demetriades and Hussein (1996), Odedokun (1996), and Xu (2000).

over the 1980-2010 period, averaged over 5 years periods. They find a threshold beyond which private sector credit is not beneficial. This threshold value is 88% of GDP, close to Cecchetti and Kharroubi's (2012) value of 90%. Threshold effects are also considered by Law et al. (2013), but they attempt to identify the institutional quality thresholds that may affect the finance–growth relationship. Using data for 85 countries for the 1980-2008 period, and using both Hansen (2000)-type threshold regressions and Caner and Hansen (2004)-type IV threshold regressions, they find that institutions shape the finance– growth relationship: financial development promotes growth after institutions exceed a certain threshold level.

Owen and Temesvary (2014) contribute to the finance-growth literature by showing that the effect of bank finance on growth is heterogeneous across countries and across types of bank lending (domestic and foreign). Such heterogeneity is captured by grouping countries based on the conditional distribution of growth rates. Specifically, they find that country characteristics such as the extent of stock market development, the degree of rule of law, and even the development of the banking sector itself vary considerably across countries and affect the productivity of bank lending in encouraging growth. The issue about domestic and external sources of financing has been looked at, but with industry-level data, by Rajan and Zingales (1998), who provide new insights into the finance-growth relationship. Here, financial development reduces the costs of external finance to firms, so that industries that are more dependent on external financing (due to the initial project scale, cash-flow patterns, profit margins, etc.) ought to perform better in countries with more developed financial systems.

Beck et al. (2014) seek to disentangle the effects of the financial system by considering the effects of size (i.e., its value added as a proportion of GDP) and the degree of intermediation (i.e., the private credit-to-GDP ratio) on GDP per capita growth and growth volatility. Based on a sample of 77 countries for the period 1980–2007, they find using the OLS estimator that financial intermediation activities increase growth and reduce volatility in the long-run.[21] Importantly, over the medium term, a large financial sector stimulates growth at the cost of higher volatility in high-income countries, while intermediation activities stabilize the economy, especially in low-income countries.

In a similar, but using a different methodology – the pooled mean group (PMG) estimator – Loayza and Ranciere (2006) distinguish between the short- and long-run effects of finance on growth. Employing annual data over the 1960-2000 period for 75 countries, the authors use a panel error- correction model and estimate it by the PMG estimator. The novelty of this approach is that it allows for heterogeneity in parameters in growth regressions, apart from separating the short- and long-run effects of financial development. They find a significant and positive long-run relationship between financial development and economic growth, while the short-run impact is significant and negative. They suggest that the negative short–run effect may be a result of cross-country heterogeneity and higher volatility of business cycles. They, nevertheless, do not allow for the non-monotonic effect of financial deepening. Given that Loayza and Ranciere (2006) attempt to reconcile some of the remaining unresolved issues in the finance-growth nexus using a new and fairly novel methodology, we have adopted this in our own research.

Finally, addressing similar questions as Loayza and Ranciere (2006), but using a somewhat different approach, Rousseau and Wachtel (2011) show that the impact of financial deepening on growth is not as strong with more recent panel data (1990-2004) compared to 1960 -1989. They posit that the rapid growth of credit and widespread

[21] As mentioned earlier, Easterly et al. (2000) find a non-linear effect of the financial system on growth volatility.

liberalization in the nineties led to both inflationary pressures and a weakening of the banking system that ultimately triggered financial crises, which are responsible for “the disappearance of the finance effect”. So, from a policy perspective, there appears to be a need for financial sector reform and regulation to accompany financial deepening. This finding is interesting and of topical relevance, and provides further motivation to the study we undertake in this paper.

As the preceding discussion makes clear, various empirical approaches have been used to explore the relationship between finance and growth. A summary of the type of data, econometric methods used, and the criticisms leveled against such methods may be in order here. Earlier research was based on cross-sectional data using standard OLS estimation methods, which confirmed the positive correlation between financial development and economic growth (see, for instance, Goldsmith, 1969; King and Levine, 1993a, 1993b; and Levine and Zervos, 1998). While their findings suggest that finance helps to predict long-term growth, a number of authors (Chuah and Thai, 2004; Khan and Senhadji, 2003; and Barro, 1991) argue that conclusions based on cross-sectional analysis are unreliable and have several econometric problems. First, the results are sensitive to the sample of countries chosen: it may be inappropriate to draw policy implications from cross-country studies that treat different economies as homogeneous entities. Second, they do not take advantage of time-series variation in the data. Finally, the issue of causality cannot be handled formally in cross-sectional studies (Khan and Senhadji, 2003). As Ahmed (1998) and Ericsson et al. (2001) point out, using instrumental variables does not solve the endogeneity problem when the data are averaged over long periods. Furthermore, using time-series data does not resolve these problems either: Christopoulos and Tsionas (2004) and Beck (2008) argue that high-frequency data are required to gain econometric power from the time series approach, which limits the analysis to just a few countries for which such data are available.

In order to reduce the shortcomings of both cross-sectional and time series analysis, researchers have increasingly turned to panel data that enable them to combine time series and cross-sectional features and offer a variety of estimation approaches (for example Calderon and Liu, 2003; Christopoulos and Tsionas, 2004; Dawson, 2010). However, these studies apply either the traditional fixed or random effect methods, or the panel cointegration technique. The former averages the data per country to isolate the trend effects which hides the dynamic relationship between the variables of interests. The latter has the disadvantage that the evidence of long-term relationships can be obtained only when variables are integrated at the same level (Pesaran and Smith, 1995; Pesaran, 1997; and Pesaran and Shin, 1999).[22] In our data and methodology sections that follow, we explain how we take into account the above points while deciding on the econometric exercises that we adopt in our paper.

4.3. DATA DESCRIPTION

This study is based on panel data covering 23 upper and 29 lower middle- income countries, as classified by the World Bank (WB) in 2010, over the period 1980-2008, to examine the dynamic relationship between financial development and economic growth.[23] Table 4.1 provides a list of the countries included in the sample.

[22]This issue is discussed more extensively in the methodology section.

[23]We have checked if there were any changes relative to the 2013 World Bank classification. We have found that Fiji moved to the lower income category. Ecuador, Jordan and Peru become upper middle-income countries. However, it is noteworthy that when we re-estimated all the models with these changes, the results in terms of sign and significance level remain the same as in the main estimation in this paper. Therefore, we did not report these changes in our current version. A number of middle income countries were excluded from our sample due to lack of sufficient data.

Table 4.1. **Sample of Countries.**

Upper Middle Income[24] (23)	Lower Middle Income[25] (29)
Algeria	Belize
Argentina	Bolivia
Brazil	Cameroon
Chile	Cape Verde
Colombia	Congo, Rep.
Costa Rica	Cote d'Ivoire
Dominica	Ecuador
El Salvador	Egypt, Arab Rep.
Fiji	El Salvador
Gabon	Guatemala
Grenada	Guyana
Iran, Islamic Rep.	Honduras
Jamaica	India
Malaysia	Indonesia
Mauritius	Jordan
Mexico	Sri Lanka
Panama	Syrian Arab Republic
Seychelles	Swaziland
South Africa	Papua New Guinea
Suriname	Paraguay
Turkey	Peru
Uruguay	Philippines
Venezuela, RB	Senegal
	Thailand
	Tonga
	Tunisia
	Vanuatu
	Morocco
	Pakistan

4.3.1. The dependent variable and control variables

The dependent variable is economic growth, measured as the growth rate of real GDP. As far as the control variables are concerned, we initially considered a broad set of control variables typically used in the growth literature: initial real GDP (to capture the tendency for growth rates to converge across countries over time); gross fixed capital formation (to account for investment in physical capital); population growth (as an indicator of the growth of the labor force); openness to trade (to capture the

[24] The World Bank classification of economies is based on estimates of gross national income (GNI) per capita in 2010. Upper middle- income countries are ones for which GNI per capita for the previous year is $4,086 to $12,615.
[25] Lower middle- income countries are ones for which GNI per capita for the previous year is $1,036 to $4,086.

importance of international factors in influencing economic activity); government expenditure as a share of GDP (this captures the extent of public goods provided by the government, especially in education, health care and infrastructure, but it also reflects the distortionary effects of public spending and taxation), life expectancy (as a proxy for human capital[26]), and inflation (proxying for the stability of the macroeconomic and business environment).[27] However, when including all variables in the regression, several turned out to be insignificant. We, therefore, proceeded to omit the insignificant explanatory variables one by one until we were left with a model that contained trade openness, government expenditure, population growth and fixed capital formation as control variables. The full results are available upon request.

4.3.2. Measures of financial development

The construction of the variables to capture financial development is a difficult task due to a number of reasons. Financial services are provided by a wide range of financial institutions and agents. Among them, banks and stock markets both play a major role. In order to capture a complete picture, we need to consider different aspects of financial development, for instance, whether the financial sectors of the studied countries are dominated by banks or the stock market or both. However, our prime objective is to investigate the long-run relationships. Therefore, we use bank-based financial proxies

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[26] Our attempts to include education (specifically, secondary school enrolment) resulted in too many missing observations.

[27] We also included foreign direct investment (FDI) as a control in our regressions. FDI could increase growth by improving productivity, enabling technology transfers and introducing new processes and skills in the domestic market. However, whether FDI boosts growth could depend on the extent of development of domestic financial markets (De Mello, 1999; Alfaro et al., 2004, 2010), or a sufficient level of human capital in the host country (Borensztein et al.,1998). The results of the inclusion of FDI in our analysis did not essentially change the significance level or the sign of the financial development variable. These results are reported in Appendix 4 (see Table A4.21 to Table A4.26).

due to the unavailability of long-span time series data for the stock market for many of the countries.[28]

Most of the empirical literature on this topic uses monetary aggregates such as the M2 and/or M3 as a ratio of nominal GDP to capture the overall size and depth of the financial sector. However, some researchers such as Khan and Senhadji (2003) argue that M2/GDP might be a poor proxy for financial development in the case of countries with underdeveloped financial systems for two reasons. First, high level of monetization might be linked to financial underdevelopment. Second, M2 mostly captures the ability of the financial system to provide transaction services rather than its ability to link up surplus and deficit agents in the economy. Several papers including Beck et al (2000a); Favara (2003) and Deidda and Fattouh (2002) suggest to employ M3/GDP, which is a less liquid monetary aggregate, as a proxy for financial development. Therefore, in this study we use the M3, as a proportion of GDP.

The M3/GDP captures the amount of liquid liabilities of the financial system, including the liabilities of banks, central banks and other financial intermediaries, that reflects financial deepening, which is in turn positively related with financial services (King and Levine, 1993a/b; Demetriades and Hussein, 1996; Favara, 2003). Nevertheless, Fry (1997) and Ang and McKibbin (2007) among others argue that monetary aggregates are not good proxies for financial development since they reflect

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[28] We initially considered stock market indicators, such as market capitalization, turnover, and stock returns, as measures of financial development, along with bank-based indicators. However, due to missing data, we had to exclude these and utilize only the bank-based data. This mirrors the practice in much of the related literature on emerging economies which focuses on the banking sector and omits stock market development, either because of data unavailability, or because the banking sector is the dominant sector in these countries. For individual country examples, see Demetriades and Luintel, 1996, and Bhattacharya and Sivasubramanian, 2003, for the case of India; Ang and McKibbin, 2007, for Malaysia; Ozturk, 2008 for Turkey. For middle- income countries, see, for example, Hassan et al., 2011; Hauner, 2009. Given that Demirguc-Kunt and Levine (1999) find in a cross-section of 150 countries that the stock market tends to play a more important role in high income countries than in middle and lower income countries, we feel we should not lose much by not being able to include stock market variables.

the extent of transaction services provided by the financial system rather than the ability of the financial system to channel funds from depositors to investors. Therefore, credit to the private sector as a proportion of GDP is the third most widely used alternative measure of financial development (see Demetriades and Hussein, 1996; King and Levine, 1993a; Beck et al, 2000a; Favara, 2003; Liang and Teng, 2006; Arcand et al., 2012). The importance of this measure rests in the fact that it only accounts for credit granted to the private sector that enables the utilization of funds and their allocation to more efficient and productive activities. It also excludes credit issued by the central bank and thus is a more accurate measure of the savings that financial intermediaries channel to the private sector.

Some studies use the ratio of commercial bank assets divided by the sum of commercial bank and central bank assets (see, Ang and McKibbin, 2007; Campos and Kinoshita, 2008; Rioja and Valev, 2004a,b). This variable measures the relative importance of a specific type of financial institutions (commercial banks) in the financial system. Ang and McKibbin (2007) argue that the advantage of this measure is that commercial banks make more efficient use of funds than central banks by channeling savings to profitable investment opportunities.

Rather than use multiple closely related yet different variables, we construct an aggregate indicator of financial development to represent the overall development in the financial sector. The resulting variable combines the three aforementioned widely used indicators of financial development: the ratio of liquid liabilities (or M3) to nominal GDP, the ratio of commercial bank assets to the sum of commercial bank assets and central bank assets, and the ratio of bank credit to the private sector to GDP. The source of these data is the 2008 version of World Bank’s Financial Structure Dataset (Beck et al., 2000b).[29] We follow Ang and McKibbin (2007), Gries et al. (2009), and Campos and Kinoshita (2010), among others, to combine these variables into a single indicator by using principal components analysis (PCA). We denote the resulting variable as FD. The advantages of doing this are two-fold. First, the financial development variables are highly correlated among themselves. Using PCA serves to overcome the problem of multicollinearity. Second, studies attempting to investigate the link between financial development and growth have no uniform argument as to which proxies are most appropriate for capturing this linkage: they choose a number of different measures and subsequently come up with different results (see Chuah and Thai, 2004; Khan and Senhadji, 2003; King and Levine, 1993a; Savvides, 1995; among others). We believe that this new index of financial development is able to capture most of the information in the original data and is a better indicator than the individual variables.

Table 4.2 presents the results of the principal components analysis. The first component is the only one with an eigenvalue greater than 1 and it explains about 63% of the variation of the dependent variable. The second principal component explains another 28%, and the last principal component accounts for only 9% of the variation. Hence, it is clear that the first principal component has the maximum explanatory power. We use it therefore as our financial development indicator (FD).

Table 4.2. Principal components analysis for financial development index.

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.88	1.02	0.63	0.63
Comp2	0.85	0.58	0.28	0.91
Comp3	0.26	.	0.09	1.00

[29] Available at http://econ.worldbank.org/staff/tbeck.

4.4. METHODOLGY AND MODEL SPECIFICATIONS

In this section, we briefly review the general framework for analyzing panel data. First, we discuss, in terms of efficiency and consistency, the method employed in this study and compare it with other standard methods. Then, we rationalize the case for the use of a panel ARDL model based on the use of three alternative estimators: the mean group estimator (MG) of Pesaran and Smith (1995), the pooled mean group estimator (PMG) and the dynamic fixed effects (DFE) estimator developed by Pesaran et al. (1999).

4.4.1. Static models

The standard panel models, such as pooled OLS, fixed effects and random effects models have some serious shortcomings. For instance, pooled OLS is a highly restrictive model since it imposes a common intercept and slope coefficients for all cross-sections, and thus disregards individual heterogeneity. The fixed effects model, on the other hand, assumes that the estimator has common slopes and variance but country-specific intercepts. Both the cross-sectional and time effects can be observed through the introduction of dummy variables, especially in two-way fixed effects models; however, this estimator faces severe problems due to the loss of degrees of freedom (Baltagi, 2008). Furthermore, the parameter estimates produced by the fixed effects model are biased when some regressors are endogenous and correlated with the error terms (Campos and Kinoshita, 2008). In contrast to the fixed effects model, the random effects model is relatively less problematic in terms of degrees of freedom by assuming common intercepts. Nevertheless, the random effects model has another limitation in that it considers the model to be time invariant. This implies that the error at any period is uncorrelated with the past, present and future, known as strict exogeneity (Arellano, 2003). In real life, this assumption is very often invalid. Additionally, as Loayza and Ranciere (2006) argue, static panel estimators do not take advantage of the panel dimension of the data by distinguishing between the short and long run relationships. Furthermore, conventional panel data models assume homogeneity of the coefficients of the lagged dependent variable (Holly and Raissi, 2009). This can lead to a serious bias when in fact the dynamics are heterogeneous across the cross-section units.

To conclude, the static panel approaches are unable to capture the dynamic nature of the data, which is a fundamental issue in the empirical growth literature. In addition, these estimators can only deal with the structural heterogeneity in the form of random or fixed effects, but impose homogeneity in the model's slope coefficients across countries even when there may be substantial variations between them.

4.4.2. Dynamic panel model

Roodman (2006) states that when the data feature a large numbers of countries (N) relative to the time period (T), the GMM-difference estimator proposed by Arellano and Bond (1991) and the GMM-system estimator by Arellano and Bover (1995) and Blundell and Bond (1998) work well. These two estimators are typically used to analyze micro panel datasets (Eberhardt, 2012). However, a wide range of recent literature has applied GMM techniques to macro panel data, including in the area of financial development and growth (e.g. Arcand et al, 2012). Roodman (2006) argues that in the small N and large T case, the GMM estimators are likely to produce spurious results for two reasons. First, small N might lead to unreliable autocorrelation test.[30] Second, as the

[30] The test of the (AR) by Arrelano-Bond is based on the assumption that there is no second-order serial correlation in the residuals of the first-difference equation.

time span of the data gets larger, the number of instruments will get larger too. This affects the validity of the Sargan test of over-identification restriction and cause the rejection of the null hypothesis of the exogeneity of instruments. Hence, we have doubts about the reliability and consistency of the results obtained using GMM. Another point is that GMM captures only the short run dynamics and the stationarity of the variables tends to be ignored because these models are mostly restricted to short time series. Thus, it is not clear whether the estimated panel models represent a structural long–run equilibrium relationship or a spurious one (Christopoulos and Tsionas, 2004). More importantly, Kiviet (1995) argues that in GMM estimation the imposition of homogeneity assumptions on the slope coefficients of lagged dependent variables could lead to serious biases.[31] These estimation procedures are likely to produce inconsistent and misleading long-run coefficients unless the slope coefficients are, indeed, identical (Pesaran and Smith, 1995; Pesaran, 1997; Pesaran and Shin, 1999).

Based on Pesaran et al. (1999), the dynamic heterogeneous panel regression can be incorporated into the error- correction model using the autoregressive distributed lag ARDL(p,q) technique, where p is the lag of the dependent variable, and q is the lag of the independent variables, and stated as follows (Loayza and Ranciere, 2006):

$$\Delta GDPG_{i,t} = \sum_{j=1}^{p-1} \gamma_j^i \Delta GDPG_{i,t-j} + \sum_{j=0}^{q-1} \delta_j^i \Delta X_{i,t-j} + \varphi^i \left[GDPG_{i,t-1} - \left\{ \beta_0^i + \beta_1^i X_{i,t-1} \right\} \right] + \epsilon_{it}, \tag{4.1}$$

[31] See Bond (2002) for further information about the use of GMM panel estimators in the empirical growth studies.

where **GDPG** is the GDP growth rate[32], **X** is a set of independent variables including the financial development indicator, $\boldsymbol{\gamma}$ and $\boldsymbol{\delta}$ represent the short-run coefficients of lagged dependent and independent variables respectively, $\boldsymbol{\beta}$ are the long-run coefficients, and $\boldsymbol{\varphi}$ is the coefficient of speed of adjustment to the long-run equilibrium. The subscripts **i** and **t** represent country and time indexes, respectively. The term in the square brackets of equation (4.1) contains the long-run growth regression, which includes the long-run coefficients of X vectors, which is derived from the following equation.

$$GDPG_{i,t} = \beta_0^i + \beta_1^i \mathrm{X}_{\mathrm{i},t} + \mu_{i,t} \qquad where\ \mu_{i,t} \sim I(0) \tag{4.2}$$

Equation (3.3) can be estimated by three different estimators: the mean group (MG) model of Pesaran and Smith (1995), the pooled mean group (PMG) estimator developed by Pesaran et al. (1999), and the dynamic fixed effects (DFE) estimator. All three estimators consider the long-run equilibrium and the heterogeneity of the dynamic adjustment process (Demetriades and Law, 2006) and are computed by maximum likelihood.

Pesaran and Smith (1995), Pesaran (1997) and Pesaran and Shin (1999) present the autoregressive distributed lag (ARDL) model in error correction form as a relatively new cointegration test. However, here the emphasis is on the need to have consistent and efficient estimates of the parameters in a long-run relationship. According to Johansen (1995) and Philipps and Bruce (1990), the long-run relationships exist only in the context of cointegration among variables with the same order of integration. Pesaran

[32] We also tried the GDP per capita growth rate and the results were similar.

and Shin (1999) show that panel ARDL can be used even with variables with different orders of integration and irrespective of whether the variables under study are I(0) or I(1) or a mixture of the two. This is an important advantage of the ARDL model, as it makes testing for unit roots unnecessary.[33] In addition, both the short-run and long-run effects can be estimated simultaneously from a data set with large cross-section and time dimensions. Finally, the ARDL model, especially PMG and MG, provides consistent coefficients despite the possible presence of endogeneity because it includes lags of dependent and independent variables (Pesaran et al, 1999). For further understanding of the key features of the three different estimators in the dynamic panel formwork, we present the assumptions relating to each estimator.

4.4.3. Pooled Mean Group (PMG) model

The main characteristic of PMG is that it allows the short-run coefficients, including the intercepts, the speed of adjustment to the long-run equilibrium values and error variances to be heterogeneous country by country, while the long-run slope coefficients are restricted to be homogeneous across countries. This is particularly useful when there are reasons to expect that the long-run equilibrium relationship between the variables is similar across countries or, at least, a sub-set of them. The short run adjustment is allowed to be country-specific, due to the widely different impact of the vulnerability to financial crises and external shocks, stabilization policies, monetary policy and so on. However, there are several requirements for the validity, consistency and efficiency of this methodology. First, the existence of a long-run relationship among the variables of

[33] Nevertheless, we test for the presence of unit roots to ensure that no series exceeds I(1) order of integration. We use the tests of Im, Pesaran and Shin (2003), Breitung (2000), Levin, Lin and Chu (2002) and Karavias and Tzavalis (2014). Asteriou and Monastiriotis (2004) indicate that when some variables are I(2), the estimation is not consistent. This is, however, not the case here. The results of these tests are available in Appendix A4.27 and A4.28 (see Appendix A4).

interest requires the coefficient on the error-correction term to be negative and not lower than -2. Second, an important assumption for the consistency of the ARDL model is that the resulting residual of the error-correction model be serially uncorrelated and the explanatory variables can be treated as exogenous. Third, the relative size of T and N is crucial, since when both of them are large this allows us to use the dynamic panel technique, which helps to avoid the bias in the average estimators and resolves the issue of heterogeneity. Eberhardt and Teal (2011) argue that the treatment of heterogeneity is central to understanding the growth process. Therefore, failing to fulfill these conditions will produce inconsistent estimation in PMG.

4.4.4. Mean Group (MG) estimator

The second technique (MG) introduced by Pesaran and Smith, (1995) calls for estimating separate regressions for each country and calculating the coefficients as unweighted means of the estimated coefficients for the individual countries. This does not impose any restrictions. It allows for all coefficients to vary and be heterogeneous in the long run and short run. However, the necessary condition for the consistency and validity of this approach is to have a sufficiently large time-series dimension of the data. The cross-country dimension should also be large (to include about 20 to 30 countries). Additionally, for small N, the average estimators (MG) in this approach are quite sensitive to outliers and small model permutations (see Favara, 2003).

4.4.5. Dynamic Fixed Effects (DFE) model

Finally, the dynamic fixed effects estimator (DFE) is very similar to the PMG estimator and imposes restrictions on the slope coefficient and error variances to be equal across all countries in the long run. The DFE model further restricts the speed of adjustment coefficient and the short-run coefficient to be equal too. However, the model features country-specific intercepts. DFE has cluster option to estimate intra-group correlation with the standard error (Blackburne and Frank, 2007). Nevertheless, Baltagi et al (2000) point out that this model is subject to a simultaneous equation bias due to the endogeneity between the error term and the lagged dependent variable in case of small sample size.

4.4.6. Model Selection

Equation (4.1) is estimated for the whole sample with PMG, MG, and DFE. As we consider middle-income countries only, we expect this sample to be homogenous with respect to economic growth and financial development. However, in the short run, there is bound to be country-specific heterogeneity due to the effect of local laws and regulations. The PMG estimator offers more efficient estimates compared to the MG estimators under the assumption of long-run homogeneity. Moreover, the time span for this study is 28 years, and the MG estimator may lack degrees of freedom. Consequently, the PMG estimation is more relevant for this analysis. However, to choose among the MG, PMG and DFE methods, the Hausman test is used to test whether there is a significant difference between these estimators. The null of this test is that the difference between PMG and MG or PMG and DFE estimation is not significant. If the null is not rejected, the PMG estimator is recommended since it is efficient. The alternative is that there is a significant difference between PMG and MG or PMG and DFE and the null is rejected. If there are outliers the average estimator may have a large variance and in that case the Hausman test would have little power. The PMG will be used if the P-value is insignificant at the 5% level. On the other hand, if it happens to have a significant P-value, then the use of a MG or DFE estimator is appropriate.

Another important issue is that ARDL lag structure should be determined by some consistent information criterion.[34] Based on the Schwartz Bayesian criterion we impose the following lag structure (1,1,1,1,1) for the GDP growth rate, fixed capital, government expenditure, population growth and financial development respectively. (The test results are available upon request). Finally, besides analyzing all middle-income countries together, we also consider whether there is a differential impact of financial development upon economic growth according to the income level by estimating separate models for upper and lower middle- income countries.

4.5. **RESULTS AND DISCUSSION**

4.5.1. PMG, MG and DFE: linear relationship

In order to identify the impact of the variables of interest, error correction based on autoregressive distributed lag ARDL (p,q) model has been used, with focus on the exclusive feature of PMG model over the other error-correction based estimations, MG and DFE. Table 4.3 reports the results of PMG, MG, and DFE estimation along with the Hausman *h*-test to measure the comparative efficiency and consistency among them. The results indicate that financial development (FD) has a negative but insignificant impact on economic growth in the long run and no impact in the short run according to the PMG estimator, whereas the MG estimator suggests a positive and insignificant coefficient in the long-run but negative and significant coefficient in the short run. The

[34] Lag structure might also be imposed according to the data limitation. When the time dimension is not long enough to overextend the lags, one can impose a common lag structure across countries (see, Pesaran et al, 1999; Loayza and Ranciere, 2006; Demetriades and Law, 2006).

DFE model, in turn, suggests a significant and negative impact of FD on growth in the long as well as short run. The validity of the long-run homogeneity restriction across countries, and hence the efficiency of the PMG estimator over the other estimators, is examined by the Hausman test. As expected, the Hausman test accepts the null hypothesis of the homogeneity restriction on the regressors in the long-run, which indicates that PMG is a more efficient estimator than MG. Similarly, comparing the result of DFE and PMG, the Hausman test again clearly favors the PMG specification over DFE.

Next, we examine to what extent the above finding varies with the income level by re-estimating the models for the sub-samples, the upper middle- income countries (UMIC) and lower middle- income countries (LMIC). The results for the UMIC are reported in Table 4.4. The long-run coefficient of FD this time appears highly significant with the negative sign under PMG and DFE approaches, but insignificant under MG. As regards the short run FD coefficients, they appear negative and statistically significant with all three estimators. Again, the Hausman test confirms that the PMG estimator is the efficient estimator compared to MG and DFE in the case of UMIC. In contrast, when LMIC are considered as shown in Table 4.5, all the three approaches find a statistically insignificant impact of FD on long and short run growth.

To summarize, these results undermine the notion that financial development has a positive and significant long run impact on economic growth in the MIC as a whole or in the LMIC. Moreover, they suggest that financial development has a negative and significant impact on long run growth in the UMIC. Furthermore, financial development does not contribute to economic growth in the short run, with the three models, PMG, MG, and DFE, yielding similar results.[35] Finally, the results from the Hausman test for the three samples; MIC and the sub–samples, UMIC and LMIC, suggest that the regressors have homogeneous long-run and heterogeneous short-run effects on growth.

The findings of this study contradict the common assumption that financial development plays an essential role in promoting economic growth. Nevertheless, they are in line with Ang and McKibbin (2007), who find that the return from financial development depends on the mobilization of savings and allocation of funds to productive investment projects. Due to frictions in the market in the form of high transaction costs and improper allocation of resources, the interaction between savings and investment and its link with economic growth is not strong in developing countries. Our findings of an adverse effect of financial development on economic growth in UMIC are consistent also with Arcand et al. (2012), Easterly et al. (2000), and Deidda and Fattouh (2002). These studies find either a negative or an insignificant impact of financial development on economic growth, in different cross–county samples. Furthermore, our results tally with Sundarajan and Balino (1991) and Gavin and Hausman (1996), who found a weak and sometimes negative impact of financial development on economic growth. They attribute their finding to the expansion in credit along with a lack of regulatory control and monitoring from the bankers. This may result in an inappropriate selection of projects, which could show up as an adverse impact of financial development on economic growth.

[35]As a robustness check, we have repeated all empirical exercises presented in the this study with the individual measures of financial development: the ratio of liquid liabilities (M3) to GDP, private credit/GDP and bank asset/GDP. These results are similar to those using the FD indicator, with the exception of those with the the ratio of commercial bank assets to the sum of commercial bank and central bank assets, which appears significant and positive in the long-run only in the case of middle-income countries. Given that the most commonly used measure of financial development, monetary aggregates and credit to private sector, yield the same results as our FD measure. These results are reported in Appendix A4 (see Table A4.5 to Table A4.13). As another robustness check, we changed the lag structure to (1,0,0,0,0) according to the data limitation (Loayza and Ranciere (2006) but the results remain the same for FD variable that is either negative and significant or has no impact on growth. Therefore, it is omitted from this chapter but can make them available upon request.

Table 4.3. All Middle- Income Countries.

	Pooled Mean Group		Mean Group		Dynamic Fixed Effects	
Variable	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Long-Run Coefficients						
Trade	2.799***	(0.436)	6.063***	(2.209)	4.098***	(0.673)
Fixed Capital	0.0605	(0.474)	0.0306	(1.271)	0.454	(0.741)
Government Expenditure	-2.151***	(0.482)	-6.17***	(2.198)	-2.861***	(0.704)
Population Growth	-0.111	(0.182)	0.188	(1.332)	0.624**	(0.283)
Financial Development	-0.145	(0.115)	0.0122	(0.635)	-0.498***	(0.186)
Error correction Coefficient	-0.891***	(0.043)	-1.128***	(0.039)	-0.794***	(0.025)
Δ Trade	-1.61	(1.693)	0.647	(2.075)	-0.794	(0.966)
Δ Fixed Capital	11.59***	(1.516)	9.906***	(1.567)	8.077***	(0.797)
Δ Government Expenditure	-10.97***	(1.963)	-11.67***	(2.238)	-4.801***	(1.040)
Δ Population Growth	4.144	(4.881)	12.87*	(7.289)	-0.239	(0.297)
Δ Financial Development	-0.847	(0.542)	-1.474**	(0.647)	-1.032***	(0.363)
Intercept	-1.766***	(0.296)	-2.229	(11.260)	-6.736**	(3.040)
Country	52		52		52	
Observation	1,454		1,454		1,454	
Hausman Test			3.92 [a]		4.18 [b]	
p-value			0.560		0.523	

Notes:*, **, and *** indicate significance at 10 %, at 5 %, and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population and Financial Development. All the middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[a] PMG is more efficient estimation than MG under null hypothesis.

[b] PMG is more efficient estimation than DFE under null hypothesis.

Table 4.4. Upper Middle- Income Countries.

	Pooled Mean Group		Mean Group		Dynamic Fixed Effects	
Variable	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Long-Run Coefficients						
Trade	2.481***	(0.715)	5.081**	(2.124)	3.883***	(0.987)
Fixed Capital	-1.474**	(0.747)	-1.679	(2.090)	-1.016	(1.110)
Government Expen.	-3.326***	(0.709)	-11.10***	(3.594)	-2.841***	(0.969)
Population Growth	-0.352*	(0.293)	-0.488	(2.060)	0.347	(0.430)
Financial Development	-0.327**	(0.163)	-0.0471	(0.477)	-0.72***	(0.255)
Error correction Coefficient	-0.938***	(0.063)	-1.171***	(0.058)	-0.85***	(0.037)
Δ Trade	-0.773	(2.805)	1.379	(3.065)	-1.083	(1.463)
Δ Fixed Capital	15.00***	(2.297)	13.65***	(2.698)	10.52***	(1.159)
Δ Government Expenditure	-11.12***	(2.376)	-14.27***	(2.654)	-4.64***	(1.546)
Δ Population Growth	7.873	(12.880)	12.3	(14.260)	-0.438	(0.521)
Δ Financial Development	-1.602*	(0.945)	-2.081*	(1.114)	-1.50***	(0.566)
Intercept	7.092***	(0.707)	16.64	(17.850)	-2.069	(4.723)
Country	23		23		23	
Observation	644		644		644	
Hausman Test			5.25 [a]		2.03 [b]	
p-value			0.386		0.844[b]	

Note: *, **, and *** indicate significance at 10 %, at 5 %, and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population and, Financial Development. Upper Middle- Income, annual data 1980–2008.

[a] PMG is more efficient estimation than MG under null hypothesis.

[b] PMG is more efficient estimation than DFE under null hypothesis.

Table 4.5. Lower Middle- Income Countries.

	Pooled Mean Group		Mean Group		Dynamic Fixed Effects	
Variable	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Long-Run Coefficients						
Trade	2.924***	(0.545)	6.842*	(3.617)	3.729***	(0.926)
Fixed Capital	1.265**	(0.605)	1.386	(1.552)	1.840*	(0.993)
Government Expen.	-1.892***	(0.670)	-2.258	(2.548)	-3.32***	(1.032)
Population Growth	0.128	(0.247)	0.724	(1.767)	0.905**	(0.382)
Financial Development	0.0995	(0.168)	0.0592	(1.085)	-0.164	(0.278)
Error correction Coefficient	-0.851***	(0.058)	-1.00***	(0.053)	-0.74***	(0.034)
Δ Trade	-0.851***	(0.058)	-1.09***	(0.053)	-0.74***	(0.034)
Δ Fixed Capital	-2.442	(2.084)	0.0667	(2.860)	-0.361	(1.290)
Δ Government Expen.	8.528***	(1.776)	6.93***	(1.665)	4.865***	(1.127)
Δ Population Growth	-10.71***	(3.203)	-9.60***	(3.408)	-4.959***	(1.391)
Δ Financial Development	3.035	(3.405)	13.33*	(6.847)	-0.236	(0.358)
Intercept	-6.167***	(0.504)	-17.19	(14.040)	-7.963**	(3.994)
Country	29		29		29	
Observation	810		810		810	
Hausman Test			0.88 [a]		2.54 [b]	
p-value			0.971		0.770	

Note: *, **, and *** indicate significance at 10 %, at 5 %, and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population and Financial Development. Lower Middle- Income countries, annual data 1980–2008.

[a] PMG is more efficient estimation than MG under null hypothesis.

[b] PMG is more efficient estimation than DFE under null hypothesis.

4.5.2. Non-monotonic relationship

As far as the econometrics is concerned, there is no single correct approach to modeling nonlinearity. Polynomials (such as adding squares) and threshold models are both used. They take different approximations: polynomials are smooth functions while threshold models may entail sharp discrete shifts. To investigate the potential non-monotonicity in the linkage between financial development and economic growth, this study applies both techniques.

4.5.2.1. Quadratic polynomial of financial development

Arcand et al. (2012), Easterly et al. (2000), and Deidda and Fattouh (2002) find a non-monotonic association between FD and economic growth. Specifically, Deidda and Fattouh (2002), focusing on high- and low- income countries, conclude that the relationship between financial development and economic growth is non-linear. Therefore, we check for the existence of a non-monotonic relationship as well. To accomplish the task, we first include a quadratic term of FD in the panel ARDL model.

The results of which are shown in Tables 4.6, 4.7 and 4.8. Interestingly, Table 4.6 reveals that FD has a positive and significant coefficient, while FD^2 has a negative and significant coefficient under the PMG estimation in the whole sample (MIC). Hausman test results confirm again that PMG is a better estimator than MG and DFE. This result supports the “Too Much Finance” hypothesis put forward by Arcand et al. (2012). It confirms that the marginal effect of financial development in the long-run is positive up to a certain threshold point, and negative after the threshold. Specifically, the turning point of the long-run relationship is attained at a value of FD equal to 1.03. Given the distribution of FD, this implies that the relationship between financial development and growth is positive for nearly 80% of observations included in our sample. Note that the short-run effect is not significantly different from zero, which is why we only compute the turning point for the long-run coefficients. [36]

For a number of countries in our sample, the size of the financial sector may be too large with respect to the socially optimal level. Hence, increasing FD can have a negative marginal effect on GDP growth. Note that these findings are almost the same for the whole sample, UMIC and LMIC.[37]

[36] For calculating the turning point: $-\frac{b1(FD)}{2b2(FDSQ)} = 1.03$.

[37] Loayza and Ranciere (2006), who use a similar methodology as the one is used in the current study, do not consider the possibility that the effect of financial development might be non-monotonic. As a robustness check, we replicate their analytical framework with our data: to do this, we add the initial GDP per capita and inflation terms, and omit population growth and physical capital; we use our composite FD measure rather than the ratio of credit to the private sector to GDP used by Loayza and Ranciere. Reassuringly, we obtain a similar result: FD appears to have a significantly positive effect on growth when entered linearly. This indicates that the differences between our results and those of Loayza and Ranciere are not due to the choice of sample. Instead, they may be due to the different sets of controls. Importantly, when we enter FD as a quadratic polynomial, both the linear and quadratic terms are significant and the effect of FD on growth is inverted U-shaped, as in the baseline results reported above. Hence, the relationship between financial development and growth remains inverted U-shaped even when we replicate Loayza and Ranciere’s result while allowing for non-monotonicity. These results are reported in Appendix A4 (see Table A4.29 to A4.30).

Table 4.6. All Middle- Income Countries with Non-linear Effect of FD.

	Pooled Mean Group		Mean Group		Dynamic Fixed Effects	
Variable	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Long-Run Coefficients						
Trade	2.923***	(0.460)	5.528**	(2.468)	3.954***	(0.669)
Fixed Capital	0.22	(0.468)	1.007	(1.393)	0.553	(0.741)
Government Expen.	-2.31***	(0.511)	-6.60***	(2.360)	-3.29***	(0.712)
Population Growth	0.0268	(0.187)	0.0916	(1.469)	0.528*	(0.281)
Financial Development	0.246**	(0.125)	-2.97	(1.817)	-0.29	(0.197)
Financial Development SQ	-0.12***	(0.039)	-0.938	(0.986)	-0.15***	(0.061)
Error- correction Coefficient	-0.89***	(0.044)	-1.17***	(0.039)	-0.79***	(0.025)
Δ Trade	-1.645	(1.687)	0.754	(2.101)	-0.856	(0.961)
Δ Fixed Capital	11.12***	(1.483)	9.442***	(1.585)	7.818***	(0.795)
Δ Government Expenditure	-10.5***	(2.005)	-10.75***	(2.344)	-4.87***	(1.034)
Δ Population Growth	4.876	(4.891)	15.07	(9.361)	-0.209	(0.295)
Δ Financial Development	0.777*	(1.595)	-0.752	(1.720)	-0.94***	(0.361)
Δ Financial Development Sq	-0.289*	(0.669)	-0.858	(0.801)	-0.43***	(0.104)
Intercept	-2.26***	(0.322)	-2.668	(14.180)	-5.198*	(3.064)
Country	52		52		52	
Observation	1,454		1,454		1,454	
Hausman Test			4.15 [a]		5.76 [b]	
p-value			0.656		0.450	

Note:*, **, and *** indicate significance at 10 %, at 5 %, and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects.While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population, Financial Development and Financial development Square. All the middle- income countries, annual data 1980–2008.

[a] PMG is more efficient estimation than MG under null hypothesis.

[b] PMG is more efficient estimation than DFE under null hypothesis.

Table 4.7. Upper Middle- Income Countries with Non-linear Effect of FD.

	Pooled Mean Group		Mean Group		Dynamic Fixed Effects	
Variable	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Long-Run Coefficients						
Trade	2.550***	(0.715)	4.637**	(2.296)	3.878***	(0.983)
Fixed Capital	-1.505**	(0.744)	-0.0252	(2.044)	-0.963	(1.115)
Government Expen.	-3.484***	(0.754)	-9.81***	(2.827)	-3.03***	(0.991)
Population Growth	-0.314	(0.296)	-1.161	(2.308)	0.314	(0.428)
Financial Development	0.443**	(0.201)	-1.494	(2.068)	-0.575*	(0.296)
Financial Development Sq	-0.195***	(0.064)	-0.267	(1.161)	-0.0873*	(0.094)
Error- correction Coefficient	-0.938***	(0.067)	-1.21***	(0.056)	-0.85***	(0.037)
Δ Trade	-0.983	(2.808)	1.936	(3.244)	-1.033	(1.459)
Δ Fixed Capital	14.79***	(2.376)	12.54***	(2.585)	10.17***	(1.164)
Δ Government Expenditure	-10.92***	(2.500)	-11.6***	(2.662)	-4.85***	(1.543)
Δ Population Growth	8.343	(11.200)	9.162	(13.300)	-0.438	(0.520)
Δ Financial Development	1.197	(1.037)	0.857	(1.912)	-1.187**	(0.579)
Δ Financial Development Sq	-0.128	(0.665)	0.262	(0.789)	-0.380**	(0.154)
Intercept	7.543***	(0.703)	8.917	(19.690)	-1.546	(4.795)
Country	23		23		23	
Observation	644		644		644	
Hausman Test			5.14 [a]		5.22 [b]	
p-value			0.525		0.515	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth , Financial Development and Financial development Square. Upper Middle- Income Countries, annual data 1980–2008.

[a] PMG is more efficient estimation than MG under null hypothesis.

[b] PMG is more efficient estimation than DFE under null hypothesis.

Table 4.8. Lower Middle- Income Countries with Non-linear Effect of FD.

	Pooled Mean Group		Mean Group		Dynamic Effects	Fixed
Variable	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Long-Run Coefficients						
Trade	3.471***	(0.602)	6.235	(4.071)	3.529***	(0.922)
Fixed Capital	1.490**	(0.601)	1.826	(1.919)	1.995**	(0.994)
Government Expen.	-1.898***	(0.698)	-4.061	(3.562)	-3.830***	(1.031)
Population Growth	0.262	(0.249)	1.085	(1.910)	0.774**	(0.379)
Financial Development	0.264	(0.175)	-4.141	(2.830)	0.0137	(0.280)
Financial Development SQ	-0.102*	(0.057)	-1.471	(1.521)	-0.197**	(0.081)
Error- correction Coefficient	-0.86***	(0.057)	-1.14***	(0.056)	-0.75***	(0.034)
Δ Trade	-2.31	(2.035)	-0.184	(2.792)	-0.436	(1.285)
Δ Fixed Capital	7.835***	(1.560)	6.983***	(1.885)	4.713***	(1.123)
Δ Government Expenditure	-10.09***	(3.206)	-10.00***	(3.672)	-4.905***	(1.383)
Δ Population Growth	3.955	(5.212)	19.75	(13.200)	-0.175	(0.356)
Δ Financial Development	0.62	(2.797)	-2.029	(2.692)	-0.838*	(0.469)
Δ Financial Development Sq	-0.669	(1.134)	-1.747	(1.282)	-0.42***	(0.145)
Intercept	-8.84***	(0.687)	-11.86	(20.190)	-6.22	(4.003)
Country	29		29		29	
Observation	810		810		810	
Hausman Test			1.72 [a]		3.43 [b]	
p-value			0.943		0.753	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population, Financial Development and Financial development Square. Lower Middle- Income Countries, annual data 1980–2008.

[a] PMG is more efficient estimation than MG under null hypothesis.

[b] PMG is more efficient estimation than DFE under null hypothesis.

Sufficient Condition for a Quadratic Relationship

Lind and Mehlum (2010) point out that the conventional econometric model is not suitable for testing the composite null hypothesis that at the left side of the interval the relationship is decreasing, and at the right side of the interval it is increasing, or vice-versa. Moreover, Arcand et al. (2012) argue that if the model does not allow for non-monotonocity, it may lead to a downward bias in the estimated effect of financial development on economic growth. Therefore, to confirm our finding of an inverted U-shaped relationship, we conduct the U test of Lind and Mehlum (2010). To accomplish this, we estimate the following model:

$$gdpg_i = aFD_i + bFD_i^2 + Z_iC + \varepsilon_i. \tag{4.3}$$

Then test the joint hypothesis:

$$H_0: (a + b2FD_{min} \leq 0) \cup (a + b2FD_{max} \geq 0), \tag{4.4}$$

against the alternative hypothesis:

$$H_1: (a + b2FD_{min} > 0) \cup (a + b2FD_{max} < 0), \tag{4.5}$$

where FD_{min} and FD_{max} represent the minimum and maximum values of financial development, respectively. If the null hypothesis is rejected, this confirms the existence of an inverted U shape.

The test results in Table 4.9 show that the lower bound slope of FD is positive (0.74) while the upper bound slope of FD is negative (-1.04). Both are statistically significant which means that the null hypothesis of no inverted U-shape is rejected. This test is also conducted for the two sub-samples. The lower bound slope of FD is positive

(0.82) while the upper bound slope is negative (-0.87) for the UMIC subsample. Both are statistically significant at 10% which again means that the null hypothesis of no inverted U-shape is rejected for the upper middle income countries. Similarly, the U-Test also indicates that inverted U shape exits in the lower middle-income countries as the lower bound of FD is positive (0.92) while the upper bound slope is negative (-1.21). Both are highly significant at 1% (these results are also included in Table (4.9). The SLM test in the bottom panel of Table 4.9 for MIC, UMIC and LMIC shows that the null hypothesis is rejected, which indicates that our results are consistent with the presence of an inverted U-shaped relationship between financial development and economic growth.[38]

Table 4.9. U-Test.

The table reports the results of the Sasabuchi-Lind-Mehlum test for inverse U-shaped relationship. Three models have been considered i) All Middle- Income Countries (MIC) ii) Upper Middle- Income Countries (UMIC) and iii) Lower Middle- Income Countries (LMIC).

	MIC	**UMIC**	**LMIC**
Slope at FD_{min}	0.74***	0.82**	0.92***
	(2.36)	(0.07)	(2.34)
Slope at FD_{Max}	-1.04***	-0.87*	-1.21***
	(-2.49)	(-1.32)	(-2.13)
SLM test for inverse U shape	2.36	1.96	2.14
P Value	0.009	0.06	0.01

T- Value in parentheses *** p<0.01, ** p<0.05, * p<0.1

As regards the control variables, all the models used in this paper found more or less similar results. Trade has a positive and significant impact on economic growth in the long run, in the whole set of middle- income countries (and also among upper middle-

[38] Further robustness checks have been carried out for detecting both outliers and leverage points. This resulted in removing Tonga, Vanuatu, Dominica, India and Indonesia from the analysis. This had little influence on the estimators, nevertheless. These results are available in appendix A4.(see from A4.14 to A4.20.)

and lower middle- income countries). This result is consistent with several theoretical predictions and empirical findings in the literature: see, for example, Dollar (1992), Ben-David (1993), Sachs and Warner (1995), Harrison (1996), Edwards (1998), Frankel and Romer (1999), Easterly and Levine (2001), Irwin and Tervio (2002), Dollar and Kraay (2003), etc., and is a reflection of the favorable effects of policies encouraging trade liberalization and globalization pursued by many of these countries, as well as issues linking trade with technology transfers, institutional quality and geographical factors. In the short-run, trade exhibits a negative but insignificant impact on growth for all MIC and UMIC, except in one case as shown in Table 4.5, where the trade coefficient appears to be negative and significant for the LMIC. This finding may appear to be somewhat unusual, but some of the literature points to the possibility of trade hindering growth if there is specialization in the 'wrong' sector (which is an old argument in favor of trade protectionism, see Ethier, 1982).

In line with much of the literature, the long run impact of fixed capital formation was found to be positive and significant for the lower middle- income countries, but in the sample including all middle income- countries, this effect was positive but insignificant. However, somewhat surprisingly, Tables 4.4 and 4.7 suggest that fixed capital formation adversely affects economic growth for upper middle- income countries in the long run. Neoclassical growth theory asserts that long run growth cannot be sustained through capital deepening alone (Solow, 1957), as diminishing returns to physical capital set in, and what is required to overcome this is the complementary effect of human capital and/or public capital in production.[39] One could point to the ineffectiveness of these complementary inputs (the issue we turn to next) as a causal factor behind this result. The negative impact of physical capital in the long run

[39] See, for instance, Mankiw et al. (1992) and Futagami et al. (1993) on the importance of human and public capital, respectively, in promoting growth.

could also be due to the absence of proper market incentives in these countries that renders physical capital relatively unproductive.

In all the models, government expenditure negatively and significantly impacts on economic growth in both long run and short run. This can happen because of an increase in government consumption expenditure, which usually has distortionary effects, when accompanied by an increase in the present and/or future tax burden on citizens, and which leads to a reduction in private spending and investment (Barro, 1974, 1991). Even when a sizeable proportion of public spending in an economy is attributed to government investment, our results may be vindicated when a shift towards an a priori more productive category of spending may not raise the growth rate if its initial share is too high (Devarajan et al., 1996), or if optimizing governments misperceive the productivities of the different types of public goods and allocate their expenditures out of line with their productivities (Ghosh and Gregoriou, 2008).

Moreover, we obtain an insignificant impact of population growth on economic growth in the long run as well as short run in most cases. The signs of the coefficient of population growth in both short and long run are mixed, which implies that the impact of population growth on economic growth remains inconclusive, in contrast to much of the empirical research that finds a negative effect of population growth on economic growth. This happens typically because with higher population growth, the available capital must be spread more thinly over the population of workers (see Mankiw et al., 1992). However, there are others like Simon (1996) who argues that population growth can put pressure on resources and raise prices, but this process provides incentives for innovation which turn out to be so successful that the price changes are reversed and income grows with time. So, the impact of population growth could well be mixed.

4.5.2.2. Robustness check using Panel Threshold model

As another approach to examine nonlinearity in the finance-growth nexus, we apply a newly developed dynamic panel threshold estimator. In a seminal work, Hansen (1999) proposed a panel threshold estimator that is only suitable for static and balanced panels. However, some macroeconomic variables such as GDP growth are highly persistent, meaning that a dynamic panel framework is more appropriate. To consider nonlinearity in dynamic panel data, Bick (2010) and Kremer et al. (2013) proposed a dynamic panel threshold estimator which is an extension of the threshold models by Hansen (1999), Hansen (2000), and Caner and Hansen (2004). This estimator allows us to investigate the potential existence of a discrete shift in a dynamic framework. Accordingly, the structural equation of interest with one potential threshold, γ, is given by

$$GDPG_{it} = \mu_i + \beta_1 FD_{it} I(FD_{it} \leq \gamma) + \delta_1 I(FD_{it} \leq \gamma) + \beta_2 FD_{it} I(FD_{it} > \gamma) + \emptyset z_{it} + \varepsilon_{it}, \quad (4.6)$$

where subscript $i = 1, \dots, N$ indexes the country and $t = 1, \dots, T$ represents the time; μ_i stands for the country specific fixed effects; $I(.)$ is an indicator function and depending on whether the threshold variable is larger or smaller than γ, it divides the observations into two regimes distinguished by differing regression slopes, β_1 and β_2; δ_1 is the regime intercept which is the same for all individuals; and z_{it} is an m-dimensional vector of explanatory variables, including the GDP at *t*-1 and the remaining control variables entered contemporaneously.

The dynamic panel threshold estimation results of equation (4.6) are presented in Table 4.10. In particular, three estimations are reported: In the first column, all MIC are considered, while the second and the third columns represent estimation results for UMIC and LMIC, respectively. The estimated threshold values of the FD indicator are around 0.92 for MIC and UMIC while it decreases to 0.433 for LMIC, suggesting that the turning point is lower for the LMIC. Among all MIC in our sample, 28 countries, or 54% of countries, exceed the threshold value of 0.915. The most striking feature of our results is that the estimated coefficients on FD have different signs above and below the threshold level in all equations. More specifically, below the threshold regime, the estimated coefficient of FD is positive and significant in all equations with the exception of LMIC. However, the FD coefficients turn out to be negative and statistically significant above the threshold regime. This indicates that an increase in finance below the threshold value enhances growth whereas excessive FD beyond the threshold value undermines economic growth. Given the distribution of the FD indicator, this implies that the relationship between financial development and economic growth is positive for nearly 78% of observations included in our sample.[40] Our results again lend support to the view that excessive finance harms the economy and are consistent with the findings of previous empirical studies (see e.g., Arcand et al.,2012; Rousseau and Wachtel, 2011; Law and Singh, 2014, among others). As for control variables, almost all variables used in the threshold model have coefficients similar to those we obtained in our previous finding with the exception of fixed capital formation and population. We do not replicate the discussion of the control variables for brevity. Briefly, fixed capital formation is found to be statistically highly significant for all MIC, UMIC and LMIC. As regards the population growth variable, it appears to be statistically insignificant for all middle- income countries and for lower middle- income countries, but positive and significant for upper middle- income countries. Overall,

[40] This is very close to the turning point we obtained from inserting the square of FD. See footnote 36.

considering that all control variables are plausibly signed, our empirical results from the dynamic panel threshold estimation confirm the existence of an inverted U shape in the financial-growth relationship.

Table 4.10. Results of dynamic panel threshold estimations

	MIC		UMIC		LMIC	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
Threshold estimates						
$\hat{\gamma}$	0.915		0.918		0.433	
95% Confidence interval	[0.685 1.050]		[0.978 0. 929]		[0.203 0.487]	
Financial Development						
$\hat{\beta}_1$	1.430***	(0.488)	3.214***	(1.148)	0.001	(0.447)
$\hat{\beta}_2$	-0.718***	(0.195)	-0.984***	(0.263)	-0.855***	(0.344)
Impact of covariates						
$\mathrm{GDP\ Growth}_{i,t-1}$	0.232***	(0.040)	0.172***	(0.056)	0.276***	(0.052)
Trade_{it}	2.196***	(0.629)	2.232**	(0.975)	1.725**	(0.787)
$\mathrm{Fixed\ Capital}_{it}$	2.204***	(0.701)	2.512**	(1.161)	1.896 **	(0.814)
$\mathrm{Government\ Expenditure}_{it}$	-2.365***	(0.712)	-3.022***	(1.082)	-2.705***	(0.958)
$\mathrm{Population\ Growth}_{it}$	1.259	(0.991)	3.900**	(1.682)	0.238	(1.273)
$\hat{\delta}_1$	2.856***	(0.771)	5.935***	(1.602)	-0.843	(0.561)
Observations	1454		644		810	
N	52		23		29	

Note: ** and *** indicate significance at 5 % and at 1 %.

4.6. CONCLUDING REMARKS

Financial development and economic growth have traditionally been strange bedfellows. Most studies conclude that on the whole, financial development plays a significant role in fostering growth. However, some recent studies find that financial deepening adversely affects growth. In this chapter, we apply advanced econometric techniques to assess the impact of FD on growth. These include the error-correction based autoregressive distributed lag ARDL (p,q) model, which offers three different tests: namely, mean group (MG) presented by Pesaran and Smith (1995), pooled mean group (PMG) developed by Pesaran et al. (1999), and dynamic fixed effects (DFE) estimators. In doing so, we specifically allow for a non-linear relationship between financial development and economic growth. The results obtained when imposing a linear relationship suggest that financial development and economic growth are negatively associated in the long-run in the sample of all middle income countries. This finding is partially in line with Loayza and Ranciere (2006) who found that FD negatively influences economic growth in the short-run, but not in the long-run.

In an effort to go beyond Loayza and Ranciere (2006), we explore the possible non-monotonic impact of FD on growth by applying two different methodologies: we introduce a quadratic polynomial of financial development, and estimate a threshold model. Our findings demonstrate that financial development and economic growth are not linearly related, similar to the findings of Arcand et al. (2012). Specifically, we find evidence of an inverted U-shaped relationship. We confirm this using Lind and Mehlum's (2010) U-test to obtain sufficient conditions for the existence of an inverted U relationship. These results suggest that more finance might not always be better in the case of the MIC. Moreover, our empirical results from the dynamic panel threshold estimation confirm the existence of an inverted U shape in the finance-growth nexus.

As we found that the relationship between financial development and economic growth follows an inverted U-shape, this implies that up to a certain level of financial development economic growth is promoted and beyond that point, further finance adversely affects growth. This finding partially can be explained by Romer's endogenous growth model. In endogenous growth models, physical capital, and other variables (like financial capital) that augment output, grow at the same rate in a steady state, and so does output. But the growth rate varies from one steady state to another.

Although financial capital is expected to augment the productivity of physical capital, if it is increased beyond a certain level, it tends to reduce the marginal product of private capital, and hence the growth rate decreases from one steady state to another.

We also conclude that the impact of financial development varies across the countries due to the heterogeneous nature of economic structures, institutional quality, financial markets, and so on. However, we believe that our results are of potential importance to policymakers in terms of optimizing the financial deepening that needs to be undertaken to ensure that the maximum possible gain for the economy can be achieved through the banking sector. Specifically, an intermediate level of financial development should be associated with optimal growth performance. Encouraging financial development for its own sake, therefore, may be counter-productive. Rather, policymakers should seek to strengthen the appropriate type and quality of finance rather than expanding the financial per se. They could then focus on other growth-enhancing strategies if the appropriate finance threshold has been achieved. This resonates with the argument put forward, among others, by Cetorelli and Peretto (2012). They point out that the relationship between financial development and accumulation of physical capital is ambiguous: more bank competition translates into more credit availability for firms, but at the same time banks provide fewer additional services to the firms, resulting in greater probability of the investment failing (see also Bezemer et al., 2014; and Law and Singh, 2014). Further research should shed more light on this, including the factors that underlie the relationship between financial development and economic growth (or investment). Possible underlying factors could include the level of economic development and/or the quality of the institutional environment.

APPENDIX A4

Table A4.1. Descriptive Statistics.

The summary statistics of the variables used in the econometric analysis for the 52 middle- income countries during the period 1980-2008 and extract from the World Bank

Variable	Obs	Mean	Std. Dev	Min	Max
GDP Growth Rate	1506	3.539446	4.432292	-17.146	23.5977
GDP per Capita Growth Rate	1508	1.643451	4.413579	-19.6798	19.8214
M3/GDP	1441	0.4626401	0.2609722	.0450278	1.323384
Private/GDP	1482	0.3192095	0.2164487	.01737	1.65962
Bank Asset/GDP	1467	0.7867373	0.1892425	.045232	1.26446
FD	1508	0.0022351	1.343541	-3.23216	6.07906
Government Expenditure/GDP	1486	14.81404	5.713606	2.975538	38.83615
Gross Fixed Capital/GDP	1459	22.13563	6.555832	6.510486	59.7324
Trade/GDP	1483	78.34604	42.3759	11.54567	283.4363
Population	1508	4.18e+07	1.29e+08	64400	1.10e+09

Table A4.2. Definitions of the variables and sources.

VARIABLES	Label	DEFINITIONS	source
Gdpg	GDP growth rate	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	World Bank Indicators (WBI)
Gdppg	Per capita growth rate GDP denoted	GDP per capita is gross domestic product divided by midyear population. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	WDI
Pop	Population	Number of total population	WBI
Trd	The ratio of exports plus imports to GDP	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	WBI
Gov	government consumption expenditure	General government final consumption expenditure (includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. Data are in current U.S. dollars.	WBI
Lnca	Gross fixed capital formation (% of GDP)	Gross fixed capital formation includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings.	WBI
M3	Liquid liabilities	Liquid liabilitiesare also known as broad money. They are the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents.	Thorsten
basset	Bank assets	the ratio of commercial bank assets divided by commercial bank plus central bank assets	Thorsten
private	Private credit	Private credit by deposit money banks to GDP.	Thorsten
dincome	Dummy variable	A dummy for the middle income countries as following, upper middle income countries =1, and the lower middle income countries = 0.	By the author

Table A4.3. Correlation Matrix between financial development variables.

	Private/GDP	Basset/GDP	M3/GDP
Private/GDP	1		
Basset/GDP	0.8630	1	
M3/GDP	0.6841	0.4721	1

Table A4.4. Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Unexplained
M3	0.6079	-0.4864	0.6276	0
Private	0.6739	-0.1019	-0.7317	0
Bank Asset	0.4198	0.8678	0.2659	0

Figure B4.1.

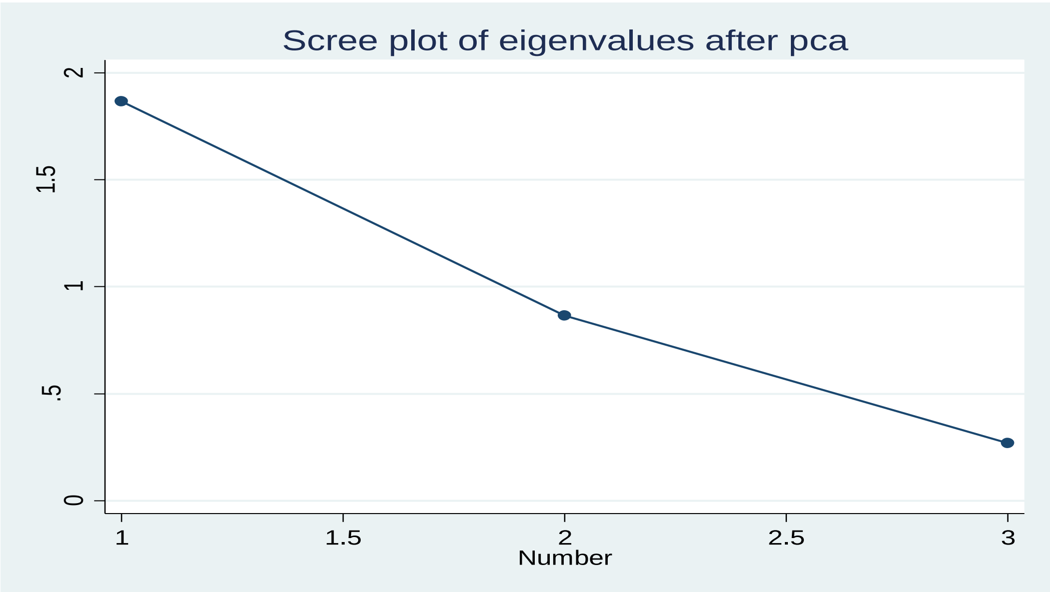

Table A4.5. Middle- Income Countries (Full- sample). (M3/ GDP as a measure financial development).

	PMG		**MG**		**DFE**	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.893***		-1.106***		-0.797***
		(0.0411)		(0.0423)		(0.0245)
Δ Trade		-0.751		1.224		-1.054
		(1.581)		(2.205)		(0.959)
Δ Fixed Capital		11.75***		9.758***		8.354***
		(1.506)		(1.603)		(0.790)
Δ Government Expenditure		-10.61***		-9.779***		-3.950***
		(2.046)		(2.375)		(1.045)
Δ Population Growth		5.546		7.858		-0.169
		(6.496)		(6.127)		(0.294)
Δ M3		-13.47***		-19.29***		-14.60***
		(4.867)		(5.740)		(2.151)
Hausman Test[41]					3.24(0.66)	
Hausman Test[42]					1.87(0.86)	
Trade	3.290***		10.92		3.908***	
	(0.421)		(7.594)		(0.669)	
Fixed Capital	0.601		1.708		0.544	
	(0.470)		(2.025)		(0.727)	
Government Expenditure	-1.845***		-2.827		-2.449***	
	(0.469)		(4.180)		(0.702)	
Population Growth	0.0789		0.423		0.565**	
	(0.175)		(2.482)		(0.279)	
M3	-1.510**		5.241		-2.881***	
	(0.708)		(11.95)		(1.026)	
Constant		-5.433***		-0.701		-6.026**
		(0.393)		(14.85)		(2.942)
Observations	1,447		1,447		1,447	

Note:*, **, and *** indicate significance at 10 %, at 5 %, and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, M3. All the middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[41] PMG is more efficient estimation than MG under null hypothesis.
[42] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.6. Upper Middle- Income Countries (M3/ GDP as a measure financial development).

	PMG		MG		DFE	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.960***		-1.184***		-0.853***
		(0.0543)		(0.0523)		(0.0361)
Δ Trade		-0.248		-1.207		-1.749
		(2.509)		(2.702)		(1.466)
Δ Fixed Capital		14.77***		13.56***		10.48***
		(2.216)		(2.593)		(1.144)
Δ Government Expenditure		-10.62***		-12.65***		-4.071***
		(2.386)		(2.441)		(1.558)
Δ Population Growth		12.81		8.157		-0.405
		(16.73)		(11.94)		(0.520)
Δ M3		-11.55		-12.79*		-13.61***
		(8.094)		(7.705)		(3.054)
Hausman Test[43]	2.54(0.77)					
Hausman Test[44]	1.18(0.94)					
Trade	2.413***		1.274		3.698***	
	(0.669)		(2.510)		(0.984)	
Fixed Capital	-1.645**		-0.520		-1.257	
	(0.739)		(1.894)		(1.098)	
Government Expenditure	-2.688***		-8.634***		-2.300**	
	(0.698)		(3.227)		(0.981)	
Population Growth	-0.128		-2.055		0.330	
	(0.275)		(2.039)		(0.432)	
M3	-2.036**		-5.571		-3.158**	
	(0.902)		(3.745)		(1.266)	
Constant		6.990***		27.36		-0.824
		(0.721)		(19.14)		(4.693)
Observations	640		640		640	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, M3. All the upper middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[43] PMG is more efficient estimation than MG under null hypothesis.
[44] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.7. Lower Middle- Income Countries (M3/ GDP as a measure financial development).

	PMG		MG		DFE	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.834***		-1.045***		-0.746***
		(0.0543)		(0.0619)		(0.0330)
		-1.484		3.152		-0.128
Δ Trade		(2.015)		(3.321)		(1.280)
		8.830***		6.747***		5.328***
Δ Fixed Capital		(1.848)		(1.862)		(1.119)
		-9.918***		-7.502**		-3.842***
Δ Government Expenditure		(3.387)		(3.781)		(1.394)
		1.569		7.620		-0.138
Δ Population Growth		(4.200)		(5.809)		(0.353)
		-17.06***		-24.44***		-15.17***
Δ M3		(6.126)		(8.274)		(3.056)
Hausman Test[45]					1.99(0.85)	
Hausman Test[46]					1.95(0.85)	
Trade	3.728***		18.58		3.647***	
	(0.542)		(13.40)		(0.929)	
Fixed Capital	1.872***		3.474		2.110**	
	(0.599)		(3.301)		(0.976)	
Government Expenditure	-1.695***		1.779		-2.850***	
	(0.644)		(6.991)		(1.023)	
Population Growth	0.266		2.388		0.799**	
	(0.235)		(4.150)		(0.373)	
M3	-0.0841		13.81		-1.795	
	(1.229)		(21.25)		(1.774)	
Constant		-11.03***		-22.96		-8.374**
		(0.770)		(21.25)		(3.783)
Observations	808		808		808	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, M3. All the lower middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[45] PMG is more efficient estimation than MG under null hypothesis.
[46] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.8. Middle- Income Countries (private/ GDP as a measure financial development).

	PMG		MG		DFE	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.880***		-1.124***		-0.793***
		(0.0431)		(0.0372)		(0.0250)
Δ Trade		-1.672		0.517		-0.978
		(1.662)		(1.772)		(0.961)
Δ Fixed Capital		11.64***		9.618***		8.070***
		(1.496)		(1.717)		(0.794)
Δ Government Expenditure		-9.540***		-9.883***		-4.577***
		(1.860)		(2.196)		(1.036)
Δ Population Growth		5.626		11.22		-0.255
		(5.971)		(7.059)		(0.296)
Δ PRIVATE		-16.29***		-23.52***		-9.699***
		(3.875)		(6.379)		(2.115)
Hausman Test[47]					4.72(0.45)	
Hausman Test[48]					4.37(0.49)	
Trade	2.375***		5.004***		3.930***	
	(0.452)		(1.935)		(0.662)	
Fixed Capital	0.486		-0.534		0.796	
	(0.490)		(1.326)		(0.743)	
Government Expenditure	-2.168***		-5.710***		-2.740***	
	(0.485)		(2.206)		(0.708)	
Population Growth	-0.157		-1.424		0.579**	
	(0.189)		(1.465)		(0.282)	
PRIVATE	-1.897***		-6.734		-3.813***	
	(0.631)		(6.082)		(1.073)	
Constant		-0.578**		1.558		-6.218**
		(0.280)		(11.47)		(2.959)
Observations	1,450		1,450		1,450	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, private. All the Middle- Income Countries, annual data 1980–2008. Source: Authors' estimations.

[47] PMG is more efficient estimation than MG under null hypothesis.
[48] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.9. Upper Middle- Income Countries (private/ GDP as a measure financial development).

	PMG		MG		DFE	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.958***		-1.207***		-0.861***
		(0.0661)		(0.0470)		(0.0368)
Δ Trade		-0.0693		1.970		-1.100
		(2.726)		(2.866)		(1.448)
Δ Fixed Capital		14.61***		13.86***		10.33***
		(2.260)		(2.898)		(1.146)
Δ Government Expenditure		-8.698***		-10.99***		-4.746***
		(2.443)		(2.812)		(1.538)
Δ Population Growth		8.959		6.138		-0.429
		(14.79)		(12.05)		(0.519)
Δ PRIVATE		-16.16**		-18.98**		-8.269***
		(7.351)		(9.026)		(2.591)
Hausman Test[49]					7.80(0.16)	
Hausman Test[50]					2.13(0.83)	
Trade	2.142***		5.258**		3.815***	
	(0.674)		(2.445)		(0.962)	
Fixed Capital	-1.174		-0.157		-0.856	
	(0.745)		(1.859)		(1.094)	
Government Expenditure	-3.182***		-8.175***		-2.777***	
	(0.697)		(3.073)		(0.968)	
Population Growth	-0.446		-1.325		0.351	
	(0.306)		(2.170)		(0.423)	
PRIVATE	-4.182***		-8.886**		-5.267***	
	(0.913)		(3.773)		(1.413)	
Constant		9.030***		8.655		-0.976
		(0.924)		(20.65)		(4.699)
Observations	640		640		640	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, private. All the upper middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[49] PMG is more efficient estimation than MG under null hypothesis.
[50] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.10. Lower Middle- Income Countries (private/ GDP as a measure financial development).

	PMG		MG		DFE	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.815***		-1.058***		-0.731***
		(0.0528)		(0.0527)		(0.0337)
Δ Trade		-2.935		-0.635		-0.639
		(2.058)		(2.244)		(1.282)
Δ Fixed Capital		8.991***		6.257***		5.031***
		(1.788)		(1.867)		(1.123)
Δ Government Expenditure		-10.21***		-9.005***		-4.333***
		(2.992)		(3.281)		(1.391)
Δ Population Growth		3.458		15.25*		-0.284
		(4.099)		(8.423)		(0.355)
Δ PRIVATE		-18.15***		-27.13***		-14.44***
		(4.582)		(9.005)		(3.761)
Hausman Test[51]					1.55(0.90)	
Hausman Test[52]					2.83(0.72)	
Trade	3.164***		4.803*		3.481***	
	(0.622)		(2.915)		(0.917)	
Fixed Capital	1.807***		-0.832		2.641**	
	(0.654)		(1.892)		(1.027)	
Government Expenditure	-2.491***		-3.755		-3.275***	
	(0.711)		(3.115)		(1.055)	
Population Growth	0.126		-1.503		0.791**	
	(0.255)		(2.018)		(0.384)	
PRIVATE	1.088		-5.027		-1.735	
	(1.063)		(10.57)		(1.667)	
Constant		-7.031***		-4.070		-8.284**
		(0.520)		(12.69)		(3.784)
Observations	810		810		810	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, private. All the lower middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[51] PMG is more efficient estimation than MG under null hypothesis.
[52] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.11. Middle- Income Countries (Bank Asset / GDP as a measure financial development).

	PMG		MG		DFE	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.904***		-1.144***		-0.809***
		(0.0417)		(0.0376)		(0.0248)
Δ Trade		-1.226		-0.324		-1.027
		(1.538)		(1.887)		(0.961)
Δ Fixed Capital		11.04***		10.80***		7.589***
		(1.527)		(1.810)		(0.804)
Δ Government Expenditure		-11.52***		-13.01***		-5.095***
		(1.906)		(2.208)		(1.042)
Δ Population Growth		5.700		9.342		-0.166
		(6.341)		(8.776)		(0.299)
Δ Bank Asset		11.35**		9.161*		6.452***
		(5.166)		(5.391)		(1.793)
Hausman Test[53]					4.81(0.43)	
Hausman Test[54]					2.87(0.71)	
Trade	2.517***		4.285**		3.655***	
	(0.409)		(2.002)		(0.651)	
Fixed Capital	-0.396		-0.261		-0.0767	
	(0.479)		(1.295)		(0.740)	
Government Expenditure	-1.931***		-6.127***		-2.739***	
	(0.486)		(2.366)		(0.704)	
Population Growth	0.0611		-1.244		0.777***	
	(0.183)		(1.625)		(0.282)	
Bank Asset	1.872**		9.727*		1.526	
	(0.730)		(5.123)		(1.043)	
Constant		-1.774***		0.0421		-5.579*
		(0.310)		(11.20)		(2.971)
Observations	1,448		1,448		1,448	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, bank asset. All the middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[53] PMG is more efficient estimation than MG under null hypothesis.
[54] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.12. Upper Middle- Income Countries (Bank Asset /GDP as a measure financial development).

	PMG		MG		DFE	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.959***		-1.199***		-0.862***
		(0.0580)		(0.0576)		(0.0365)
Δ Trade		-0.105		-0.531		-0.976
		(2.402)		(2.934)		(1.455)
Δ Fixed Capital		14.69***		15.02***		9.569***
		(2.355)		(2.923)		(1.173)
Δ Government Expenditure		-12.43***		-17.18***		-4.730***
		(2.535)		(2.760)		(1.558)
Δ Population Growth		10.83		8.832		-0.298
		(15.19)		(16.30)		(0.525)
Δ Bank Asset		3.412		-3.287		7.345***
		(5.217)		(6.586)		(2.487)
Hausman Test[55]					7.16(0.20)	
Hausman Test[56]					0.91(0.96)	
Trade	2.591***		2.526		3.807***	
	(0.689)		(1.952)		(0.971)	
Fixed Capital	-2.318***		-0.831		-1.631	
	(0.788)		(2.255)		(1.127)	
Government Expenditure	-2.302***		-12.98***		-2.070**	
	(0.726)		(3.248)		(0.984)	
Population Growth	0.186		-0.603		0.476	
	(0.300)		(2.078)		(0.432)	
Bank Asset	2.310**		-0.452		0.609	
	(1.082)		(7.020)		(1.487)	
Constant		3.850***		33.06*		-2.765
		(0.626)		(18.69)		(4.777)
Observations	640		640		640	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, bank asset. All the upper middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[55] PMG is more efficient estimation than MG under null hypothesis.
[56] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.13. Lower Middle- Income Countries (Bank Asset /GDP as a measure financial development).

	PMG		**MG**		**DFE**	
GDP Growth	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
EC		-0.860***		-1.100***		-0.764***
		(0.0574)		(0.0488)		(0.0336)
Δ Trade		-2.542		-0.160		-0.594
		(2.001)		(2.504)		(1.285)
Δ Fixed Capital		8.100***		7.453***		4.696***
		(1.772)		(2.115)		(1.132)
Δ Government Expenditure		-10.35***		-9.696***		-5.376***
		(2.886)		(3.208)		(1.386)
Δ Population Growth		2.696		9.746		-0.155
		(3.511)		(9.276)		(0.359)
Δ Bank Asset		16.96**		19.03**		3.886
		(7.876)		(7.747)		(2.623)
Hausman Test[57]					3.97(0.55)	
Hausman Test[58]					3.45(0.63)	
Trade	2.034***		5.681*		3.263***	
	(0.522)		(3.250)		(0.878)	
Fixed Capital	1.244**		0.191		1.346	
	(0.612)		(1.513)		(0.981)	
Government Expenditure	-1.860***		-0.695		-3.710***	
	(0.662)		(3.053)		(1.006)	
Population Growth	0.0569		-1.752		1.089***	
	(0.237)		(2.431)		(0.374)	
Bank Asset	1.999*		17.80**		2.932**	
	(1.020)		(7.054)		(1.459)	
Constant		-4.432***		-26.14**		-6.766*
		(0.367)		(11.69)		(3.753)
Observations	808		808		808	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, bank asset. All the lower middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[57] PMG is more efficient estimation than MG under null hypothesis.
[58] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.14. All middle- income courtiers after removing outlier.

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.881***		-1.128***		-0.806***
		(0.0453)		(0.0415)		(0.0266)
Δ Trade		-2.069		0.585		-0.422
		(1.706)		(2.142)		(1.041)
Δ Fixed Capital		11.21***		9.407***		8.122***
		(1.652)		(1.729)		(0.837)
Δ Government Expenditure		-11.21***		-11.92***		-5.423***
		(2.149)		(2.471)		(1.092)
Δ Population Growth		5.855		12.84		-0.237
		(5.573)		(8.191)		(0.312)
Δ FD		-0.544		-1.107*		-0.976**
		(0.557)		(0.606)		(0.379)
Hausman Test[59]					3.26(0.659)	
Hausman Test[60]					3.56(0.614)	
Trade	3.135***		6.494***		4.490***	
	(0.492)		(2.373)		(0.712)	
Fixed Capital	-0.379		-0.757		0.542	
	(0.516)		(1.343)		(0.771)	
Government Expenditure	-2.302***		-5.918**		-3.139***	
	(0.510)		(2.456)		(0.736)	
Population Growth	0.0770		0.247		0.658**	
	(0.203)		(1.489)		(0.294)	
FD	-0.127		0.318		-0.410**	
	(0.123)		(0.683)		(0.194)	
Constant		-1.784***		-2.769		-7.969**
		(0.313)		(12.22)		(3.218)
No Courtiers	47		47		47	
Observations	1,286		1,286		1,286	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, Financial development. All middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[59] PMG is more efficient estimation than MG under null hypothesis.
[60] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.15. Upper middle- income courtiers after removing outlier.

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.954***		-1.184***		-0.868***
		(0.0657)		(0.0619)		(0.0386)
Δ Trade		-1.551		0.922		-1.081
		(2.959)		(3.268)		(1.558)
Δ Fixed Capital		15.58***		14.23***		10.93***
		(2.429)		(2.923)		(1.227)
Δ Government Expenditure		-11.62***		-14.61***		-5.367***
		(2.261)		(2.702)		(1.612)
Δ Population Growth		7.486		11.21		-0.643
		(14.53)		(15.55)		(0.574)
Δ FD		-1.309		-1.758*		-1.360**
		(1.001)		(1.020)		(0.583)
Hausman Test[61]					4.20(0.520)	
Hausman Test[62]					1.55(0.907)	
Trade	2.861***		5.156**		3.997***	
	(0.752)		(2.104)		(1.021)	
Fixed Capital	-1.646**		-1.962		-0.857	
	(0.767)		(2.277)		(1.141)	
Government Expenditure	-3.573***		-11.03***		-3.017***	
	(0.738)		(3.942)		(1.009)	
Population Growth	-0.331		-0.292		0.282	
	(0.296)		(2.219)		(0.442)	
FD	-0.311*		0.0418		-0.607**	
	(0.167)		(0.514)		(0.264)	
Constant		6.871***		15.28		-2.411
		(0.768)		(18.86)		(4.877)
No Countries	21		21		21	
Observations	588		588		588	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, Financial development. Upper middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[61] PMG is more efficient estimation than MG under null hypothesis.
[62] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.16. Lower middle- income courtiers after removing outlier.

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.819***		-1.081***		-0.752***
		(0.0587)		(0.0553)		(0.0363)
Δ Trade		-2.424		0.303		0.419
		(1.976)		(2.889)		(1.398)
Δ Fixed Capital		7.040***		5.357***		4.655***
		(1.810)		(1.685)		(1.170)
Δ Government Expenditure		-11.05***		-9.653**		-5.651***
		(3.822)		(3.936)		(1.466)
Δ Population Growth		5.813*		14.21*		-0.151
		(3.018)		(7.872)		(0.365)
Δ FD		0.0628		-0.561		-0.720
		(0.585)		(0.715)		(0.493)
Hausman Test[63]					0.63(0.986)	
Hausman Test[64]					1.95(0.855)	
Trade	3.666***		7.617*		4.375***	
	(0.638)		(4.027)		(0.994)	
Fixed Capital	0.803		0.256		1.913*	
	(0.672)		(1.580)		(1.040)	
Government Expenditure	-2.304***		-1.627		-3.824***	
	(0.721)		(2.873)		(1.087)	
Population Growth	0.500*		0.700		1.007**	
	(0.290)		(2.044)		(0.398)	
FD	0.197		0.549		-0.0434	
	(0.188)		(1.192)		(0.293)	
Constant		-7.218***		-17.93		-9.676**
		(0.537)		(15.65)		(4.301)
No Courtiers	26		26		26	
Observations	698		698		698	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth and, Financial development. Lower middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[63] PMG is more efficient estimation than MG under null hypothesis.
[64] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.17. All middle- income courtiers after removing outlier (Non- liner estimation).

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.883***		-1.167***		-0.811***
		(0.0463)		(0.0415)		(0.0266)
Δ Trade		-1.956		0.654		-0.487
		(1.720)		(2.217)		(1.034)
Δ Fixed Capital		10.94***		8.677***		7.827***
		(1.629)		(1.679)		(0.834)
Δ Government Expenditure		-10.98***		-11.67***		-5.520***
		(2.194)		(2.589)		(1.084)
Δ Population Growth		7.126		8.761		-0.211
		(5.435)		(7.767)		(0.309)
Δ FD		1.293		-0.278		-0.933**
		(1.702)		(1.718)		(0.377)
Δ FD^2		-0.486		-1.341		-0.437***
		(0.739)		(0.851)		(0.107)
Hausman Test[65]					4.70(0.582)	
Hausman Test[66]					4.78(0.571)	
Trade	3.344***		5.658**		4.366***	
	(0.508)		(2.685)		(0.706)	
Fixed Capital	0.0136		-0.136		0.642	
	(0.505)		(1.389)		(0.769)	
Government Expenditure	-2.605***		-6.983***		-3.640***	
	(0.543)		(2.623)		(0.745)	
Population Growth	0.172		-0.209		0.546*	
	(0.207)		(1.629)		(0.291)	
FD	0.309**		-2.294		-0.192*	
	(0.131)		(1.771)		(0.204)	
FD^2	-0.144***		-1.432		-0.174***	
	(0.0394)		(1.055)		(0.0613)	
Constant		-2.763***		1.739		-6.267*
		(0.351)		(15.42)		(3.237)
No Countries	47		47		47	
Observations	1,286		1,286		1,286	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1,1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development and Financial development square. All middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[65] PMG is more efficient estimation than MG under null hypothesis.

[66] PMG is more efficient estimation than PMG under null hypothesis.

Table A4.18. Upper middle- income courtiers after removing outlier, (Non- liner estimation).

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.956***		-1.229***		-0.870***
		(0.0714)		(0.0603)		(0.0386)
Δ Trade		-1.896		1.402		-1.010
		(2.931)		(3.458)		(1.553)
Δ Fixed Capital		15.48***		13.34***		10.55***
		(2.500)		(2.770)		(1.233)
Δ Government Expenditure		-11.41***		-12.29***		-5.591***
		(2.436)		(2.845)		(1.608)
Δ Population Growth		7.784		8.206		-0.649
		(12.42)		(14.53)		(0.572)
Δ FD		1.213		0.522		-1.037*
		(1.148)		(1.659)		(0.596)
Δ FD^2		-0.259		-0.225		-0.378**
		(0.706)		(0.676)		(0.157)
Hausman Test[67]					4.73(0.579)	
Hausman Test[68]					4.37(0.626)	
Trade	2.791***		4.669**		4.025***	
	(0.744)		(2.287)		(1.017)	
Fixed Capital	-1.599**		0.102		-0.826	
	(0.759)		(2.223)		(1.145)	
Government Expenditure	-3.681***		-9.832***		-3.278***	
	(0.781)		(3.101)		(1.033)	
Population Growth	-0.349		-1.129		0.244	
	(0.299)		(2.509)		(0.440)	
FD	0.522**		-1.869		-0.432*	
	(0.204)		(2.172)		(0.302)	
FD^2	-0.225***		-0.664		-0.110*	
	(0.0642)		(1.229)		(0.0949)	
Constant		7.667***		7.372		-1.727
		(0.769)		(20.52)		(4.948)
No Courtiers	21		21		21	
Observations	588		588		588	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects while the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development and Financial development square. Upper middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[67] PMG is more efficient estimation than MG under null hypothesis.
[68] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.19. Lower middle- income courtiers after removing outlier, (Non- liner estimation).

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.825***		-1.116***		-0.760***
		(0.0561)		(0.0561)		(0.0364)
Δ Trade		-2.034		0.0255		0.296
		(1.971)		(2.925)		(1.392)
Δ Fixed Capital		6.607***		4.760***		4.460***
		(1.598)		(1.718)		(1.163)
Δ Government Expenditure		-10.90***		-11.14***		-5.608***
		(3.841)		(4.176)		(1.454)
Δ Population Growth		7.461		9.226		-0.0925
		(5.002)		(7.762)		(0.363)
Δ FD		1.386		-0.949		-0.949*
		(3.062)		(2.867)		(0.498)
Δ FD^2		-1.070		-2.277		-0.453***
		(1.300)		(1.449)		(0.151)
Hausman Test[69]					2.24(0.895)	
Hausman Test[70]					2.57(0.860)	
Trade	4.364***		6.489		4.163***	
	(0.684)		(4.599)		(0.986)	
Fixed Capital	1.540**		-0.337		2.083**	
	(0.669)		(1.788)		(1.036)	
Government Expenditure	-2.616***		-4.589		-4.429***	
	(0.744)		(4.059)		(1.084)	
Population Growth	0.601**		0.564		0.849**	
	(0.286)		(2.167)		(0.393)	
FD	0.377**		-2.652		0.142	
	(0.191)		(2.740)		(0.293)	
FD^2	-0.110*		-2.077		-0.207**	
	(0.0610)		(1.656)		(0.0814)	
Constant		-10.82***		-2.992		-7.663*
		(0.779)		(22.88)		(4.306)
No Courtiers	26		26		26	
Observations	698		698		698	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment (ec). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1,1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development and Financial development square. Lower Middle- Income Countries, annual data 1980–2008.

[69] PMG is more efficient estimation than MG under null hypothesis.
[70] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.20. List of Countries with Outliner and Leverage Observation.

Outlier and leverage Countries with unusual Observation	Minimum 10 %/ Maximum 10%
Tonga	Mini
Vanuatu	Mini
Dominica	Mini
India	Maxi
Indonesia	Maxi

Estimation results after adding FDI.

Table A4.21. All middle- income courtiers after adding FDI. (Full- sample).

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.885***		-0.937***		-0.795***
		(0.0459)		(0.0438)		(0.0250)
Δ Trade		-1.971		-0.282		-0.781
		(1.628)		(1.930)		(0.967)
Δ Fixed Capital		11.51***		9.918***		8.083***
		(1.469)		(1.496)		(0.798)
Δ Government Exp		-11.25***		-11.56***		-4.794***
		(2.047)		(2.394)		(1.041)
Δ Population		3.900		12.01*		-0.243
		(4.986)		(6.323)		(0.298)
Δ FD		-0.765		-1.540**		-1.026***
		(0.561)		(0.711)		(0.364)
Δ FDI		-0.0148		0.125		-9.04e-11
		(0.0691)		(0.103)		(4.23e-10)
Hausman Test[71]					6.00 (0.423)	
Hausman Test[72]					5.42(0.366)	
Trade	2.993***		4.260**		4.108***	
	(0.434)		(1.683)		(0.674)	
Fixed Capital	-0.303		0.0939		0.473	
	(0.463)		(1.258)		(0.742)	
Government Ex	-2.187***		-7.335***		-2.867***	
	(0.478)		(2.155)		(0.704)	
Population Growth	-0.135		-0.0393		0.618**	
	(0.175)		(1.102)		(0.283)	
FD	-0.102		-0.274		-0.489***	
	(0.115)		(0.509)		(0.187)	
FDI	-2.69e-10*		0.237*		-1.44e-10	
	(1.56e-10)		(0.136)		(2.90e-10)	
Constant		-1.362***		6.015		-6.793**
		(0.310)		(10.80)		(3.044)
Observations	1,454		1,454		1,454	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects.While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development (FD) and FD and Foreign direct investment(FDI). All the middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[71]PMG is more efficient estimation than MG under null hypothesis.
[72]PMG is more efficient estimation than DFE under null hypothesis

Table A4.22. Upper Middle- Income Countries after adding FDI.

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.832***		-0.924***		-0.851***
		(0.0633)		(0.0623)		(0.0369)
Δ Trade		-0.849		2.123		-1.057
		(2.647)		(2.893)		(1.467)
Δ Fixed Capital		14.84***		13.90***		10.53***
		(2.272)		(2.596)		(1.162)
Δ Government Exp		-10.97***		-13.26***		-4.635***
		(2.383)		(2.776)		(1.549)
Δ Populatio		7.941		9.499		-0.447
		(13.24)		(11.17)		(0.523)
Δ FD		-1.423		-2.198**		-1.497***
		(0.973)		(1.119)		(0.567)
Δ FDI		0.0445		0.215		-0
		(0.115)		(0.160)		(4.34e-10)
Hausman Test[73]					7.50(0.277)	
Hausman Test[74]					2.27(0.810)	
Trade	2.903***		4.642**		3.900***	
	(0.732)		(2.275)		(0.989)	
Fixed Capital	-1.791**		-1.683		-0.985	
	(0.757)		(2.215)		(1.115)	
Government Exp.	-3.580***		-11.58***		-2.845***	
	(0.714)		(3.515)		(0.971)	
Population	-0.290		0.421		0.337	
	(0.293)		(2.066)		(0.431)	
FD	-0.292*		-0.168		-0.709***	
	(0.166)		(0.527)		(0.257)	
FDI	-2.36e-10		0.305		-8.91e-11	
	(1.58e-10)		(0.204)		(2.81e-10)	
Constant		6.849***		16.26		-2.182
		(0.726)		(17.93)		(4.741)
Observations	644		644		644	

Note: **, and *** indicate significance at 5 % and at 1 %, respectively. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development (FD) and FD and Foreign direct investment (FDI). Upper middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[73]PMG is more efficient estimation than MG under null hypothesis.
[74]PMG is more efficient estimation than DFE under null hypothesis

Table A4.23. Lower Middle- Income Countries after adding FDI.

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.849***		-0.919***		-0.743***
		(0.0654)		(0.0612)		(0.0337)
Δ Trade		-3.085		-2.189		-0.462
		(2.031)		(2.580)		(1.289)
Δ Fixed Capital		8.595***		6.756***		4.915***
		(1.686)		(1.518)		(1.127)
Δ Government Exp		-11.15***		-10.21***		-4.768***
		(3.342)		(3.711)		(1.392)
Δ Population		3.107		14.00*		-0.273
		(3.801)		(7.245)		(0.358)
Δ FD		-0.437		-1.019		-0.762
		(0.648)		(0.921)		(0.469)
Δ FDI		-0.0471		0.0530		-0.0414
		(0.0902)		(0.135)		(0.0378)
Hausman Test[75]					1.07(0.982)	
Hausman Test[76]					3.98(0.678)	
Trade	2.777***		3.957		3.605***	
	(0.537)		(2.453)		(0.934)	
Fixed Capital	1.083*		1.503		1.742*	
	(0.579)		(1.397)		(0.999)	
Government Exp	-1.825***		-3.971		-3.259***	
	(0.655)		(2.561)		(1.035)	
Population	0.0347		-0.404		0.932**	
	(0.233)		(1.138)		(0.388)	
FD	-0.0295		-0.359		-0.196	
	(0.166)		(0.821)		(0.280)	
FDI	0.109**		0.183		0.0546	
	(0.0512)		(0.185)		(0.0527)	
Constant		-5.348***		-2.109		-7.572*
		(0.533)		(13.25)		(3.996)
Observations	810		810		810	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects.While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development (FD) and FD and Foreign direct investment (FDI). Lower middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[75]PMG is more efficient estimation than MG under null hypothesis.

[76]PMG is more efficient estimation than DFE under null hypothesis

Table A4.24. All middle- income courtiers after adding FDI (Non- liner estimation).

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.890***		-0.983***		-0.798***
		(0.0471)		(0.0442)		(0.0250)
Δ Trade		-2.055		-0.133		-0.843
		(1.642)		(2.160)		(0.961)
Δ Fixed Capital		11.08***		10.54***		7.824***
		(1.438)		(1.726)		(0.795)
Δ Government Exp.		-10.83***		-11.21***		-4.870***
		(2.100)		(2.294)		(1.034)
Δ Populatio		4.621		13.37		-0.213
		(4.766)		(8.720)		(0.296)
Δ FD		0.991		-0.822		-0.944***
		(1.614)		(1.894)		(0.362)
Δ FD^2		-0.282		-1.219		-0.431***
		(0.694)		(0.936)		(0.104)
Δ FDI		0.001		-0.020		-1.01e-10
		(0.0691)		(0.319)		(4.21e-10)
Hausman Test[77]				3.24 (0.918)		
Hausman Test[78]				5.93 (0.431)		
Trade	3.052***		5.518**		3.965***	
	(0.451)		(2.431)		(0.669)	
Fixed Capital	-0.0322		6.280*		0.570	
	(0.456)		(3.764)		(0.742)	
Government Exp	-2.171***		-3.475		-3.299***	
	(0.506)		(3.234)		(0.712)	
Population	-0.00617		-0.0647		0.523*	
	(0.180)		(1.937)		(0.281)	
FD	0.287**		-3.290*		-0.282*	
	(0.123)		(1.956)		(0.198)	
FD^2	-0.110***		-1.323		-0.160***	
	(0.0410)		(1.088)		(0.0608)	
FDI	-1.79e-10		1.588		-1.34e-10	
	(2.00e-10)		(1.966)		(2.87e-10)	
Constant		-2.376***		-1.183***		-5.251*
		(0.340)		(13.77)		(3.067)
Observations	1,454		1,454		1,454	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development (FD), FD square and Foreign direct investment (FDI). All middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[77] PMG is more efficient estimation than MG under null hypothesis.
[78]PMG is more efficient estimation than DFE under null hypothesis.

Table A4.25. Upper Middle- Income Countries after adding FDI (Non- liner estimation).

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.934***		-0.941***		-0.853***
		(0.0684)		(0.0567)		(0.0369)
Δ Trade		-1.160		2.876		-1.008
		(2.711)		(3.017)		(1.463)
Δ Fixed Capital		14.81***		12.72***		10.18***
		(2.308)		(2.407)		(1.167)
Δ Government Exp.		-10.75***		-10.73***		-4.846***
		(2.511)		(2.834)		(1.546)
Δ Population		7.789		9.863		-0.447
		(10.69)		(11.66)		(0.521)
Δ FD		1.619		0.335		-1.179**
		(1.131)		(2.708)		(0.580)
Δ FD^2		-0.0535		-0.167		-0.380**
		(0.671)		(1.201)		(0.154)
Δ FDI		0.0782		0.157		-5.63e-11
		(0.109)		(0.216)		(4.32e-10)
Hausman Test[79]					4.90(0.672)	
Hausman Test[80]					5.76(0.450)	
Trade	2.915***		4.562*		3.897***	
	(0.724)		(2.756)		(0.985)	
Fixed Capital	-1.685**		0.527		-0.935	
	(0.751)		(2.059)		(1.118)	
Government Exp.	-3.375***		-10.59***		-3.044***	
	(0.757)		(3.193)		(0.992)	
Population	-0.225		-1.130		0.303	
	(0.298)		(2.351)		(0.430)	
FD	0.517***		-3.165		-0.560*	
	(0.197)		(2.754)		(0.299)	
FD^2	-0.185***		-0.660		-0.0887	
	(0.0668)		(1.507)		(0.0944)	
FDI	-1.90e-10		0.249		-8.65e-11	
	(2.23e-10)		(0.311)		(2.80e-10)	
Constant		6.140***		6.207		-1.644
		(0.654)		(19.75)		(4.811)
Observations	644		644		644	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects.While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC).Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development (FD) and FD and Foreign direct investment(FDI). Upper middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[79] PMG is more efficient estimation than MG under null hypothesis.
[80] PMG is more efficient estimation than DFE under null hypothesis.

Table A4.26. Lower Middle- Income Countries- With FDI& FD, FD2.

	PMG		MG		DFE	
VARIABLES	Long Run	Short Run	Long Run	Short Run	Long Run	Short Run
Error Correction		-0.860***		-0.926***		-0.749***
		(0.0654)		(0.0642)		(0.0338)
Δ Trade		-3.007		-2.114		-0.539
		(1.994)		(2.488)		(1.283)
Δ Fixed Capital		7.833***		6.749***		4.758***
		(1.475)		(1.619)		(1.123)
Δ Government Exp.		-10.37***		-10.96***		-4.709***
		(3.336)		(4.037)		(1.383)
Δ Population		4.286		24.97		-0.211
		(5.489)		(16.91)		(0.356)
Δ FD		0.798		-2.099		-0.882*
		(2.861)		(3.399)		(0.469)
Δ FD^2		-0.756		-2.628		-0.432***
		(1.208)		(1.675)		(0.144)
Δ FDI		-0.0315		0.296*		-0.0402
		(0.0891)		(0.160)		(0.0376)
Hausman Test[81]					1.96(0.962)	
Hausman Test[82]					6.52(0.482)	
Trade	3.269***		2.474		3.397***	
	(0.578)		(2.506)		(0.929)	
Fixed Capital	1.303**		1.640		1.892*	
	(0.573)		(1.949)		(1.000)	
Government Exp.	-1.705**		-5.067		-3.770***	
	(0.683)		(3.226)		(1.034)	
Population	0.143		-0.500		0.804**	
	(0.234)		(1.726)		(0.384)	
FD	0.0712		-2.343		-0.0176	
	(0.178)		(2.986)		(0.281)	
FD^2	-0.0791*		-1.370		-0.200**	
	(0.0588)		(1.622)		(0.0813)	
FDI	0.140***		0.534***		0.0580	
	(0.0520)		(0.180)		(0.0521)	
Constant		-8.128***		2.961		-5.797
		(0.761)		(17.12)		(4.006)
Observations	810		810		810	

Note:*, **, and *** indicate significance at 10 %, at 5 % and at 1 %. Estimations are done by using (xtpmg) routine in Stata. Pooled mean group, mean group, and dynamic fixed effects, all controlling for country and time effects.While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). Hausman test is indicating that PMG is consistent and efficient estimation than MG and DFE estimation. The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Trade, Fixed Capital, Government Expenditure, Population Growth, Financial development (FD) and FD and Foreign direct investment (FDI). Lower middle- income countries, annual data 1980–2008. Source: Authors' estimations.

[81] PMG is more efficient estimation than MG under null hypothesis.
[82] PMG is more efficient estimation than DFE under null hypothesis

Panel Unit Root tests

It is known that the standard unit root tests, for example, Augmented Dickey-Fuller (ADF) test in time series or Levin, Lin and Chu (LLC) test in panel data, do not allow for a potential structural break in the data. This might lead to the null hypothesis of a unit root in the presence of one or more structural breaks in the data to be rejected with a low power. In this study, one of the important advantages of using the ARDL approach to long-run modelling, as noted by Pesaran, Shin and Smith (1999), is that by using this method, a pre-testing for unit root is unnecessary. The reason is that the ARDL methodology can be employed whether the underlying variables are purely I(0), or purely I(1), or a mixture of both. This is considered to be a superior feature of using ARDL compared to its other traditional counterparts, such as Johansen (1995), where all series considered have to be either I(1) or I(2), and one cannot have a mixture of I(1) and I (0). Therefore, almost all the papers that applied ARDL and estimated the model using PMG, including the Loayza and Ranciere (2006) paper, did not report any unit root tests. Therefore, in the footnote (32), we mentioned the reason for conducting this test in this study just to make sure that none of the variables are I(2), to avoid any possibility of having biased or inconsistent results, as stated by Asteriou and Monastiriotis (2004).

As regards the test of unit root taking into consideration a structural break, although there are many papers that address unit root testing with structural break in time series data, to the best of the author's knowledge, there are few studies that consider this issue in panel data. Two examples of panel unit root tests conducted in the presence of a break are: (1) Carrion-i-Silvestre et al. (2005), who develop a panel unit root test that considers a break, utilizing data for 15 OECD countries from more than a century, specifically from 1870 to 1994; (2) Hadri and Rao (2008), who extend the Carrion-i-Silvestre et al. (2005) work and also utilize the data for half-a-century and introduce four tests for models with (i) a break in the level without time trend, (ii) break in level and a time trend without a break,(iii) a level with no a break and a time trend with break, (iv) a level and time trend, both with a break. (Hadri and Rao, 2008).   As can be observed from these two studies, the time-dimension of the panel data model (T) is very large, and more importantly, they assume that it is larger than the group of countries (N). Thus, the use of a unit root test with structural break is insufficient for unit root models to function precisely if the time dimension is not large. It might also result in a serious size distortion and power reduction (Harris and Tzavalis, 1999). In this study, we have only 28 years of annual data. Therefore, such a unit root test with structural breaks will have trivially low power.

However, as an alternative to this, we apply a very recent newly developed unit root test that allows for a common structural break in short panel data by Karavias and Tzavalis (2014), one for the model with break in the level and no time trend, and one for the model in level with a time trend. This test assumes that a change has taken place in each series at an unknown common point, referred to as the common break point (Karavias and Tzavalis (2014)). Appendix A4.28, presents the results of the unit root test of Karavias and Tzavalis that allows for a structural break. It can be seen that the table has two values, C and Z. Z is the test statistic and C is the 5% critical value. If Z is smaller than the C value, we reject the unit root hypothesis. In all cases, the unit root test is rejected, which implies that the data are I(0).

Beside the unit root tests mentioned above, three different types of panel unit root tests are employed: (i) Im, Pesaran and Shin, (ii) Breitung, and (iii) Levin, Lin and Chu to determine the order of integration between all the series in our data-set. Appendix A.4.27. reports the results of unit root tests, which suggest that most of the variables under consideration are stationary of order I(0) with constant and trend, while financial development (FD), the ratio of liquid liabilities to nominal GDP (M3), the ratio of commercial bank assets to the sum of commercial bank assets and central bank assets (BASSET), and the ratio of credit issued to the private sector by banks to GDP (PRIVATE) are integrated of order I(1). Due to these mixed orders of integration, panel ARDL approach rather than the traditional panel cointegration test is appropriate.

Table A4.27. Unit Root tests.

	Level			1st Difference		
	Im, Pesaran &Shin 2003	Breitung 2005	Levin, Lin, Chu 2002	Im, Pesaran & Shin	Breitung	Levin, Lin & Chu
GDPG	-20.98***	-10.81***	-19.83***	-37.89***	-15.29***	-29.96***
LNCA	-4.51***	-3.22***	-4.98***	-22.25***	-13.58***	-21.62***
LNGOV	-2.52***	-2.19***	-1.43*	-22.99***	-14.25	-21.44***
LNTRD	-2.97***	0.32	-2.43***	-24.72***	-13.37***	-22.05***
POPG	-5.45***	4.21	-7.53***	-17.84***	0.05	-8.10***
FD	1.18	4.66	1.71	-17.55***	-11.41***	-17.32***
PRIVATE	0.90	2.82	1.63	-11.81***	-9.42***	-12.27***
BASSET	-2.15***	0.88	-2.72***	-20.92***	-12.51***	-20.23***
M3	-1.18	1.87	1.86	-15.42***	-10.95***	-16.07***

Note:*, **, and *** indicate significance at 10 %, ** at 5 % and *** at 1 % respectively. In all tests, the null hypothesis is that of a unit root.

Table A4.28. Panel Unit Root tests account for the structural break.

	Level		Level & T rend	
Variables	C	Z	C	Z
GDPG	-145.2861	-58.4976	-74.0493	-53.8264
LNCA	-0.2005	-0.2011	-0.1941	-0.0963
LNGOV	-0.1670	-0.0930	-0.1802	-0.0720
LNTRD	-0.1741	-0.0224	-0.0807	-0.0946
POPG	-2.2465	-1.2760	-10.7469	-0.3400
FD	-1.9879	-0.9027	-1.3377	-0.3857
PRIVATE	-0.0946	-0.0653	-0.1194	-0.0268
BASSET	-0.0583	-0.0208	-0.0349	-0.0235
M3	-0.0829	-0.0587	-0.0499	-0.0306

C is 5% critical values, and Z is the test statistic. If Z is smaller than C the null unit root hypothesis has to be rejected.

Table A4.29. Replicating Loayza & Ranciere (2006)- linear Effect of FD.

Liner Effect of Financial Development on Economic Growth Using PMG estimation.

	ALL MIC		**UMI**		**LMI**	
VARIABLES	LR	SR	LR	SR	LR	SR
EC		-0.807***		-0.882***		-0.751***
		(0.0489)		(0.0610)		(0.0746)
Δ Initial real GDP		-7.456***		-10.85***		-5.801*
		(2.553)		(4.136)		(3.473)
Δ Government Exp		-9.962***		-8.522***		-11.41***
		(2.271)		(1.725)		(3.723)
Δ Trade		3.558**		3.754*		3.800**
		(1.403)		(2.218)		(1.834)
Δ Inflation		-1.382***		-1.734***		-1.136***
		(0.284)		(0.553)		(0.256)
Δ FD		-0.927		0.00345		-1.316*
		(0.610)		(0.989)		(0.789)
Initial real GDP	-6.451***		-8.214***		-5.359***	
	(0.688)		(1.090)		(0.933)	
Government Exp.	-3.551***		-3.236***		-3.258***	
	(0.509)		(0.796)		(0.659)	
Trade	5.582***		7.772***		4.588***	
	(0.453)		(0.782)		(0.603)	
Inflation	-0.583***		-0.269*		-0.844***	
	(0.106)		(0.146)		(0.180)	
FD	0.805***		1.112***		0.712***	
	(0.143)		(0.247)		(0.194)	
Constant		31.96***		41.54***		24.25***
		(2.078)		(3.045)		(2.506)
Observations	1,349	1,349	598	598	751	751

Note: LR: Long-Run, SR:Short-Run, Ec: error correction , Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC). The lag structure is ARDL (1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Initial real GDP, Government Expenditure, Trade, inflation and, FD.

Table A4.30. Replicating Loayza & Ranciere (2006)- Non-linear Effect of FD.

Non-linear Effect of Financial Development on Economic Growth Using PMG estimation.						
	ALL MIC		**UMI**		**LMI**	
VARIABLES	LR	SR	LR	SR	LR	SR
EC		-0.830***		-0.894***		-0.782***
		(0.0491)		(0.0673)		(0.0733)
Δ Initial real GDP		-7.225**		-10.55**		-5.439
		(2.823)		(4.839)		(3.527)
Δ Government Exp.		-9.042***		-6.885***		-11.22***
		(2.209)		(1.688)		(3.559)
Δ Trade		3.582**		4.170*		3.563*
		(1.445)		(2.326)		(1.859)
Δ Inflation		-1.315***		-1.544***		-1.227***
		(0.274)		(0.554)		(0.234)
Δ FD		1.921		4.879***		0.251
		(1.646)		(1.705)		(2.707)
Δ FD2		-0.536*		-0.330		-0.751
		(0.811)		(0.832)		(1.363)
Initial real GDP	-6.311***		-8.318***		-5.115***	
	(0.741)		(1.170)		(0.974)	
Government Exp.	-3.221***		-2.975***		-3.247***	
	(0.509)		(0.769)		(0.705)	
Trade	5.337***		7.797***		4.314***	
	(0.478)		(0.777)		(0.603)	
Inflation	-0.560***		-0.239*		-0.892***	
	(0.106)		(0.143)		(0.173)	
FD	0.891***		1.256***		0.647***	
	(0.149)		(0.240)		(0.224)	
FD2	-0.138**		-0.139*		-0.254**	
	(0.0584)		(0.0889)		(0.104)	
Constant		31.87***		41.98***		24.50***
		(2.063)		(3.376)		(2.413)
Observations	1,349	1,349	598	598	751	751

Note:LR: Long-Run, SR: Short-Run, EC: error correction , Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. While the first panel (LR) shows long-run effects. The second panel reports both short-run effects (SR) and the speed of adjustment or the error correction coefficient (EC).The lag structure is ARDL (1, 1, 1, 1, 1, 1, 1) and the order of variables is: GDP Growth, Initial real GDP, Government Expenditure, Trade, inflation and, FD and FD square.

CHAPTER FIVE

FINANCIAL DEVELOPMENT SPILLOVERS AND ECONOMIC GROWTH: EVIDENCE FROM BRICS COUNTRIES

5.1. INTRODUCTION

The consequences of the recent economic downturn brought by the financial crisis hit almost all countries in the world. However, the crisis had a non-uniform impact on the different countries. While many advanced economies experienced severe adverse economic conditions and slid into recession, some emerging economies were less affected by the crisis or experienced rapid recovery. In particular, the economies of Brazil, Russia, India, China and South Africa (BRICS) continued to maintain healthy economic growth (see Cheng et al., 2007; Biggemann and Fam, 2011; O'Neill, 2011). Therefore, understanding how these economies avoided the adverse consequences of the crisis is of crucial importance.

The BRICS countries have witnessed a remarkable development in different aspects of their economies. Notably, the BRICS's financial sectors have evolved substantially over the past two decades. More importantly, increasing mutual trades and financial ties among the BRICS economies has introduced them as the potential economic superpowers in the world (O'Neill, 2004). In light of the strengthening of financial and trade integration among the BRICS economies, one might think that growth in one of the BRICS might be driven by the common positive shocks that affect other BRICS simultaneously. Accordingly, this study attempts to investigate the impact of financial development shocks on economic growth with special focus on the BRICS.

In this context, three main issues concerning the finance-growth nexus are addressed. First, the impact of a positive domestic shock in the various financial development indicators on economic growth for each individual member of the BRICS is investigated in a global framework. This study considers three financial development indicators, namely the credit to private sector, money supply, and equity price. Second, the potential existence of a spillover effect from financial development to economic growth from one BRICS country to another country is examined. This is done to investigate whether or not the common trade linkages among the BRICS enable financial development shocks to be transmitted across the BRICS. Third, treating the BRICS as a single economy, we enquire whether financial development shocks in the region can promote economic growth in the BRICS region.

To do so, this study applies the Global Vector Autoregressive (GVAR) model originally introduced by Pesaran, Schuermann and Weiner (2004; henceforth PSW) and later extended by Dees, Mauro, Pesaran and Smith (2007; hereafter DMPS), based on quarterly data from 1989Q1 to 2012Q4 for 34 countries. The reason for using the GVAR model is because it allows capturing any interdependencies that may have occurred among different economies, and this inter-connection is achieved through international trade in this study. Furthermore, in order to solve the problem of modelling so many countries in a coherent global manner, the GVAR approach initially incorporates estimating a vector error-correction model for each country. More specifically, each domestic variable is linked to its corresponding foreign variable using bilateral trade matrices. Subsequently, the effects of shock emanating from any of the financial development variables in one of the BRICS to the real economy in other BRICS can be examined via generalized impulse responses.

This study contributes to the existing finance and growth literature in three respects. First**,** this study focuses on the spillover effects of financial development in a global context where interdependencies between countries are taken into account. Despite its crucial importance, much less is known about how financial development spreads across countries. In fact, most previous studies only consider the finance-growth nexus either in a single country framework (see for example, Studart (2000) for Brazil; Koivu (2002); Ono (2012) for Russia; Singh (2008) for India; Liang and Teng (2006); Zhang et al (2012); Allen et al (2005) for China), or in a multi-country framework where the interdependencies among countries are disregarded (see Demetriades and James (2011) for Sub-Saharan Africa; Pradhan et al (2013) for the BRICS region).

Second, this study is, to the best of the author's knowledge, the first empirical work that applies the GVAR method to investigate the finance and growth relationship in a global framework. This model allows the author to examine the impact of financial development on economic growth while capturing the spillover effects of financial development shocks across economies. In fact, the recent literature shows that, due to globalisation and technological advances, domestic economic shocks within a country can spread to other countries through trade ties (see Galesi and Sgherri, 2009; Eickmeier and Ng, 2011; Chudik and Fratzscher, 2011).

Another main contribution of this chapter is that the finance-growth nexus is investigated with a special focus on the BRICS. Over the last three decades, these countries have rapidly increased their shares in the global GDP and strengthened the trade and financial links among themselves. These factors have contributed to the

BRICS being regarded as having the potential to become leading economies in the next few years (O'Neill, 2001; Wilson and Purushothaman, 2003). Nevertheless, the global interactions between the BRICS and the rest of the global economy have not been much investigated empirically.[1] This study aims to fill this gap, which may lead to important policy implications concerning the finance-growth nexus in the current global economic system.

The empirical results of this chapter reveal that credit to the private sector has a significant and positive impact across all the BRICS economies, while the impact of other financial development indicators on economic growth is mixed. Interestingly, when considering the impact of a shock to the financial development variables of a BRICS country to another BRICS country, it is found that credit to the private sector is the main channel through which there are spillovers from financial shocks internationally. More specifically, a positive credit shock in India helps to promote the growth in China and South Africa. Likewise, the credit shock in China transmits to India and influences its real economy positively. On the other hand, the study finds no evidence of a spillover and any contributions of the other financial development variables (money supply and equity price) in promoting growth among the BRICS region. Finally, it is shown that credit to the private sector also plays a key role in promoting economic growth when BRICS countries are treated as a single economy. In particular, a positive credit shock affects growth positively in the entire BRICS region. These results call for further attention to be paid to credit supply measures in economic modelling and policy making.

[1] An exception to this is the study by Samake and Yung (2014) who apply a GVAR model to examine growth spillover from BRICS to the lower middle-income countries.

The rest of this chapter is organised as follows. Section 5.2 reviews the literature on finance and growth nexus and spillover to put our study in context. Section 5.3 introduces the BRICS countries. Section 5.4 describes the dataset. Section 5.5 describes the methodology used in this study. Section 5.6 explains the estimation procedure of the GVAR approach. In Section 5.7 the dynamic analysis of impulse responses is presented. The empirical results of the study are discussed in section 5.8, and Section 5.9 concludes.

5.2. LITERATURE REVIEW

In this section, an overview of the literature on the relationship between financial development and economic growth is presented. After that, the literature on the effects of financial integration and spillovers on the real economy is reviewed.

The theoretical perspectives on the relation between financial development and economic growth have been described originally by Schumpeter (1932), Gurley and Shaw (1955) and Goldsmith (1969), who argue that a well-developed financial system stimulates growth by channelling savings to the most productive investment projects. Conversely, financial repression results in a poorly functioning financial system that in turn depresses growth: this can happen as a result of excessive government interference in the financial system with measures such as interest rate ceilings, higher bank reserve requirements, and direct credit programs to preferential sectors. The recent endogenous growth literature highlights the positive role of the financial sector in driving economic growth, particularly through its role in mobilizing savings, allocating resources to the most productive investments, reducing information, transaction and monitoring costs, diversifying risks and facilitating the exchange of goods and services. This results in a more efficient allocation of resources, a more rapid accumulation of physical and human capital, and faster technological progress (see Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; Roubini and Sala-i-Martin, 1992; King and Levine, 1993a; Greenwood and Smith, 1997; Levine, 1997; Levine, 2005).

Empirically, various econometric approaches have been used to explore the relationship between finance and growth and to discover the different aspects of this relationship.[2] Earlier research on the finance-growth relationship was based on cross-sectional data using the standard OLS estimation methods which confirmed the positive correlation between financial development and economic growth (for instance, Goldsmith, 1969; King and Levine, 1993a, 1993b; and Levine and Zervos, 1998). Later, in order to gain a better understanding of the different aspects of this topic such as causality and the long-run relationships, large numbers of studies applied time-series data for an individual country or set of heterogeneous countries, and others studies employed panel data for different samples of countries (see for example, Al-Yousif, 2002; Hondroyiannis et al., 2005; Demetriades, 2006; Calderon and Liu, 2003; Christopoulos and Tsionas, 2004; Dawson, 2010; Loayza and Ranciere, 2006; Deidda and Fattouh , 2002). The evidence from these studies suggests that there are substantial differences in the way in which finance influences economic growth across countries.

In the context of the finance-growth nexus in the BRICS economies, a growing body of literature has focused on investigating different aspects of the finance- growth linkage in each individual BRICS country. However, limited attention has been paid to

[2] Chapter 4 provides an extensive discussion of the empirical literature that employs different econometric approaches on different types of data to investigate the linkage between finance and growth across countries.

examine such an issue in a global framework with respect to the BRICS countries as a whole.

Stefani (2007) employs a cointegrated VAR model to investigate the relationship between financial development and economic growth in Brazil. Three indicators of financial development are used in her study, which are private credit, money supply and stock market capitalization. The study finds that both bank and market capitalization contribute to the economic growth in Brazil. A study by Singh (2008) investigates the long-run equilibrium and short-run dynamic relationship between financial development and economic growth in India. He finds evidence of the bidirectional Granger-causality between financial development and economic growth. Another study for India has been conducted by Bhaumik et al, 2011, who point out that expansionary monetary policy enhanced the banking sector across the different states of India. Moreover, Fulford, (2013) concludes that the poverty rate in India would be reduced due to increasing the facilitation access to the rural banks.

As for the linkage between financial development and economic growth in China, Allen et al. (2005) point out that poor governance in China has constrained the performance of the listed state firms compared with the private non-listed sectors. They find that the private sector in China is growing rapidly and also that it has driven China's economic growth. They conclude that despite the lack of a well-developed financial system, the Chinese economy has continued to maintain a high growth rate. In addition, Hasan et al. (2009) carried out a study for China using a panel data of the Chinese provinces to investigate the role of legal institutions, financial deepening and economic growth. They note that the reform programs in China, which began in 1978, led to a development in several Chinese sectors, especially the private sector. Furthermore, they argue that there is a strong association between the size of the private sector and economic growth. Moreover, they show that only capital market depth has a strong influence on growth while the effect of the banking sector is neglected and sometimes negative. Boyreau-Debray (2003) attempts to study the impact of financial deepening on China at the provincial level. He finds little influence of financial intermediation depth on the local economy. He attributes this finding to the limited growth in credit in the 1990s, which was mainly allocated to the private sector. However, in the context of China again, there are a number of studies that found the financial development significantly promotes the Chinese economy (see among others, Cheng and Degryse, 2010; Guariglia and Poncet, 2008; Zhang, 2012; Xu and Ho, 2011).

The literature on the finance-growth nexus in Russia is relatively sparse. Ono (2012) applies the Johansen cointegration approach to investigate whether money supply spurs the economic growth of Russia. The study shows that money helps economic growth while growth leads to an increase in loans. An econometric investigation is carried out by Koivu (2002) in the context of emerging economies, including Russia. The study suggests that the lower interest rate explains growth. However, the size of banks cannot promote the Russian GDP growth significantly.

In the case of South Africa, Andrianova et al. (2014) indicate that the financial market is still undeveloped in African countries, even though South Africa enjoys modern banking services. Nonetheless, due to the poor financial regulations, the expansion of monetary policy hinders growth (Ncube (2007). Another study by Menyah et al. (2014) suggest that financial development and trade liberalization need to be advanced to have a significant impact on economic growth in the Africa region.

Over the last three decades, there was remarkable integration of trade and financial transactions among the industrial economies, and between industrial and emerging economies. This evokes the interest of many researchers to investigate the impact of financial integration on various aspects of the economic indicators. Tahari et al. (2007) define financial integration as a process of connecting banking, equity and other type of financial markets across countries. They argue that financial integration would eliminate the restrictions on cross-border capital flows, and improve the access of foreign investors to the domestic financial system. The international financial integration literature can be divided into two streams. The first looks at financial globalization as a source of economic growth. The second comprises studies that believe in the dark side of financial integration as the main cause of spillover of the financial crisis.

Proponents of increasing financial integration claim that it helps to mobilize domestic saving and allocate capital in an efficient way. Furthermore, it contributes to the international risk sharing and increases stability (see, for example, Mishkin, 2007; Prasad et al., 2003; Bekaert et al., 2005; Kose et al., 2009; Kose et al., 2010). Furthermore, Kose et al. (2006) point out that financial integration lowers the volatility of macroeconomic fluctuations, in particular in developing countries. Accordingly, this could happen by facilitating access to capital, which can help these countries to diversify their production base. However, some economists such as Fischer (1998) and Summers (2000) indicate that the developing or emerging countries would potentially gain more from financial globalization than advanced economies, since they are characterized by being relatively capital scarce and labor abundant. Furthermore, Kose et al. (2010) point out that the potential benefits of financial integration would not occur directly, but indirectly via institutional development and financial market development.

On the empirical front, Dreher (2006) investigates the effect of globalization on economic growth using a panel of 123 countries. The author develops an index of globalization that covers three main dimensions: economic integration, social integration, and political integration. He finds that when the globalization index measures economic integration, in particular the absence of restrictions on trade and capital, more globalization helps to maintain higher growth rate. Dollar (1992) analyses the relationship between economic performance and openness to trade by employing cross-section estimates. He concludes that openness to trade is robustly related to growth. Nevertheless, Edison et al. (2002) could not establish a clear link between financial integration and economic growth. Kose et al. (2006) explore whether trade and financial integration affect the relationship between growth and volatility. They consider a panel of 85 (industrial and developing) countries over the period 1960–2000. Their general finding is that financial integration, measured by gross capital flows across country borders, weakens the relationship between growth and volatility.

As for spillover effects, Samake and Yang (2014) consider growth spillovers to other economies. More specifically, the authors investigate the economic linkages between BRICS economies and the Low Income countries (LIC) by utilizing the GVAR model. Moreover, they observe the response of GDP growth in the LIC to different shocks such as trade, productivity, foreign direct investment and exchange rate, originating from the BRICS economies. Their study provides evidence of significant growth spillovers from the BRICS to the LIC. In addition, they highlight the important role of trade and financial integration between the two groups of economies in shielding them from the adverse impact of the global financial crisis. Feldkircher and Korhonen (2012) apply the GVAR approach and find that when the Chinese economy flourished, it helped other big economies including Brazil. The study also finds that the trading partners of China benefitted from the economic growth of China.

In contrast, opponents of financial integration claim that financial integration is associated with risk and greater economic fluctuations (see for example, Rodrik, 1998; Bhagwati, 1998; Stiglitz, 2002). More recent attention has focused on the contagion effect of financial crisis originating from influential industrial economies and examines how it might transmit to other countries. For example, Ahmad et al. (2013) apply dynamic conditional correlation (DCC-GARCH) approach to investigate the impact of the recent stock market crisis in selected Europe countries (Greece, Ireland, Portugal, Spain and Italy), USA, UK and Japan on the stock markets of the BRICS, Indonesia and South Korea. The study finds evidence of the transmission of the crisis to the BRICS.

On another front, the GVAR methodology has been frequently used in the literature to investigate the international transmission of business cycle shocks, credit supply shocks, and liquidity shocks among advanced and emerging economies. For example, by applying the GVAR model, Gurara and Ncube (2013) observe that financial shocks of Euro-zone and BRICS countries affect African economic growth as well. Recent evidence suggests that emerging BRICS markets are prone to financial contagion, with the severity of the effect being greater in the case of industry-specific shocks (Kenourgios et al, 2011).

Similarly, the GVAR method is used by Helbling et al. (2011) to examine the importance of credit market shocks in driving the business cycle during the last two decades. This study concludes that the credit shocks generated in the US economy have a significant impact on the global macroeconomic fluctuations in other economies. Galesi and Sgherri (2009) employ the GVAR model to explore how different types of financial shocks can be transmitted from the U.S. to several advanced and emerging countries. They find that in the short-run negative shocks to the U.S equity markets plays a significant role in the transmission of financial shocks to the other countries. The credit shock plays a significant role in the transmission of financial shocks in the long run**.** Similarly, by using quarterly data from 1979Q1 to 2009Q4, Xu (2012) employs GVAR method to analyse the spillover effect of US credit shocks to the UK, the Euro area, Japan and other industrialized economies. Moreover, Xu (2012) exclusively identifies that credit shock explains economic growth, inflation and long run interest rates for countries with a developed banking sector.

With this backdrop, it can be concluded that there are significant limitations in the existing literature which considers the finance-growth linkage in the context of a global framework, in particular with regard to the BRICS nations. The available studies focus on the contagion of the financial crisis, mainly on industrial and European economies, rather than the spillover effects of financial development or growth spillovers. In fact, in the globalization era, it is expected that any shock, whether positive or negative, in any major economy would not remain confined within the country, rather it might be transmitted to the partner countries. This study aims to fill in the gap in the literature and offers a comprehensive analysis of the channels through which financial development shocks originating from a BRICS country are transmitted to the real economy of another BRICS country/region.

5.3. OVERVIEW OF THE BRICS ECONOMIES AND THEIR FINANCIAL SECRORS

Over the last three decades, the economic significance of the BRICS countries has been growing in the global growth paradigm. The term BRICS refers to a selected leading group of large emerging economies: Brazil, Russia, India, China and South Africa. The grouping was originally known as “BRIC” which was created in 2001 by Jim O’Neill before the inclusion of South Africa in 2010. The BRICS have little in common in terms of their culture, alliances background, language, and economic structure, but their trade relations have gained attention in media and academic circles. This can be attributed to their distinct features in terms of the size of their economies, trade, population, territory, military power and political influences that have reshaped the world order. Therefore, economists in Goldman Sachs reported in 2003 the prediction that in about 40 years, their economies might lead to the transfer of power from the West to the East and could be larger than the combined economies of the G6; U.S., Japan, and the four largest European economies of Germany, France, Italy, and the United Kingdom (see Wilson and Purushothaman, 2003; Hammoudeh et al., 2012; O’ Neill, 2001& 2004).

In order to recognize the significance of the role of the BRICS in the global economic context, this section provides a discussion of the general background of the key economic eras in BRICS countries. In addition, it briefly discusses the recent development of the BRICS financial sector.

5.3.1. Overview of the BRICS Economies

This section presents an overview of the BRICS economies. First, the global position of the BRICS in the world economy will be presented. Subsequently, an analysis of the economic condition of individual BRICS countries will be made.

The contribution of the BRICS to the global economy is expanding significantly. At present, the BRICS together possess more than a quarter of the world's land (Jacobs and Van Rossem, 2014; Mensi et al. 2014). Furthermore, the BRICS account for 42.59% of the world's population (see Table 5.1). More importantly, while 8.21% of global GDP in 1989-92 could be attributed to the BRICS, this percentage has risen considerably to 14.05% during the period from 2008-2012 (see Table 5.2). This is an indication of their outstanding economic performance, which was fuelled by their large share of investment coupled with strong growth in exports. However, their share of GDP lags behind their population share. Interestingly, during the period from 1989 to 2012, there was a sharp and unprecedented increase in BRICS GDP growth. In particular, during the financial crisis, the BRICS reported a constant growth rate that was on average 4.69 % over the period of 2007-2012. In contrast, the European Union and OECD reported -0.17% and 0.52 % growth rate during the same period, respectively (see Table 5.3). This implies that the BRICS economies may have experienced less impact of the financial downturn in compared with other U.S and European countries.

Table 5.1: Population share of World, 1989-2012.

Variables	1989-92	1993-97	1998-02	2003-07	2008-12
BRICS	44.27	44.07	43.74	43.25	42.59
Brazil	2.83	2.84	2.85	2.86	2.83
Russia	2.76	2.64	2.40	2.20	2.07
India	16.52	16.71	17.08	17.36	17.51
China	21.44	21.22	20.68	20.08	19.43
South Africa	0.67	0.68	0.71	0.73	0.75

Author Calculation, Data Source, World Development Indicator, 2014.

Table 5.2: GDP share of World, 1989-2012.

Variables	1989-92	1993-97	1998-02	2003-07	2008-12
BRICS	8.21	8.05	8.91	10.83	14.05
Brazil	1.95	1.99	1.91	1.90	2.06
Russia	2.84	1.84	1.34	1.54	1.75
India	1.11	1.23	1.42	1.65	2.19
China	1.86	2.66	3.58	4.93	7.33
South Africa	0.54	0.52	0.51	0.53	0.56

Author Calculation, Data Source, World Development Indicator, 2014.

Turning to each specific country of the BRICS, it is worth mentioning that China, India, Russia, Brazil and South Africa are the world's 3rd, 4th, 7th, 8th and 26th largest economies (Factbook, CIA, 2013). To date, the scale of China's economy and pace of its development has outpaced those of its BRICS peers. China alone contributed more than half of the BRIC countries' share and greater than 7% of the growth in world economic output from 2007 to 2012. Moreover, China is the world leader in gross value of industrial output. In contrast, the service sector has brought India many advantages as it contributes about 65% of the total economy (Factbook, CIA, 2013). On the other hand, Russia has made significant changes since the breakdown of the Soviet Union, moving from a globally-isolated and centrally-planned economy to a more market-based and globally-integrated economy. Currently, their service sector is comprises 58.4 % of the total economy.

India is transforming into an open market economy through economic liberalization, for example, industrial deregulation, privatization, foreign trade and investment. Since, the 1990s, the economy has been expanding rapidly, on an average by 7% per year. The larger territory and higher population enabled the economy to be diversified with agriculture, manufacturing and a multitude of services. Despite having many advantages, the country has many challenges yet to address, for instance, poverty, corruption, violence and so on. In addition, the economy experienced sluggish growth in 2011 because of a decline in investment, high interest rates and high inflation.

However, due to post-election economic reform, the economy has started to enjoy higher growth again.

Brazil's economy overshadows that of all other South American countries as its presence in the world markets grows. Since 2003, Brazil has gradually enhanced its macroeconomic stability, accumulating foreign reserves, and reducing its debt. Lastly, South Africa is recognized as one of the world's largest producers of some strategic goods such as gold, platinum, and chrome, which are important resources to support domestic and global economic growth. Therefore, the inclusion of South Africa in the BRICS group offers some opportunities to set up a dedicated investment strategy in terms of economic diversification opportunities, mainly in Africa (Biggemann and Fam, 2011).

On another front, the rapid pace of the dynamics of trade relations within the BRICS and with other developing and advanced countries has been a central focus of the new political economic paradigm. Table 5.3 reveals that on average the BRICS account for 27.23 % of the trade share of their own GDP over the period of 1987-1992, but it increased to 48.62 % over the period of 2007-12. Similarly, import and export share of GDP expanded steadily over the same period. It is important to consider that the last economic depression has had a less harmful impact on the pace of BRICS's trade, as imports and exports have increased from 2007-2012 as shown in Table 5.3 However, Table 5.3 reports average trade share of the BRICS GDP to be below the average value of the world, EU and OECD. This clearly shows that the EU and OECD are still the leading exporters and importers of goods and services.

Table 5.3. BRICs in the Global Economy, 1989-2012.

Year	Region	GDP Growth Rate	GDP ($ Per Capita)	Population Growth Rate	Import % GDP	Export % GDP	Trade % of GDP
1989-92	World	2.86	5793.41	1.65	19.90	19.67	39.53
	BRICS	3.95	3085.25	1.50	14.49	16.73	27.23
	EU	2.74	21060.05	0.29	27.18	26.93	54.49
	OECD	3.11	23502.32	0.88	18.15	17.89	36.51
1992-97	World	2.77	5956.92	1.47	21.24	21.62	42.47
	BRICS	3.24	2750.2	1.30	16.76	18.06	36.28
	EU	1.95	22274.89	0.21	28.26	29.71	57.25
	OECD	2.64	24854.86	0.80	19.24	19.67	38.38
1997-02	World	2.78	6529.48	1.31	24.15	24.54	48.79
	BRICS	4.5	2909.38	1.16	18.93	22.32	41.26
	EU	2.63	25539.09	0.20	33.71	34.54	68.26
	OECD	2.56	27945.55	0.72	22.48	22.25	44.73
2002-07	World	3.74	7176.103	1.21	27.34	27.59	54.94
	BRICS	7.35	3582.3	0.80	22.92	26.29	49.22
	EU	2.57	28091.44	0.38	36.43	37.28	73.72
	OECD	2.71	30443.10	0.70	24.82	23.86	44.47
2007-12	World	1.73	7725.296	1.16	29.22	29.23	58.46
	BRICS	4.69	4340.03	0.83	23.79	24.68	48.62
	EU	-0.17	28852.89	0.22	39.31	40.67	80.34
	OECD	0.52	31053.61	0.63	27.09	26.35	52.44

Author Calculation, Data Source, World Development Indicator, 2014.

The existence of comparative and absolute advantages among the BRICS nations and their trading ties have made them stronger. For instance, China is the prime supply partner to Russia and India and second to Brazil, whilst China is the third largest market for Brazil, fourth for India and sixth for Russia (Biggemann and Fam, 2011). Furthermore, each of the BRICS countries has some special advantages. For example, China is known as the factory of the world, whereas, India has turned to be a key exporter of information technology and software workers. Brazil possesses a significantly large manufacturing and service capacity as the country is the largest exporter in Latin America, whereas Russia is the world's leading supplier of oil and natural gas, and prime producer of technology products and services. On the other hand, South Africa has absolute advantage in exporting gold, diamond, platinum other metals and minerals, machinery and equipment. The country accounts for 11.8%, 8.3%, and

4.2% of exports to China, US, and India respectively in 2012. However, South Africa imports machinery and equipment, chemicals, petroleum products, scientific instruments, foodstuffs from China, Saudi Arabia, and India and so on. The interdependencies among the BRICS lead to both demand- and supply-side spillovers across countries, resulting in a higher degree of synchronization of output among the trading partners. In addition, the stronger trade association facilitates increased specialization of production among BRICS, as they have sector-specific influences.

Table 5.4. Bilateral Trade between BRICS Country (in Million USD).

	Russia - Brazil	Russia - China	Russia - India	Russia- South Africa	Brazil - China	Brazil - India	Brazil - South Africa	China - India	China - South Africa	India- South Africa
Mean	2449.682	386.7892	3305.301	211.17	1320.848	2406.745	1154.729	6664.96	1214.397	3743.036
SD	2306.424	215.0628	2482.993	199.0496	907.2307	3220.636	840.8153	6637.483	277.7516	4144.849
Min	22.196	129.6637	556.431	0.8	393.6579	169.2734	273.6505	871.136	761.287	0.095211
25 Percent	645.889	211.2957	1375.319	80.667	781.5365	392.6165	545.782	2425.983	1064.539	703.65
Median	1177.818	367.2399	2136.532	132.371	899.833	909.1945	735.634	3720.68	1236.272	2271.142
75 Percent	4492.514	458.1125	5327.87	284.4407	1818.803	2753.256	1793.23	8424.773	1379.273	5546.358
Max	6711.84	880.75	8400.59	691.5	3405.209	11124.01	2698.856	23170.4	1844.074	13686.47

Source of data: Bilateral trade (Import + Export) data for BRICS nation is collected from Direction of Trade Statistics (DOTS) - IMF eLibrary Data over the year from 1989-2012. Note: SD indicates standard deviation. Last five raw represents the quartile distribution of the data

Primarily, this study aims to investigate whether there is a spillover of financial development among the BRICS nations, where the trade and financial integration are assumed to be the channels through which this spillover occurs. Thus, it is important to focus on bilateral trade relationship between BRICS countries. Table 5.4 reports the descriptive statistics of the pattern of bilateral trade over the period of 1989 to 2012. It can be observed that the highest bilateral trade took place between China and India. The table also illustrates that India and China account for 3743.036 USD million, which is the second highest average bilateral trade in BRICS. The lowest bilateral flow of trade is recorded between Russia and South Africa, which is only 211.17 USD million.

However, the Table also reports that the standard deviation of the flow of trade is highest for China - India and India –South Africa.

Table 5.5. Bilateral Foreign Direct Investment (FDI) between the BRICS (Million USD).

	Mean	SD	25 Percent	Median	75 Percent	Min	Max
Brazil to Russia *							
Brazil to India*							
Brazil to China*							
Brazil to South Africa*							
Russia to Brazil	1.7975	1.004112	1.127	1.585	0.878	0.878	3.142
Russia to India	217.5055	248.7799	13.9005	146.1155	2.08	2.08	597.338
Russia to China	34.504	17.23291	22.48325	27.4805	19.586	19.586	62.841
Russia to South Africa	149.4043	226.0763	39.9635	62.403	5.22	5.22	602.964
India to Russia	14.573	11.58362	5.016	14.409	2.606	2.606	32.904
India to Brazil*							
India to China	38.66333	10.99736	33.1	38.4	27.8	27.8	49.79
India to South Africa							
China to Brazil	166.29	149.4376	11.34	36.755	6.43	6.43	487.46
China to Russia	548.2017	250.824	239.5525	423.67	30.62	30.62	784.62
China to India	100.5867	103.4158	9.7725	34.815	24.88	24.88	276.81
China to South Africa	814.325	1551.363	11.0975	41.165	814.91	814.91	4807.86
South Africa to Russia	2	1.414214	2.5	2	3	1	3

Data source: Bilateral FDI data is collect from United Nation Conference on Trade and Development over the year from 2000 to 2012. Note: SD indicates standard deviation. Last five columns represents the quartile distribution of the data.
* Data is not available.

Table 5.5 exhibits the average bilateral FDI inflow and outflow between BRICS over the period of 2000 to 2012. It shows that China made the highest investment into other BRICS member countries. On an average, China invested 814.325 USD million in South Africa, which is recorded as the highest investment in the BRICS countries. In addition, China invested 166.29 USD, 548.2017 USD, and 100.5867 USD million per year as FDI in Brazil, Russia and India respectively. The table also shows Russia is the second highest source of FDI in BRICS countries. However, India, Brazil and South Africa do not have notable FDI outflow into other BRICS countries.

5.3.2. Financial Sectors of BRICS

Over the last few years, the BRICS have taken two prime financial initiatives to increase intra-BRICS co-operation: (i) the launching of BRICS bank in 2013 through a formal agreement among the five countries on financial cooperation, and (ii) the contingent reserve pooling arrangements and bilateral swaps. These initiatives of the BRICS rival the International Monetary Fund (IMF) and World Bank (WB), since these nations made an agreement to use local currency credit facilities and multilateral letter of Credit Confirmation Facility (LCC) instead of USD (International Monetary Fund, 2011; Foster et al., 2009; Griffith-Jones, 2014). In consequence, this effort merely strengthens and develops trade and economic relations among member countries. In turn, it also allows the financial institutions and enterprises of BRICS to make transactions with local currency for their trading purposes with minimum risk. Most importantly, the agreement of the BRICS lessens their dependency on USD, lowers the trading cost, and increases trade and investment. Consequently, such activities encourage the global market to use their currencies. Apart from that, the BRICS nations are committed to developing their financial institutions and stock markets to mobilize resources within them by creating a common and innovative platform.

As shown in the previous section, the BRICS economies have been integrating with each other and with the global economy mainly through trade relations. Given sharp economic growth and strong trade integration within BRICS and the rest of the world, it is also worth highlighting the extent of their financial ties. The BRICS financial ties have been strengthened by the development in macroeconomic management and the business climate. Therefore, it is important to focus on financial development of the BRICS economies and compare it with the rest of the world. Since the BRICS countries still face challenges in term of infrastructure development due to their inadequate long-term financing and foreign direct investment, it is expected that the BRICS bank may help to mobilize resources for infrastructure and sustainable development projects in the BRICS (Griffith-Jones, 2014).

The financial development of BRICS economies, shown in Table 5.6 as the average money supplies, are 90.22% of GDP, which is a smaller proportion of GDP than for the world and OECD money supplies, but bigger than the corresponding value for the EU over the period of 2007-12. The ratio of broad money to GDP of the BRICS economies rose from 51.07% to 90.22% while the world's rate rose from 86.45% to 111.28% over the period, 1987-92 to 2007-2012. As an important component of financial development, the growth rate of domestic credit to the private sector as a percentage of GDP had a steady growth rate in the BRICS. Table 4.6 reports that the rate of domestic credit to the private sector was only 58.66% in the BRICS, while it was 101.7%, 83.05% and 110.24% for the world, EU and OECD respectively, over the period 1989-92. However, these rates of domestic credit increased to 84.98%, 129.82%, 136.67% and 156.33% for the BRICS, World, EU and OECD respectively over 1992-97.

As regards the stock market, due to the financial crisis, most sectors including the stock market experienced a downward trend. Sontakke (2014) shows that the Chinese economy significantly contributed to the world economy as the Chinese stock market is inversely associated with US ten years Treasury yields. The Indian stock market is performing better compared to those in the other BRICS. The stock market of India is much more diversified. The market is substantially dominated by banking, finance and technological sectors. Sontakke, (2014) observes that only India's stock market is positively correlated with treasury yields. The distinct feature of the Russian stock market is that it is mostly dominated by oil and gas companies. However, the performance of their stock market has been adversely affected by the crisis in Crimea and Ukraine (see, World Bank Russia Economic Report, 2014). In this market the US treasury isn't an influential driver, hence the association between stock index values with treasury yield is insignificant. In the case of the Brazilian stock market, it is also diversified like India's. However, there is still some operating inefficiency and financial irregularities, which cause a downturn of the index value. Moreover, the stock index value is unresponsive to US treasury yields. On the other hand, the stock market of South Africa has been performing well since 2002. The market is enjoying an upward trend of index value and bond yields. The above discussion shows that the stock markets of the BRICS have distinct characteristics, yet need to be improved. The last column of Table 5.6 provides an important insight into the financial markets of BRICS, as the market capitalization over GDP is increasing over the time. This implies nothing other than an endorsement of well-functioning financial systems which are supposed to be a key factor of their economic growth. Table 4.6 exhibits important aspects of financial indicators comparing other economic regions.

Moving to each individual BRICS country, Table 5.7 exhibits the statistics of financial development of the members. It encompasses three important indicators of financial development, e.g. broad money, domestic credit to private sector, and market capitalization share of GDP. As regards these indicators, all three have increased remarkably from 1989 to 2012 in all BRICS economies.

With this backdrop of the BRICS economies and their financial sectors and in the era of globalization, it is interesting to ascertain whether the financial development of any member country of BRICS significantly influences a partner's economy.

Table 5.6. Financial Statistics.

		Broad money % of GDP	Domestic credit to the private sector % GDP	Market capitalization (% GDP)
1989-92	World	86.45	101.7	51.96
	BRICS	51.07	58.66	29.05
	EU		83.05	33.19
	OECD	94.19	110.24	55.87
1992-97	World	89.08	109.58	63.32
	BRICS	54.91	63.51	40.37
	EU	111.52	85.02	45.82
	OECD	97.15	120.62	68.33
1997-02	World	97.53	125.79	92.11
	BRICS	63.53	62.81	44.97
	EU	68.26	98.01	83.58
	OECD	104.19	140.51	104.41
2002-07	World	98.18	131.1	99.04
	BRICS	76.2	72.83	88.03
	EU	73.72	115.74	79.62
	OECD	103.98	149.78	105.95
2007-12	World	111.28	129.82	73.55
	BRICS	90.22	84.98	70.34
	EU	80.34	136.67	56.33
	OECD	118.16	156.33	80.28

Author Calculation, Data Source, World Development Indicator, 2014.

Table 5.7. Financial Statistics of BRICS Countries.

Country	Series Name	1989-92	1992-97	1997-02	2002-07	2007-12
Brazil	Broad money % of GDP	59.42	48.93	45.52	54.78	71.21
	Domestic credit to private sect. % of GDP	74.86	65.97	30.68	35.43	57.25
	Market capitalization % of GDP	9.02	26.33	30.24	62.32	56.82
Russia	Broad money % of GDP		20.38	23.31	34.96	48.64
	Domestic credit to private sect. % of GDP		10.47	15.44	28.53	44.50
	Market capitalization % of GDP	0.05	9.04	24.06	78.64	49.08
India	Broad money % of GDP	42.40	44.54	54.05	65.70	76.35
	Domestic credit to private sect. % of GDP	24.58	22.99	27.20	38.82	49.23
	Market capitalization % of GDP	15.11	33.73	28.50	79.66	71.13
China	Broad money % of GDP	80.36	104.30	137.36	154.31	175.72
	Domestic credit to private sect. % of GDP	85.41	91.47	112.02	115.75	124.28
	Market capitalization % of GDP	2.43	11.54	34.62	75.37	66.73
South Africa	Broad money % of GDP	53.67	50.08	57.42	71.24	79.22
	Domestic credit to private sect. % of GDP	87.08	115.57	128.75	145.64	149.65
	Market capitalization % of GDP	111.87	161.60	152.44	232.23	178.30

Data Source, World Development Indicator, 2014.

5.4. DATA

Quarterly data for 34 countries (the BRICS and 29 developed and developing countries) is used. The sample of countries used in the analysis covers the period from 1989Q1 to 2012Q4 and displayed in Table A5.2 (see Appendix A5). All data series are extracted from the DataStream database. The variables of interest include real gross domestic product (GDP), consumer price index (CPI) and the three widely used indicators of financial development in the literature: broad money supply (M2), credit to private sector (P) and equity price index (Eq). Broad money supply (M2) indicates the size and depth of the banking sector. The credit to private sectors (P) captures banks' activities and their ability to use finance and allocate it to the most proactive investments. Equity price index (Eq) is computed as an adjusted market capitalization weighted index, which indicates the performance of the market and its size.[3] In addition, oil prices are used as a proxy for common global factors. Oil prices are treated as weakly exogenous in all 33 countries in the models, except in the U.S., where they are considered as an endogenous variable.[4]

5.5. METHODOLOGY[5]

In order to study the interdependency among the BRICS and understand how a shock is transmitted directly or indirectly within a country and from one country to other countries in a transparent way, a model is needed that looks at the issue from a global perspective and takes into account the interrelationships that could take place

[3] For a detailed discussion on the financial development measurements, see Chapters 3 and 4.
[4] Given the fact that the US is the largest economy in our sample, it is also likely to have the biggest influence.
[5] The chapter's estimation is done by using the GVAR Toolbox (Version 1.1) developed by Alessandro Galesi, and L.Vanessa Smith. http://www-cfap.jbs.cam.ac.uk/research/gvartoolbox/index.html

among national economies. This section presents the empirical approach employed in this study to analyse the international transmission of financial development shocks to the real economy across a multi-country border. The study builds a Global Vector Autoregressive model (GVAR), pioneered in PSW (2004) and further advanced in DMPS (2007). The GVAR methodology is one of the most accurate and consistent approaches that allow us to model a global spillover of shocks in a large- scale macroeconomic system with a large set of countries. In other words, this technique yields a coherent, theory-consistent solution to the curse of dimensionality in international modelling (see PSW, 2004; Chudik and Fratzscher, 2011). The GVAR model is constructed using a country or region specific vector error correction model in which each country or region has its own domestic macroeconomic variables and is linked to the other countries by including the corresponding foreign- specific variables that can interact simultaneously. Therefore, the implementation of the GVAR model entails two main stages. In the first stage, individual country-specific vector error-correcting models VECMX, including foreign variables that are treated as weakly exogenous, are estimated. In the next stage, the individual country models are stacked to a global VAR model simultaneously using trade weights.

In this study, in order to generate the foreign variables for each country in the GVAR model, the time-fixed trade weighted foreign variables are used. More specifically, we use the direction of the trade statistics database (DOTS) from the International Monetary Fund (IMF) to construct the bilateral trade shares matrices. For all the countries considered in the study, the shares of exports and imports (c.i.f.) over the period 1989 to 2012 with annual frequency are computed. The 34×34 trade-weight matrix is displayed in Appendix A5.3. The importance of this matrix is that it connects all different countries together and highlights the extent of the dependency of one country/region on the remaining countries. It is worth mentioning that the construction of the interlinkages matrix between the domestic and foreign variables can be done by using any financial, trade or distance linkage weights.[6] However, in this study, trade-weighted matrices is used, following PSW (2004) and DMPS (2007). Furthermore, number of studies find that bilateral trade is the most significant determinant of global inter-country linkages, for example (See Forbes and Chinn, 2004; Imbs, 2004; Baxter and Kouparitsas, 2005). In this study, we believe that the trade weights are more relevant in the context of BRICS where the trade interrelationships are very much pronounced among them.

The GVAR model is composed of 34 countries (BRICS and 29 developed and developing countries). As mentioned earlier, the first step of estimating the GVAR model is to estimate the individual 34 country specific vector error-correcting models augmented by weakly exogenous country specific foreign variables and a global variable that is denoted by VARX*, including a constant and a deterministic time trend.

The general specification of a country-specific model (VARX*) can be described as follows:

Suppose there are $N+1$ countries in the global economy, indexed by $i = 0,1,2,\ldots,N$, where $N = 33$ and country 0 is treated as a reference country (the United States in this case).[7] For each country i an augmented VARX$^*(q_i, q_i^*)$ model, where q_i and q_i^* are the lags orders of the domestic and foreign variables respectively, can be written as follows:

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[6] Galesi and Sgherri (2009) use financial linkage weights based on bank lending data across countries. Hiebert and Vansteenkiste (2007) adopt weights based on sectorial input-output tables across industries, whereas Vansteenkiste (2007) uses geographical distance based weights.

[7] GVAR literature uses the United States as a reference country based on its size and influence on the global economy and this study is no exception.

$$x_{i,t} = a_{i,0} + a_{i,1}t + \sum_{j=1}^{qi} \alpha_{i,j}\, x_{i,t-j} + \sum_{j=0}^{q_i^*} \beta_{i,j}\, x_{i,t-j}^* + \sum_{j=0}^{li} \gamma_{i,j}\, d_{t-j} + u_{i,t}, \tag{5.1}$$

for t=1,2,…3, T and i=0,1,…,N, where x_{it} is the $k_i \times 1$ vector of country- specific domestic or endogenous variables, X_{it}^* is the $k_i^* \times 1$ vector of country-specific foreign variables (weakly exogenous), d_t a vector of global exogenous variable (here, oil prices) that exist in every country VARX, $a_{i,0}$ is a constant, t is a linear trend, and $u_{it}$is the $k_i \times 1$ vector of idiosyncratic, serially uncorrelated, country specific shocks such that $\boldsymbol{u}_{it} \sim i.i.d$ and have a zero mean with a covariance matrix $cov(u_{it}, u_{jt}) = E(u_{it}u_{j\acute{t}}^{\prime}) = \Sigma_{u,ij}$, for $i \neq j$. Further, qi and $q_i^*$are the lag orders of the domestic and foreign variables respectively, for *i*th country.

The country-specific foreign variables $\mathbf{X}_{it}^*$ in VARX* models are constructed using the bilateral trade of the other country domestic variables as the weights, w_{ij},

$$x_{it}^* = \sum_{j=o}^{N} w_{ij} x_{jt}, \tag{5.2}$$

Where the weights, w_{ij} for $j = 0,1,\ldots,N$, capture the importance of country $j$for country i's economy. $w_{ii} = 0$, and $\sum_{j=0}^{N} w_{ij} = 1$. These weights are fixed and computed based on countries' average bilateral trade over 2006-2008 (see appendix B).

Setting $z_{i,t} = (x'_{it}, x_{it}^*)'$, neglecting d_t for simplicity and defining p_i= max (q_i, q_i^*), equation (5.1) of the individual models can be re-written

$$\mathrm{A}_{i,o}\mathrm{z}_{i,t} = \mathrm{a}_{i,0} + \mathrm{a}_{i,1}t + \sum_{j=1}^{pi} A_{i,j}\, \mathrm{z}_{i,t-j} + \mathrm{u}_{i,t}, \quad (5.3)$$

where $\mathbf{A}_{i,o} = (I_{k_{i,}} - \beta_{i,o})$ and $\mathbf{A}_{i,j} = (\alpha_{i,j}, \beta_{i,j})$.

The vector $\mathbf{z}_{it}$ then linked to x_t = $(\mathbf{x}'_{o,t}, \mathbf{x}'_{1,t}, \ldots, \mathbf{x}'_{N,t})'$, a K× 1vector containing all endogenous (domestic) variables of the system, through the link matrix W_i: that can be written as

$$\mathrm{z}_{it} = \mathrm{W}_i \mathrm{x}_{t,} \;\; i = 0,1,2, \ldots, N, \quad (5.4)$$

where W_i is a link matrix of dimension$(k_i + k_i^*) \times k$ constructed based on country specific weights and capturing the bilateral trade between countries under investigation.

Equation (5.1) is then (again neglecting d_t) equivalent to

$$\mathrm{A}_{i,o} W_i \mathrm{x}_t = \textstyle\sum_{j=1}^{pi} \mathrm{A}_{i,j} W_i \mathrm{x}_{t-j} + u_{it.} \quad (5.5)$$

After that the estimated coefficients from the individual country specific VARX models are stacked, obtaining the model for all the variables in the global system $\mathbf{x}_t$:

$$\mathrm{G}_0 \mathrm{x}_t = a_o + \; a_1 t + \sum_{j=1}^{p} G_j \;\, x_{t-j} + \; u_t, \quad (5.6)$$

where

$$\mathbf{G_0} = \begin{pmatrix} \mathbf{A}_{0.0}\mathbf{W}_0 \\ \mathbf{A}_{1,0}\mathbf{W}_1 \\ \vdots \\ \mathbf{A}_{N,o}\mathbf{W}_N \end{pmatrix}, \mathbf{G}_{\boldsymbol{j}} = \begin{pmatrix} \mathbf{A}_{0.\mathrm{j}}\mathbf{W}_0 \\ \mathbf{A}_{1,\mathrm{j}}\mathbf{W}_1 \\ \vdots \\ \mathbf{A}_{N,j}\mathbf{W}_N \end{pmatrix}, \boldsymbol{a_0} = \begin{pmatrix} \boldsymbol{a}_{0.0} \\ \boldsymbol{a}_{1.0} \\ \vdots \\ \boldsymbol{a}_{\mathrm{N}.0} \end{pmatrix}, \boldsymbol{a_1} = \begin{pmatrix} \boldsymbol{a}_{0.1} \\ \boldsymbol{a}_{1.1} \\ \vdots \\ \boldsymbol{a}_{\mathrm{N}.1} \end{pmatrix}, \; \boldsymbol{u_t} = \begin{pmatrix} \boldsymbol{u}_{0.\mathrm{t}} \\ \boldsymbol{u}_{1.\mathrm{t}} \\ \vdots \\ \boldsymbol{u}_{\mathrm{N}.\mathrm{t}} \end{pmatrix}$$

and $p = max(p_1, \dots, p_N)$.

Premultiplying equation (5.6) by G_0^{-1} yields the autoregressive representation of the GVAR (p)model

$$\mathrm{x}_t = b_o + b_1 t + \sum_{j=1}^{p} F_j \, x_{t-j} + \epsilon_t, \tag{5.7}$$

where $F_j = G_0^{-1} G_{j,}\, b_0 = G_0^{-1} a_0, b_1 = G_0^{-1} a_1$ and $\epsilon_t = G_0^{-1} u_t$.

The model in equation (5.7) above can be solved recursively and used for generalized impulse response analysis and forecast in the usual manner.

5.6. GVAR ESTIMATION PROCEDURES

5.6.1. Integration properties of the series- Unit Root Test

Prior to estimating the individual country-specific cointegrating VARX* model, it is necessary to identify the order of integration of the respective endogenous and exogenous variables and ensure that almost all of them are I(1). Two unit root tests are applied: (i) the Augmented Dickey-Fuller test (ADF) proposed in Dickey and Fuller (1981); and (ii) the weighted symmetric of ADF type regressions (hereafter ADF-WS) introduced by Park and Fuller (1995). These two tests are applied to all country-specific domestic and foreign variables and also the global variable over the period 1989Q1-2012Q4, on the log- levels with linear trends including constant terms for the first difference. However, we only focus on the results from the ADF-WS test statistic as this test has more superior features than the standard ADF test especially with small-sample[8] (see Leybourne, Kim and Newbold, 2005; Pantula, Gonzalez- Farias and Fuller, 1994). The order of the optimum lag of the domestic and foreign variables of the country-specific VARX* models in the ADF-WS unit root test is selected according to the Akaike information criterion (AIC).[9] Table A5.5 and A5.6 (see Appendix A5) display the summary results of ADF-WS tests in the level and first differences for all the country-specific variables and the country-specific foreign variables, respectively. The unit root test results in tables (A5.5) and (A5.6), overall, support the treatment of the variables as being I(1). The computed value of the ADF-WS test with trend in level for the global variable (oil price) is -2.17, which is smaller than the critical value, -3.24. Therefore, we fail to reject the null hypothesis of "unit root" at 5%. Whereas for the first difference, the null hypothesis is rejected as the computed value is -6.67, which is higher than the critical value, -3.24 at the %5 significant level, so oil price series is I(1).

5.6.2. Lag Order Selection and Cointegrating Relations

After fulfilling the assumption of having approximately all the domestic and foreign variables integrated of order 1, I(1) for short, by conducting unit root tests on these variables, the next exercise of the GVAR analysis is to estimate each of the 34 country/ region -specific cointegration (VARX*) models. This can be done based on the error correction model (ECM) to identify the number of the cointegrating relationships. Nevertheless, before carrying out these estimations, it is necessary to determine the lag order of the domestic $(q_i i)$ and foreign variables (q_i^*) for each country VARX* model. For this purpose, we follow DMPS (2007) in selecting the lag specification for

[8] The results of ADF- WS unit root statistic test differs than the ADF test only in a very few cases, therefore we only focus on ADF-WS results. Nevertheless, the full version of ADF statistics test can be provided up on request.
[9] AIC is normally preferred more than the Schwarz Bayesian Criterion (SBC) for the selection of the lag orders, as AIC includes more lags, so that it helps to reduce the serial correlation in the models.

endogenous and exogenous variables based on the AIC. However, due to the constraints enforced by dealing with a small number of time series observations relative to the number of parameters in each model, the maximum lag length we allow for foreign variables $q^*_{i\,max}$ is 2, whereas the maximum lag order for domestic variable qi_{max} is 3, which has to be always greater than q^*_i. Afterwards, we proceed to apply the cointegration tests with a specification of unrestricted intercept and restricted trend coefficients in the cointegration relations, which is the case IV of Pesaran et al., (2000).[10]

The results of the cointegration test are initially based on Johansen's trace statistic at the 95% significance level, given that it is known to have better small-sample power compared to the maximal eigenvalue statistic. However, when we check the stability of the global model through the persistence profile, we notice that some models obtain eigenvalues larger than unity that causes instability in the global model. In order to ensure the stability of the global model and also to resolve any potential overestimation of cointegrating relations based on asymptotic critical values, the numbers of the cointegrating relations are reduced relative to the number of countries. The final selections of the number of cointegrating relations are presented in Table 5.8 along with a selected VARX* lag order for each country which is reported in column 1 of this table. As can be seen in Table 5.8, the rank of cointegrating relations varies across individual VARX models. However, most of the models have two or three cointegrating relations (29 countries out of 34 countries).

Table 5.8. Lag orders of VARX* (q_i, q_i^*) models and the number of cointegrating relations (r_i)

[10] According to the GVAR literature, case IV by Pesran et al., (2000) is the most commonly case used to avoid the possibility of having a quadratic trend in our selected variables in their level, for further detailed see, PSW (2003).

Country	VARX*(q_i, q_i^*) q_i	q_i^*	r_i	Country	VARX*(q_i, q_i^*) q_i	q_i^*	r_i
ARGENTINA	3	2	2	MEXICO	3	2	3
AUSTRALIA	3	2	2	NETHERLANDS	1	1	2
AUSTRIA	3	1	2	NEW ZEALAND	1	1	2
BELGIUM	1	1	1	NORWAY	1	1	2
BRAZIL	3	2	3	PERU	3	2	3
CANADA	3	2	3	PHILIPPINES	2	2	3
CHILE	3	2	2	RUSSIA	3	2	2
CHINA	3	1	3	SINGAPORE	1	1	2
ECUADOR	2	1	1	SOUTH AFRICA	3	2	2
FINLAND	3	2	2	SPAIN	3	1	2
FRANCE	1	1	2	SWEDEN	2	2	2
GERMANY	3	1	1	SWITZERLAND	3	1	3
INDIA	1	1	2	THAILAND	1	1	3
INDONESIA	3	1	3	TURKEY	1	1	2
ITALY	3	2	1	UK	2	2	2
JAPAN	2	1	3	USA	3	2	2
MALAYSIA	3	2	2	VENEZUELA	3	1	1

Note: q_i and q_i^*, denote to the lag order of the domestic variables and foreign variables respectively.

5.6.3.Testing for residual serial correlation

The F statistic for the residual serial correlation test is the F-version of the familiar Lagrange Multiplier (LM) statistic (see, Godfrey, 1978a, Godfrey, 1978b), also known as ‘modified LM’ statistic. Both the F-statistics for the residual serial correlation from the estimated VECMX models and the corresponding critical values at 5% significance level are reported in Table A5.8 (see appendix A5). There are some regressions which could not pass the residual serial correlation test at the 5% significant level. However, the overall test results appear to be acceptable.

5.6.4. Conditions for the GVAR estimations: The Weak Exogeneity Test

After selecting the optimum lag order (qi,q_i^*) and the number of cointegrating relations r_i, it is necessary to examine the validity of the weak exogeneity assumption. The weak exogeneity assumption is very crucial in the implementation of the GVAR approach. The assumption implies that the country-specific foreign variables and the global variable have to be weakly exogenous with respect to the long run parameters of the conditional model. Specifically, the endogenous variables in the domestic economy are not allowed to have a long run feedback on the exogenous variables in the rest of the world. The exogeneity test further implies that an interaction may exist between foreign and global variable in the short run (Johansen, 1992; and Granger and Lin, 1995).

In order to conduct the weak exogeneity test, Johansen (1992) and Harbo et al.(1998) framework are followed. The test involves estimating the 34 VARX*(qi,q_i^*) models independently to examine whether the foreign and global variables are weakly exogenous or not. We then run the following regression for each l^{th} element of x_{it}^*

$$\Delta x_{it,l}^* = a_{il} + \sum_{j=1}^{r_i} \gamma_{ij,l}\, \mathrm{ECM}_{i,t-1}^{j} + \sum_{K=1}^{q\,i} \varphi_{ik,l}\, \Delta\, x_{i,t-k} + \sum_{m=1}^{q*_i} \vartheta_{im,l}\, \Delta\, \tilde{x}_{i,t-m}^* + {}_{it,l}, \tag{5.8}$$

where $\mathrm{ECM}_{i,t-1}^{j}$ j=1, 2, ...r_i are the estimated error correction coefficients associated with r_i co-integrating relations for the l^{th} the country model, and q_i and $q*_i$ are the optimum orders of lag for the domestic and foreign variables, respectively. $\Delta\, \tilde{x}_{it}^*$ refers to the foreign variables that have to be weakly exogenous under the null hypothesis. For the weak exogenous assumption to hold, the ECM of the above equation must not be statistically significant. Specifically, the joint null hypothesis that $\gamma_{ij,l}$ =0 for each j=1,2, ...r_i in 5.8 equation has to be accepted under the F-test. The weak exogeneity test results are displayed in the Table A5.9 (see appendix A4). As shown in Table A5.9, the null hypothesis of the weak exogeneity test cannot be rejected at the 5 % significance level for the majority of the foreign variables considered. More specifically, the assumption of weak exogeneity does not hold for the CPI in the Argentina and Norway models, M2 in the model for Canada, and the equity prices index in the models for France and Singapore. Given that the assumption is ruled out only for 5 out of 300 foreign variables, which is negligible, therefore we proceed with the estimation of GVAR model.

5.6.5. Average pairwise cross-section correlations

Another requirement for the validity of the GVAR model is that the idiosyncratic shocks of the individual country model have to be cross-sectionally "weakly correlated". This implies that the covariance between the foreign variables and the error terms tends to zero as the numbers of the countries goes to infinity: $cov\ (x^*_{it,} u_{it,}) \rightarrow 0$ as $N \rightarrow \infty$. Once this condition is satisfied, the weak exogeneity assumption of the foreign variables in the GVAR model is ensured. The main concept is that since the country-specific models are conditioned by weakly exogenous foreign variables, viewed as proxies for the 'common' unobserved global factors, it is sensible to anticipate that the correlation of the variables shocks in each country in the GVAR model will be potentially idiosyncratic or modest.

In order to check whether this condition is met in our model, the average pairwise cross-section correlations for the domestic (endogenous) variables of each country is computed. This computation is done for both the level and the first differences of the domestic variables. In addition, the average pairwise cross-section correlations of the residuals obtained from the estimation of each country-VECMX* model is calculated, which includes both the domestic and foreign (exogenous) variables.

In Table A5.10 (Appendix A5), the three sets of average pairwise cross-section correlations results are summarized. It can be seen that the average cross-section correlations are generally high for the level of the domestic variables. However, it decreases when the first differences of these variables are considered. The degree of this correlation depends on both the variable and country. Noticeably, compared with the first two sets when the domestic variables were only considered, the average pairwise cross-section correlations results of the residuals of the estimation of the individual country VECMX* models are found to be much lower for all variables in all countries. Among the variables in levels, country specific money supply (M2) shock appears to be the most correlated variable with the money supply (M2) variable of the rest of the world. For example, the maximum correlation is 0.86 for Brazil, 0.97 for Russia and China, 096 for India and 0.91 for South Africa. In contrast, the correlation tends to be smaller with respect to the first differences of the variables that are found to be 0.01 for Brazil, 0.03 for China, 0.13 for Russia, -0.01for India and 0.06 for South Africa. However, the effect of the cross-section correlation of the residuals from the VARX* models has the most remarkable contribution to lower or even disappear the correlation of each variable shock with the rest of the world. Thus, we can conclude that the foreign variables in the country specific model estimation in the GVAR approach have effectively reduced the common correlation factors across countries and thus allows us to simulate shocks that are mainly country- specific.

5.6.6. Persistence Profiles

The validity of the long-run cointegrating relations in the GVAR methodology can be analysed by considering their persistence profiles (PPs) (Pesaran and Shin, 1996). Specifically, the PPs enable us to assess the time that the system needs to take to converge or return to its long-run equulibruim states, after being hit by shocks on the exactly underlying cointegrating vectors. The PPs are normalized to take the value of unity on impact and if the identified cointegrating vector is valid, they are expected to be converging toward zero value at fast rate. Figure B4.1 (see Apndix B4) displays the persistence profiles (PPs) and show that over a simulation horizon of 40 quarters, almost all countries return to their equilibrium within 6 to 14 years[11].

5.7. DYNAMIC ANALYSIS

This section presents the dynamic analysis of a positive shock to financial development and the GDP responses in the BRICS countries. As highlighted in the data section, financial development is measured in three different ways; credit supply to the private sector (P), money supply (M2) and equity prices index (Eq). The GVAR model (of order 3) is utilized to stimulate the effects of shocks to the selected variables and generate the responses of other variables in the system.

In order to avoid the difficulty of identifying the structural shocks in the GVAR model, the current study employs the Generalized Impulse Response Function (GIRF) introduced by Koop et al. (1996) and adapted to VAR models in Pesaran and Shin (1998). In this regard, PSW (2004) have shown that applying GIRFs may be more preferable as they are invariant to the order of the equations in the system. Thus, the GIRFs show what is most likely to happen after the shock. The results shown in this section are based on 1000 replications.

To this end, the dynamic analysis of the current section includes three subsections as follows; First section represents the effect of positive shocks to financial development on the same country's GDP. This includes the five countries of BRICS region; Brazil, Russia, India, China and South Africa (see section 5.7.1). The second subsection shows the financial development spillover impact on economic growth within the BRICS group (see section 5.7.2). More specifically, this section demonstrates

[11] In the case of the US, the country return to the equilibrium in response to shock at very slow rate (20 years), this can be referred to the impact of the financial crisis which has been considered in our sample period.

the GDP responses in each BRICS country to the positive shocks to the selected financial development indicators in other BRICS countries. Finally, in the third section, the BRICS countries are treated as one economy, and hence we consider the aggregate GDP response to a positive shock to financial development within the BRICS as a whole (see section 5.7.3).[12]

5.7.1. Within-country GDP responses to positive shocks to financial development

Figure 4.1, 4.2 and 4.3 display the estimated GIRFs of a one standard error (1SD) increase in financial development variables on GDP in each individual BRICS. The individual country GDP responses to shocks to financial development could be classified into three categories**;** positive shock to credit supply, positive shock to money supply and positive shock to equity prices index.

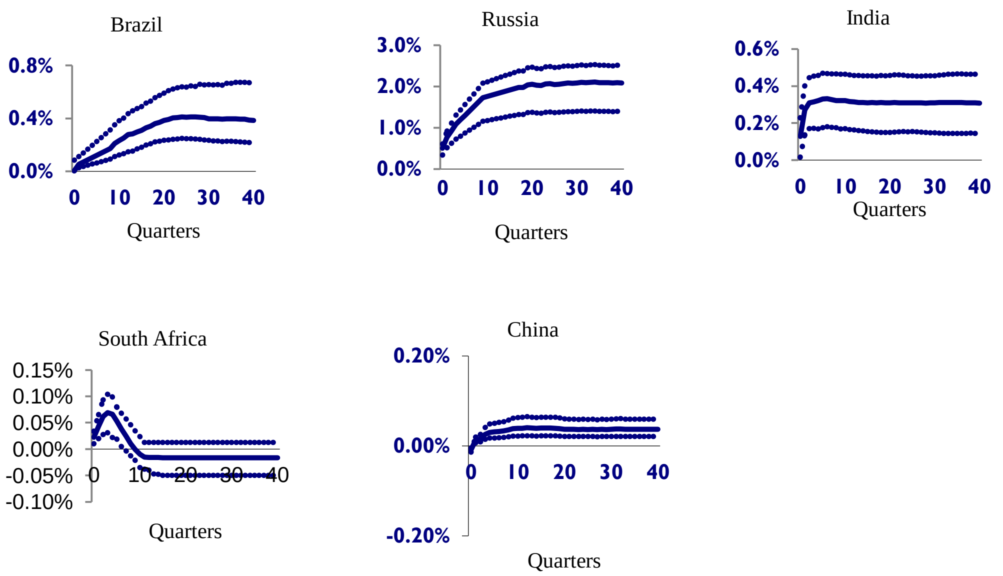
5.7.1.1. Positive shock to credit supply

In order to investigate the link between financial development, measured by credit supply, and economic growth, we stimulate a one standard deviation (1SD) shock to the 'credit supply' variable within each country in the BRICS region, and estimate the GDP response to the shock within the same country. Results, reported in Figure 5.1, show evidence of positive and statistically significant GDP response to the positive shocks to credit supply in all of the BRICS countries. Interestingly, the GDP response to the credit shock seems to be the highest in the case of Russia where the immediate response was 0.5 % and increased to 1% in quarter 3, while it persists at around 2% starting from quarter 8. The GDP response was positive and statically significant, but much weaker, in the case of China and South Africa. In China, there is a positive and significant GDP

[12] Given the sizable output of the GVAR model and for brevity's sake, the discussion is narrowed down to only statistically significant GDP responses to different type of shocks.

response to the shock where it was almost zero from the first to the third quarter and became 0.03% from the end of the first year and onwards. However, the South African GDP responded immediately to the credit shock where the effect was positive and statistically significant and equivalent to 0.02% which increases to 0.7% in quarter 4. In contrast to China, the GDP response in South Africa decreased after the first year and was almost 0.01% in quarter 8, which turns to be insignificant from quarter 7 and onwards. In Brazil, there was an immediate response. By the end of year 1, the GDP response was 1% increase which became 2% in the second year. This effect persists at around 0.3% increase in the GDP from quarter 13. Finally, the Indian GDP response started immediately at 2% positive and significant change while it increases to 0.5% from quarter 5 and continues to be the same afterwards.

Figure 5.1. GDP responses to one SD credit supply shock in each individual BRICS.

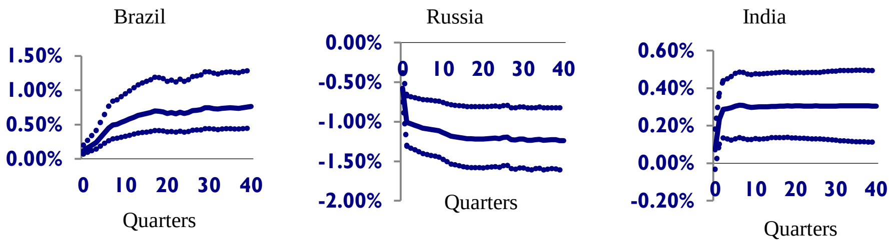


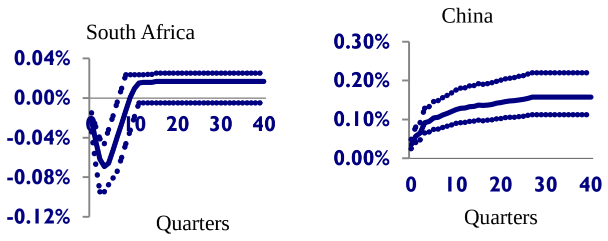
5.7.1.2. Positive shock to money supply

Figure 5.2 displays the GIRFs of a 1SD positive shock to money supply in each individual BRICS and its effect on GDP within the same country. The results of the money supply shocks are mixed among the BRICS. In detail, some countries show a significant positive response such as Brazil, India and China, whereas Russia and South Africa exhibit a significant negative GDP response. In particular, the GDP positive responses to the money supply shock were around 0.6 %, 0.3% and 0.1% in Brazil, India and China, respectively. India GDP immediate response was the highest, 0.1% change in quarter zero, compared to almost no response in Brazil and China in the same quarter.

In addition, countries that show statistical significant negative responses to the shock are Russia and South Africa. A negative response is observed in Russia where its GDP decreases by 1 % as a response to the underlying shock, which appears to be a long-lasting effect. As regards South Africa, there is a negative relationship between a 1SD positive shock to money supply shock in South Africa and economic growth in the same country, where GDP decreased by 0.06 % after the shock. However, this response seems to be statistically insignificant after 2 years.

Figure 5.2. GDP responses to one SD money supply shock in each individual BRICS.

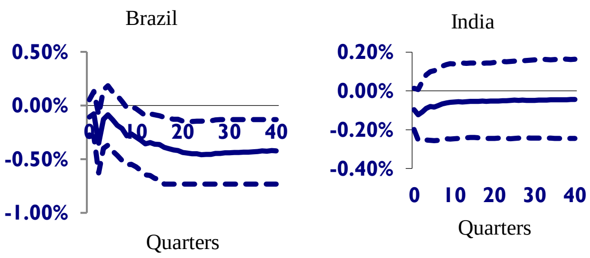


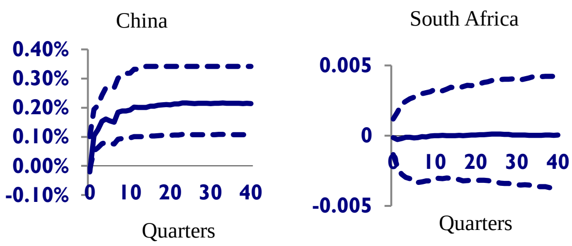


5.7.1.3. A positive shock to equity prices index

The GDP response to a 1SD positive shock to equity prices index in individual BRICS countries are presented in figure 5.3 It shows that neither India nor South Africa has a significant connection between financial development measured by equity price and economic growth. Only China shows a positive and statistically significant response where its GDP increases by 0.1 % as a result of the shock. This effect persists around 2% change in GDP after the first year. Furthermore, there is a negative relationship in the case of Brazil. However, it becomes statistically significant only after the second year. Finally, we were unable to stimulate a positive shock to equity prices index in Russia due to data limitation.

Figure 5.3. GDP responses to one SD Equity price shock in each individual BRICS.





5.7.2. Financial development spillover and economic growth in the BRICS region

As a second exercise, we examine whether financial development in one BRICS member state has any impact on GDP in another BRICS members, which is one of the key contributions of this study. Figures 5.4 to 5.17 report the GIRFs related to a positive shock to financial development variables in one of the BRICS and its impact on economic growth on the other BRICS countries. As in the previous subsection, we implement positive shocks to credit supply, money supply and equity prices index.

First, Figures 5.4 to 5.8 present the GDP responses to a 1SD positive shock to credit in one BRICS and its effect on the GDP of the other BRICS countries. Figure 5.4 shows no evidence of financial development spillover effect from Brazil to the real economy of any of the BRICS, where all GIRFS seem to be statistically insignificant. Furthermore, with only few exceptions, we could draw a similar conclusion for Russia (Figure 5.5), India (Figure 5.6), China (Figure 5.7), and South Africa (Figure 5.8). The exceptions are statistically significant GDP responses found between India and China. In Figure 5.6, a 1SD increase in credit supply in India is more likely to lead to a positive and statistically significant 1% change in the Chinese GDP. Similarly, Indian GDP seems to positively respond to credit supply shock in China as Figure 5.7 shows. In addition to this pattern, Figure 5.6 shows a positive response of the GDP in South

Africa to a positive shock to credit supply in India. In Section 5.8, we try to rationalise these findings in light of the existing literature.

Second, Figures from 5.9 through 5.13 present the GDP responses to a 1SD positive shock to money supply in one BRICS country and its effect on the GDP of the other BRICS countries. According to the GIRFs in these graphs, there is no statistically significant evidence of financial development spillover in terms of positive shock to money supply on output growth among the BRICS economies. More specifically, the GDP responses appear to be trivial and very close to zero in all countries. We shall elaborate more in explaining such insignificant responses in Section 5.8.

Finally, Figures 5.14 through 5.17 present the GDP responses to a 1SD positive shock to equity prices index in one specific BRICS country and its effect on the GDP of other BRICS countries. Similar to the money supply spillover, we do not observe any statistically significant spillover impact of equity prices index on GDP within the BRICS region. As well, we explain this in Section 5.8.

Figure 5.4. GDP response to 1SD credit supply shock in Brazil.

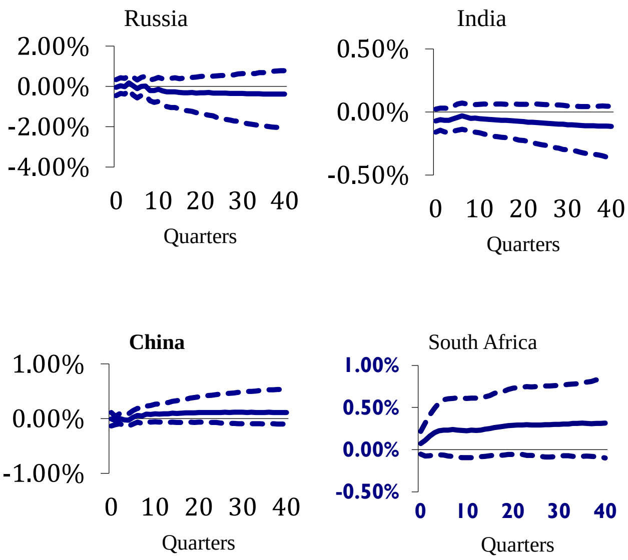


Figure 5.5. GDP response to 1SD credit supply shock in Russia.

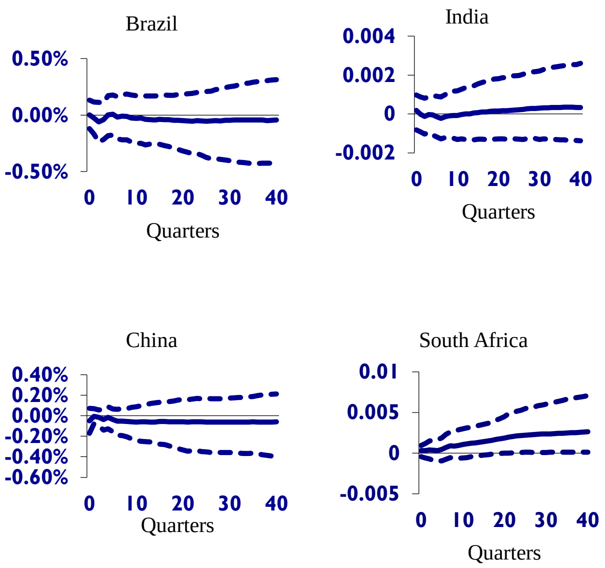
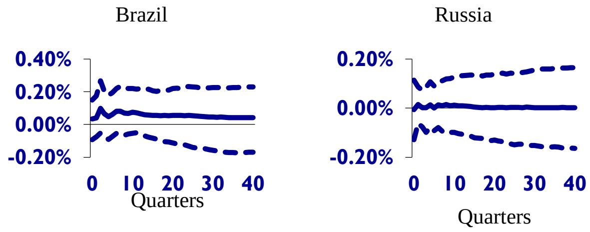


Figure 5.6. GDP response to 1SD credit supply shock in India.



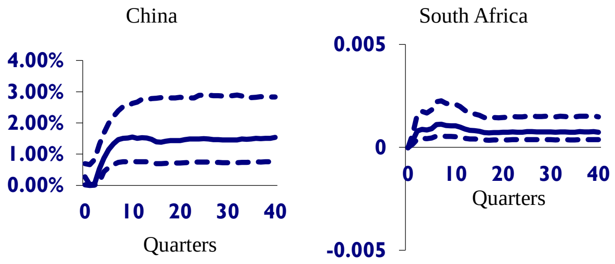


Figure 5.7. GDP response to 1SD credit supply shock in China.

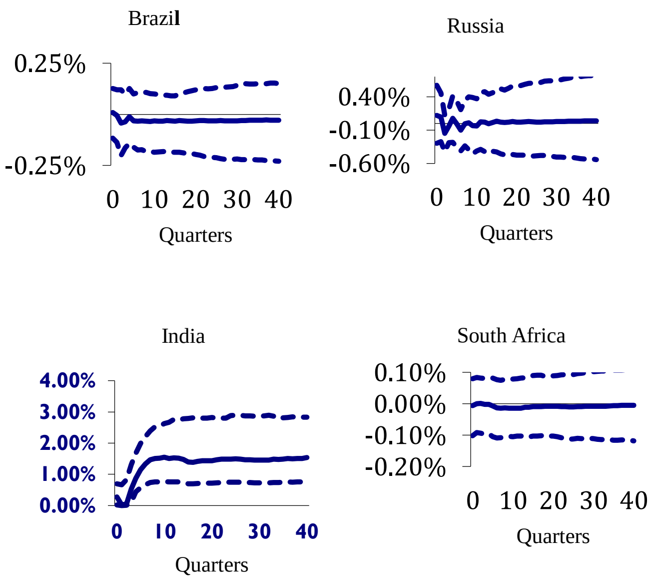
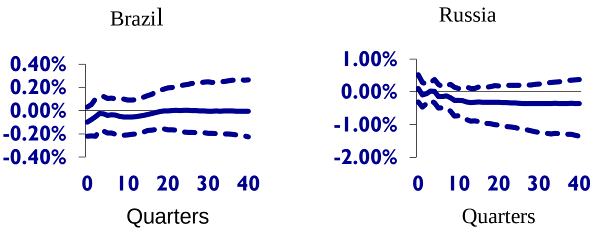


Figure 5.8. GDP response to 1SD credit supply shock in South Africa.



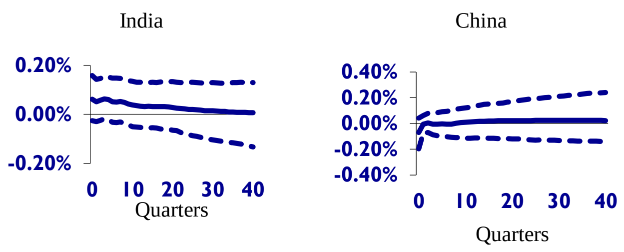

India
0.20%
0.00%
-0.20%
0 10 20 30 40
Quarters
China
0.40%
0.20%
0.00%
-0.20%
-0.40%
0 10 20 30 40
Quarters

Figure 5.9. GDP response to 1SD money supply shock in Brazil.

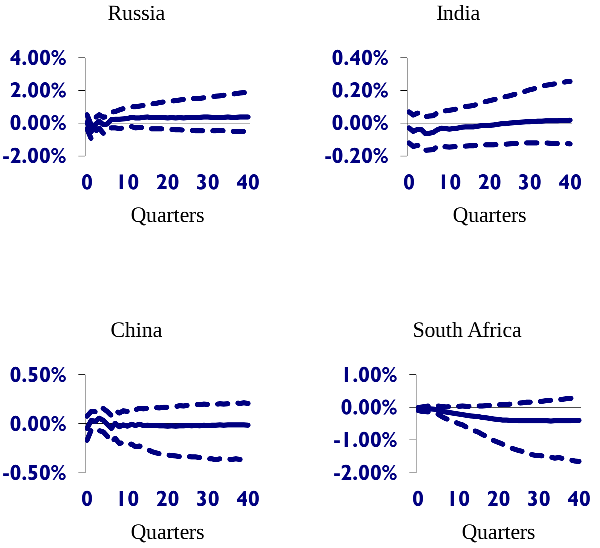


Figure 5.10. GDP response to 1 SD money supply shock in Russia.

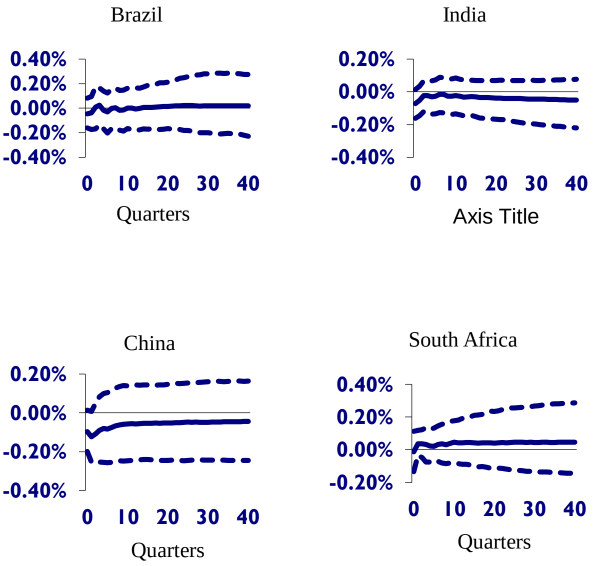


Figure 5.11. GDP response to 1SD money supply shock in India.

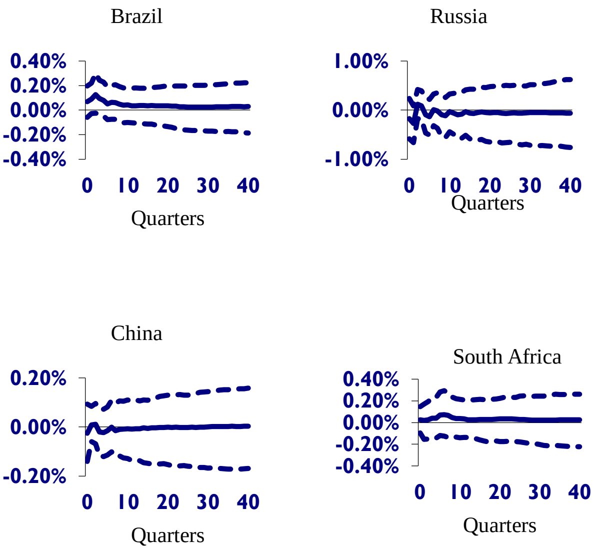


Figure 5.12. GDP response to 1SD money supply shock in China.

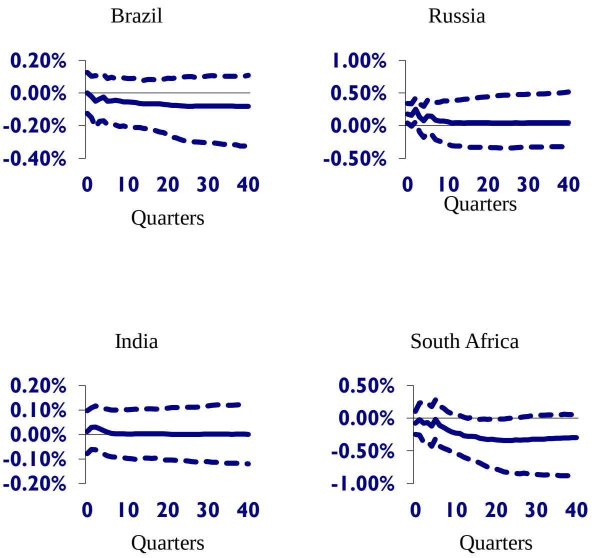


Figure 5.13. GDP response to 1SD money supply shock in South Africa.

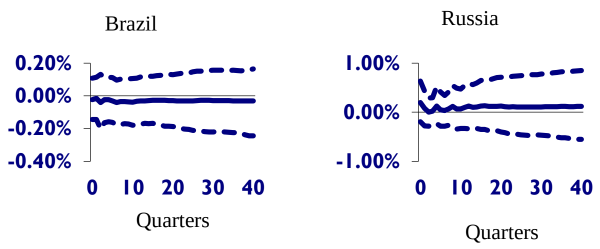


Figure 5.14. GDP response to 1SD shock to equity prices index in Brazil.

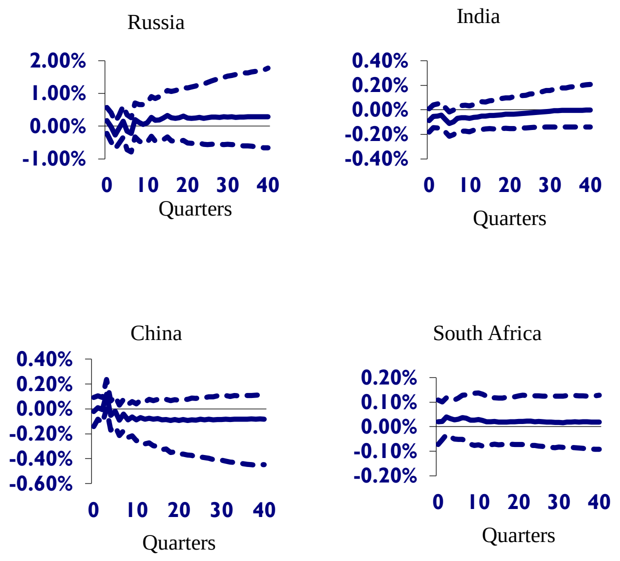


Figure 5.15. GDP response to 1SD shock to equity prices index in India.

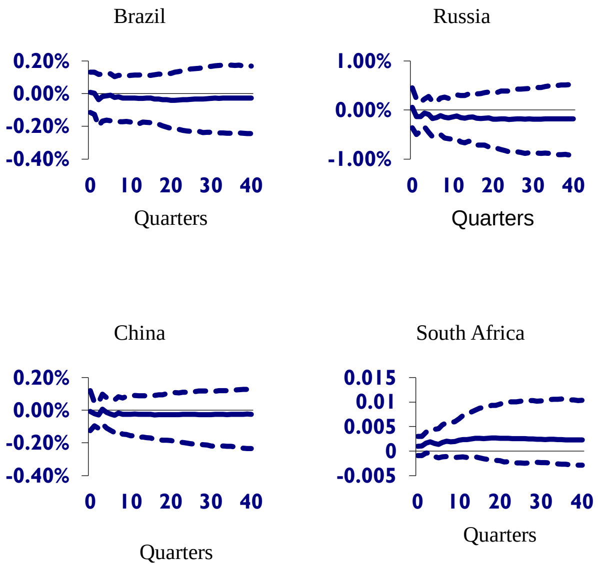


Figure 5.16. GDP response to 1SD shock to equity prices index in China.

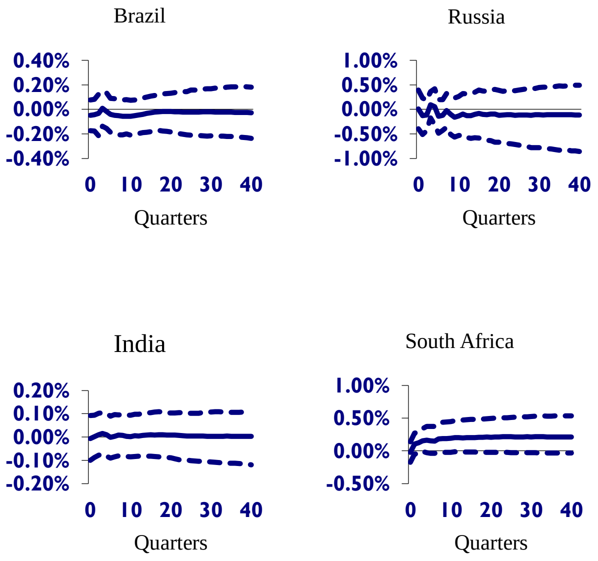
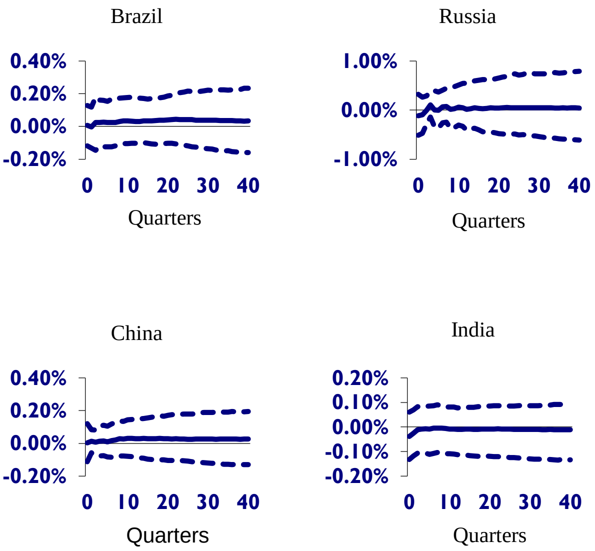


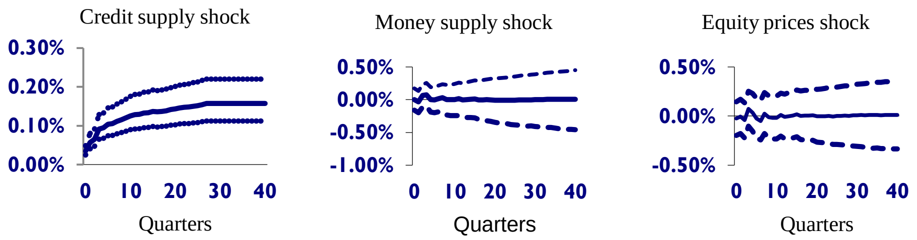
Figure 5.17. GDP response to 1SD shock to equity prices index in South Africa.



5.7.3. BRICS GDP response to a regional positive shock to financial development

One of the advantages of the GVAR model is that one can group countries into a region and treat that region as one economy. We exploit this feature and pool all the BRICS countries into a single region. Countries are weighted according to their contributions to the total regional output. Then we stimulate a positive shock to financial development in the region (i.e. simultaneous improvements to financial conditions in all BRICS countries). Thus, we examine the growth impact of financial development in this artificially created economy. Figure 5.18 shows the GIRFs of the regional GDP responses to different shocks to financial development indicators. The striking result regarding the BRICS region is that only a positive shock to credit supply in the BRICS region seems to positively affect the GDP in the same region. In contrast, GDP growth overall does not appear to be sensitive with respect to the other financial development indicators (i.e, money supply or equity prices index).

Figure 5.18. BRICS regional GDP responses to 1SD regional shock to financial development.



5.8. SUMMARY AND DISCUSSION

Prior to measuring the spillover or regional impact of financial development across countries' borders, it is sensible to measure its impact on the local economy. Table 5.9 shows a summary of how the GDP of each of the BRICS countries was affected by the different types of financial development shocks (P, M3 and Eq) during the study period. The first panel in table 5.9 shows the effect of a credit shock to each individual BRICS member. It can be seen from table 5.9 that credit to the private sector has a positive significant impact on the local GDP growth in all BRICS economies. This finding is in line with the endogenous growth model (see Jung 1986; Greenwood and Jovanovic, 1990; Roubini and Sala-i-Martin, 1992) and consistent with numerous empirical studies, such as King and Levine (1993a, b); Levine (1997); Levine and Zervos (1998); Neusser and Kugler, (1998); Rousseau and Wachtel (1998) and Levine (2005). In contrast, the results of the effect of money supply and equity price shocks on GDP of each BRICS country were mixed. In the following sections, these results will be discussed in detail.

The results for Brazil are not a surprise. Since 2003, Brazil has gradually enhanced its macroeconomic stability, reinforcing foreign reserves, and reducing its debt. The

GDP response after the credit to private sector shock is positive and significant. From 1992 to 2012 the domestic credit to private sector share of GDP expanded dramatically from 97.12% to 124.28 % (Table 5.7). Expansion of the credit might be directed to productive investments, which in turn fosters economic growth. This result is confirmed by Stefani (2007) who found evidence of a positive and significant relationship between financial development, measured by credit, and economic growth. In the same way, during 1992 to 2012, money supply increased from 59.42% to 71.21% (Table 5.7), which might be conducive to economic growth. However, In spite of the fact that the Brazilian financial structure is classified as a market-based, a puzzling result regarding the equity shock is obtained. The GDP response to the equity price shock was found negligible or even negative. This result contrasts with Stefani (2007) who found that the stock market capitalization contributes to the economic growth in Brazil. This rather contradictory result may be due to the differences in the sample period between the current study and Stefani (2007) study.[13] Another possible explanation is that the stock market is still not developed enough and needs to pass a certain period to experience a significant impact on economic growth.

In the case of Russia, among the three measures of financial development, only the credit to private sector shock appears to significantly boost the growth of the Russian economy. In contrast, the shock to money supply seems to hinder the GDP growth. The GVAR model could not determine the consequences of the shock to equity price on the Russian economy due to insufficient data.

The paradoxical result of credit and money supply shocks in Russia might be attributed to the characteristics of the Russian economy. More specifically, the Russian economy had undergone massive changes and converted from a state controlled or

[13] The Stefani (2007) sample period covered 1968-2006.

socialist market to a globally integrated economy. Hence, the role of privatization was crucial for economic development. In other words, the role of the banking sector in providing credit was vital to spur the economic growth (Bonin and Wachtel, 2003). The fact is that in the 1990s many sectors such as the industrial, energy and defence sectors became privatized. Those sectors played a role in the integration with the global economy. As regards to the negative impact of the money supply shock on economic growth, it contrasts with Ono (2012) who found that money supply causes the economic growth in Russia. This inconsistency between Ono's study and the current study may be due to different time periods or different methodologies used in the two studies.

In the context of India, the results of the credit and money supply are along expected lines. In fact, in the early 90's, the Indian financial sector underwent major changes as a consequence of economic reforms. The changes included different aspects of the Indian financial sector, such as increasing the liberalisation of the financial system, improving both the banking services and management of priority sector lending, and strengthening the measures of risk management (Mohan, 2005). Furthermore, as part of the financial reform, the numbers of rural branches of banks has increased sharply. As a result, deposit and savings have risen remarkably and the geographical coverage of banking services to provide credit services has expanded. The allocation of credit was mainly prioritised for agriculture, agro-processing and small-scale industries (Fulford, 2013; Bhaumik et al, 2011; Mohan, 2005). On top of that, Deakin et al. (2010) indicate that the reform program in India in the 1990s and 2000s were not limited only to the economic and financial sectors, but it also included legal reforms. The legal reforms in India strengthen creditor protection, which in turn leads to the enhancement of the development of the Indian banks.

With regard to the positive and significant impact of money supply shock on the GDP growth in India, Bhaumik et al, (2011) indicate that expansionary monetary policy lowered the interest rate in Indian economy, which led to reduction of the cost of investment. Moreover, it indirectly fostered banking performance and mobilized the credit disbursement and promoted macroeconomic stability. Singh, (2008) among others finds that financial development raises investment levels and accelerated efficient capital allocation, hence it promotes economic growth. Given the fact that Indian's economy underwent remarkable reform programs, the insignificant impact of the equity price shock on GDP growth might seem surprising at first. However, this can be attributed to the fact that the banking sector in India is still considered as the dominant sector in providing finance to non-state or corporate sectors rather than financial markets. Nevertheless, it is expected that the stock market will play much more significant role in the economy in the near future. Overall, it can be concluded that the active reform programs in India, have contributed to making the Indian financial sector more efficient, competitive and stable.

Turning to the findings for China, China's GDP showed better responses to the shocks of the three indicators of financial development as compared with the other BRICS. This result is as expected, because as with India, starting from 1978, China experienced gradual but significant reforms in the economic and financial system (Srinivasan, 2004; Zhang et al., 2012). These changes have been reflected in improving the performance of the Chinese financial sector and lead to it being more liberalised (see Hao, 2006; Sen 2007; Zhang et al., 2012). Furthermore, the result of the current study is consistent with the findings of a number of researchers who found that financial development significantly promotes growth in China (See for example, Hao, 2006; Cheng and Degryse, 2010; Guariglia and Poncet , 2008; Xu and Ho, 2011). However, this result differs from some studies (see the findings of Boyreau-Debray, 2003; Allen et al. 2005 and Hasan et al., 2009). They find that financial development and economic growth are negatively related. They explain their results in terms of the financial sector of China being largely under the central government's control, which results in a larger misallocation of financial resources.

The finding for South Africa is quite similar to Russia. The results show that when a positive shock occurs in domestic credit to the private sector, it promotes economic growth. As discussed in the dynamic analysis section, although the South African GDP responds immediately to the credit shock where the effect was positive and statistically significant, this response turned out to be insignificant after the quarter 7. This result is consistent with Honohan and Beck, (2007), who indicate that pooling savings in South Africa does not necessary represent financial deepening. Furthermore, Demetriades and James (2011), state that Sub-Saharan Africa banks in general do not lend enough due to many problems in asymmetric information and weak contract enforcement. Hence, they suggest that it’s crucial for the banking sector in these countries to strengthen the creditor protection laws and related informational infrastructure, including credit information bureaus. Moreover, Andrianova et al. (2014) confirm that among African countries, South Africa in particular has a well-developed and modern baking system, while financial regulation and capital market still remain underdeveloped. Given the fact of weak regulation and weak institutional quality, expansionary monetary policy hindered the growth in South Africa, which is in line with the study by Ncube (2007). The impact of equity shock is undefined due to lack of data. In addition, the financial sector in South Africa is relatively small in comparison to India, China, Russia or even Brazil.

Table 5.9. Within-county GDP responses to positive shocks to financial development.

	P shock	M2 shock	Eq shock
GDP response in Brazil	+	+	-
GDP response in Russia	+	-	NA
GDP response in India	+	+	#
GDP response in China	+	+	+
GDP response in South Africa	+	-	#

Note: the table summarizes the individual country GDP responses to positive shocks to financial development indicators. (+) sign denotes a statistically significant positive response, (-) sign denotes a statistically significant negative response, (#) denotes to a statistically insignificant response and (NA) denotes an unavailable response due to data limitation.

The second objective of this study was to determine the spillover impact of the financial development on economic growth among the BRICS countries. Tables 5.10 to 5.14 summarise the spillover results among the BRICS. As can be seen, none of the indicators of financial development in Brazil, Russia and South Africa have a significant spillover effect on the economic growth in the rest of the BRICS. This finding indicates that the domestic financial sectors of these countries have yet to mature to exert the spillover effect to the BRICS partner countries. It can also be taken as an indication that the financial sectors in these three countries are too small to affect the other BRICS, and/or these three countries are too far and insufficiently inter-related through trade for such effects to occur.

In contrast, striking results have been found in regards to India and China. More specifically, with regards to India, a positive shock to the domestic credit in India has a spillover effect on the economic growth of both China and South Africa. This finding is sensible with respect to the large volume of trade between China and India and India and South Africa (See table 5.4). Therefore, we speculate that this spillover effect takes place through the trade integration between the respective countries. The other indicators of financial development shocks, money supply and equity price, have insignificant spillover effects. Such connections that exist between India-China and India-South Africa could be explained by the earlier finding of the present study which shows evidence of the importance of the domestic credit to the private sector in promoting Indian domestic GDP growth. Hence, it could be suggested that the credit to private sector not only spurs the Indian local economy but it also has a spillover effect on the real sector of China and South Africa. Another possible explanation is that as discussed before the BRICS economies have worked to strengthen their trade and financial integration. Therefore, the increasing trade integration among BRICS members has been reflected in their financial integration as well. Given the fact that the GVAR framework of this study considers the trade matrix as the means of connecting the BRICS economies, it is expected to exert a significant spillover effect among them. According to that, it is imperative to highlight the bilateral trade relationships between India-South Africa and India-China. In fact, the past decade has witnessed a substantial surge of the bilateral India-Africa trade which has grown by nearly 32% annually between 2005 and 2011 (see, CII, WTO 2013). Even more importantly, Indian private investment in Africa has increased remarkably. According to the International Division of the Confederation of Indian Industry (CII) and the Development Division of the World Trade Organization (WTO) estimates, total Indian investments in Africa at the end of 2011 were US$14.1 billion. The Indian private investments in South Africa include different sectors, such as telecommunications, IT, energy, and automobiles sectors (see, CII, WTO 2013).

As for the mutual spillover impact of the credit to private sector in India and China (Table 5.10, 5.11), this would popularly attributed, largely, to the significant relation between India and China that has grown stronger (Zhang and Yu, 2013). In fact, the volume of bilateral trade between India and Chain has increased notably in the last two decades (See table 5.4). In 2000 the volume of trade was worth about $ 2.92 billion while it became $ 73.9 billion in 2011, (Wu and Zhou, 2006). Furthermore, Holscher et al. (2010) indicate that during 1985–88, the ‘‘open door policy’’ started in China. The main advantages of this policy are to support the integration of China into the world economy through both trade and FDI. Furthermore, with regard to the finding of the transmission of the financial development shock from China to India, this is in line with the finding of the study by Feldkircher and Korhonen (2012). By applying the GVAR model, they find that a positive shock to real Chinese output has a significant impact on the global economy. Furthermore, the response to the Chinese output shock was more pronounced in Brazil than India and Russia.

Based on the above discussion, it is clear that there is a strong association between India and South Africa and also there are mutual relations between China and India in term of trade integration as shown in Table 5.4. This association between these countries has mirrored the spread of the financial development shock across them. This spillover may take place through various macroeconomic channels, such as imports and exports demand, foreign direct investment, productivity and exchange rate (Moghadam, 2011). Particularly, trade integration has been found to be a prime source of economic growth in the growth literature (Wacziarg and Welch, 2008). A number of empirical studies have demonstrated that domestic financial development significantly promotes the sectoral composition of exports (Wacziarg and Welch, 2008, Moghadam, 2011). China is a major trading partner to India, and India is a major trading partner to South Africa which might explain how these countries influence the economies of the other countries. Eichengreen (2001) argues that financial integration without trade integration may hinder the efficient allocation of resources as capital inflows move to sectors with less comparative advantages. Furthermore, he concludes that integration helps to augment domestic saving, improve allocation of capital, and lower the cost of external capital.

Table 5.10. Across-country GDP responses to positive shocks to financial development in Brazil.

Shock in Brazil	P shock	M2 shock	Eq shock
GDP response in Russia	#	#	#
GDP response in India	#	#	#
GDP response in China	#	#	#
GDP response in South Africa	#	#	#

Note: the table summarizes the financial development shock in Brazil and the GDP response in the other member of the BRICS. (#) denotes a statistically insignificant response.

Table 5.11. Across-country GDP responses to positive shocks to financial development in Russia.

Shock in Russia	P shock	M2 shock	Eq shock
GDP response in Brazil	#	#	#
GDP response in India	#	#	#
GDP response in China	#	#	#
GDP response in South Africa	#	#	#

Note: the table summarizes the financial development shock in Russia and the GDP response in the other member of the BRICS. (-) sign denotes a statistically significant negative response and (#) denotes a statistically insignificant response.

Table 5.12. Across-country GDP responses to positive shocks to financial development in India.

Shock in India	P shock	M2 shock	Eq shock
GDP response in Brazil	#	#	#
GDP response in Russia	#	#	#
GDP response in China	+	#	#
GDP response in South Africa	+	#	#

Note: the table summarizes the financial development shock in India and the GDP response in the other member of the BRICS. (+) sign denotes a statistically significant positive response and (#) denotes a statistically insignificant response.

Table 5.13. Across-country GDP responses to positive shocks to financial development in China.

Shock in China	P shock	M2 shock	Eq shock
GDP response in Brazil	#	#	#
GDP response in Russia	#	#	#
GDP response in India	+	#	#
GDP response in South Africa	#	#	#

Note: the table summarizes the financial development shock in China and the GDP response in the other member of the BRICS. (+) sign denotes a statistically significant positive response and (#) denotes a statistically insignificant response.

Table 5.14. Across-country GDP responses to positive shocks to financial development in South Africa.

South Africa	P shock	M2 shock	Eq shock
GDP response in Brazil	#	#	#
GDP response in Russia	#	#	#
GDP response in India	#	#	#
GDP response in China	#	#	#

Note: the table summarizes the financial development in South Africa and the GDP response in the other member of the BRICS. (#) denotes a statistically insignificant response.

The third aim of this research was to assess whether financial development in the BRICS region spurs economic growth of BRICS as a whole. Table 5.15 reveals that economic growth is fostered by shocks to credit to the private sector in the BRICS region. In contrast, the shocks to money supply and equity prices insignificantly affect growth. One possible explanation of this result is that the study found evidence of the significant role of domestic credit to the private sector in promoting the economic growth within all the BRICS countries. Hence, it would be expected to have a cross-boundary impact as well. The channel through which credit to the private sector can help to raise economic growth in BRICS could be domestic savings. Moreover, this result is in line with a view that bank credit has a significant role in transmitting global financial shocks. For example, Xu (2012) found that a negative shock to credit in the US is transferred to the real economy of the UK, the Euro area, Japan and other industrialized countries. Indeed, financial integration may not help growth directly, but it helps indirectly through financial market development, institutional development, and macroeconomic aspects (Kose et al. 2010).

In summary, together these results provide important insights into the importance of India and China in shaping much of world economy this century. Consequently, a key challenge for Indian and Chinese policymakers is to ensure that BRICS financial ties continue to enhance local banks' links to the other BRICS member globally and help boost domestic savings. Therefore, it is crucial that the Indian and Chinese government work toward improving the investment climate. In future investigations, it might be possible to see the impact of financial integration on other economies such as G7, Oil exporting countries, etc.

Table 5.15. Within-BRICS GDP response to positive regional shock to financial development.

BRICS FD socks	P shock	M2 shock	Eq shock
GDP response in BRICS	+	#	#

Note: the table summarize the financial development in BRICS and the GDP response in the BRICS; treated as a single economy. (+) sign denotes a statistically significant positive response and (#) denotes a statistically insignificant response.

5.9. CONCLUSIONS

This chapter aims to investigate three facets of the impact of financial development on economic growth. Specifically, we first focus on how economic growth in each BRICS economy is affected by financial development shocks. As for the second facet, we concentrate on the international transmission of the financial development shocks across the BRICS economies. Accordingly, we identify financial development shocks originating in one of the BRICS and then trace their effect on the economic performance of the other BRICS. Finally, the third facet is to highlight the importance of financial integration among the BRICS. In particular, we assess whether financial development in the BRICS region helps to foster growth within the region. In order to examine the above-mentioned aspects, this study applies the GVAR model on a sample of 34 countries over the period 1989Q1-2012Q4. In particular, this model provides a computationally convenient tool to address our aims in a global framework.

The main results of the empirical analysis are twofold. First, the only measure of financial development that consistently affects economic growth is credit to the private sector. This finding obtains at three different levels of the analysis: when studying the effect of credit-market shocks on growth within the same country, when considering the spillover effects of shocks in one country to the other BRICS, and the same pattern is again observed when we consider the BRICS as a single region instead of looking at individual countries. In contrast, the results obtained with the money supply and equity price index are mixed or insignificant.

Second, not all of the BRICS can be considered global heavyweights with respect to the international transmission of shocks and their impact on economic growth. In fact, only financial development shocks in China and India have any spillover effects on the growth of the other countries. In other words, it is the IC in BRICS that matters at the global stage, whereas the BRS remain relatively unimportant. Further research will show whether this is due to the relative size of the countries, whereby China and India dwarf the remaining three, or whether this finding is driven by the extent to which these two countries' economies have become integrated into the global economy.

The empirical results of this study have important policy implications for the BRICS economies. Although the findings show some evidence of the BRICS being on the path of greater financial integration, there are still more steps to be undertaken to achieve a maturity level of this international integration that would lead to maximum possible gain for the economy. On the one hand, compared to the banking sectors, equity markets in the BRICS are less effective in promoting economic growth. This suggests that BRICS need to work toward optimizing financial integration and increasing financial cooperation between them as this would be associated with better growth opportunities and risk-sharing among them. On the other hand, it is essential to pay greater attention to the quality and type of financing rather than expanding the financial sector in order to achieve a deeper financial sector. Moreover, in an international context, BRICS have to increase the globalization of their banking sectors. For example, similarly to the European Union, it is possible to establish a single set of bank rules among them to ensure the provision of equal access to financial instruments and financial services to promote financial integration.

APPENDIX A5

A5.1. Data

We employ quarterly data for 34 countries[1] covering the period of 1989Q1 to 2012Q4. The data in this study obtained DataStream (Table A5.1. shows the datastream hits). The variables of interest are real GDP (gdp), Consumer Price Index (CPI), Equity Price index (equity), Broad Money supply (M2), Credit to private sector (credit) and oil price. A logarithmic transformation has been applied to all the variables used in our dataset for the common statistical reasons. Furthermore, whenever seasonally unadjusted data collected from the source, the X-12-ARIMA seasonal adjustment in Eviews package was used.

Real per capita GDP:

Data collected were not seasonally adjusted. Data for the real per capita GDP (all items) are collected for all countries.

Consumer price index CPI:

Seasonally unadjusted data for the CPI (all items) are collected for all countries.

Deposit Money Banks: Claims on Private Sector (CR)

The data were available for all countries except, Austria, Belgium, Brazil, Finland, France, Germany, Italy, Netherland, Philippines, Spain and Switzerland.

Money supply M2

Data collected were not seasonally adjusted. There were no data available for Ecuador, Spain and Venezuela.

Equity price index:

Data for equity price index are computed as the quarterly average of the Morgan Stanley Capital International (MSCI) Emerging Markets index[2]. Data for Canada, Ecuador, Russia, and Venezuela are missing.

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[1] Table A.5.2 shows the list of countries.

[2] MSCI country index is "a free oat-adjusted market capitalization weighted index that is designed to measure the equity market performance in the underline country", see Datastream manual for more details about calculating the MSCI index.

Oil price index:

The oil price index is the OPEC oil basket price are obtained for current month free on board (F.O.B) in US $/Barrel from January 1989 to December 2012 (hit T42463(P) in Datastream). These were averaged to obtain the quarterly index.

Trade matrix:

We use the directions of Trade statistics database (DOTS) from the International Monetary Fund (IMF) to construct the bilateral trade shares matrices for all countries. We computed the shares of exports and imports (c.i.f.) over the period 1989 to 2012 with annual frequency for all the countries considered in our model. The 34×34 trade-weight matrix is displayed in appendix A4 (see Table A5.3**)**. The importance of this matrix is that it's connecting up the models of different countries together and highlights the extent of the dependency of one country/region on the remaining countries which enable us to construct the weight matrix that required to generate the foreign variables in each of the country models.

Table A5.1. Data Source- Stream hits.

Country	GDP	CPI	EQITY	M2	CREDIT	OIL	PPP-GDP
Argentina	AGXGDHD.C	AGQ64...F	MSARGTL	AGXMON..A	AGQ32D..A	T42463(P)	WDI-World Bank
Australia	AUXGDHD.C	AUI64...F	MSAUSTL	AUXMON..A	AUQ32D..A		
Austria	OEXGDHD.C	OEQ64...F	MSASTRL	OEXMON2.A	.		
Belgium	BGXGDHD.C	BGQ64...F	.	BGXMON2.A	BRQ22D..A		
Brazil	BRXGDHD.C	BRQ64...F	MSBRAZL	BRXMON2.A	CNQ32D..A		
Canada	CNXGDHD.C	CNQ64...F	MSCNDAL	CNXMON2.B	CLQ12D..A		
Chile	CLXGDHD.C	CLXCPI..F	MSCHILL	CLXMON2.A	CHQ32D..A		
China	CHXGDHD.C	CHXCPI..F	MSCHINL	CHXMON2.A	EDQ12D..A		
Ecuador	EDI99BIPC	EDQ64...F	.	.	MYQ22D..A		
Finland	FNXGDHD.C	FNQ64...F	MSFINDL	FNXMON2.A	MXQ22D..A		
France	FRXGDHD.C	FRQ64...F	MSFRNCL	FRXMON2.A	.		
Germany	BDXGDHD.C	BDQ64...F	MSGERML	BDXMON2.B	INQ32D..A		
India	INXGDHD.C	INQ64...F	MSINDIL	INXMON2.B	IDQ12D..A		
Indonesia	IDXGDHD.C	IDQ64...F	MSINDFL	IDXMON2.A	JPQ32D..A		
Italy	ITXGDHD.C	ITQ64...F	MSITALL	ITXMON2.A	MYQ22D..A		
Japan	JPXGDHD.C	JPQ64...F	MSJPANL	JPXMON2.B	MXQ22D..A		
Malaysia	MYXGDHD.C	MYQ64...F	MSMALFL	MYXMON2.A	.		
Mexico	MXXGDHD.C	MXQ64...F	MSMEXFL	MXXMON2.A	NZQ22D..A		
Netherlands	NLXGDHD.C	NLQ64...F	MSNETHL	NLXMON2.A	NWQ12D..A		
New Zealand	NZGDPPCAC	NZI64...F	MSNZEAL	NZQMA001E	PEQ32D..A		
Norway	NWXGDHD.C	NWQ64...F	MSNWAYL	NWXMON2.A	.		
Peru	PEGDP...C	PEQ64...F	MSPERU$	.	RSQ22D..A		
Philippines	PHXGDHD.C	PHQ64...F	MSPHLFL	PHXMON2.A	SPQ32D..A		
Russia	PEGDP...C	PEQ64...F	MSPERU$	RSXMON2.A	SAQ52D..A		
Singapore	SPXGDHD.C	SPQ64...F	MSSINGL	SPXMON2.B	.		
South Africa	SAXGDHD.C	SAQ64...F	MSSARFL	SAXMON2.A	.		
Spain	ESXGDHD.C	ESQ64...F	MSSPANL	ESXMON2.A	SWQ32D..A		
Sweden	SDXGDHD.C	SDQ64...F	MSSWDNL	SDXMON2.A	THQ22D..A		
Switzerland	SWXGDHD.C	SWQ64...F	MSSWITL	SWXMON2.B	TKQ32D..A		
Thailand	THXGDHR.C	THQ64...F	MSTHAFL	THXMON2.A	UKQ22D..A		
Turkey	TKXGDHD.C	TKQ64...F	MSTURKL	TKXMON..A	USQ42D..A		
UK	UKXGDHD.C	UKQ64...F	MSUTDKL	UKXMON2.B	VEQ52D..A		
US	USXGDHD.C	USQ64...F	MSUSAML	USXMON2.B	USQ42D..A		
Venezuela	VEXGDHD.C	VEXCPI.YR	.	VEXMON2.A	USQ42D..A		

Table A5.2: List of Countries and Regions in the GVAR model.

AUSTRALIA	**FINLAND**	**MEXICO**	**SOUTH AFRICA**	**VENEZUELA**
AUSTRIA	**FRANCE**	**NETHERLANDS**	**SPAIN**	
BELGIUM	**GERMANY**	**NEW ZEALAND**	**SWEDEN**	**BRICS**
BRAZIL	**INDIA**	**NORWAY**	**SWITZERLAND**	**BRAZIL**
CANADA	**INDONESIA**	**PERU**	**THAILAND**	**RUSSIA**
CHILE	**ITALY**	**PHILIPPINES**	**TURKEY**	**INDIA**
CHINA	**JAPAN**	**RUSSIA**	**UK**	**CHINA**
ECUADOR	**MALAYSIA**	**SINGAPORE**	**USA**	**SOUTH AFRICA**

Table A5.3.

	ARGENTINA	AUSTRALIA	AUSTRIA	BELGIUM	BRAZIL	CANADA	CHILE	CHINA	ECUADOR	FINLAND	FRANCE	GERMANY	INDIA	INDONESIA	ITALY	JAPAN	MALAYSIA	MEXICO	NETHERLANDS	NEW ZEALAND	NORWAY	PERU	PHILIPPINES	RUSSIA	SINGAPORE	SOUTH AFRICA	SPAIN	SWEDEN	SWITZERLAND	THAILAND	TURKEY	uk	USA	VENEZUELA
ARGENTINA	0	0.00	0.00	0.00	0.13	0.00	0.07	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.02
AUSTRALIA	0.00	0	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.01	0.01	0.01	0.04	0.05	0.01	0.07	0.04	0.00	0.00	0.28	0.00	0.00	0.02	0.00	0.04	0.03	0.01	0.01	0.01	0.05	0.01	0.02	0.01	0.00
AUSTRIA	0.00	0.00	0	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.07	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.01	0.01	0.01	0.04	0.00	0.01	0.01	0.01	0.00
BELGIUM	0.01	0.01	0.02	0	0.02	0.01	0.01	0.02	0.01	0.04	0.12	0.08	0.04	0.01	0.05	0.01	0.01	0.00	0.15	0.01	0.03	0.00	0.01	0.02	0.01	0.03	0.05	0.06	0.03	0.01	0.03	0.07	0.02	0.01
BRAZIL	0.35	0.01	0.00	0.01	0	0.01	0.10	0.01	0.04	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.00	0.01	0.08	0.00	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.06
CANADA	0.01	0.02	0.01	0.01	0.02	0	0.03	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.03	0.01	0.03	0.01	0.02	0.04	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.26	0.01
CHILE	0.07	0.00	0.00	0.00	0.04	0.00	0	0.00	0.06	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
CHINA	0.00	0.02	0.00	0.01	0.01	0.00	0.00	0	0.00	0.00	0.00	0.01	0.05	0.02	0.01	0.05	0.05	0.00	0.01	0.01	0.00	0.00	0.09	0.00	0.09	0.01	0.00	0.00	0.02	0.05	0.00	0.02	0.01	0.00
ECUADOR	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
FINLAND	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.03	0.01	0.00	0.05	0.00	0.01	0.01	0.08	0.01	0.00	0.01	0.01	0.00	0.00
FRANCE	0.03	0.02	0.04	0.17	0.04	0.01	0.04	0.03	0.01	0.04	0	0.12	0.04	0.02	0.15	0.02	0.02	0.01	0.08	0.02	0.09	0.01	0.01	0.05	0.03	0.04	0.22	0.07	0.11	0.02	0.08	0.10	0.03	0.01
GERMANY	0.05	0.05	0.49	0.23	0.08	0.02	0.04	0.06	0.01	0.17	0.23	0	0.07	0.03	0.22	0.06	0.03	0.03	0.27	0.05	0.16	0.04	0.05	0.17	0.04	0.15	0.19	0.19	0.31	0.03	0.17	0.16	0.07	0.02
INDIA	0.02	0.05	0.00	0.02	0.02	0.01	0.03	0.04	0.01	0.01	0.01	0.01	0	0.05	0.01	0.01	0.04	0.00	0.01	0.01	0.00	0.01	0.01	0.02	0.04	0.04	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03
INDONESIA	0.01	0.04	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.04	0	0.00	0.05	0.04	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.12	0.01	0.01	0.00	0.00	0.05	0.01	0.00	0.01	0.00
ITALY	0.03	0.03	0.10	0.05	0.04	0.01	0.05	0.03	0.03	0.04	0.11	0.09	0.04	0.02	0	0.02	0.04	0.01	0.05	0.02	0.04	0.04	0.01	0.12	0.01	0.04	0.12	0.04	0.12	0.02	0.10	0.05	0.02	0.02
JAPAN	0.02	0.22	0.01	0.02	0.05	0.03	0.11	0.18	0.03	0.02	0.02	0.02	0.05	0.23	0.02	0	0.15	0.04	0.02	0.12	0.02	0.07	0.20	0.06	0.10	0.13	0.02	0.02	0.03	0.24	0.02	0.03	0.10	0.01
MALAYSIA	0.01	0.04	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.04	0.08	0.00	0.05	0	0.01	0.01	0.04	0.00	0.00	0.06	0.01	0.19	0.02	0.00	0.00	0.00	0.09	0.01	0.01	0.02	0.00
MEXICO	0.04	0.01	0.00	0.00	0.03	0.03	0.05	0.01	0.02	0.00	0.00	0.01	0.01	0.00	0.01	0.02	0.01	0	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.00	0.00	0.16	0.03
NETHERLANDS	0.03	0.02	0.04	0.18	0.05	0.01	0.05	0.03	0.02	0.08	0.07	0.12	0.03	0.03	0.06	0.03	0.03	0.01	0	0.01	0.10	0.02	0.06	0.15	0.02	0.04	0.06	0.07	0.05	0.02	0.03	0.10	0.02	0.02
NEW ZEALAND	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
NORWAY	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.03	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0	0.00	0.00	0.01	0.00	0.00	0.01	0.12	0.00	0.00	0.01	0.05	0.00	0.00
PERU	0.02	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
PHILIPPINES	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.02	0.00	0.00	0.01	0.00	0.00	0	0.00	0.03	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.01	0.00
RUSSIA	0.02	0.00	0.03	0.02	0.03	0.00	0.00	0.00	0.03	0.17	0.03	0.05	0.02	0.01	0.05	0.03	0.00	0.00	0.04	0.00	0.02	0.00	0.00	0	0.00	0.01	0.03	0.04	0.01	0.01	0.17	0.02	0.01	0.00
SINGAPORE	0.00	0.07	0.00	0.00	0.01	0.00	0.00	0.11	0.00	0.00	0.01	0.01	0.07	0.17	0.00	0.04	0.18	0.00	0.01	0.05	0.01	0.00	0.12	0.00	0	0.01	0.00	0.00	0.01	0.08	0.00	0.01	0.02	0.02
SOUTH AFRICA	0.02	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.01	0.01	0.02	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.00
SPAIN	0.04	0.01	0.02	0.03	0.03	0.00	0.03	0.01	0.02	0.02	0.10	0.05	0.02	0.01	0.08	0.01	0.01	0.02	0.03	0.01	0.03	0.03	0.00	0.02	0.00	0.05	0	0.03	0.03	0.01	0.05	0.05	0.01	0.03
SWEDEN	0.00	0.01	0.02	0.02	0.01	0.00	0.01	0.01	0.00	0.16	0.02	0.03	0.01	0.01	0.02	0.01	0.00	0.00	0.02	0.01	0.10	0.01	0.00	0.02	0.00	0.02	0.02	0	0.01	0.01	0.02	0.03	0.01	0.00
SWITZERLAND	0.01	0.01	0.06	0.01	0.02	0.00	0.00	0.02	0.00	0.01	0.03	0.05	0.05	0.01	0.05	0.01	0.01	0.00	0.01	0.01	0.01	0.07	0.00	0.04	0.01	0.02	0.02	0.01	0	0.02	0.04	0.02	0.02	0.01
THAILAND	0.01	0.05	0.00	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.00	0.00	0.02	0.05	0.00	0.06	0.07	0.00	0.01	0.03	0.00	0.01	0.05	0.01	0.06	0.02	0.00	0.00	0.01	0	0.01	0.01	0.01	0.00
TURKEY	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.01	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.07	0.00	0.01	0.02	0.01	0.01	0.01	0	0.02	0.01	0.00
UK	0.02	0.06	0.03	0.08	0.03	0.03	0.01	0.05	0.01	0.07	0.09	0.09	0.06	0.02	0.07	0.03	0.02	0.01	0.10	0.05	0.24	0.01	0.01	0.05	0.03	0.09	0.09	0.09	0.05	0.03	0.08	0	0.05	0.01
USA	0.14	0.15	0.05	0.07	0.23	0.76	0.22	0.23	0.46	0.06	0.07	0.09	0.19	0.12	0.07	0.29	0.19	0.76	0.07	0.15	0.07	0.27	0.22	0.06	0.15	0.14	0.05	0.07	0.10	0.15	0.08	0.13	0	0.62
VENEZUELA	0.02	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.09	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.03	0

Note: Trade weighs are computed as shares of exports and imports displayed in column by country. Source: International Monetary Fund, Direction of Trade Statistics, 2006-2008.

Table A5.4: Country weights.

Country	GDP	CPI	M2	P	Eq	poil
ARGENTINA	0.009	0.009	0.009	0.011	0.010	
AUSTRALIA	0.014	0.014	0.015	0.017	0.015	
AUSTRIA	0.006	0.006	0.006		0.006	
BELGIUM	0.007	0.007	0.007			
BRAZIL	0.034	0.034	0.036	0.043	0.036	
CANADA	0.023	0.023	0.024	0.029	0.025	
CHILE	0.005	0.005	0.005	0.006	0.005	
CHINA	0.135	0.135	0.140	0.167	0.143	
ECUADOR	0.002	0.002		0.003		
FINLAND	0.054	0.054	0.056		0.057	
FRANCE	0.003	0.003	0.004		0.004	
GERMANY	0.038	0.038	0.040		0.040	
INDIA	0.059	0.059	0.061	0.073	0.062	
INDONESIA	0.016	0.016	0.016	0.019	0.017	
ITALY	0.034	0.034	0.035		0.036	
JAPAN	0.079	0.079	0.082	0.098	0.084	
MALAYSIA	0.007	0.007	0.007	0.009	0.007	
MEXICO	0.028	0.028	0.029	0.034	0.029	
NETHERLANDS	0.012	0.012	0.013		0.013	
NEW ZEALAND	0.002	0.002	0.002	0.003	0.002	
NORWAY	0.005	0.005	0.005	0.006	0.005	
PERU	0.001	0.001	0.001	0.001	0.001	
PHILIPPINES	0.006	0.006	0.006		0.006	
RUSSIA	0.039	0.039	0.040	0.048		
SINGAPORE	0.004	0.004	0.005	0.005	0.005	
SOUTH AFRICA	0.009	0.009	0.009	0.011	0.009	
SPAIN	0.025	0.025			0.027	
SWEDEN	0.006	0.006	0.006		0.007	
SWITZERLAND	0.006	0.006	0.006	0.007	0.006	
THAILAND	0.010	0.010	0.010	0.012	0.010	
TURKEY	0.017	0.017	0.018	0.021	0.018	
UK	0.041	0.041	0.043	0.051	0.043	
USA	0.258	0.258	0.267	0.319	0.273	1
VENEZUELA	0.006	0.006		0.008		

Table A5.5: ADF-WS Unit Root Test Statistics for Domestic Variables (Based on AIC Order Selection).

Domestic Variables	gdp	Δgdp	CPI	Δcpi	M2	ΔM2	P	ΔP	Eq	ΔEq
ARGENTINA	-2.27	-3.31	-2.13	-7.23	**-0.13**	-4.63	0.39	3.93	-0.79	-3.96
AUSTRALIA	-2.08	-5.41	-2.50	-3.61	-1.66	-2.60	-2.17	-7.16	-2.76	-6.11
AUSTRIA	-2.25	-3.48	-1.15	-4.06	-1.84	-5.84	--	--	-2.40	-6.58
BELGIUM	-1.03	-5.38	-1.67	-5.57	-0.22	-3.83	--	--	--	--
BRAZIL	-0.98	-6.72	-0.40	-3.38	-2.26	-5.02	-1.77	-2.54	-0.50	-2.98
CANADA	-1.49	-4.37	-1.24	-5.27	-2.50	-2.68	-1.81	-7.18	-2.69	-6.13
CHILE	-1.53	-4.48	-0.71	-8.47	-0.30	-2.95	-1.42	-3.39	-1.89	-4.99
CHINA	-1.34	-4.55	-2.54	-2.77	-0.75	-2.43	-1.09	-3.19	-1.60	-5.82
ECUADOR	-2.48	-3.89	-1.30	-7.05	--	--	-2.21	-6.84	--	--
FINLAND	-2.39	-6.02	-0.86	**-4.07**	-1.16	-3.24	--	--	-1.89	-4.91
FRANCE	-1.79	-4.39	-0.52	-4.07	0.22	-4.49	--	--	-2.33	-4.80
GERMANY	-1.92	-5.01	0.03	-4.11	-2.36	-5.83	--	--	-2.47	-5.80
INDIA	-0.45	-6.32	-0.91	-5.34	0.91	-7.09	-0.37	-4.24	-2.90	-6.31
INDONESIA	-1.85	-4.04	-1.51	-5.64	-0.34	-2.64	-1.44	-8.36	-1.91	-6.00
ITALY	-0.68	-4.46	0.16	**-3.08**	-1.49	-2.79			-1.92	-4.59
JAPAN	-2.68	-5.62	0.47	-4.21	-2.10	-2.84	-1.09	-6.06	-3.02	-4.42
MALAYSIA	-1.70	-5.11	-1.31	-6.25	-1.03	-5.03	-1.14	-4.51	**-1.97**	-6.14
MEXICO	**-0.32**	-5.60	-0.46	-2.65	0.55	-4.75	1.38	-3.93	-1.51	-6.25
NETHERLANDS	-0.37	-3.86	-2.16	-3.33	-1.24	-6.45			-1.92	-5.43
NEW ZEALAND	-2.07	-3.64	-2.12	-4.66	-2.77	-4.68	-0.78	-3.99	-2.49	-5.09
NORWAY	-0.03	-6.67	-0.91	-6.74	-1.73	-3.59	-2.85	-4.50	-2.94	-6.01
PERU	-1.84	-7.92	0.14	-2.80	0.02	-3.45	-1.40	-5.38	-2.27	-5.78
PHILIPPINES	-0.84	-5.59	0.27	-3.97	-1.98	-3.76	--	--	-2.22	-5.23
RUSSIA	0.84	-3.95	-1.71	-2.73	-1.42	-6.25	-1.82	-3.01	--	--
SINGAPORE	**-1.36**	-5.67	-0.85	-4.70	-0.83	-3.50	-0.61	-5.06	**-2.59**	-6.02
SOUTH AFRICA	-0.78	-3.67	0.28	-3.37	-1.59	-6.87	-0.43	-3.74	-2.77	-6.05
SPAIN	-0.98	-5.32	0.58	-3.53			--	--	-1.54	-4.72
SWEDEN	-2.39	-4.46	-0.40	**-2.81**	-2.45	-4.66	--	--	-2.31	-5.25
SWITZERLAND	-2.54	-4.59	0.13	-3.82	0.58	-2.89	-1.02	-4.72	-2.03	-4.19
THAILAND	-1.28	-5.78	-1.03	-5.22	0.26	7.63	-1.09	-5.07	-1.91	-5.13
TURKEY	**-0.46**	-6.68	-0.87	-2.88	-2.30	-3.77	0.58	-3.68	-1.30	-5.26
UK	-1.06	-3.60	-1.39	-2.67	-1.09	-3.35	-1.69	-3.81	-1.97	-5.85
USA	-1.30	-4.16	-0.82	-5.11	-2.85	-4.40	-1.62	-4.90	-1.89	-4.63
VENEZUELA	-2.55	-4.28	-3.16	-6.63			-2.54	-2.64		

Note: Based on univariate autoregressive specifications, the ADF-WS statistics for the level and first differences of the variables are all computed on the same sample period, namely from 1989Q1 to 2012Q4. The ADF-WS statistics for all variables are based on regressions including a linear trend (except those are in bold where only an intercept is considered). The 95% critical value of the ADF-WS statistics for regressions with trend is -3.24, and for regressions with an intercept only is -2.55.

Table A5.6: ADF-WS Unit Root Test Statistics for Foreign Variables (Based on AIC Order Selection).

Foreign Variables	gdp	Δgdp	CPI	Δcpi	M2	ΔM2	P	ΔP	Eq	ΔEq
ARGENTINA	-2.59	-6.25	-0.11	-3.14	-2.19	-5.05	-2.07	-4.37	-0.61	-3.14
AUSTRALIA	-3.09	-5.57	0.58	-2.69	-1.48	-2.88	-0.18	-6.59	**-1.64**	-5.52
AUSTRIA	-3.05	-5.39	-1.47	-4.12	-1.57	-5.67	-1.21	-3.95	-2.17	-5.68
BELGIUM	-2.04	-4.61	-0.88	-8.67	-2.48	-3.82	-0.62	-6.55	-2.10	-5.65
BRAZIL	**0.66**	-5.29	0.39	-10.23	-3.10	-4.25	0.01	-8.93	-1.83	-6.00
CANADA	-1.64	-4.39	1.26	-3.37	-2.88	-4.44	-1.64	-4.02	-1.94	-4.57
CHILE	**0.87**	-5.91	1.36	-4.30	-2.31	-5.13	-0.13	-3.47	-1.13	-6.16
CHINA	-2.99	-5.67	0.65	-3.89	-1.54	-3.77	-0.45	-4.38	-3.06	-5.40
ECUADOR	-2.94	-5.85	1.47	-3.53	-2.65	-4.24	-0.58	-5.40	-1.64	-6.06
FINLAND	-1.02	-2.72	-1.52	-2.56	-2.18	-5.75	-1.62	-3.70	-2.19	-5.01
FRANCE	-1.90	-4.99	-1.13	-3.72	-2.45	-5.48	-0.92	-3.66	-2.01	-5.70
GERMANY	-1.67	-3.93	**-1.33**	-3.17	-2.54	-3.02	-1.05	-4.93	-2.00	-5.81
INDIA	-3.15	-4.61	0.10	-3.96	-1.99	-4.10	0.50	-7.11	-2.68	-5.46
INDONESIA	-3.09	-5.94	0.24	-4.29	-1.14	-2.79	-0.66	-3.25	-3.58	-5.65
ITALY	-1.30	-4.21	-1.27	-3.31	-2.34	-3.44	-0.98	-6.98	-2.09	-5.80
JAPAN	-3.21	-4.18	-0.12	-3.30	-1.60	-3.64	0.13	-7.78	-2.97	-5.78
MALAYSIA	-3.02	-5.74	0.49	-2.64	-1.19	-3.26	-0.52	-7.95	-1.63	-5.76
MEXICO	-1.67	-4.43	1.69	-3.18	-2.90	-4.48	-0.88	-3.03	-1.87	-4.57
NETHERLANDS	-2.40	-3.43	-1.16	-5.84	-2.51	-3.83	-1.03	-4.91	-2.19	-5.81
NEW ZEALAND	-2.66	-5.11	1.37	-2.93	-1.96	-2.62	-0.50	-7.18	-3.19	-5.59
NORWAY	-1.79	-4.33	-0.79	-4.48	-2.15	-6.37	-0.39	-3.37	-2.05	-5.55
PERU	**1.09**	-5.45	**0.85**	-3.99	-2.26	-4.46	-0.62	-4.41	-1.06	-5.99
PHILIPPINES	-2.90	-5.45	0.37	-3.30	-1.72	-3.60	0.04	-5.78	**0.52**	-5.84
RUSSIA	-2.35	-4.61	0.68	-2.63	-2.17	-3.96	0.41	-3.78	-1.87	-5.53
SINGAPORE	-2.52	-4.63	0.08	-4.33	-1.00	-5.14	-0.82	-7.45	**-1.16**	-6.15
SOUTH AFRICA	-2.79	-5.01	0.83	-4.66	-2.31	-4.73	0.66	-3.11	-2.32	-5.95
SPAIN	-2.36	-5.41	-0.53	-3.26	-2.40	-3.23	-0.28	-3.92	-1.98	-4.94
SWEDEN	-1.75	-5.53	-1.21	-3.91	-2.32	-3.30	-0.39	-3.60	-2.15	-5.67
SWITZERLAND	-2.40	-4.77	-0.39	-6.66	-2.26	-3.56	-0.70	-4.66	-2.25	-5.82
THAILAND	1.20	-5.73	0.17	**-2.92**	-1.42	-2.89	-0.56	-7.44	**-1.65**	-5.56
TURKEY	-0.81	-2.63	-1.52	-2.64	-2.32	-3.02	-1.55	-3.03	-2.12	-4.96
Uk	-2.21	-5.07	-0.95	-3.98	-2.46	-3.28	-0.40	-5.86	-2.21	-5.07
USA	0.62	-4.99	0.82	-5.11	-0.08	-3.92	-0.13	-3.94	-2.62	-6.18
VENEZUELA	-2.15	-4.74	1.10	-3.44	-2.94	-4.58	-0.83	-6.40	-1.33	-6.04

Note: Based on univariate autoregressive specifications, the ADF-WS statistics for the level and first differences of the variables are all computed on the same sample period, namely from 1989Q1 to 2012Q4. The ADF-WS statistics for all variables are based on regressions including a linear trend (except those are in bold where only an intercept is considered). The 95% critical value of the ADF-WS statistics for regressions with trend is -3.24, and for regressions with an intercept only is -2.55.

Table A5.7. Trace Statistic and critical value at the 5% Significance Level.

	Cointegration Results for the Trace Statistic						Critical Values for Trace Statistic					
Country	**r=0**	**r=1**	**r=2**	**r=3**	**r=4**	**r=5**	**r=0**	**r=1**	**r=2**	**r=3**	**r=4**	**r=5**
ARGENTINA	449.09	223.96	122.56	40.73	16.88		156.44	119.03	85.44	55.50	28.81	
AUSTRALIA	193.03	128.44	79.73	43.45	18.51		156.44	119.03	85.44	55.50	28.81	
AUSTRIA	218.48	136.43	66.60	28.05			119.03	85.44	55.50	28.81		
BELGIUM	105.11	51.03	21.39				85.44	55.50	28.81			
BRAZIL	346.26	205.76	120.20	67.26	30.27		156.44	119.03	85.44	55.50	28.81	
CANADA	247.13	156.51	98.60	56.36	20.46		156.44	119.03	85.44	55.50	28.81	
CHILE	223.05	145.09	86.59	47.58	19.14		156.44	119.03	85.44	55.50	28.81	
CHINA	291.47	200.85	123.04	71.20	26.98		156.44	119.03	85.44	55.50	28.81	
ECUADOR	98.20	44.50	21.38				85.44	55.50	28.81			
FINLAND	224.79	139.86	71.96	28.15			119.03	85.44	55.50	28.81		
FRANCE	199.50	130.67	72.53	22.20			119.03	85.44	55.50	28.81		
GERMANY	135.99	81.72	42.68	19.23			119.03	85.44	55.50	28.81		
INDIA	215.70	143.94	93.12	45.38	19.32		156.44	119.03	85.44	55.50	28.81	
INDONESIA	247.46	148.70	85.05	48.07	20.34		156.44	119.03	85.44	55.50	28.81	
ITALY	141.91	83.86	44.23	18.70			119.03	85.44	55.50	28.81		
JAPAN	244.52	148.12	94.74	53.90	24.40		156.44	119.03	85.44	55.50	28.81	
MALAYSIA	261.89	152.65	86.57	38.51	14.10		156.44	119.03	85.44	55.50	28.81	
MEXICO	288.82	207.89	147.38	87.73	36.54		156.44	119.03	85.44	55.50	28.81	
NETHERLAN	170.36	108.99	61.26	23.39			119.03	85.44	55.50	28.81		
NEW ZEALAND	214.73	131.08	81.97	49.78	18.40		156.44	119.03	85.44	55.50	28.81	
NORWAY	239.07	121.78	74.41	39.60	13.78		156.44	119.03	85.44	55.50	28.81	
PERU	371.76	177.49	108.53	59.30	26.63		156.44	119.03	85.44	55.50	28.81	
PHILIPPINES	168.19	95.00	56.38	25.20			119.03	85.44	55.50	28.81		
RUSSIA	189.60	92.02	44.80	19.31			119.03	85.44	55.50	28.81		
SINGAPORE	255.74	123.91	82.30	48.50	22.01		156.44	119.03	85.44	55.50	28.81	
SOUTH AFRICA	198.04	142.55	89.52	50.50	21.76		156.44	119.03	85.44	55.50	28.81	
SPAIN	98.61	47.86	20.21				85.44	55.50	28.81			
SWEDEN	204.74	138.05	77.54	25.24			119.03	85.44	55.50	28.81		
SWITZERLAN	299.65	190.40	127.23	76.68	38.09		156.44	119.03	85.44	55.50	28.81	
THAILAND	266.63	180.83	106.99	59.81	25.73		156.44	119.03	85.44	55.50	28.81	
TURKEY	234.46	144.02	86.66	42.74	15.70		156.44	119.03	85.44	55.50	28.81	
UK	256.47	166.25	108.58	54.57	23.72		156.44	119.03	85.44	55.50	28.81	
USA	321.74	205.26	142.78	94.30	51.50	18.91	184.53	145.30	110.03	78.52	50.72	26.24
VENEZUELA	96.36	51.31	14.71				85.44	55.50	28.81			

The critical values are extracted from MacKinnon, Haug, and Michelis (1999).

Table A5.8: F Statistics for Tests of Residual Serial Correlation for Country-Specific VARX* model.

		Fcrit_0.05	GDP	CPI	M2	P	Eq	poil
ARGENTINA	F(3,65)	2.75	0.93	**2.85***	0.32	1.14	0.02	
AUSTRALIA	F(3,65)	2.75	**3.74***	0.80	1.34	1.15	0.94	
AUSTRIA	F(3,73)	2.73	**3.46***	0.39	0.54		0.63	
BELGIUM	F(3,82)	2.72	0.08	0.78	0.98			
BRAZIL	F(3,64)	2.75	0.46	1.45	**3.14***	0.19	0.74	
CANADA	F(3,64)	2.75	1.99	**3.45***	0.46	0.46	1.44	
CHILE	F(3,65)	2.75	**3.44***	2.34	0.82	0.20	0.40	
CHINA	F(3,70)	2.74	4.34	0.42	2.07	0.04	1.00	
ECUADOR	F(3,79)	2.72	2.34	1.71		1.06		
FINLAND	F(3,67)	2.74	0.13	0.94	3.01		1.19	
FRANCE	F(3,81)	2.72	0.02	0.30	7.28*		0.67	
GERMANY	F(3,74)	2.73	1.17	0.18	0.66		1.88	
INDIA	F(3,81)	2.72	0.09	0.64	0.69	0.51	2.25	
INDONESIA	F(3,71)	2.73	0.09	3.50	3.34	0.68	2.17	
ITALY	F(3,68)	2.74	0.64	0.09	2.05		0.83	
JAPAN	F(3,76)	2.72	0.63	1.14	2.20	0.08	0.75	
MALAYSIA	F(3,65)	2.75	0.98	1.53	1.24	2.91	1.99	
MEXICO	F(3,64)	2.75	2.40	0.64	3.78	**3.01***	0.70	
NETHERLANDS	F(3,81)	2.72	5.00	0.24	0.07		3.57	
NEW ZEALAND	F(3,81)	2.72	1.91	0.92	0.64	0.30	0.59	
NORWAY	F(3,81)	2.72	2.16	0.98	2.16	**8.14***	2.22	
PERU	F(3,64)	2.75	1.83	2.80	3.27*	1.41	0.59	
PHILIPPINES	F(3,70)	2.74	2.59	0.42	0.73		3.15	
RUSSIA	F(3,67)	2.74	7.58	1.30	1.44	2.15		
SINGAPORE	F(3,81)	2.72	0.73	0.28	1.14	0.08	1.49	
SOUTH AFRICA	F(3,65)	2.75	0.59	2.72	1.67	0.72	0.63	
SPAIN	F(3,76)	2.72	4.08	0.30			1.08	
SWEDEN	F(3,71)	2.73	1.82	0.30	1.35		1.73	
SWITZERLAND	F(3,70)	2.74	0.94	0.05	1.68	1.02	1.50	
THAILAND	F(3,80)	2.72	4.36	0.80	2.32	1.85	1.82	
TURKEY	F(3,81)	2.72	1.33	2.35	0.90	2.98	0.82	
UK	F(3,70)	2.74	1.32	0.86	1.98	1.93	0.43	
USA	F(3,67)	2.74	1.04	0.27	0.36	3.99	2.38	0.75
VENEZUELA	F(3,76)	2.72	0.46	0.08		0.62		

Note: * denotes statistical significance at the 5% level or less.

Table A5.9. F Statistics for Testing the Weak Exogeneity of the Country-specific Foreign Variables- selected countries.

Country	F test	Fcrit_0.05	GDP	CPI	M2	p	Eq	poil
ARGENTINA	F(2,57)	3.16	0.74	3.97*	1.25	0.56	2.72	0.25
AUSTRALIA	F(2,57)	3.16	0.13	0.20	2.87	1.11	0.49	0.66
AUSTRIA	F(2,67)	3.13	1.52	2.86	0.47	0.48	0.32	1.06
BELGIUM	F(1,81)	3.96	0.87	3.00	0.88	0.18	0.00	0.88
BRAZIL	F(3,56)	2.77	0.92	0.73	2.97	0.95	2.35	0.35
CANADA	F(3,56)	2.77	0.99	0.30	3.42*	0.04	1.27	0.12
CHILE	F(2,57)	3.16	1.22	0.32	0.13	0.99	0.39	0.64
CHINA	F(3,62)	2.75	0.87	2.74	1.20	0.31	0.64	1.44
ECUADOR	F(1,78)	3.96	0.00	1.17	1.14	3.08	0.00	2.81
FINLAND	F(2,61)	3.15	0.43	0.62	0.99	3.43	0.20	2.10
FRANCE	F(2,79)	3.11	7.05	0.33	0.23	2.33	3.38*	3.84
GERMANY	F(1,68)	3.98	0.06	1.99	2.74	0.11	2.02	0.06
INDIA	F(2,78)	3.11	2.41	1.39	2.46	0.29	0.57	1.25
INDONESIA	F(2,63)	3.14	0.85	1.93	1.00	0.41	0.62	0.94
ITALY	F(1,62)	4.00	1.54	2.66	1.57	0.11	0.33	1.24
JAPAN	F(2,73)	3.12	2.08	0.52	0.06	0.45	0.64	4.77
MALAYSIA	F(2,57)	3.16	0.01	1.49	0.03	0.54	0.88	0.15
MEXICO	F(3,56)	2.77	0.17	0.54	0.97	0.41	1.09	1.42
NETHERLANDS	F(2,79)	3.11	1.45	1.18	0.90	0.22	1.64	0.73
NEW ZEALAND	F(2,78)	3.11	0.19	0.14	0.61	1.27	0.78	2.87
NORWAY	F(2,78)	3.11	0.92	3.78*	1.20	0.99	3.03	0.02
PERU	F(3,56)	2.77	0.82	1.12	0.45	0.13	1.45	2.18
PHILIPPINES	F(3,68)	2.74	1.11	0.15	1.00	1.28	0.08	0.24
RUSSIA	F(2,61)	3.15	0.76	1.58	0.85	0.68	0.90	0.38
SINGAPORE	F(2,78)	3.11	0.73	0.62	0.50	0.92	3.91*	1.14
SA	F(2,57)	3.16	0.06	0.16	0.72	0.64	0.75	0.63
SPAIN	F(1,72)	3.97	5.15	0.09	0.06	0.18	3.07	0.85
SWEDEN	F(2,69)	3.13	0.87	1.70	0.12	0.84	0.51	0.96
SWITZERLAND	F(3,62)	2.75	0.49	1.35	0.90	0.68	1.07	0.26
THAILAND	F(3,77)	2.72	0.27	0.44	0.57	1.00	1.13	0.69
TURKEY	F(2,78)	3.11	1.72	5.82	1.41	0.90	0.24	2.38
UK	F(2,67)	3.13	0.23	0.26	0.60	5.46	0.54	0.42
USA	F(2,57)	3.16	1.69	0.56	0.24	0.04		
VENEZUELA	F(1,72)	3.97	2.12	0.11	1.86	3.39	0.02	0.03

Note: * denotes statistical significance at the 5% level.

Table A5.10. Average pairwise cross-section correlations of all variables and associated models' residuals.

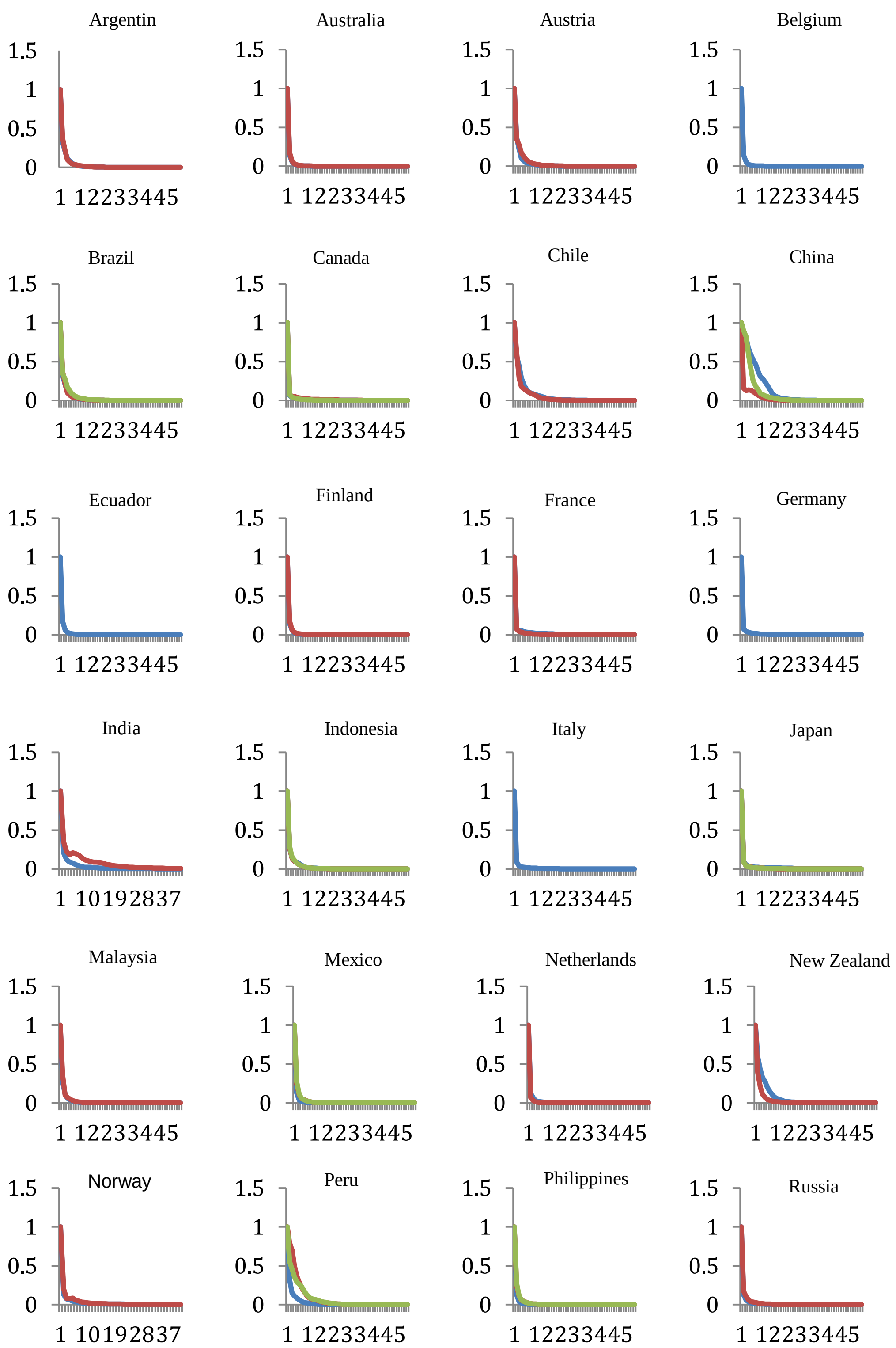
Country	GDP			CPI			EQ		
	level	1st diff.	VECMX Residuals	level	1st diff.	VECMX	level	1st diff.	VECMX Residuals
Argentina	0.77	0.09	0.02	0.8	0.26	-0.01	0.61	0.43	0.07
Australia	0.91	0.12	-0.03	0.87	0.19	0.04	0.71	0.6	0.02
Austria	0.91	0.31	0.01	0.9	0.35	0.04	0.46	0.57	0.07
Belgium	0.9	0.34	0.01	0.89	0.31	0.07			
Brazil	0.87	0.16	0.02	0.79	0.07	-0.05	0.65	0.18	-0.06
Canada	0.89	0.29	0.01	0.88	0.28	0.05	0.7	0.6	0.05
Chile	0.9	0.15	0	0.9	0.41	-0.02	0.65	0.39	0.05
China	0.91	0.06	-0.02	0.86	0.19	0	-0.19	0.48	0.04
Ecuador	0.88	0.01	-0.01	0.87	0.16	-0.01			
Finland	0.88	0.33	0.02	0.88	0.32	0.02	0.57	0.43	-0.04
France	0.89	0.34	-0.01	0.89	0.37	0.08	0.61	0.6	-0.06
Germany	0.91	0.31	0.03	0.9	0.33	0.07	0.63	0.61	-0.06
India	0.91	0.09	-0.02	0.89	0.12	-0.01	0.64	0.54	0
Indonesia	0.85	0.06	0	0.87	0.01	0.02	0.57	0.48	0.04
Italy	0.73	0.3	0.01	0.9	0.43	0.06	0.46	0.54	-0.02
Japan	0.89	0.23	0	0.39	0.31	0.03	-0.26	0.5	-0.04
Malaysia	0.89	0.23	0.02	0.9	0.27	-0.01	0.53	0.43	0.01
Mexico	0.88	0.23	0.03	0.88	0.18	-0.01	0.69	0.54	0.05
Netherlands	0.9	0.3	0.02	0.89	0.21	0.05	0.57	0.62	0.01
New Zealand	0.9	0.2	0.02	0.87	0.19	-0.01	0.37	0.5	0.05
Norway	0.86	0.13	0.01	0.89	0.21	0.06	0.7	0.61	0.06
Peru	0.9	0.13	-0.02	0.68	0.27	0.01	0.61	0.46	0.06
Philippines	0.88	0.21	0.02	0.9	0.28	0.02	0.38	0.42	0.01
Russia	0.52	0.07	-0.02	0.83	0.11	-0.07			
Singapore	0.91	0.23	0.01	0.86	0.22	0.01	0.62	0.6	-0.01
South Africa	0.84	0.26	0.02	0.9	0.32	0.03	0.67	0.52	0.04
Spain	0.87	0.21	0.01	0.9	0.4	0.08	0.65	0.59	0.03
Sweden	0.91	0.27	0.03	0.9	0.38	0.08	0.68	0.58	-0.02
Switzerland	0.88	0.31	0.01	0.89	0.42	0.06	0.66	0.57	-0.01
Thailand	0.88	0.14	0	0.9	0.26	0.06	0.06	0.41	-0.02
Turkey	0.89	0.19	0.01	0.87	0.08	-0.01	0.67	0.42	0
UK	0.88	0.32	0	0.89	0.35	0.05	0.65	0.62	0
USA	0.89	0.27	-0.04	0.89	0.36	0.06	0.65	0.58	0
Venezuela	0.24	0.07	0	-0.49	0.04	0.03			

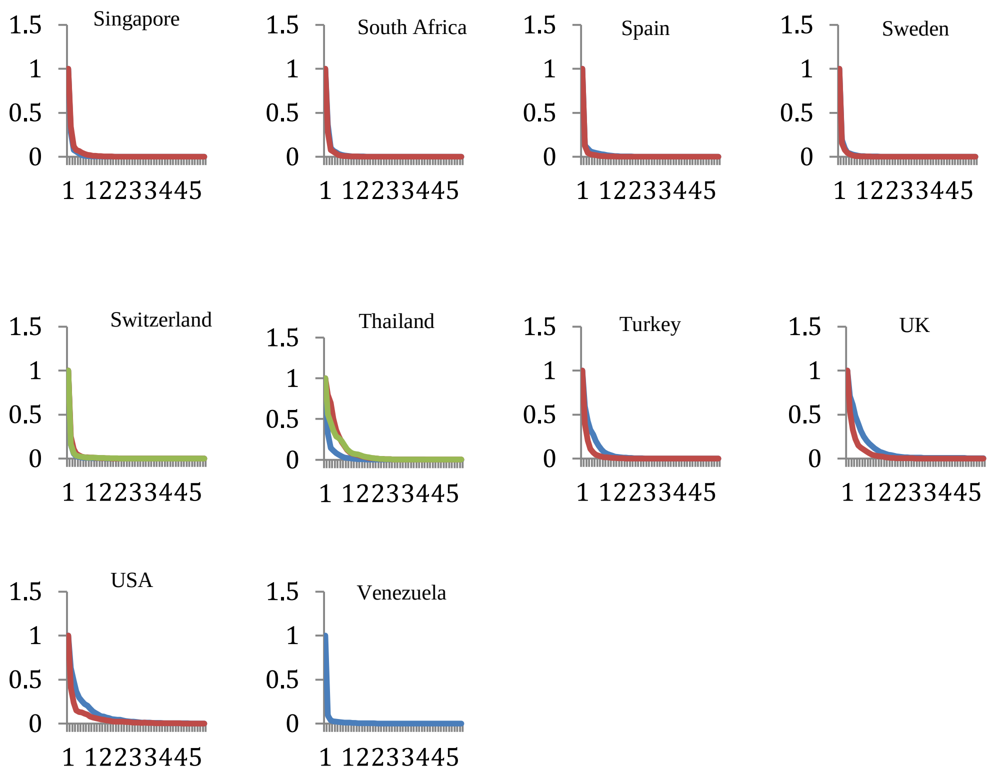
	M2			p		
Country	level	1st diff.	VECMX Residuals	level	1st diff.	VECMX Residuals
Argentina	0.93	0.02	-0.02	0.64	0.04	0.01
Australia	0.97	0.1	0.04	0.74	0.07	0.01
Austria	0.97	0.14	0.04			
Belgium	0.94	0.04	0.01			
Brazil	0.86	0.01	-0.05	0.62	0.06	0.01
Canada	0.96	0.03	0.02	0.72	-0.02	-0.04
Chile	0.96	0.13	0.07	0.68	0.03	0.02
China	0.97	0.03	-0.01	0.75	0	-0.01
Ecuador				0.08	-0.01	-0.01
Finland	0.94	0.15	0.03			
France	0.95	0.12	0.08			
Germany	0.97	0.04	-0.03			
India	0.96	-0.01	0.01	0.73	0.01	0.02
Indonesia	0.96	0.06	0	0.52	-0.04	0.02
Italy	0.95	0.14	0.04			
Japan	0.97	0.01	-0.03	-0.61	-0.01	-0.01
Malaysia	0.97	0.1	0.04	0.72	0.08	-0.01
Mexico	0.96	0.18	0.08	0.73	0.09	0.01
Netherlands	0.97	0.07	0			
New Zealand	0.97	0.04	0.02	0.74	0.11	0.01
Norway	0.97	0.09	0.03	-0.73	-0.09	0
Peru	0.97	0.16	0.08	0.64	0.08	-0.02
Philippines	0.92	0.03	0.02			
Russia	0.97	0.13	0.02	0.74	0.04	0.01
Singapore	0.97	0.1	0.02	0.74	0.03	-0.03
South Africa	0.91	0.06	-0.01	0.75	0.09	-0.01
Spain						
Sweden	0.93	-0.01	0.01			
Switzerland	0.94	0.07	0.03	0.72	0.01	-0.04
Thailand	0.95	0.01	0	0.67	0.12	-0.01
Turkey	0.97	0.06	0.01	0.74	0.14	0.02
UK	0.96	0	0	0.73	0.08	-0.01
USA	0.97	0.05	-0.06	0.72	0.05	-0.02
Venezuela				0.73	0.07	0

Appendix B5.

Figure B5.1.Persistence Profiles

Note: Figures are median effects of a system-wide shock to the cointegrating relations.




Singapore
South Africa
Spain
Sweden
Switzerland
Thailand
Turkey
UK
USA
Venezuela

CHAPTER SIX

CONCLUDING REMARKS

This thesis contributes to the literature on financial development and economic growth. The motivation for pursuing research in this area arose because we noted that the earlier and recent literature on this topic do not converge with respect to their findings on the contribution of financial development to a nation's growth. While the early contributions by Schumpeter (1934) and Gurley and Shaw (1955), and later by King and Levine (1993b) and Greenwood and Smith (1997), etc., found a positive relationship between the two variables, the more recent papers by Arcand et al. (2012) and Cecchetti and Kharroubi (2012), among others, typically find a non-monotonic effect of financial development on economic growth. With this backdrop, in this thesis the different aspects of this relationship using advanced econometric techniques are explored. The empirical models include time series analysis, dynamic panel data models, dynamic panel threshold and the Global Vector Autoregressive (GVAR) model. The general conclusion based on the empirical investigations carried out in this thesis is that the relationship between financial development and growth may have different effects on growth in different countries, time periods or stages of development. This general finding is in line with a number of studies, such as Demetriades and Hussein (1996), De Gregorio and Guidotti (1995), and Odedokun (1996), among others. The main contributions and conclusions of this thesis could be summarized below.

First, Chapter 3 contributes to the literature on financial development and growth by considering the impact of financial development on economic growth in the context of an oil-rich economy, Saudi Arabia, for the period, 1968-2010. In doing so, the investigation in this chapter allows the effect of financial development to be different for the oil and non-oil sectors. The analysis is based on time series data using the Autoregressive Distributed Lag (ARDL) bounds test technique. The empirical results obtained show that financial development has a positive impact on the growth of the Saudi non-oil sector only. In contrast, its impact on the oil sector and overall GDP growth is negative and significant. The results of this chapter confirm that for an oil-rich economy like Saudi Arabia, financial development does not yet have a major role to play in the growth of the overall economy. However, from a policy perspective, it is useful to further develop the Saudi banking system with a view to aid the growth of the non-oil sector, given that the impact of financial development on the latter is positive and significant. This suggests that the financial development and growth nexus may be fundamentally different in resource–dominated economies. Hence, in future research it might be interesting to examine the impact of financial development on growth in a sample of oil-exporting or natural resource producing countries using panel data techniques. This would help to show to what extent the results of this chapter can be generalized to other natural resource dependent countries.

Second, Chapter 4 re-examines the relationship between financial development and economic growth in a sample of 52 middle-income countries from 1980 to 2008. The main contribution of this chapter rests in using a variety of panel data approaches to investigate both the possible presence of linear and non-monotonic relationships between financial development and growth. In addition, the analysis distinguishes between the short-run and long-run effects of financial development on economic growth and takes into account the heterogeneity among countries. The findings of this chapter confirm that there is an inverted U-shape relationship between finance and growth in the long-run. In contrast, the short-run relationship is insignificant. This suggests that the economy may be adversely affected due to “too much” finance. In other words, there is a threshold beyond which financial development does not boost growth. This finding also confirms that the impact of financial development varies across countries due to many factors such as the heterogeneous nature of economic structures, institutional quality, financial markets, and so on. Our results are of potential importance to policymakers in terms of optimizing the financial deepening that needs to be undertaken to ensure that the maximum possible gain for the economy can be achieved through the banking sector: thus, policymakers should seek to strengthen the appropriate type and quality of finance rather than expanding the financial sector per se.

Third, Chapter 5 contributes to the financial development and growth literature as one of the first studies that investigate the channel through which financial development shocks can be transmitted internationally across countries’ borders. The BRICS countries are considered in our analysis. The effect of the shock to financial development indicators on economic growth is investigated from three different angles. First, we focus on how economic growth in each BRICS economy is affected by the financial development shocks in that economy. We next concentrate on the international transmission of such shocks across the BRICS economies. Accordingly, we identify financial development shocks emanating from one of the BRICS and then trace their effect on the economic performance of the other BRICS. Finally, we assess whether financial development in the BRICS region as a whole helps to foster growth within the region. The empirical analysis is conducted by using the GVAR model over the period, 1989-2012. The key findings of the empirical analysis are threefold. First, financial development measured by an own-country shock to credit to the private sector promotes GDP growth; this finding is confirmed in all individual BRICS. In contrast, we find no evidence of any significant response in GDP to the money supply or equity price shocks in the BRICS. These findings indicate that the banking sector is the dominant sector in the BRICS. Second, the results reveal that an increase in credit to the private sector is the main channel through which financial shocks spill over internationally. In particular, a positive credit supply shock in India helps to grow the economies of both China and South Africa. Likewise, positive credit shock in China drives economic growth in India. This suggests that credit to the private sector in China and India plays an important role in the international transmission of shocks and it is the source of growth in the BRICS. Third, among financial development indicators, it is found that only credit to the private sector of the BRICS region has a notable impact on aggregate GDP growth within the region. The results presented in the chapter show that only China and India among the BRICS can be considered global heavyweights with respect to the international transmission of financial development shocks and their impact on economic growth, but further work needs to be done in the area. Future work might examine the impact of financial development shocks in India and China on other major industrial economies. Furthermore, since credit to the private sector was found to be the only aspect of financial development having an effect on the real economy, future research should attempt to ascertain whether such credit is used to foster the real economy, real estate or other asset markets.

Although the author believes that this thesis covers quite a lot of ground, nevertheless, it also has several limitations. One of the main limitations of this research is the data on financial development. In fact, in order to obtain a complete picture of the extent of financial development in a country, several factors must be taken into account. These factors should mirror the degree of depth and efficiency in the financial sectors: for example, factors related to the financial access, financial stability (non-performing loans or stock market volatility) and efficiency of the financial system, etc. Since the three essays in this thesis focused mainly on developing and emerging countries, the analysis was hindered by limitations in obtaining data that reflects all aspects of the degree of financial development in the samples of countries used in the analysis. Therefore, the analysis conducted in this thesis narrowed the selection of the financial development indicators to the most widely-used measures that were considered in the previous literature based on data availability. The author hopes, however, that despite these limitations, the three empirical essays in this thesis were able to make a fairly significant contribution to the substantial literature on financial development and economic growth.

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