A SURVEY OF RECENT DEVELOPMENTS IN THE LITERATURE OF FINANCE AND GROWTH

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Abstract. This paper provides a survey of the recent progress in the literature of financial development and economic growth. The survey highlights that most empirical studies focus on either testing the role of financial development in stimulating economic growth or examining the direction of causality between these two variables. Although the positive role of finance on growth has become a stylized fact, there are some methodological reservations about the results from these empirical studies. Several key issues unresolved in the literature are highlighted. The paper also points to several directions for future research.

Keywords. Financial development; Financial liberalization; Economic growth

1. Introduction

A financial system comprises banking institutions, financial markets, other financial intermediaries such as pension funds and insurance companies, and a large regulatory body – a central bank, which oversees and supervises the operations of these intermediaries. It is a sector in the economy that utilizes productive resources to facilitate capital formation through the provision of a wide range of financial tools to meet the different requirements of borrowers and lenders. Thus, the financial system plays a crucial role in mobilizing and intermediating saving, and ensuring these resources are allocated efficiently to productive sectors.

The standard neoclassical theory assumes that financial systems function efficiently where financial factors are often abstracted from the analyses. For example, growth theory views economic growth as the results of innovation, human capital and physical accumulation while little attention is given to the financial sector. Since a healthy financial system is integral to the sound fundamentals of an economy, designing policies for economic development while completely ignoring improvement of the financial system is a significant oversight. An inadequately supervised financial system may be crisis-prone, with potentially devastating effects. The important role of financial intermediaries and financial markets therefore merits more attention from researchers and policy makers.

Although economists attach different degrees of importance to financial development, its role in contributing to long-term growth can be theoretically postulated,

and this has increasingly been supported by the findings of growth empirics. However, due to the lack of sufficient time series data for developing countries, empirical research on this subject has been dominated by cross-country studies. These studies have consistently shown a positive relationship between financial development and economic growth. Nevertheless, economists have not reached a consensus with regard to the direction of causality between these two variables, nor do they provide a satisfactory solution on the endogeneity of the variables used in their analyses. Furthermore, the results may vary considerably due to different institutional and structural characteristics of each economy. Given the above, the assertion that financial development contributes to output growth may be an unqualified assumption, and its validity needs to be tested within specific cases. For that reason, more empirical case studies are necessary to throw light on the issue.

This paper provides an overview of the theoretical and empirical evidence on the relationship between financial development and economic growth. While the theory was initiated in the 1950s, most of the empirical counterparts have only been developed since the 1990s, following the seminal work of King and Levine (1993a). However, the focus has been largely on assessing the cross-country evidence. The paper highlights the drawbacks of these broad comparative analyses by providing evidence on sensitivity of the results, and argues in favour of a country in-depth case study approach.

The rest of the paper is structured as follows. Sections 2 and 3 explain the emergence and functions of financial systems, respectively. Section 4 describes the evolution of finance-growth thoughts. The scepticisms on financial development are highlighted in Section 5. Section 6 provides a summary of financial development and economic growth models. The empirical findings are summarized and assessed in Section 7. The econometric techniques employed are critically appraised and some caveats on the interpretation of the results highlighted. In Section 8, some key issues which remain unresolved in the literature are discussed. The last section concludes and suggests some directions for future research.

2. The Emergence of Financial Markets and Intermediaries

Financial intermediaries emerge mainly due to information and transaction costs. In an economy, some agents may have extra funds while some entrepreneurs may experience shortages of funds to finance investment projects. To raise the necessary funds in the absence of a sound financial system, entrepreneurs have to approach individual agents who have surplus funds to lend. Since the agents have very little knowledge about the investment projects involved, and the entrepreneurs have to find out which agents have surplus funds and how much each is willing to lend, this process turns out to be time consuming and costly.

In addition, when borrowers and lenders do not share common information, optimal financial contracts often involve agency costs, which are costs required in monitoring investment projects (Williamson, 1986; Bernanke and Gertler, 1989, 1990). While borrowers typically possess inside information about the investment

projects, they have little incentive to disclose such information. Efforts made
by a third party to obtain additional information are often costly. Furthermore,
since lenders cannot distinguish between honest and dishonest borrowers prior to
issuing loans, the incorporation of a lemons premium into the market interest rate
discourages honest borrowers. Given that the necessary information is not available,
credit rationing by way of limiting loan size arises in the market (Jaffee and Russell,
1976). As such, without proper information transfer, credit markets will perform
poorly as loans are given to 'wrong' borrowers while genuine borrowers with good
characteristics may sometimes be turned down.

Well-functioning financial markets and intermediaries ensure funds are allocated
efficiently. Through economies of scale and economies of scope, financial markets
and intermediaries are able to ameliorate the problems of asymmetric information
and high transaction costs. The ability of financial markets and institutions to reduce
these market frictions can lead to more efficient allocation of resources and thereby
foster long-run growth (Diamond, 1984; Boyd and Prescott, 1986; Williamson, 1986;
King and Levine, 1993b).

3. The Functions of Financial Systems

Growth theory suggests that there are two distinct and yet complementary channels
through which financial development can influence growth – the capital accu-
mulation channel and the total factor productivity (TFP) channel. The capital
accumulation channel, often known as the quantitative channel, is developed based
on the 'debt-accumulation' hypothesis of Gurley and Shaw (1955). It focuses on
the financial sector's ability to overcome indivisibilities through mobilizing saving.
The mobilized saving is then channelled to productive sectors to fund investment
projects, thereby leading to increased capital accumulation and higher output growth.
The TFP channel, often known as the qualitative channel, emphasizes the role of
innovative financial technologies in reducing informational asymmetries that hinder
the efficient allocation of financial resources and the monitoring of investment
projects (Townsend, 1979; Greenwood and Jovanovic, 1990; King and Levine,
1993b). An efficient financial system also facilitates the adoption of expensive new
technologies.

These effects arise due to the key functions provided by the financial systems,
which are fundamental in establishing the links between financial development and
economic growth. In a comprehensive survey article, Levine (1997) classifies the
functions of financial systems into the following five categories.

3.1 *Allocating Resources*

A well-functioning financial system leads to more efficient allocation of resources.
Tobin and Brainard (1963) argue that with the ability to evaluate investment projects,
financial intermediaries allow entrepreneurs to expand their business by borrowing
at lower rates and with easier terms. Financial intermediaries evaluate different
investment opportunities available by assessing the associated risks so that funds

are channelled to the most promising projects. This leads to improved quality of investments that can have an expansionary effect on the economy. Financial markets may have a comparative advantage over financial intermediaries to fund new innovative investment projects since market participants can acquire relevant information on firms quickly, leading to more efficient allocation of resources.

3.2 *Mobilizing Saving*

Financial intermediaries and financial markets perform an important role in coordinating the saving and investment decisions of households and firms, respectively (Wicksell, 1935). Savings from households may be insufficient to fully fund a borrower. Financial systems induce mobilization of saving by pooling the savings of diverse households and making this aggregate fund available for lending. Hence, as financial systems expand, more deposits will be attracted from savers, and more funds will be available for investments. This facilitates financial intermediating activities, and hence deepens the financial systems.

3.3 *Reducing Risks*

Efficient financial systems allow investors to diversify their portfolios and hedge against risks. With the advantage of a large number of borrowers and lenders, financial intermediaries can effectively provide liquidity by properly matching the different maturity periods of loans (Diamond and Dybvig, 1983). Emergence of financial intermediaries significantly ameliorates the liquidity risks faced by individuals, and therefore facilitates investment activities. As a result, unnecessary liquidations can be avoided (Bencivenga and Smith, 1991). Financial markets also provide ample liquidity. Many potentially lucrative investment projects require long-term commitment of capital, but investors are often reluctant to tie up their savings. Financial markets, particularly stock markets, offer a solution by allowing investors to invest in these high-return projects and yet be able to sell the investment quickly and obtain cash when necessary. This makes stock markets attractive avenues for some investors.

3.4 *Facilitating Transactions*

Business transactions are facilitated through offering credit facilities and guaranteeing payments. Gurley and Shaw (1960) contend that the main function of financial intermediaries is to transform primary securities into indirect securities. Financial intermediaries can obtain profits during the course of this transformation by exploiting economies of scale in lending and borrowing. Since financial intermediaries can manage and invest funds at a much lower cost, small individual depositors can avoid the hassles of having to evaluate every potential borrower and firms seeking to borrow can save significant time and efforts to search for funds. This therefore reduces the costs of information and therefore greatly facilitates transactions.

3.5 *Exercising Corporate Control*

Costs related to monitoring firms may fall with the increased availability of services provided by financial intermediaries. If it is costly for outside investors to verify project returns, firms will be discouraged from borrowing more, given that more borrowing implies a greater risk of default. Hence, these verification costs may impede efficient investment (Bernanke and Gertler, 1989). With the existence of financial intermediaries, Diamond (1984) shows that monitoring costs will be reduced through proper financial arrangements. From the financial market perspective, the valuation of company assets based on stock prices provides a yardstick to measure managers' performance. This leads to improved corporate controls, and may exert a positive influence on economic growth.

4. The Evolution of the Thinking on Finance and Growth

Economists hold different perspectives on the links between financial development and economic growth. The important role of credit markets in the process of economic development can be traced back to Schumpeter (1911), who contends that entrepreneurs require credit in order to finance the adoption of new production techniques. Banks are viewed as key agents in facilitating these financial intermediating activities and promoting economic development. Hence, well-developed financial systems can channel financial resources to the most productive use. The alternative explanation initiated by Robinson (1952) suggests that financial development does not lead to higher economic growth. Instead, financial development responds passively to economic growth as a result of higher demand for financial services. When an economy expands, households and firms demand more financial services. In response to this increased demand, more financial institutions, financial products and services emerge, thereby leading to an expansion of the financial systems.

The notable early works on finance and development along the Schumpeterian lines include Gurley and Shaw (1955), Goldsmith (1969) and Hicks (1969). They argue that development of a financial system is crucially important in stimulating economic growth. Under-developed financial systems retard economic growth. The policy implication of this view points to the importance of formulating policies aimed at expanding the financial systems in order to foster growth. The creation of more financial institutions and the provision of a greater variety of financial products and services generate a positive effect on the saving–investment process, and hence on economic growth. This was dubbed the 'financial structuralist view'. However, this view had little impact on development policy making in the early post-war decades, partly because it was not presented in a 'formal' manner, and partly because of the dominant influence of the Keynesian 'financial repressionist' ideology. Financial repression refers to various restrictive measures imposed on the financial systems, including interest rate controls, high reserve requirements and directed credit programmes. These distortionary policies were popular in developing countries as ways to finance fiscal deficits without increasing tax or inflation. However, these measures weaken the incentive to hold money and other financial assets, and

therefore reduce the credit available for investors. Hence, financial repression curtails the size of the banking system and suppresses financial intermediation.

In the 1970s, the applicability of the Keynesian view to analysing the role of financial intermediaries and financial markets in the development process was cogently challenged by McKinnon (1973) and Shaw (1973). The McKinnon model, which was further developed and popularized by its followers (i.e. Kapur, 1976; Mathieson, 1980; Fry, 1988; Pagano, 1993), assumes that investment in a typical developing economy is mostly self-financed. Given its lumpy nature, investment cannot materialize unless sufficient saving is accumulated in the form of bank deposits. Such a complementary role between money and physical capital is termed the 'complementarity hypothesis'. On the other hand, the 'debt-intermediation' view presented by Shaw (1973) postulates that financial intermediaries promote investment and raise output growth through borrowing and lending. These two arguments suggest that a higher level of financial development, which can be the result of financial liberalization, will lead to increased output growth.

Building upon the early works of Gurley and Shaw (1955), Goldsmith (1969), Hicks (1969) and others, McKinnon (1973) and Shaw (1973) challenge the financial repression paradigm and provide a new paradigm in the design of financial policies. Their theories suggest that distortions in the financial systems, such as loans issued at an artificially low interest rate, directed credit programmes and high reserve requirements are both unwise and unnecessary. These can reduce saving, retard capital accumulation, and prevent efficient resource allocation. By allowing interest rates to adjust freely according to market mechanisms, entrepreneurs have more incentives to invest in high-yield projects. As such, higher economic growth is expected. Therefore, they called for financial liberalization, which refers to the process of eliminating or significantly alleviating financial system distortions. This was dubbed the 'financial liberalization view'.

In the early 1980s, the McKinnon–Shaw school of thought was severely criticized by a group of neo-structural economists led by van Wijnbergen (1982, 1983), Taylor (1983) and Buffie (1984). Several key assumptions, which differed from the McKinnon–Shaw framework, were introduced. The most distinctive feature in their models of developing economies is the focus on competitive and efficient 'curb markets', or non-institution credit markets. Since commercial banks are subject to reserve requirements, which involve a leakage in the intermediation process, the neo-structuralists argue that curb markets perform more efficiently in intermediating savers and investors. Their models assume that households own three types of assets: gold, bank deposits, and curb market loans, which are substitutes for each other. A rise in the bank deposit rates induces households to substitute curb market loans for bank deposits, resulting in a fall in the supply of loanable funds. This discourages investment and dampens output. Therefore, the neo-structuralists claim that financial liberalization is unlikely to raise growth in the presence of efficient curb markets.

However, as Fry (1988) contends, curb markets are not necessarily as competitive and efficient as commercial banks. If this were the case, the neo-structuralists' claim that financial liberalization is likely to reduce economic growth by lowering credit supply may not hold. Furthermore, Owen and Solis-Fallas (1989) show that

the relative efficiency of intermediation in formal and informal credit markets significantly influences the outcome of portfolio allocation effects generated through higher bank deposit rates. They contend that the characterization of unorganized credit markets as a perfectly efficient intermediation system by the neo-structuralists is highly unrealistic.

With the evolution in the growth literature in the 1980s, more complex types of models incorporating financial institutions into endogenous growth models emerged in the early 1990s (see, for example, Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991, 1993; Saint-Paul, 1992; King and Levine, 1993b; Pagano, 1993; Bencivenga et al., 1995; Greenwood and Smith, 1997; Blackburn and Hung, 1998). Various techniques, such as externalities and quality ladders, were employed to model financial intermediation explicitly rather than taking it for granted as in the McKinnon–Shaw framework. These models support the finance-led argument by demonstrating that financial development reduces informational frictions and improves resource allocation efficiency. The policy implication of these views is that the abolition of government restrictions should foster real sector growth in developing countries.

The McKinnon–Shaw framework emphasizes the importance of financial liberalization in increasing saving and, hence, investment, whereas most endogenous financial development and growth models focus on the role of financial intermediation in improving efficiency (rather than amount) of investment. Hence, their main distinction lies in the different focus of investment, i.e. quality versus quantity. Besides, unlike the McKinnon–Shaw models, which highlight the role of financial development in the process of economic growth, the endogenous financial development and growth models show reciprocal interactions between these two variables. That is, on the one hand, a higher level of economic development stimulates more demand for financial services, leading to increased competition and efficiency in the financial intermediaries and financial markets. On the other hand, the provision of timely and valuable information by financial intermediaries to investors allows investment projects to be launched more efficiently, and this enhances capital accumulation and economic growth.

As an important extension to the existing body of knowledge, some studies have focused on the relative merits of a bank-based ('German–Japanese') financial system and a market-based ('Anglo-Saxon') financial system in promoting economic growth (see Allen and Gale, 1999, 2000; Beck and Levine, 2002; Ergungor, 2004; Levine, 2005). Although banks continue to play an important role in allocating resources to fuel economic growth, the increased importance of financial markets is widely observed especially in more advanced economies. A bank-based financial system typically has relatively less developed financial markets. The main feature of this system is that firms rely more on finance provided by banks rather than on financial markets. As such, banks are more closely involved with firms where they can exercise a monitoring role. Firms are usually owned by a small number of shareholders with large share stakes and so hostile takeovers are also less likely to be seen in a bank-based system. This system tends to promote long-term growth as banks tend to offer longer-term loans.

In contrast, a market-based financial system (such as the UK and the USA), is characterized by the presence of highly developed financial markets. Banks are less involved in the allocation of funds or ownership of financial assets, and long-term funds are usually raised through financial markets which are active, liquid and efficient. Firms are owned by a large number of shareholders with relatively small share stakes. Hence, mergers and takeovers are widely observed. A market-based financial system is more likely to have short-term effects as firms are primarily concerned with their immediate performance.

The model developed by Boyd and Smith (1998) shows that credit and equity markets function as complements rather than substitutes. As Merton and Bodie (2004) argue, the issue is overall financial development and not which type of financial structure provides the financial services required to fuel growth. Given their diverse roles, it is possible for financial intermediaries and financial markets to have mutually reinforcing roles in the overall development of financial systems and economic growth.

5. Scepticisms of Financial Development

5.1 *The Irrelevance of Finance*

Not all researchers are convinced about the importance of financial systems. For instance, Lucas (1988) argues that economists tend to overemphasize the role of financial factors in the process of economic growth. Modigliani and Miller (1958) develop a framework in which real economic decisions are independent of the financial structure. Their model assumes a world of perfect markets with informational symmetry, and no transaction costs are involved in any economic activity. Applying this framework, Fama (1980) demonstrates that in a competitive banking sector with equal access to capital markets (such that depositors can always refinance their loans to achieve the best interest), a change in lending decision by any individual bank will have no effect on price and real activity under a general equilibrium setting.

5.2 *Negative Influence of Banks*

Morck and Nakamura (1999) and Morck *et al*. (2000) put forward that bankers' surveillance on corporate governance is to ensure corporate borrowers do not default on their debt. This casts doubt on the reliability of bankers, given that they may encourage risk-averse behaviour in investment undertakings and promote excessive investment in tangible assets (rather than knowledge-based assets), which can be used as loan collateral. This may constrain firms' opportunity to expand and exert a negative influence on economic growth. Hence, in principle, banking sector development can have a negative influence on economic growth.

5.3 *Destabilizing Effects of Stock Markets*

The argument that stock markets promote economic growth is also subject to debate. Stock market growth can result in portfolio substitution from bank loans

to stocks rather than accumulating and generating additional resources to fuel growth. Keynes (1936) argues that stock markets produce too much speculative activities, and these are not conducive to the stability of an economy. In his view, due to their unstable and speculative nature, stock markets have malign and destabilizing effects on an economy. Similarly, Kindleberger (1978) put forward that the instability of expectation and asset speculation regarding over-leveraged situations can have severe negative consequences for an economy. Psychological factors stimulate excessive speculative behaviour (mania) when some events change the economic circumstances. In the presence of a weak banking system, a snap in confidence (panic) can cause the economy to enter a crisis (crash). In short, irrational speculation leads to asset price bubbles, which will burst and induce economic crises due to fragility of the banking system. This point is further supported by Singh (1997) who contends that expansion of the stock market in developing countries is likely to impede long-term growth. Given that most stock markets in developing countries are still immature and subject to informational problems, a lack of transparency and disclosure deficiencies can contribute to the fragility of these markets. Hence, stock markets are likely to undermine rather than promote economic growth.

5.4 *Financial Crises*

Minsky (1975) points out that financial crises induced by instability in financial systems can have severe adverse effects on the economy. He views an economy as being naturally unstable, with constant government intervention required to achieve stabilization. According to Minsky's (1991) 'financial instability hypothesis', an economy naturally progresses from a robust financial structure to a fragile financial structure. Rapid economic expansion encourages the adoption of a more risky behaviour. This will transform the economy to a boom phase fuelled by speculative economic activities. Such an over-leveraged situation provides conditions for a crisis caused by events that induce firms to default on their loan repayments. Consequently, higher financial costs and lower income can lead to higher delinquency rates. When bankruptcies kick in, the economy would enter a state of economic recession. Minsky (1991) calls for intervention of central banks and more government spending in order to mitigate these cyclical fluctuations.

5.5 *Oppositions to Financial Liberalization*

Several prominent economists, led by Joseph Stiglitz, have substantial reservations about the benefits of financial liberalization. Stiglitz (2000) argues that the increased frequency of financial crises is closely associated with liberalization of the financial sector. Stiglitz (1994) suggests that government intervention by way of repressing financial systems can reduce market failures and improve the overall performance of an economy. For example, keeping interest rates at low levels can raise the average quality of borrowers. Imposing credit constraints can encourage the issue of more equity to finance business expansion. This lowers the cost of capital. Directed credit programmes can channel resources to high technological spillover sectors. Similarly,

Mankiw (1986) put forward that government intervention, such as providing a credit subsidy and acting as a lender for certain borrowers, can substantially improve the efficiency of credit allocation.

6. Models of Financial Development and Economic Growth

This section provides an overview on different models of financial development and economic growth.

6.1 *Keynesian Model*

According to Keynes, individuals hold money for three reasons: transactions motive, precautionary motive and speculative motive. The speculative demand for money arises from decisions about choosing between holding money and holding bonds. Bonds always yield the market interest rate (i). When the interest rate is low, individuals have more incentives to hold speculative money balances. In Keynes's model, there are some interest rates that individuals consider as 'normal' at a particular point in time. When the interest rates fall below their normal level, all individuals form the same expectation that the interest rate will rise in future. Hence, a rise in money supply will have no effect on interest rates since no one would want to purchase more bonds. This phenomenon is known as the 'liquidity trap', which has a crucial implication for the equilibrium level of output. Summing up, the real money demand function, $(M/P)^D$, can be expressed as

$$(M/P)^D = \alpha + \beta/(i - \tilde{i}), \ \alpha > 0, \beta > 0 \tag{1}$$

where α and β are parameters, i is the market interest rate, $\tilde{i}$ is the liquidity trap interest rate and $i > \tilde{i}$. Hence, market interest rate is inversely related to the demand for real balances.

In this simple Keynesian model, planned investment is solely determined by real interest rate. When the real interest rate increases, planned investment will be lower than planned saving at the full employment level in the presence of a liquidity trap, resulting in unintended inventory accumulation. Aggregate output must fall to restore equilibrium. Therefore, the Keynesian framework implies a high interest rate is not conducive for growth. However, the Keynesian model is criticized for its assumption on price rigidity and short-term orientation.

6.2 *Neoclassical Model*

The neoclassical model assumes that capital markets operate costlessly and perfectly. Notwithstanding money has a role to satisfy the transactions motive, it has no direct role to play in capital accumulation. As such, it is not important to distinguish between currency and deposits, as money in this case can be considered as the outside fiat money. The key idea of the neoclassical model can be summarized as

$$(M/P)^D = f(Y, R_{\text{CAPITAL}}, R_{\text{MONEY}}); f_Y > 0, f_{R_{\text{CAPITAL}}} < 0, f_{R_{\text{MONEY}}} > 0 \tag{2}$$

where $(M/P)^D$ is the real money demand, Y is the real income, $R_{CAPITAL}$ is the real rate of return on capital and R_{MONEY} is the real return on money. Y is positively related to $(M/P)^D$ due to the transactions motive demand for money. The main assumption of this model is that money and capital are substitutes. Hence, an increase in R_{MONEY} reduces demand for physical capital. In other words, holding large real cash balances will prevent the accumulation of capital. This implies $R_{CAPITAL}$ is negatively associated with $(M/P)^D$ whereas R_{MONEY} is positively associated with $(M/P)^D$.

6.3 *The McKinnon–Shaw Model*

The two financial liberalization models developed by McKinnon (1973) and Shaw (1973) emphasize different aspects of the effects of raising interest rates. McKinnon's model stresses the relationship between the deposit rate and investment whereas Shaw's model focuses on the importance of lending and borrowing activities. The main difference between these two models lies in the assumption about the way finance is raised. In McKinnon's outside money model, all finance is raised internally whereas Shaw (1973) postulates an inside money model that considers externally raised funds. Outside money refers to money held outside the monetary base, for example gold or cash. In contrast, inside money refers to any debt that is used as money. For practical considerations, most projects are financed by a combination of own funds (outside money) and borrowed funds (inside money). Therefore, these two models should be viewed as complementary (Molho, 1986).

   The McKinnon–Shaw model has strong implications for financial development, which can begin by allowing the real interest rate to free flow according to market mechanisms. However, it is criticized on the ground that the use of interest rate as a key indicator of financial development is unconvincing. As De Gregorio and Guidotti (1995) put forward, this is misleading since high interest rates may reflect a lack of confidence in economic policy and the banking system, and the adoption of more risky behaviour in investment undertakings.

6.3.1 *McKinnon's (1973) model*

McKinnon (1973) criticizes both the Keynesian and neoclassical models for assuming that capital markets function competitively with a single rate of interest governing the markets. These views cannot adequately explain the operation of capital markets in poor countries, which are often characterized by fragmented rates of interest. The complementarity hypothesis of McKinnon (1973) states that money and capital are complements in developing countries in the absence of efficient financial systems. The hypothesis is derived from an outside money model where it is assumed that all economic units are confined to self-finance and money is essentially the fiat currency issued by the public sector. Because of fragmented economic conditions and the lack of external finance to firms, physical capital has a lumpy nature. Entrepreneurs must accumulate sufficient funds in monetary assets to finance

investment projects. As such, money and capital are viewed as complementary assets where money serves as a channel through which capital accumulation takes place.

Using the complementarity hypothesis as the basis, McKinnon (1973) develops an alternative monetary model that can better explain the relationship between the monetary process and capital accumulation in less developed economies. The complementarity hypothesis is a joint hypothesis where the demand for real money balances, $(M/P)^D$, depends positively on the real average return on capital (R_{CAPITAL}), and the investment ratio (I/Y) rises with the real deposit rate of interest (R_{MONEY}). This joint hypothesis implies that both $(M/P)^D$ and I/Y react positively to a rise in R_{CAPITAL} and R_{MONEY}, which can be summarized as

$$(M/P)^D = f(Y, R_{\text{CAPITAL}}, R_{\text{MONEY}}); f_Y > 0, f_{R_{\text{CAPITAL}}} > 0, f_{R_{\text{MONEY}}} > 0 \quad (3)$$

and

$$I/Y = g(R_{\text{CAPITAL}}, R_{\text{MONEY}}); g_{R_{\text{CAPITAL}}} > 0, g_{R_{\text{MONEY}}} > 0 \quad (4)$$

6.3.2 *Shaw's (1973) model*

The debt-intermediation view of Shaw (1973) is based on an inside money model, where money created as loans to the private sector is based on the internal debt of the private sector. The higher the money stock in relation to economic activity, the greater the extent of financial intermediation between savers and investors through the financial systems. Shaw (1973) argues that high interest rates are essential in attracting more saving. With more supply of credit, financial intermediaries may promote investment and raise output growth through borrowing and lending. Shaw (1973) stresses the importance of raising funds externally where money plays the role of credit and tangible medium of exchange. Complementarity has no role to play here as investors are not constrained to self-finance. If institutional credit is not available, non-institutional credit will appear. This model can be summarized as

$$(M/P)^D = f(Y, R_{\text{OPP}}, R_{\text{MONEY}}, T); f_Y > 0, f_{R_{\text{OPP}}} < 0, f_{R_{\text{MONEY}}} > 0, f_T > 0 \quad (5)$$

where Y is real income, R_{OPP} is a vector of opportunity costs of holding money in real terms, R_{MONEY} is the real deposit rate of interest and T is the technological improvement in the financial industry. Technological advancement is assumed to have a positive impact on money demand.

6.4 *Endogenous Financial Development and Growth Models*

In the neoclassical growth model, production in an economy depends on the amount of capital stock and labour and the level of technological progress. Assuming that there is no technological progress and the labour force grows at a constant rate, per capita production depends only on per capita capital stock. The law of diminishing marginal returns results in less and less output produced as per capita capital stock increases. As such, higher capital accumulation due to higher saving can only have

a temporary impact on growth. Achieving long-run growth requires continuous technological progress. This consideration leads to the emergence of endogenous growth models following the seminal work of Lucas (1988).

As highlighted previously, development in the financial systems can lead to higher economic growth through technological progress, given that expansion in the financial systems allows more innovative projects to be carried out. However, long-term growth is only possible with continuous technological development. Since technological progress is treated as an exogenous factor, financial development cannot be a determinant of long-run growth in the neoclassical framework. The endogenous growth models are models in which long-run growth is an endogenous variable. These models provide a theoretical framework, demonstrating that financial intermediation can have both growth and level effects.

For an illustration, consider the model developed by Pagano (1993) to highlight the relevance of financial factors in the process of economic growth. Pagano (1993) assumes the simplest endogenous growth setting, i.e. the *AK* model of Rebelo (1991). It is postulated that only capital (K_t) is used in the production, and it exhibits constant returns to scale. Capital depreciates at a rate of δ and there is no population growth so that $K_{t+1} = I_t + (1 - \delta)K_t$. It is also assumed that a certain proportion of saving, the size of $1 - \phi$, is lost during the process of financial intermediation. Only the fraction ϕ of total saving can be used to finance investment. Such a saving leakage indicates inefficiency in the financial systems. Therefore, the saving–investment relationship can be described as $I_t = \phi S_t$, and the steady state growth rate (g) expressed as

$$g = \frac{K_{t+1} - K_t}{K_t} = \frac{I_t + (1 - \delta)K_t - K_t}{K_t} = \frac{\phi S_t}{K_t} - \delta = A\phi s_t - \delta \qquad (6)$$

where $s_t = S_t/Y_t = S_t/AK_t$. From the above, it can be seen that there are three ways in which finance can influence growth: (1) increasing the marginal productivity of capital (A); (2) raising the proportion of saving channelled to investments (ϕ) and (3) influencing saving rates (s). The rate of depreciation (δ) is assumed to be constant. The two limitations are that this is a closed economy model which does not account for capital inflows, and the model is restricted to financial intermediation activities while ignoring stock market activities and other components in the financial system.

7. Empirical Evidence

Building upon the early works of Schumpeter (1911), Gurley and Shaw (1955), Patrick (1966), Goldsmith (1969), McKinnon (1973), Shaw (1973) and others, there have been a number of empirical studies focusing on examining the relationship between financial development and economic growth using data for various countries and time periods. Although most of these studies document a positive association between financial development and economic growth, this does not necessarily imply that financial development is always exogenous to economic growth (Levine, 1997). The empirical results nonetheless have a far-reaching influence on the policy prescriptions adopted by many developing countries during the 1970s and

1980s, which tended to encourage more financial saving by increasing real interest rates.

The empirics on this subject can be broadly categorized into three groups – pure cross-country, time series and panel studies – based on the nature of the data employed. Pure cross-country and panel analyses typically use growth equations in the style of Barro (1991), while time series analyses mainly adopt either a vector autoregression (VAR) framework or a single equation error-correction framework. All types of study are subject to some limitations.

7.1 *Cross-Country Evidence on Finance and Growth*

The positive relationship between financial development and economic growth was documented in an early study by Goldsmith (1969). However, empirical studies on this subject only burgeoned in the 1990s, following the prominent work of King and Levine (1993a). They study 80 countries over the period 1960–1989 by controlling for other factors that affect long-run growth. Their results imply that the initial level of financial development is a good predictor of the subsequent rates of economic growth. Their empirical specifications, especially the measures of financial development, have been widely used with some modifications in many recent studies.

While King and Levine (1993a) focus on using banking variables to proxy the level of financial development, some studies attempt to examine the role of stock markets in promoting economic growth. The results of Atje and Jovanovic (1993) show that stock markets have both positive levels and growth effects on economic activity. Subsequent studies by Demirguc-Kunt and Maksimovic (1998) and Levine and Zervos (1998) confirm these results.

There is also considerable interest in examining the relative importance of a bank-based or market-based financial system in economic growth. The cross-country results of Levine (2002) indicate that although there is a strong connection between financial development and economic growth, there is no overall empirical support for either the bank- or market-based view. By exploiting firm-level data for 40 countries, Demirguc-Kunt and Maksimovic (2002) show that overall financial development helps explain the growth of firms; however, firms do not tend to grow faster in either bank- or market-based systems.

Quite apart from the general findings of the literature, Ram (1999) shows that financial development and economic growth are negatively correlated based on the results of 95 countries. The correlation between financial development and economic growth in these countries is found to be weakly negative or even negligible. Similar results are obtained when the analyses are performed on each individual country, and on each sample grouped by the level of growth rates.

The main findings of pure cross-country analyses are summarized in Table 1. On the whole, the results of a majority of these studies seem to suggest that financial development exerts a positive impact on economic growth. Although these studies have made significant contributions to the literature for understanding the finance–growth nexus, the results are subject to the several criticisms outlined below.

Table 1. Pure Cross-Country Evidence on Finance and Growth: A Summary.

Study	Sample	Method	Key findings
Goldsmith (1969)	Annual data for 35 countries over the period 1949–1963	Ordinary least squares (OLS) and graphical analysis	The regression results show a clear relationship between financial development and economic growth. However, the relationship is statistically weak in the sense that the correlation coefficients are low and negative for developed countries
Atje and Jovanovic (1993)	Annual observations for 94 countries during the period 1960–1985	OLS	Stock markets have both positive levels and growth effects on economic activity. However, a similar effect of bank lending is not observed
King and Levine (1993a)	Annual data for 80 countries over the period 1960–1989	OLS	Various indicators of financial development are found to be positively and strongly associated with real per capital GDP growth, the rate of physical capital accumulation and TFP growth. The empirical results provide some support for the Schumpeterian view that finance matters for growth
Harris (1997)	Annual data for 39 countries over the period 1980–1988	Two stage least squares (2SLS)	In contrast to the results reported by Atje and Jovanovic (1993), the paper finds little support for the argument that stock market activity helps explain growth in per capita output. For less developed countries, the stock market effect is rather weak. However, stock market activity is found to have some effect on growth in developed countries
Demirguc-Kunt and Maksimovic (1998)	Annual data for 30 developing and developed countries for the period 1980–1991	OLS	The analysis shows that in countries with better and more efficient legal systems, more firms use long-term external finance. A larger banking sector, a more active stock market and a well-developed legal system enable firms to obtain external funds more easily, which in turn facilitates firms' growth. These firms typically report lower returns on capital and profits. Government subsidies do not appear to play a role in these economies

Table 1. *Continued*

Study	Sample	Method	Key findings
Levine (1998)	Annual data for 42 countries covering the period 1976–1993	OLS and generalized method of moments (GMM)	Countries with more efficient legal systems tend to have better developed banking systems. Banking sector development contributes positively to per capita GDP growth
Levine and Zervos (1998)	Annual data for 47 countries over the period 1976–1993	OLS	The results are consistent with the view that financial development leads to higher economic growth. Stock market liquidity and banking sector development both positively affect real per capita GDP growth, capital accumulation and productivity growth. Stock market size, volatility and international integration are robustly related to growth
Levine (1999)	Annual data for 49 countries over the period 1960–1989	GMM	The results show that financial systems are better developed in countries with sound legal and regulatory systems. Furthermore, financial development is found to be positively associated with economic growth
Ram (1999)	Annual data for 95 countries over the period 1960–1989	OLS	Based on the data for 95 individual countries, the correlation between financial development and economic growth is found to be weakly negative or negligible. Similar patterns are observed when regression analyses are performed on each individual country, and on each sample grouped according to the level of growth rates
Deidda and Fattouh (2002)	Annual data for 80 countries over the period 1960–1989	Threshold OLS model	Using initial per capita income as the threshold variable, the authors find that higher levels of financial development are positively related to higher growth rates. In the model without threshold effects, the results only hold for high-income countries but not for low-income countries

Study	Data	Method	Results
Demirguc-Kunt and Maksimovic (2002)	Firm-level data for the largest publicly traded manufacturing firms in 40 countries over the period 1989–1996	2SLS	The impact of the stock market and banking sector development on firms' growth is closely related to the level of development of the country's legal environment. There is no evidence that development of a market-based or bank-based financial system *per se* affects firms' access to financing
Levine (2002)	Annual data for 48 countries over the period 1980–1995	OLS and instrumental variables (IV)	The results provide no evidence for either the bank-based or market-based view. The overall level of financial development helps explain cross-country growth variations. The legal system is an important factor which influences financial development, and this in turns influences long-run economic growth
McCaig and Stengos (2005)	Annual data for 71 countries from 1960 to 1995	GMM	The results indicate a strong positive effect of finance on growth when private domestic credit or liquid liabilities is used as the measure of financial development. However, the link is considerably weaker when the ratio of commercial bank assets to central bank assets is used as the indicator of financial development

7.2 *Limitations of Pure Cross-Country Studies*

While many empirical studies have tried to investigate the link between financial development and economic growth, the standards of the econometric techniques employed are often subject to criticism. Pure cross-country regressions typically construct observations for each country by averaging out the variables over the entire period of study. The empirical specification is often adopted from Barro's (1991) regression model, augmented with financial development indicators. However, there are several econometric problems associated with this specification.

Most studies take the finance–leading view for granted and so focus explicitly on how the financial system affects growth, while little effort has been given to examining the reverse. As a result, these studies typically employ a single equation approach in specifying the finance–growth relationship. While such an empirical specification is intuitively appealing for its simplicity, its use may pose some conceptual problems. Since potential endogeneity has not been properly controlled for, this is likely to yield biased and inconsistent estimators.

Researchers often include instrumental variables in the estimation to deal with the problems of endogeneity bias. However, as demonstrated by Ahmed (1998) and Ericsson *et al.* (2001), this technique is inadequate to account for the possible reverse causality from economic growth to financial development when data are averaged over decades. Averaging data over long periods may mask the important features of the growth path of the economy and eliminate all dynamics. It may also introduce a spurious contemporaneous correlation between time-averaged variables, although the original series may not be contemporaneously correlated. Both the sign and size of the induced correlation may differ from those of the original series.

Indeed, when financial development is specified as the dependent variable instead, individual country studies have shown that economic development has a positive impact on financial development (see Demetriades and Luintel, 1997, 2001). Hence, in a single equation framework, the empirical specification derived from any *a priori* theoretical belief has limited use for disentangling the causal relationship of the variables. A more promising approach is to formulate a set of simultaneous equations which explicitly provides a specification for the financial development equation.

The static assumption of the econometric models adopted in pure cross-country studies reflects a one-period comparative static framework. Hence, the assertion made by these studies that the results represent the long-term economic behaviour is ungrounded. As Ericsson *et al.* (2001) argue, these analyses omit levels relationship in the specification. Thus, they estimate the short-run rather than long-run relationship. Thiel (2001) stresses the importance of having long time series for analysis of the finance–growth link. Given that cash flows or profits of firms are pro-cyclical in nature, firms' demand for external funds may be subject to the same cyclical patterns. As such, financial development measures may not necessarily be associated with growth on a short-term basis. Since economic growth is a long-term phenomenon, sufficiently long time series are required for the analysis of the finance–growth link.

The danger of grouping countries together has been highlighted clearly in an early study by Gupta (1970). Using the same source of data, Gupta (1970) re-estimates the saving functions of Rahman (1968) for all 50 available countries, instead of just 31 as arbitrarily selected by Rahman (1968). His results show that the coefficient of capital flow changes sign and becomes statistically insignificant. In another example, Harris (1997) shows that the results of Atje and Jovanovic (1993), which find a significant correlation between economic growth and stock market transactions over the period 1980–1988 for 40 countries, are not robust. Harris (1997) argues that the use of lagged investment as an instrument in their study is inappropriate to deal with the endogeneity issues since lagged investment is not highly correlated with current investment and so it is not a good instrument. Upon re-examining the results of Atje and Jovanovic's (1993) study, Harris (1997) finds only a weak impact from stock market activity on growth in per capita output.

Furthermore, Garretsen *et al.* (2004) find that once legal and other societal factors have been controlled for, the positive association between the stock markets and economic growth found in Levine and Zervos (1998) disappears. By dividing the sample countries into several groups based on the level of financial development, Rioja and Valev (2004) obtain a different impact of financial development on economic growth. The findings of these studies suggest that the results obtained from cross-country studies are at best ambiguous and fragile. They are subject to the sample countries included in the estimation, the control variables used, the time period covered and the econometric techniques employed. Hence, these studies are unlikely to yield robust results.

Empirical research on the finance–growth nexus burgeons in recent years with the availability of new data sets compiled by the World Bank. Such data sets involve a large sample of countries and have been widely employed by many empirical analyses. However, the lack of high quality data with sufficient degree of comparability across countries is a fundamental hindrance for the applicability of the findings of these broad comparative studies. These broad comparative analyses conducted at the aggregate level are unable to capture and account for the complexity of the financial environments and histories of each individual country. This is because the finance–growth nexus is largely determined by the nature and operation of the financial institutions and policies pursued in each country (Arestis and Demetriades, 1997). Therefore, without an in-depth understanding of the financial historical context and the financial environment of each individual country, the cross-country evidence provides little policy guidance. In view of these limitations, a number of researchers have put forward strong arguments for time series country-specific in-depth studies (see Demetriades and Hussein, 1996; Edwards, 1996; Neusser and Kugler, 1998; Ericsson *et al.*, 2001; Kenny and Williams, 2001; Kirkpatrick, 2005; Ang 2007, 2008).

7.3 *Time Series Studies on Finance and Growth*

Using quarterly industrial output data to measure the level of economic development, Gupta (1984) conducts the first time series investigation to study the

finance–growth nexus for 14 developing countries. The results indicate that causality runs from financial development to economic growth, suggesting a catalyst role of the financial sector in the process of economic development. However, due to a lack of better alternatives, industrial output is used in Gupta's (1984) study. This measure represents only a small portion of total output in most developing countries, and is therefore not a satisfactory indicator for economic development.

Patrick (1966) contends that the direction of causality between financial development and economic growth changes over the course of development. At the beginning of the growth process, the creation of financial institutions leads to higher growth by transferring resources from traditional sectors to modern sectors (dubbed 'supply-leading hypothesis'). However, in the second stage, higher growth creates more needs for financial services and modern financial institutions (dubbed 'demand-following hypothesis'). In an attempt to test the validity of Patrick (1966), Jung (1986) conducts Granger causality tests for 56 countries from 1950 to 1981. While the results provide more support for the supply-leading hypothesis, they yield inconclusive results for reverse temporal causality patterns. As in Gupta's (1984) study, Jung's (1986) results suffer from degrees of freedom problems in the estimation.

More recently, Neusser and Kugler (1998) study the finance–growth relationship by using financial sector GDP and manufacturing GDP as proxies for financial development and economic growth, respectively. The findings of their causality tests are consistent with the supply-leading view that finance plays an important role in economic development. Similar findings are obtained by Demetriades and Luintel (1996), Choe and Moosa (1999), Luintel and Khan (1999), Xu (2000), Bell and Rousseau (2001) and Rousseau and Vuthipadadorn (2005).

Demetriades and Hussein (1996) and Arestis and Demetriades (1997) assess the finance–growth causal links in developing and developed economies, respectively. Their results exhibit substantial variation across countries even when the same variables and estimation methods are used, highlighting the limitations of cross-country studies for treating different economies as a homogeneous entity. Arestis and Demetriades (1996) provide several accounts for the variation of causality results from country to country. Firstly, different financial systems may have different institutional structures and certain institutional structures may be more conducive to economic growth. Secondly, financial sector policies play an important role in determining whether financial development fosters economic growth. Thirdly, two countries with identical financial systems and financial sector policies may still differ due to the effectiveness of those institutions that design and implement the policies.

Using time series data from 1960 to 2001, Ang and McKibbin (2007) conduct multivariate cointegration and several causality tests to assess the finance–growth link in the small open economy of Malaysia. To deal with the issue of multi-collinearity and over-parameterization problems, they propose the use of principal component analysis to construct a financial development index using the appropriate financial development indicators. Since Malaysia has more features of a bank-based financial system, only banking variables are used in constructing the index. Contrary to the conventional findings, the results strongly support the view that output growth causes financial development in the long run, but not the hypothesis that a

bank-based financial system induces long-term growth in the real sector. In a study that explicitly examines the causal impact of stock market developments on economic growth, Caporale *et al.* (2005) find strong evidence that stock market development in Malaysia enhances economic growth through raising investment efficiency, which in turn increases the productivity of the economy at the aggregate level.

Attempts have also been made to examine the relative importance of banks and stock markets in contributing to economic growth in the time series context. Arestis *et al.* (2001) find that banks are more powerful in promoting economic growth. They argue that the role of stock markets has been overemphasized by cross-country studies. Their results show that in two of the five developed economies examined, stock markets tend to have negative effects on economic growth. However, contrasting findings are obtained by Thangavelu and Ang (2004) using Australia as the case study. In their study, the empirical test results using financial development indicators related to financial intermediaries suggest that the banking sector is reactive to the demand generated from the economic development, i.e. economic growth causes banking development in the Granger sense. On the other hand, the results of using financial market indicators are consistent with Schumpeter's (1911) view that development of the stock market is essential in fuelling economic growth.

Several studies have also attempted to examine the impact of financial repression on development of the financial system. Using India as the case study, Demetriades and Luintel (1997) find that financial repression (measured by a summary of repressionist controls) has substantial negative effects on financial development. Ang and McKibbin (2007) report similar findings for Malaysia. However, contrasting findings are obtained by Demetriades and Luintel (2001) for the Korean experience. The authors attribute these results to the presence of a sound institutional framework in the Korean financial system. In fact, in their sample of six developing countries, Arestis *et al.* (2002) find that the effects of financial liberalization on financial development vary considerably across countries. The main findings of the time series studies are provided in Table 2.

7.4 *Limitations of Time Series Studies*

Owing to data constraints, the estimation period used in many time series studies is often short. This problem is particularly severe for most developing countries where data are scarce. A meaningful time series analysis requires long series in order to properly account for the persistent dynamics, a feature common in most macroeconomic time series. In order to preserve the degrees of freedom, some studies arbitrarily select only one lag in their empirical model specification. This casts doubt on the reliability of the results, since sufficient lags are required to model short-run dynamics and properly deal with the problems of serial correlation. The results may also be sensitive to the choice of lag length and the inclusion of trend terms in the econometric specification. Furthermore, using quarterly data to increase the sample size does not fully resolve the problem as a sufficiently long time span is required to make inference on the long-run results.

Table 2. Time Series Evidence on Finance and Growth: A Summary.

Study	Sample	Method	Key findings
Gupta (1984)	Quarterly time series data from 1961Q1 to 1980Q4 for 14 developing countries	VARs and Granger causality	The results indicate that causality runs from financial systems to the economic sector, suggesting a catalyst role of the financial sector. There is some evidence of reverse causality but lesser evidence for a two-way causality
Jung (1986)	Annual data on 37 less developed countries and 19 developed countries	VARs and Granger causality	Overall, the results provide some support for Patrick's supply-leading hypothesis that causality runs from financial development to economic development in less developed countries, but a reverse causal pattern is observed in developed countries
Demetriades and Hussein (1996)	Annual data for 16 countries (Costa Rica, El Salvador, Greece, Guatemala, Honduras, India, Korea, Mauritius, Pakistan, Portugal, South Africa, Spain, Sri Lanka, Thailand, Turkey and Venezuela) with at least 27 observations	VARs, vector error-correction model (VECM), Engle–Granger cointegration, Johansen cointegration and Granger causality	Based on the causality results, the study finds little support for the view that finance is a leading factor for economic development. On the whole, the results seem to suggest that financial development and economic growth are jointly determined
Demetriades and Luintel (1996)	Annual observations for India from 1961 to 1991	Error-correction model (ECM), exogeneity tests and principal component analysis (PCA)	Banking sector controls are found to have negative effects on the process of financial development. On the basis of exogeneity tests, financial development and economic growth are found to be jointly determined
Arestis and Demetriades (1997)	Quarterly data for Germany and the USA for the period 1979Q1–1991Q4	Johansen cointegration, VECM and weak exogeneity tests	The results vary substantially across countries, highlighting the limitations of cross-country analyses. In Germany, causality runs from financial development to real GDP whereas for the case of the USA, a reverse causal pattern is found

Demetriades and Luintel (1997)	Annual data for India from 1960 to 1991	Engle–Granger cointegration, Stock–Watson cointegration, PCA and weak exogeneity tests	Financial repression, measured by a summary of repressionist controls, has substantial negative effects on financial development. Raising real deposit rate contributes to development of the financial sector. Financial development and economic growth are found to be jointly determined
Neusser and Kugler (1998)	Annual data for 13 OECD countries for the period 1970–1991	Johansen, Stock–Watson, Horvath–Watson, Phillips–Ouliaris, Engle–Granger cointegration and Granger causality	Cointegration between financial sector GDP and manufacturing GDP is found only in half of the sample countries examined. Causality results show, in general, that finance Granger-causes manufacturing TFP. Some feedback relationships are also found in several countries
Choe and Moosa (1999)	Annual data for Korea covering the period 1970–1992	VARs and Granger causality	The causality tests show that financial development leads to higher economic growth for the Korean experience. Financial intermediaries are more important than capital markets in this causal relationship
Luintel and Khan (1999)	Annual data for 10 developing countries with 36–41 observations (Costa Rica, Colombia, Greece, India, Korea, Malaysia, the Philippines, Sri Lanka, South Africa and Thailand)	VARs, VECM, Johansen cointegration, weak exogeneity and Granger causality	A bi-directional causality between financial development and economic growth is found in all 10 sample countries. Finance and output are also positively related in the long run
Xu (2000)	Annual data for 41 countries over the period 1960–1993	VARs and impulse response analyses (IRA)	The results provide evidence that financial development stimulates growth, and investment is an important channel through which finance affects growth. Out of 41 countries examined, 27 countries are found to have positive effects of financial development on investment growth and economic growth

Table 2. *Continued*

Study	Sample	Method	Key findings
Arestis *et al.* (2001)	Quarterly data for five developed countries, including Germany, the USA, Japan, UK and France over the period 1972–1998	Johansen cointegration, VECM and weak exogeneity tests	The results indicate that overall both banks and stock markets promote economic growth. However, the contributions from stock markets are relatively small compared to that of banks. The results also suggest that stock market volatility has negative real effects in Japan, France and the UK
Bell and Rousseau (2001)	Annual data for India from 1951 to 1995	Johansen cointegration, VECM, Granger causality and IRA	The results show that the financial sector plays an important role in stimulating the economic performance of India. Increases in financial aggregates have preceded increases in both investment and growth. However, financial sector has no influence on the TFP of manufacturing industries
Demetriades and Luintel (2001)	Annual data for South Korea from 1956 to 1994	ECM and PCA	The effects of financial restraints on the financial development in South Korea are positive and large. However, the effects of real interest rate on financial development are insignificant
Arestis *et al.* (2002)	Annual data for six developing countries, i.e. South Korea, the Philippines, Thailand, Greece, India and Egypt for the period 1955–1997	VECM, Johansen cointegration and PCA	The effects of financial liberalization are found to vary considerably across the six developing countries under study. Real interest rate has positive and significant effects in four out of the six countries examined
Thangavelu and Ang (2004)	Quarterly data for Australia from 1960Q1 to 1999Q4	VARs and Granger causality	The empirical results using financial development indicators related to financial intermediaries suggest that the banking sector is reactive to the demand generated from the economic development, i.e. economic growth causes banking development in Granger's sense. On the other hand, the results of using financial market indicators are consistent with the Schumpeterian view that development of the stock market is essential in fuelling economic growth

Caporale et al. (2005)	Quarterly data from 1979Q1 to 1998Q4 for Chile, Malaysia, Korea and the Philippines	VARs and modified WALD (Toda–Yamamoto) tests	The study explicitly examines the causal impact of stock market developments on economic growth. The evidence points to the causality running from stock market development to economic growth through increasing investment efficiency
Rousseau and Vuthipadadorn (2005)	Annual data for 10 Asian countries over the period 1950–2000	Johansen cointegration, VECM, Granger causality tests, modified WALD (Toda–Yamamoto) tests and variance decomposition analyses	The results show that finance is a key driving force for investment, supporting the factor accumulation channel. However, the role of financial factor in expanding output is found to be weaker
Ang and McKibbin (2007)	Annual data for Malaysia from 1960 to 2001	VECM, Johansen cointegration, Granger causality and PCA	Based on the causality results, the findings support the view that output growth leads to financial development in the long run but not the hypothesis that a bank-based financial system induces long-term growth in the real sector. Finance and output are positively related in the long run
Ang (2008)	Annual data for Malaysia from 1965 to 2004	VECM, Johansen cointegration, Granger causality and PCA	This study examines the FDI-growth nexus in Malaysia by controlling for the level of financial development. Financial development is measured by a composite index, which is a summary measure of four financial development indicators. The results show that FDI and financial development are positively related to output in the long run. The impact of FDI on output is enhanced through financial development

A majority of the available time series studies are subject to omitted variable problems. In the light of limited data points available for most developing countries, most studies typically specify a time series model, whether a single equation or simultaneous equations, with usually not more than four variables. This involves a real income variable (Y_t), a financial development indicator (F_t) and some control variables (Z_{it}), such as real interest rate, inflation, investment, etc. The variables in the time series model are always kept to a minimum in order to preserve degrees of freedom. However, there is no compelling reason to believe that $F_t = f(Y_t, Z_{it})$ and $Y_t = g(F_t, Z_{it})$ is an adequate specification of the relationship between financial development and output. This simple specification may be subject to model misspecification problems, and is of limited use to identify the transmission mechanisms linking financial development and economic growth. This problem is particularly pronounced in analyses that make use of VARs, which are often deemed to be *atheoretical* since no restrictions are imposed using economic theory.

Analyses based on Granger causality tests may misinterpret the results. This is because expectation about future economic development may induce financial development. If firms anticipate stronger economic performance in the near future, indicating higher demand for financial services, they may invest more in financial services related investments in anticipation of higher future profits. In this sense, financial development is simply a leading indicator rather than a causal factor (Ahmed, 1998). Therefore, such evidence of 'causality' must be interpreted with caveats. Furthermore, the Granger causality test is merely an examination of whether the past values of one variable are useful in predicting the current value of another variable. Since causality is assessed relative to the information set at hand, if a variable helps predict another variable, this does not necessarily imply one causes another (Demetriades and Andrianova, 2004). As Diebold (2004) explains, 'X causes Y' is simply the abbreviated expression for 'X contains useful information for predicting Y'. Therefore, the causality results should be interpreted in the probabilistic rather than the deterministic sense.

Although individual country case studies provide an important insight, which can be used as a reference for policy formulation, the findings of these case studies are not sufficient to confirm or refute the existing views on the finance–growth relationship. The results obtained from any particular country cannot be readily generalized or extended to other countries to make inference. Hence, the use of single country time series analysis may be limited to policy formulation for the particular country under investigation.

7.5 *Panel Studies on Finance and Growth*

In more recent years, researchers have tried to ameliorate the econometric short-comings associated with pure cross-sectional studies by taking into account the time dimension with the use of dynamic panel estimation techniques. The empirical results of Levine (1999), Beck *et al.* (2000), Benhabib and Spiegel (2000), Levine *et al.* (2000), Rousseau and Wachtel (2000), Beck and Levine (2004) and Rioja and

Valev (2004) consistently point to the same conclusion that the measures of financial development have a positive impact on economic growth.

In view of the issues of limited data points and 'spurious' regressions, Christopoulos and Tsionas (2004) propose the use of panel unit roots and panel cointegration techniques to examine the causality patterns. They find strong evidence of causality running from financial development to economic growth but no evidence of a feedback relationship. Similarly, using the Geweke decomposition test on pooled data of 109 developing and developed countries from 1960 to 1994, Calderon and Liu (2003) find a bi-directional causality between financial development and economic growth. However, financial development contributes more to the causal relationships in developing countries than in developed countries.

Some attempts have been made to examine the issue at the micro level by exploiting firm- or industry-level data, supplementing the findings of these cross-country studies. Rajan and Zingales (1998) contend that better-developed financial intermediaries and financial markets help reduce market frictions. This provides lower costs of external finance to facilitate firms' expansion and encourage new firm formation. Using industry-level data for a large sample of countries over the 1980s, they demonstrate those industries which are more reliant on external finance prosper more in countries with better-developed financial intermediaries and financial markets. The results suggest that financial development may play a beneficial role in firms' growth and the rise of new firms by easing the flow of external finance. The seminal work of Rajan and Zingales (1998) has stimulated much research interest in using micro level data to gain more insight into the relationship between financial development and economic growth beyond country-level (see Wurgler, 2000; Cetorelli and Gambera, 2001; Demirguc-Kunt and Maksimovic, 2002; Fisman and Love, 2003; Bertrand et al., 2004; Allen et al., 2005). The key features of the studies that have used pooled time series and cross-sectional data in a panel setting are summarized in Table 3.

Although the use of dynamic panel analysis is an attempt to incorporate the time dimension, they may still be subject to the econometric problems discussed in Section 7.2. This type of regression analysis is also subject to omitted variable problems or heterogeneity bias when the unobserved country-specific effects are included in the error term, and this leads to biased and inconsistent estimates (Pesaran and Smith, 1995). Wachtel (2003) argues that holding country-specific effects constant in panel regressions would generate a spurious aggregate relationship as the reported relationship between financial development and economic growth is due to between-country differences rather than within country differences over time. Hence, it appears it is difficult to draw any reliable policy inferences from these broad comparative analyses (Demetriades and Andrianova, 2004).

8. Key Issues in the Literature

Having discussed the cross-country, time series and panel findings, and the weaknesses associated with these studies, there are still some important issues that remain unresolved in the literature, and they are outlined below.

Table 3. Panel Evidence on Finance and Growth: A Summary.

Study	Sample	Method	Key findings
De Gregorio and Guidotti (1995)	Annual data for 99 countries during 1960–1985, and panel data for 12 Latin American countries during 1950–1985	OLS and panel data random effects	The empirical findings suggest that financial development leads to improved economic performance. However, for the case of Latin American countries, unregulated financial liberalization and expectation of government bail out can lead to negative effect of finance on growth
Odedokun (1996)	Annual data for 71 less developed countries, spanning the 1960s to 1980s	Generalized least squares (GLS)	Regression results for each country show that financial development promotes economic growth in about 85% of the sample countries. The growth-enhancing effects of finance are more prominent in low-income than in high-income less developed countries. The panel data estimation results show that the results are invariant across regions and the levels of economic development
Rajan and Zingales (1998)	41 countries with industry-level data for the period 1980–1990	OLS and panel data fixed effects	The results indicate that those industries which are more reliant on external finance prosper more in countries with better-developed financial intermediaries and financial markets. Financial development may play a beneficial role in firms' growth and the rise of new firms by easing the flow of external finance
Beck et al. (2000)	Annual data for 77 countries for the period 1960–1995	IV and GMM	Financial sector development is found to be robustly and positively correlated with both real per capita GDP growth and TFP growth. The results also provide some support for the positive role of financial development on both capital accumulation and private saving rate; but these links are statistically weaker

Study	Data	Method	Findings
Benhabib and Spiegel (2000)	Annual observations for Argentina, Chile, Indonesia and Korea from 1965 to 1985	GMM	The results show that financial development positively affects both investment rates and TFP growth. However, the results are sensitive to the inclusion of country fixed effects and different indicators of financial development
Henry (2000)	Annual data for 11 developing countries (Argentina, Brazil, Chile, Colombia, India, Korea, Malaysia, Mexico, the Philippines, Thailand and Venezuela), spanning the 1970s and 1990s	Panel data techniques	The empirical evidence shows that stock market liberalization leads to increased private investment in 9 out of 11 countries studied. The average growth rate of private investment was 22 percentage points higher than the sample mean three years after the liberalization
Levine *et al.* (2000)	Annual data for 74 countries spanning from 1960 to 1995	IV and GMM	Using both IV and dynamic panel techniques, the results show that financial intermediary development is positively related to economic growth. The results also suggest that legal systems and accounting standards help explain differences in the level of financial development
Rousseau and Wachtel (2000)	47 countries with annual data for the period 1980–1995	Panel VARs	The analysis shows that stock market liquidity and financial intermediation lead to higher per capita output. The effects of stock market capitalization on output are found to be weaker
Beck and Levine (2002)	Annual data from 1980 to 1990 on a panel of 42 countries and 36 manufacturing industries	OLS and panel data techniques	Industries that rely more on external finance tend to grow faster in countries with more advanced financial systems and more efficient legal systems. However, having a bank-based or market-based financial system *per se* does not seem to matter for growth

Table 3. *Continued*

Study	Sample	Method	Key findings
Rousseau and Wachtel (2002)	Annual data for 84 countries from 1960 to 1995	Panel data fixed effects	The results show that there is an inflation threshold of 13%–25% for the finance–growth link. Finance does not seem to increase growth when inflation exceeds this threshold level. The effects are significantly positive when inflation falls below the threshold of 6%–8%
Calderon and Liu (2003)	Pooled data of 109 developing and industrial countries from 1960 to 1994	Panel VAR, Geweke decomposition and Granger causality	A bi-directional causality is found between financial development and economic growth. Finance exerts a stronger effect in developing countries. The longer the sample period, the larger the effects of finance. Finance affects growth through both channels of capital accumulation and productivity growth, with the latter channel being more prominent
Beck and Levine (2004)	A panel data set on 40 countries over the period 1976–1998	OLS and GMM	Overall financial development contributes positively to economic growth. Both stock market and banking sector development enter the growth regressions significantly and positively, suggesting that stock markets provide financial services different from that of banks
Christopoulos and Tsionas (2004)	Annual data for 10 developing countries, i.e. Colombia, Paraguay, Peru, Mexico, Ecuador, Honduras, Kenya, Thailand, Dominican Republic and Jamaica from 1970 to 2000	Panel VECM, panel cointegration, threshold cointegration and fully modified OLS	Based on panel cointegration analysis, the results show that there is a long-run equilibrium relationship between financial development and economic growth. The long-run causality runs from finance to growth, but there is no feedback relationship observed. There is also no evidence of short-run causality

Rioja and Valev (2004)	Panel data of 74 countries for the period 1961–1995	GMM	By dividing all countries into three groups according to their levels of financial development, the evidence suggests that finance has a strong positive impact on economic growth mainly in countries with more developed financial systems. In financially less developed countries, the effect of finance on growth is ambiguous
Ketteni et al. (2005)	Panel data of 74 countries for the period 1961–1995	Semiparametric partial linear model	The authors find that the finance–growth nexus is only linear when the nonlinearities between economic growth and initial per capita income, as well as economic growth and human capital, are taken into account. The relationship appears to be nonlinear when these nonlinearities are ignored. Therefore, it appears that the alleged nonlinear finance–growth relationship is not robust
Ndikumana (2005)	Annual data for 99 countries for the period 1965–1997	OLS and panel data fixed effects	The evidence shows that various financial development indicators are positively related to domestic investment, suggesting that as financial systems grow, capital becomes more easily available and cheaper, which is conducive to capital accumulation. On the other hand, the results find no support that either a bank-based or market-based financial system is better at promoting investment. Hence, financial structure does not seem to matter
Stengos and Liang (2005)	Panel data of 66 countries for the period 1961–1995	IV augmented semiparametric partial linear model	The authors employ a semiparametric approach to study the potential nonlinearity of the effect of finance on growth. Their results indicate that a nonlinear effect exists in the relationship but the results are sensitive to the choice of the measures for financial development

8.1 *A Dearth of Country-Specific In-Depth Studies*

Until recently, a major constraint impeding research on the dynamic relationship between financial development and economic growth has been the lack of sufficient time series data for developing countries. As a result, cross-country studies have dominated the literature. Although these studies have made significant contributions to the literature and spurred much research, as Ahmed (1998) points out, the issue of causality cannot be satisfactorily addressed in a simple broad comparative framework. While the findings of these studies provide a useful guide to the finance–growth relationship, they cannot be generalized since such a causal link is largely determined by the nature and operation of the financial institutions and policies pursued in each country (Demetriades and Hussein, 1996; Arestis and Demetriades, 1997; Demetriades and Andrianova, 2004; Kirkpatrick, 2005). As Solow (2001) proposes, while a group of economies may share some common features each has its own distinctive characteristics. Explaining the evolution of the economic behaviour observed over time requires an economic model that is dynamic in nature. Hence, it is important to carry out country-specific studies in order to relate the findings to policy designs within specific cases.

8.2 *Measuring Financial Development*

The selection of key variables to indicate the level of financial services produced in an economy and measuring the extent and efficiency of financial intermediation are the main problems in empirical studies. As Edwards (1996) put forward, 'defining appropriate proxies for the degree of financial development is, indeed, one of the challenges faced by empirical researchers'. Some studies try to include as many financial proxies as possible in the estimation in order to present a more 'complete' picture of financial development. This is particularly obvious in studies that examine the relative importance of a bank- and market-based financial system. However, this leads to the problems of multicollinearity in both cross-sectional and panel data investigations, as well as over-parameterization in time series analyses.

In addition, Cole (1988) notes that the commonly used financial development measures are unable to provide a comprehensive picture of the size of the financial systems because there are many types of financial claims which are not recorded. The treatment and classification of these financial claims also differ over time and across countries. This problem is more pronounced in less developed countries with poor financial infrastructure. Even if data quality is ignored, it is still hard to be sure any single rudimentary aggregated financial measure would be sufficient to capture most aspects of financial development. This is because countries differ in terms of their financial structure, degree of concentration of financial institutions, size of financial institutions and instruments, efficiency of financial intermediaries, volume of financial transactions and effectiveness of the financial regulatory framework.

Highly aggregated measures of financial development, such as M2/GDP and bank credit/GDP, are often used to proxy financial development for convenience, despite

the possibility that different components of the financial system (stock markets, banks, insurance companies, etc.) may have different impacts on economic growth. As noted by Gurley and Shaw (1955), in the early stages of financial development, financial intermediaries are predominantly banks, providing lending and transactions services. Under such circumstances, money stock is a reliable proxy to measure the extent of financial intermediation. However, as the financial system evolves, the use of money stock becomes inappropriate with the emergence of other types of more complex financial intermediaries. Furthermore, it appears that using different measures of financial development may give rise to different conclusions about the way financial development and economic growth are related (see McCaig and Stengos, 2005; Stengos and Liang, 2005).

8.3 *Interpretation of Financial Development Indicators*

Highly aggregated financial development measures must be interpreted with caveats. For example, a high ratio of private credit/GDP or M2/GDP does not necessarily indicate a high level of sophistication in the financial systems. These ratios were rather high in several crisis-hit Asian countries before the Asian financial crisis, and remained high after the crisis. However, this clearly does not imply the existence of a sound and efficient financial system in all these economies.

   Thiel (2001) highlights that a significant portion of the bank loans issued to the private sectors may be used to finance housing loans instead of being channelled to fund productive activities. Furthermore, with increasing global financial integration, domestic financial indicators are not sufficient to capture development in the financial systems. In recent years, increasing merger and acquisition activities have been an important force for raising funds from stock markets. Thus, funds raised from stock markets are not necessarily used to finance investment projects, casting doubt on the reliability of financial development indicators based on stock market measures.

8.4 *Excessive Focus on Banks*

While examining the importance of financial markets, research has so far mainly focused on the role of banks. These studies play down the contributions from other components of the financial system, such as pension funds, insurance companies, bond markets, share markets, etc., on the grounds that these intermediaries are relatively new and small and therefore provide little funds to spur growth. Ignoring the rapid development of these intermediaries may lead to significant underestimation of the level of financial development. Furthermore, informal finance (curb markets) is also often neglected in the discussion as some economists view the informal sector as an unorganized and immaterial sector in generating resources to spur economic growth (Chandavarkar, 1992). Although informal finance may play a substantial role in intermediating resources in developing countries, it is difficult to gather these data.

8.5 *Institutional Factors*

Institutional factors have largely been ignored by most empirical studies. Since each country differs in terms of the quality of their regulatory authorities, the legal system and contract enforcement, barriers to participation of foreign banks, the perceived importance of the financial sector as an instrument of growth by the government, etc., financial intermediaries and financial markets are only as good as the environment in which they operate. Driffill (2003) highlights that while some of the empirical results on the positive influence of financial development look convincing, they must be interpreted with caveats since they may just be picking up other features of the countries involved, e.g., legal factors, institutions, geography, etc. Although it is often argued that the success of any financial sector policy critically depends on the existence of good governance, most studies take no account of institutions in their analysis, mainly because it is very difficult to find an appropriate proxy for institutions. Hence, the results obtained from these studies are far from complete. As Morck and Steiler (2005) argue, 'financial development is not a given, but depends on politics and history'. This also raises concerns about treating financial development as a purely exogenous variable.

8.6 *Fundamental Limitation of the Approach*

Empirical studies generally suffer from a fundamental limitation in their approach to understanding the finance–growth nexus. Cross-country studies typically employ Barro's (1991) regression model and augment it with some financial development indicators. Even though attempts have been made by using 2SLS or IV estimators to account for the potential endogeneity of financial variables, this single equation approach does not capture the full interaction between financial development and economic growth. A more promising way of describing the finance–growth relationship is to use a system of equations by explicitly modelling for economic growth, financial development and other variables concerned. Although time series approaches with a VAR specification treat all variables in the model as endogenous, these reduced form equations contain little theoretical backing. Structural VARs were invented to deal with this problem. However, they are accused of imposing too stringent (often zero) restrictions on the model. As a result, empirical researchers often struggle in choosing an appropriate approach. Attempts have recently been made to consider imposing some theory models on VAR, striking a balance between these two considerations (see McKibbin *et al.*, 1998; Kapetanios *et al.*, 2005).

8.7 *Functional Specification*

More recently, several papers have challenged the view that the finance–growth relationship is linear. Using a two-period overlapping generations model, Deidda and Fattouh (2002) establish a nonlinear and possibly non-monotonic relationship between finance and growth. Their results based on the threshold regression methodology show that while there is no significant relationship between finance

and growth in low-income countries, this relationship appears to be quite significant in high-income countries. In a similar vein, Rioja and Valev (2004) find that finance has a strong positive effect on growth only after it has achieved a certain threshold. Using more rigorous econometric approaches, the results of Ketteni *et al.* (2005) and Stengos and Liang (2005) based on nonparametric estimation techniques highlight that the relationship between finance and growth may be a nonlinear one. These results have important implications for the specification of the relationship between finance and growth.

9. Conclusions and Directions for Future Research

There is ample cross-country evidence pointing to a positive impact of financial development on economic growth. However, it is well known that there are significant differences among developing countries in which various structural features and institutional aspects may have a direct bearing on the impact of financial development in the process of economic growth. This points to a research agenda for more country-specific research using appropriate econometric techniques, insight of institution, and the economic histories of each country to address the key issues in financial development in order to inform appropriate analytical and policy debates.

There are several avenues in which future research can be directed. As highlighted previously, the traditional view that finance and growth present a linear relationship is subject to challenge. Using different econometric approaches, several studies have demonstrated that the finance–growth nexus may be nonlinear. An appropriate specification of the functional form is critical for the understanding of the finance–growth relationship. Therefore, more research on this area is necessary.

Research so far has mainly focused on testing the role of financial intermediation in the process of economic development. Little has been done to examine what determines financial sector development. The question of how government intervention in the financial system affects development in the financial sector is of significant relevance for the formulation of financial sector policies. While this has been illustrated by several case studies (see Demetriades and Luintel, 1997, 2001; Ang and McKibbin, 2007), cross-country analyses have not explored this issue so far. Hence, more research to shed light on what shapes financial sector development is desirable.

Another useful area for future research would be to examine how financial sector policies (financial repression/financial liberalization) impact on financial development while examining the link between financial development and economic growth. Previous studies that focus on testing the relationship between these two variables have largely ignored the role of government intervention in the financial systems. To this end, Ang and McKibbin (2007) have provided some preliminary evidence that, for countries where financial repression works positively on financial development, the finance–growth causal nexus is likely to be a bi-directional one. On the other hand, if financial repression is harmful for the development in the

financial system, then a finance-led growth seems unlikely. But more evidence is required to test the validity of these conjectures.

Acknowledgements

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