Finance and Growth:
A Survey of the Theoretical and Empirical Literature

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ABSTRACT

This paper reviews the theoretical and empirical literature on links between domestic financial development and economic growth. It starts with the pioneers in this field and then classifies two main schools favouring liberal financial regimes. First McKinnon and Shaw advocated financial liberalization in a period of widespread government intervention in credit markets. After that a period of criticism of free market regimes followed, partly based on unsuccessful policies. The literature on financial development and endogenous growth pushed the discussion back into the direction initially advocated by McKinnon and Shaw. We review a huge body of empirical literature, which generally finds positive associations between domestic financial development and economic growth. The evidence suggests, however, enormous heterogeneity across countries, regions, financial factors, and directions of causality.

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NON-TECHNICAL SUMMARY

In this paper we review the theoretical and empirical literature on links between domestic financial development and economic growth.

In the 1960s early pioneers like Goldsmith, Cameron, and Gerschenkron used crude econometric methods and case studies to explore the finance-growth nexus. They found rough associations between financial factors and output, but did not provide a strong enough theoretical fundament to answer the causality question.

In the 1970s McKinnon and Shaw developed a theoretical framework that helped to explain growth-inducing effects of financial liberalization in contrast to financial repression. They argued that the financial sector could raise the volume of savings as well as the quantity and quality of investment. This approach found only mixed empirical support and could not explain sustained increases in the growth rate of an economy either.

The literature of the 1980s witnessed a return towards market critical approaches that were based on micro (market failure related) - and macroeconomic (neostructuralist) concerns. Mixed experiences with financial liberalization policies fuelled the surge in this type of literature.

The answer economic theory gave to these questions was incorporated in the endogenous growth literature of the 1990s. It emphasizes the role of financial development in generating sustained growth through an external effect on aggregate investment efficiency. Some authors have developed a framework for reciprocal externalities between the financial and the real sector. Much empirical support has been found for the "finance promotes growth" view, but time-series evidence is less clear-cut than broad cross-section analysis. A majority of studies, however, comes to the conclusion that finance induces growth in early stages of economic development and vice versa in more advanced stages. A lot of evidence for bi-directional causality has been found as well. A specific role has been attributed to stock markets, but here in particular, the evidence is mixed.

1. Introduction

For almost a century economists have been debating the role of the financial sector in the process of economic development. Since Schumpeter (1911) put forward arguments pointing at the productivity- and growth-enhancing effects of the services provided by a developed financial sector, a considerable amount of theoretical and empirical literature has emerged. Initially this literature focused on the question whether the financial sector plays a causal role in economic development or if financial intermediaries merely originate from rapid industrialization. Put forward by Joan Robinson (1952), the latter point of view played a dominant role until the mid-1960s. Gerschenkron (1962), Patrick (1966), and particularly Goldsmith (1969), stressed the propulsive role the financial sector can play in the process of economic development. Even though this pioneering work broke ground to change the direction of thinking, the causality question has remained an important issue in the theoretical debate ever since.

In the 1970s the discussion concentrated on the phenomenon of financial repression, a policy conducted by many governments to generate growth and revenue through artificially low interest rates and inflationary monetary policies. It was based on the theoretical works of Keynes (1936) and Tobin (1965), who advocated government interference in the credit market. McKinnon (1973) and Shaw (1973) coincidentally raised arguments against policies of financial repression. They emphasized the role of the financial sector in increasing the volume of savings by creating appropriate incentives. In order to reach higher savings and investment rates, they recommended governments to abolish interest rate ceilings and advised them to give up raising seignorage through inflationary monetary policies. As a result real interest rates should rise to market clearing values, thus raising increased savings. An important feature of the McKinnon-Shaw models is that they explain only temporarily higher growth rates. Many governments in developing countries followed their policy advice and achieved significant accelerations in growth rates, but sometimes also excessively high and volatile real interest rates.

In the early 1980s the Neostructuralists criticized the McKinnon-Shaw school and predicted that financial liberalization would slow down growth. Their arguments are in the vein of those put forward by Keynes and Tobin. Joseph Stiglitz (1989) criticizes financial liberalization on the theoretical ground of market failures in financial markets.

A different strand of the theory that positively links finance and growth emerged in the early 1990s as a branch of the literature on endogenous growth. King and Levine (1993 b) follow Schumpeter's line of reasoning by emphasizing the role of innovation. Financial systems channel savings to their most productive uses and diversify the risks associated with these activities. Fulfilling these tasks, they increase the probability of successful innovation and the speed of technological progress. The most important result of the literature on endogenous growth is that the increase in growth rates can be sustained. In contrast to the school of thought based on

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physical capital accumulation (McKinnon, Shaw, 1973) the rate of technological progress is endogenously determined. This keeps the marginal productivity of capital from declining. Levine (1997) summarizes the following basic functions of financial systems that foster capital accumulation and productivity growth: they facilitate the trading, hedging, diversifying, and pooling of risk; they allocate resources; they monitor managers and exert corporate control; they mobilize savings; and facilitate the exchange of goods and services.

In this paper we shall proceed in three steps: In part 2. we summarize the pioneering literature on financial development and growth. Part 3. is concerned with the basic ideas of McKinnon and Shaw, as well as the extensions to their initial work. In section 4 we review the critiques of financial liberalization policies, namely those grounded on macroeconomic foundations (Neostructuralists) and those rooted in microeconomic theory. Part 5. examines the literature on finance and endogenous growth. Section 6 discusses the empirical evidence. The final section summarizes our main findings.

2. The 1960s: Pioneers in finance and growth

In the academic debate on the relationship between finance and growth Keynesianist arguments in favour of financial repression dominated for many years. Before the 1960s theory overwhelmingly provided support for the hypothesis that financial development followed from growth and not vice versa. Gerschenkron (1962) put the role of the banking sector into the context of what he called "economic backwardness". According to his hypothesis a country's degree of economic development at the beginning of industrialization determined the role of its banking sector. In England, the most advanced economy, industrialization didn't need an active financial sector, because investment was small-scale and needed little capital and specialized entrepreneurship. Germany, a moderately backward country, entered industrialization when technology was more advanced and investment had a large scale. The banking sector provided both capital and entrepreneurship to drive the industrialization process. Russia, even more backward, needed a strong financial sector and the leading force of the government to put large-scale, capital-intensive industries on track. Patrick (1966) focused even more specifically than Gerschenkron on the question of the causal relationships between finance and growth. He identified two patterns that he dubbed "demand following" and "supply leading", and attributed them to specific stages of the development process. In the first of the two patterns, economic development establishes a demand for financial services, which is passively satisfied by a growing financial sector. Rapid aggregate growth increases the demand for external funds. If the variance in growth across sectors or industries is great there will be more demand for financial services to transfer savings to the leading sectors. In the second pattern, however, financial intermediation induces economic growth by channelling savings of mostly small savers to large

investors. The financial sector channels resources from the traditional to the modern sectors and promotes entrepreneurship in the latter. In Patrick's view, the second, supply-leading pattern, dominates during the early stages of economic development, and subsequently gradually shifts its leading role to the demand following one. So initially the causality runs from finance to growth, a scenario that should be expected in developing countries. The demand-following pattern should then be expected to establish a causality that runs from growth to finance. More advanced economies may accordingly be expected to exhibit this direction of causality. With his framework Patrick provided a clear-cut, and empirically testable hypothesis.

Rondo Cameron (1967) argues that financial systems may be both growth-inducing and growth-induced, but he emphasizes the crucial role of the quality of its services and the efficiency with which they are provided. He subsequently summarizes important features of the financial system, in particular of banks: Financial intermediation serves as a vehicle for channelling small funds from risk-averse savers to less risk-averse people with entrepreneurial skills, which results in increased availability of funds for the latter. Secondly financial intermediation provides incentives to investors. Declining costs of borrowing encourage entrepreneurs to make larger investments. An expanding financial sector should reduce the dispersion of interest rates among users, regions, and over periods of seasonal fluctuation. Thirdly, financial institutions create possibilities for a more efficient allocation of the often-unproductive stock of initial wealth in the early stages of industrialization. Finally he emphasizes the role of banks in promoting technological progress. Cameron argues, that the majority of technical innovations are introduced by established firms with access to bank financing. Cameron's primary merit, however, doesn't lie in his theoretical considerations. He provides detailed case studies of the interactions of finance and growth in the successful industrialization processes in England, Scotland, France, Belgium, Germany, Russia and Japan in the 19th century. The comparison of these case studies highlights some striking similarities and differences: In England the authorities were very cautious in allowing the financial sector to play a constructive role in promoting growth. But lax administration and sufficiently loose law made financial innovation not impossible. So these financial innovations contributed significantly to rapid industrialization. In Scotland the contribution of finance to industrialization was even more striking. Given policies favouring freedom and competition, banks developed financial innovations like the cash credit system and engaged directly in industry. Banking in Scotland, together with a developed educational system, contributed strongly to the process of industrial development, and sustained very high growth rates for a bng time. In France the insufficiently developed banking system impeded more rapid industrialization in the first half of the 19th century. Restrictions on credit volume, a too small number of bank offices and not enough variety and specialization of financial institutions were the main reasons for the retarded economic development, effectively caused by the monopolistic position of the Banque de

France. In the second half of the century some financial reforms were put underway, but many restrictions remained. The Belgian financial system at that time featured some major innovations, like the creation of the first joint-stock bank, which was designed to promote the process of industrial development. Despite some shortcomings (e.g. the neglect of short-term commercial credit before 1851) the Belgian financial system promoted growth in a similar way as the Scottish, even though it featured significantly less competition than the latter. In Germany before 1870 private banks were the most important financial institutions that mobilized capital for industrial development. They were often closely allied with industrial enterprises, so that they demanded and supplied credit at the same time, thus playing a propulsive role in economic development. The expansion of the Prussian Bank, however, retarded progress with its restrictive policies. In general the German experience shows the importance of competition in banking, which was lacking to a substantial degree in that period. In Russia banking induced economic development more than in many other countries. Banks mobilized enormous resources that would otherwise have remained idle. Various types of public and private financial institutions jointly mobilized capital for industry and the money supply was subject to a very rigid system of note issue. Between 1868 and World War I Japan established a financial system that stimulated economic development. Banks had close ties with the industry and engaged primarily in funding long-term fixed investment and working capital. According to Patrick's terminology the Japanese banking system was "supply-leading" in that period.

Two groups of countries emerge from the analysis: In Scotland, Belgium, Russia and Japan the financial sector actively promoted industrialization, while in Germany (before 1870) and France financial development was inhibited by wrong policies. In England inappropriate policies couldn't prevent rapid financial development and innovation. In this group of countries, however, finance exhibited a rather "demand-following" pattern. Cameron et al. (1972) provide more case studies of countries that either did not achieve a significant level of industrialization before 1914 (Serbia, Spain), or countries with an incomplete and delayed industrialization (Austria, Italy), and finally countries with a rapid pace of economic development (USA, Japan). Austria's financial system is found to have played a counter-productive role during the process of industrialization because of the unwillingness of bankers to take appropriate risks. In addition to that, protectionist trade policies gave rise to less aggressive behaviour of banks and entrepreneurs. Since other wrong policies undermined the effectiveness of the financial system as well, it can be concluded that financial conditions hampered growth. In Serbia the insufficient pace of industrialization was rather a result of a general lack of managerial and entrepreneurial skills than of an underdeveloped financial system. The latter had achieved a surprisingly sophisticated structure after a few years of independence only. In Italy the financial instability induced by excessive government borrowing seemed to have hindered private domestic capital accumulation significantly. In the case of Spain the financial system couldn't sustain

industrialization because the political authorities forced it to be preoccupied with public finance and railway construction. Studies of the USA, especially Louisiana, and, again, Japan provide striking evidence of a growth-inducing role of the financial sector. This second set of cases studies shows how inappropriate financial sector policies inhibited the process of industrialization in several countries, but also that finance cannot compensate bottlenecks in other sectors.

Goldsmith (1969) asserts that the positive effect of financial intermediation on growth could be due to increasing both the efficiency and the volume of investment, even though he assigns a less important role to the latter[2]. He was the first to provide significant empirical evidence about the correlation of finance and growth for a cross-section of countries. By constructing a measure of financial development, defined as the value of all financial assets over GNP (called FIR or financial interrelations ratio[3]), Goldsmith broke ground for later empirical research conducted in that field. For a sample of 35 developed, developing, and socialist countries he finds a rough positive correlation between the financial development variable and GNP per capita, both measured for the early 1960s. The result is yet slightly spoilt by the existence of several outliers: Japan, Italy, and the UK had a much higher, and the Soviet Union a much lower value of FIR then their respective levels of national wealth would make believe. For four countries, Germany, Japan, the US, and the UK Goldsmith gives additional evidence: Over a period of about 100 years (1860-1963) the association of FIR and output was not only rough across these countries, but even within each country long-run relationships seemed to have been subject to some accident.

The studies of Gerschenkron, Patrick, Cameron, and Goldsmith triggered an ongoing academic debate that affected policy makers in developing and developed countries alike. Their theoretical framework was still relatively unsophisticated and empirical evidence for a significant relationship between finance and growth remained rough. Yet they induced a surge of interest in the subject.

3. The 1970s: The McKinnon-Shaw school

3.1. The characteristics of financial repression and its rationale

Financial repression is the main focus of the McKinnon-Shaw school. They assert that this policy is harmful for long-run growth because it reduces the volume of funds available for investment. Before we turn to the more detailed description of the McKinnon-Shaw school, we

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[2] See Goldsmith (1969), pp. 391-401, in particular p. 398. This assumption anticipated the results of a majority of econometric studies.
[3] See Goldsmith (1969), pp. 86-100 for the exact composition of the FIR formula.

therefore briefly summarize the main characteristics of this policy and explain why it has been conducted in many developing countries.

Financial repression is the combination of indiscriminate nominal interest rate ceilings and high and accelerating inflation. High reserve requirements may also play a role. It was based on the theoretical grounds of the liquidity preference theory propagated by Keynes (1936): The full-employment equilibrium level of the real interest rate, he argued, tended to be lower than the one generated by liquidity preference. So interest rates had to be lowered in order to avoid a fall in income. In Tobin's model (1965) there are small household producers who allocate their wealth among money and productive capital. Financial repression reduces the demand for money in favour of productive capital, thus raising the capital/labour ratio and accelerating economic growth. Neostructuralists argue that high interest rates increase inflation in the short run through cost-push effects and decelerate economic growth as a result of a reduced real credit volume (we will turn to the Neostructuralist view in more detail later).

These theoretical considerations are, however, complemented by policy requirements in developing countries. If the government is unable to collect sufficient tax revenue, it imposes financial repression measures as an implicit tax on the financial sector. Fry (1995) states that financial repression is a severe and unintended form of financial restriction, which he considers as a second-best policy for governments with low tax-raising power. In the case of financial restriction, financial institutions and instruments are given a priority treatment if the government can relatively easily extract seignorage from them. Reserve requirements, obligatory holdings of government bonds, or interest rate ceilings help the authorities in diverting savings to the public sector at low or zero costs. The banking and credit sector is most appropriate for that because it is more difficult to extract seignorage from the private equity and bond market.

3.2. Financial liberalization in the McKinnon-Shaw school

In 1973 both Ronald McKinnon and Edward Shaw launched an attack on the dominant theoretical schools of financial repression advocates. Contradicting Keynes and Tobin, they argue in favour of interest rate liberalization and abolition of other financial repression policy measures. Their basic model comprises financial intermediaries, savers and investors. It is an inside money model, because loans to the private sector are backed by the internal debt of the private sector. The nominal interest rate is fixed, holding the real rate below its equilibrium level. Saving is a positive and investment a negative function of the real interest rate. When the latter is driven down by either accelerating inflation or a decrease in the fixed nominal interest rate, saving will decrease. The inflation effect is sustained by another argument: If inflation is hedged by land ownership, the decrease in the real interest rate will stimulate demand for land, because deposits become less attractive. The shift in savings from bank accounts to land ownership drives

land prices up faster than the general price level. The induced wealth effect causes an increase in consumption, and, accordingly, a decline in investment. If there is financial repression in terms of a nominal interest rate fixed below the market clearing value, two scenarios are possible. If only the deposit rate is fixed, there will be a large spread between lending and deposit rates. In the case of loan and deposit rate ceilings, which is the more realistic scenario for developing countries, nonprice rationing of funds must take place. Credit allocation is determined by criteria like transaction costs, perceived risks of default, quality of collateral, political influence, reputation, loan size, and covert benefits to loan officers instead of expected investment productivity. The average efficiency of investment is reduced because investments with lower returns become profitable after the loan rate ceiling has been set at a sufficiently low level. Adverse selection takes place because entrepreneurs enter the market, who didn't request credit before the ceiling was set. Risk taking behaviour of banks is affected negatively, because risk premia cannot be charged. Credit allocation is to some extent subject to randomness, which is another factor of distortion. The policy prescription proposed by McKinnon and Shaw is therefore to abolish institutional constraints on nominal interest rates and to reduce inflation.

Even though McKinnon and Shaw essentially come to the same conclusions, their theoretical approaches feature some differences. McKinnon's model rests on the assumptions that all economic units are limited to self-finance and that there are important indivisibilities in investment. He makes no distinction between savers (households) and firms (investors). An investor must accumulate deposits or other financial assets in advance in order to invest later. So there is an intertemporal complementarity of deposits and physical capital. Since investors cannot borrow to finance investment, McKinnon's model is sometimes also interpreted as an outside money model[4].

In Shaw's model there is no necessity for complementarity, because investors are not confined to self-finance. He provides an explicit inside money approach. Financial intermediaries sustain deposit accumulation by raising real returns to savers and thus expand their lending potential. At the same time they lower real costs to investors through risk diversification, economies of scale in lending, improved operational efficiency, lower information costs to savers and investors, and accommodation of liquidity preference.

McKinnon's complementarity hypothesis and Shaw's debt-intermediation view, however, do not necessarily contradict each other, because investment may be financed both externally and internally. McKinnon refers rather to developing countries whereas Shaw's analysis describes the scenario of more advanced economies with sophisticated financial systems.

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[4] In contrast to inside money outside money is backed by loans to the government and not by the internal debt of the private sector. If money is only outside money, banks hold government bonds and make no loans to the private sector, see for instance Fry (1995), p.17 for definitions of the two money concepts.

In the aftermath of the McKinnon-Shaw debate, a number of studies has emerged that extend the original framework in specific ways. Kapur (1976), Galbis (1977), Mathieson (1980), and Fry (1980) develop formal macroeconomic models, in which financial repression is exerted by national authorities through fixing the deposit (not the loan) rate of interest below its market clearing value. Money demand depends on the (fixed) nominal interest rate and on inflation. Accelerating inflation reduces real money demand. The banks' liabilities contract in real terms and consequently also its assets, which reduces the supply of credit for investment. Using portfolio terminology, inflation reduces growth because households are induced to hold unproductive inflation hedges instead of financing productive investment through deposits.

Kapur and Mathieson introduce a specific type of financial repression: Even if interest rates are not subject to ceilings, the same effect is reached by reserve requirements. Assuming zero inflation, a fixed required reserve ratio puts a ceiling on the deposit rate. Inflation increases the wedge between loan and deposit rates even further[5]. The policy implication in this context is that reduced reserve requirements at a given inflation rate increase the scope of the banking system for lending activities. Besides a lower reserve requirement raises the deposit rate ceiling at any given loan rate. The demand for deposits increases and the financial sector expands. In the Kapur-Mathieson framework there is a developing economy with a labour surplus and a production technology of the following Harrod-Domar type: $Y = sK$. Y represents real output, K is total utilized fixed and working capital, and s stands for a constant output/capital ratio. Only the quantity of investment (ΔK) is affected by the financial sector, not the quality. Fry and Galbis extend the framework to allow the real deposit rate of interest to influence also s by raising the average efficiency of investment. In Galbis's two-sector model for instance, financial repression leads to a sustained co-existence of a traditional sector with a low constant rate of return to capital, and a modern sector with a higher rate of return. A low deposit rate leads to high self-financed investment in the traditional sector. Increasing the deposit rate raises money demand in this sector and thus allows higher investment in the modern sector financed from bank loans. This change in the composition of investment raises the average efficiency of investment. In Fry's model the deposit rate also has an impact on the level of investment.

In all models of the McKinnon-Shaw type the deposit rate that maximizes growth is the one that results from a free-market equilibrium. The authors recommend to abolish interest rate ceilings, to give up selective or directed credit programmes, to reduce reserve requirements, and, very importantly, to ensure competitive conditions in the financial sector.

Kapur, Mathieson and Fry also develop dynamic models capable of illustrating the effects of interest rate liberalization as a means of stabilization policy. They come to the conclusion that, starting from a situation of financial repression, interest rate liberalization has a

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[5] See Fry (1989), p. 16, for a detailed description of the mechanism through which inflation and reserve requirements cause financial repression.

double advantage. Apart from exerting a positive effect on long-run growth, financial liberalization reduces the contractionary effects of monetary stabilization programmes.

4. The 1980s: Critiques of financial liberalization policies

4.1. Neostructuralists

As a result of mixed experiences with financial liberalization policies the Neostructuralist school emerged, which criticized financial deregulation from a macroeconomic point of view. Taylor (1983) and van Wijnbergen (1982, 1983 a, b) most prominently put forward two arguments, one of which is specific to developing economies. In their models curb or unorganised money markets play a crucial role in determining whether financial liberalization can accelerate growth or not. If an increase in the real deposit interest rate leads to a shift of assets from the unorganised to the formal credit market, the existence of reserve requirements will lead to a decline in financial intermediation. In the unorganised money market reserve requirements do not exist. The extent of the contractionary effect on credit supply is determined by the degree to which assets are substituted out of inflation hedges or out of the curb market. The second argument is based on cost-push inflation resulting from increased interest rates, which may lead to a collapse of effective demand. Even if financial intermediation does not shrink the second argument is still valid, particularly because an increased propensity to save may weaken effective demand even more. The neostructuralist models, however, rest on the assumption that unorganised money markets are competitive which may not be the case. Another problematic feature of these models is that they consider the aggregate credit and investment volume and not investment efficiency. The latter may be enhanced by an increase in credit costs.

4.2. Market imperfections

Another group of authors focussed their attention on microeconomic underpinnings of macroeconomic policies. Stiglitz and Weiss (1981), for instance, show that disequilibria in the credit market may have causes other than government intervention. The authors show that the price of credit may affect the nature of the transaction, and may therefore not clear the market. The result is derived from an adverse selection effect and an incentive effect. High and market clearing interest rates may attract bad borrowers or induce borrowers to undertake more risky investment projects. Consequently borrowers are more likely to default. This may lead banks not to raise the interest rate to its market clearing level. As a result credit rationing may occur where only large size loans are allocated. Similarly excess supply equilibria are conceivable. These adverse outcomes are due to microeconomic shortcomings of a free credit market.

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Adverse selection may also be an issue in its own right. Mankiw (1986) discusses the problem of financial collapse in this context. He presents a model in which small changes in the interest rate may alter the riskiness of the pool of borrowers. This may lead to a collapse of the credit market if the pool of loan applicants is too risky to give the banks their required return. On top of that restrictive monetary policy may do more than move the economy along the marginal efficiency of capital schedule. It can also cause a financial crisis at the extreme.

Principal-agent problems are examined by Shleifer and Vishny (1986) and Stiglitz (1985). In the context of a corporation with many small owners they argue that it may not pay any of them to monitor the management. This free-rider problem arises from the public good character of the costly information acquisition of an individual stockholder who may easily liquidate his financial commitment.

Yet another strand of the literature related to market failure addresses the issue of asymmetric information in credit markets. Banks emerge as a result of information asymmetries between lenders and borrowers. In the costly state verification approach (e.g. Diamond, 1984) financial intermediaries can verify the success of investment only at a monitoring cost, which they try to minimize. Information asymmetries are are a problem because they may lead to capital misallocations and monitoring costs. As shown by Williamson (1987 a), the latter may cause equilibrium credit rationing even in the absence of other market failures.

Moral hazard is an issue often discussed with respect to deposit insurance schemes. Originally designed to correct negative externalities running from banks' business activities to their customers, deposit insurance may cause yet another type of market failure. It may encourage risk taking by bank managers. Gennotte and Pyle (1991), for instance, show that implementing more stringent capital requirements in the presence of deposit insurance may lead to an increase in asset risk. Monitoring and control of asset risk through the regulation authorities must counteract this.

5. The 1990s: Finance and endogenous growth

In the 1990s research on the relationship between financial development and long-run growth received new impulses from the literature on endogenous growth. A branch of this stream started to focus on the question whether financial conditions could explain sustained growth in per capita GDP. The central argument is that finance generates an external effect on aggregate investment efficiency, which offsets the decrease in the marginal product of capital. Some studies consider the role of stock markets exclusively.

In most studies the model structure is of the AK type (Romer, 1986), in the sense that there are constant returns to a sufficiently broad concept of capital. Bencivenga and Smith (1991), for instance, present a model where savings are channelled to more productive activities

by allowing investors to adjust the composition of their assets towards the illiquid growth-enhancing ones. Individuals face uncertainty about their future liquidity needs and therefore hold two types of assets: a liquid one, which is safe but unproductive, or an illiquid one with high productivity and risk. The existence of financial intermediaries shifts the composition of assets towards the more risky one and therefore increases growth. Financial institutions allow individuals to reduce the risk associated with their liquidity needs. In spite of the uncertainty individuals face about future liquidity needs, banks face a predictable demand for liquidity from their depositors as a result of the law of large numbers. Accordingly banks are enabled to allocate investment funds more efficiently. Furthermore socially unnecessary capital liquidation can be reduced because individuals are no longer forced to liquidate investment in the presence of financial intermediaries. In a similar vein Bencivenga, Smith, and Starr (1995) show that financial institutions reduce liquidity risk to which savers are exposed by making financial assets tradable (stock markets) or by enabling depositors to withdraw cash before a project's maturity (banks). This reduces the disincentive to investing in long-run projects. The lowering of transaction costs in financial markets is crucial to their analysis.

A number of papers include the possibility of reciprocal externalities between finance and growth, which allows for multiple equilibria and poverty traps. Greenwood and Jovanovic (1990) develop a model in which financial intermediation and growth are both endogenous. The authors assume a positive two-way causal relationship between financial development and growth. On the one hand, financial institutions collect and analyse information in order to find the investment opportunities with the highest return. They channel funds to the most productive uses, thereby increasing the efficiency of investment and growth. But the effect of financial institutions is twofold: The return individuals get is not only higher, but also safer, because the financial system insures investors against idiosyncratic risk. On the other hand, growth provides the means needed to implement and develop a costly financial structure. Saint-Paul (1992) analyses the effects of financial markets on technological choice and the division of labour. In this model agents can choose between two technologies: The first is flexible and allows productive diversification, but has low productivity. The second is rigid, more specialized and productive. In the presence of shocks to consumer preferences (possibly leading to lack of demand for certain products) and without financial institutions, risk-averse individuals may prefer technological flexibility instead of high productivity. Financial markets allow individuals to hold a diversified portfolio in order to insure themselves against negative demand shocks, and to opt for the more productive technology. This fosters a greater division of labour. The model allows for multiple equilibria: In the "low" equilibrium financial markets are underdeveloped and people therefore choose less productive, but flexible technologies. With these technologies there is not much risk exposure and the incentives to develop financial markets are limited. The economy is trapped in a state of underdevelopment. In the "high" equilibrium financial markets

are developed and technology is specialized and risky. This creates a need for financial markets. The model is then extended to consider multiple growth paths and divergence across identical countries. Berthélemy and Varoudakis (1996) introduce reciprocal externalities between the financial sector and the real sector into a learning-by-doing endogenous growth framework. They assume a positive influence of the financial sector on capital efficiency and thus on growth and an external effect of the real on the financial sector via the volume of savings. The mechanisms work as follows: First the financial sector channels savings to more productive uses by collecting and analysing information about investment opportunities. In return, the expansion of the real sector causes an increased volume of savings. The increased size of the financial market induces more competition and technical efficiency through learning-by doing in the financial sector. This two-way causality gives rise to a cumulative process, which causes multiple equilibria. Insufficient financial development might be a reason for the emergence of poverty traps.

King and Levine (1993 b) develop a Schumpeterian model of technological progress similar to Romer (1990) or Grossman and Helpman (1991), with cost-reducing inventions applying to an intermediate product. Financial intermediaries and securities markets enable particular entrepreneurs to undertake innovative activity, which affects growth through productivity enhancement. Financial systems affect entrepreneurial activities in four ways: They evaluate entrepreneurs, pool resources, diversify risk and value the expected profits from innovative activities. Better financial systems increase the probability of successful innovation. Distortions like deposit rate ceilings or high reserve requirements reduce the rate of innovation.

Another group of studies is concerned with issues like government interventions in the credit market or market failure. The respective authors put these "old" issues into the "new" framework of endogenous growth. Roubini and Sala-i-Martin (1992), for instance, re-examine financial repression the context of an AK model of endogenous growth with non-decreasing returns to capital. In their model governments might opt for policies of financial repression in order to generate easy inflationary revenues. Financial repression induces individuals to carry a larger stock of nominal money, which is the base for the inflation tax. Given a high income tax subject to tax evasion, governments choose to repress the financial sector and to accelerate inflation. Growth is reduced because of the negative effect of financial repression on the productivity of capital and the quantity of savings. Mattesini (1996) proposes a different approach to financial development and economic growth. He develops a simple overlapping generations model where the credit market is characterized by asymmetric information. Like in Roubini/Sala-i-Martin production is based on a Romer (1986) constant returns to scale technology. One determinant of growth is the level of monitoring costs of financial institutions, a parameter representing the efficiency of the intermediation system. This parameter is approximated by the spread between lending and borrowing rates in order to conduct empirical analysis. High monitoring costs are assumed to reduce the rate of economic growth, i.e. spreads

and growth are expected to be negatively correlated. Bencivenga and Smith (1993) present another endogenous growth model of the AK type related to market failure. In this model credit rationing and growth are jointly determined with permanent adverse effects on economic development.

A significantly large number of studies have been written about the importance of stock markets for the development process. We will review these studies separately because they partly yield different results for banking and stock market activities and show that banks and securities markets provide different services. Atje and Jovanovic (1993) for instance, do not develop an endogenous growth model, but use the approach of Greenwood and Jovanovic (1990, s.a.) and apply it to stock markets. The stock market insures investors against idiosyncratic risk and creates more information about investment projects. In return growth fosters the development of stock markets. The model developed by Greenwood and Jovanovic is a genuine endogenous growth model, implying no diminishing returns to capital as a result of financial intermediation. Levine (1991) constructs an endogenous growth model in which a stock market permanently accelerates growth by assuming two functions: it reduces liquidity risk and productivity risk. Without stock markets, risk-averse investors might be deterred from investing in a firm because of firm-specific productivity shocks. Stock markets insure investors against this idiosyncratic risk by allowing them to hold diversified portfolios. This circumstance raises the fraction of resources allocated to the firm. Secondly, liquidity shocks might force agents to prematurely sell assets at a low liquidation return. The stock market reduces that risk, because ownership can be transferred more easily and at better conditions. This reduction of liquidity risk encourages firm investment and thus indirectly accelerates growth. Premature removal of firm capital can be avoided so that unnecessary shocks to technological innovation need not take place. This increases firm productivity and directly stimulates growth. The model also shows that impeding or taxing financial market activity has a negative impact on long-run growth.

6. Empirical evidence

6.1. Financial liberalization, savings, and investment

Empirical evidence of the Mckinnon-Shaw hypothesis has been rather mixed, indicating that financial liberalization alone is a necessary, but not a sufficient condition for improving the economic performance of developing countries. Most generally, financial liberalization seems to exert a significantly positive influence on the quality of investment rather than its quantity and the volume of savings. On top of that macroeconomic stability and sound regulation of the banking sector seem to play a crucial role for the success of financial liberalization. Sharp monetary restriction in the context of financial liberalization may furthermore lead to prohibitively high real interest rates. Eventually the combined impact of several factors may lead

to financial collapse. An overview of the empirical findings discussed in this section can be found in Table A1. of the Appendix.

A number of empirical assessments have been published on the relation between real interest rates and saving. In a study using US time-series data for the 1929 -1969 period, Boskin (1978) comes to the conclusion that savings are highly interest elastic. Fry (1978) finds a similar effect using pooled time-series data of seven Asian LDCs for 1962-1972 . Giovannini (1983), however, is unable to reproduce this result for the same countries as Fry for a different period (1964-1980). He attributes this to serious data and specification problems which make the regression results difficult to interpret. De Melo and Tybout (1986) report mixed results as to the interest-saving nexus. In their study of Uruguay for the 1962-1983 period they find a significant upward shift of saving following financial sector reforms in 1973, but only a small interest elasticity of saving in general. Moreover, they find no interest elasticity for the post-reform period (the effect found is a level shift immediately after the reform). This indicates that saving may be interest elastic as long as financial repression is in place. Interest rate increases may then have a much larger marginal impact on saving behaviour. Gupta (1986) uses a simultaneous equation model to examine the role of financial liberalization in India and South Korea. In spite of significant differences in the two countries' experiences, the results show that financial liberalization has a positive impact on financial development and economic growth. The differences refer to the liberalization strategies rather than to the liberalization as such: In India nominal interest rate increases had a stronger impact on various measures of private savings than a decrease in inflation, while Korea exhibited the opposite pattern. The overall result, however, supports the hypothesis that financial repression is a serious impediment to economic growth. In a later study, however, Gupta (1987) cannot confirm the generality of this finding. For pooled time-series and cross-section data of 22 Asian and Latin American countries covering the period 1967-1976, he finds a significant interest elasticity of saving only for the Asian subsample. Athukorala and Rajapatirana (1993) look at the Sri Lankan experience and find that for the post-liberalization period (1978-1987) there is a significant impact of interest rates on various indicators of saving as well as an enormous level shift directly following reforms. In a case study of the United Kingdom for the 1971-1988 period Bayoumi (1993) shows that financial liberalization reduced the savings rate, the reduction being partly temporary and partly permanent. He attributes this fact to the relaxation of credit constraints. The impact of financial liberalization thus seems to depend on the degree of previous financial repression, which may have been higher in Sri Lanka than in the UK. In two similar approaches Warman and Thirlwall (1994) and Athukorala (1998) come to rather opposite conclusions. For the case of Mexio over the period 1960-1990 the former find a positive impact of real interest rates on financial savings alone. But it operates mainly through substitution of other assets with financial asset and through capital flight. The latter reports a positive impact of interest rates on all kinds of savings (total,

private and financial) for India in the period 1955-1995, even though a weaker one for total saving (which includes the public sector). He is not able, however, to detect significant evidence for asset substitution as predicted by neostructuralists.

Evidence for the interest elasticity of investment is also rather mixed. De Melo and Tybout (1986) show a positive association between real interest rates and investment for Uruguay's post-liberalization period and an upward shift of investment directly following financial reforms. Using a sample of 34 countries over the 1965-1985 period, Gelb (1989) provides cross-section evidence indicating that real interest rates foster growth not primarily through increasing the quantity of investment. Laumas (1990) finds a positive relationship between private investment and the real interest rate for India over the period 1954-1975. Rittenberg (1991) makes an interesting contribution to the literature with a study about Turkey over the 1964-1986 period. Negative (i.e. below equilibrium) real interest rates are found to be positively associated with investment, while the opposite holds for positive (above equilibrium) real interest rates. In contrast to De Melo and Tybout (1986) financial liberalization causes a downward shift of investment due to increased uncertainty. Interest rates are described as having been too high in the liberalization period to foster investment. According to Voridis's (1993) study of the Greek economy in the financially repressed years between 1963 and 1985 the real user cost of capital seems to have had a positive association with private investment. Morriset (1993) reports no significant interest elasticity of private investment for Argentina. He attributes this to the crowding-out of private sector credit by public sector demands as a result of a bond market collapse. The latter is due to the increased financialization of savings in the course of interest rate liberalization. Thirlwall and Warman (1994) find a negative net effect of real interest rates on total investment while the opposite holds for Athukorala (1998) who uses private investment.

As far as the quality of investment is concerned, from the empirical literature a relatively clear picture emerges: the studies confirm the hypothesis of a positive association between real interest rates and investment efficiency. In a case study of Colombia, Tybout (1983) conducts a firm-level analysis of investment behaviour over the 1973-1976 period. His findings suggest financial market fragmentation: Large firms have relatively easy access to credit and realize investment plans irrespective of their own earnings, whereas small firms depend on positive earning shocks. So there is considerable variation in the marginal efficiency of capital. Tybout concludes that financial liberalization could significantly improve the efficiency of credit allocation. Cho (1988) studies 68 different manufacturing sectors in Korea over the 1972-1984 period and reports a decline in the disparity of borrowing costs across sectors following the start of financial sector reforms in 1980. This is an indication of improved efficiency in the financial sector as artificially low interest rates were allowed to move according to market forces. Using cross-section regressions, Gelb (1989) finds that real interest rates have an impact on growth

rather through the quality (i.e. efficiency) of investment than through quantity. In a micro-level study Seabright (1991) analyses credit subsidies to the poor for livestock investment in two Indian villages in 1985. He finds that subsidized credit yields lower returns than credit at market rates. First of all his results indicate the existence of price discrimination in the livestock market because of the lack of anonymity in this rural area. Secondly he finds evidence for the lack of ability of some recipients of subsidized credit to manage livestock investment economically at this small scale of production. Using Argentinean data for the 1961-1982 period, Morisset (1993) finds a significant positive association between investment efficiency and real interest rates.

All available evidence suggests that financial liberalization policies have yielded mixed results, particularly when looking at differences between Asia and Latin America. Diaz-Alejandro (1985) forcefully challenges the position of McKinnon and Shaw. In his study about financial liberalization experiences in Latin American countries he criticises the lack of supervision of the financial sector before 1981. Deposit insurance, neglect of prudential regulations, admission of new market entrants without banking experience, and other factors caused a financial crash like the one in Chile. Interestingly Ronald McKinnon himself (1989) concedes, that "we now recognize that our knowledge of how best to achieve financial liberalization remains seriously incomplete"[6]. He continues to emphasize the importance of financial liberalization for an efficient allocation of the economy's scarce capital. But he emphasizes the risks of adverse selection and moral hazard that it can give rise to in immature bank markets without appropriate supervision and regulation practices. In two case studies of Chile and Korea he empirically highlights some problems of financial liberalization in the context of price stabilization programmes. In Chile real interest rates rose to excessive levels in the 1976-82 reform period, which caused severe adverse selection among non-bank borrowers as well as moral hazard among the banks themselves. Lack of proper bank supervision contributed to the breakdown of the liberalization programme. In contrast to this he shows that in Korea the price stabilization programme of the 1979-83 period was deliberately combined with a management of nominal interest rates. Along with maintained capital account restrictions and appropriate exchange rate policies, the scaling down of nominal interest rates in the course of disinflation prevented excessive incentives for foreign capital to move into the Korean economy. Therefore a massive build-up of international indebtedness of the country didn't occur.

6.2. Financial development and economic growth

Evidence for a robust association between financial factors and growth has been increasing over time, but the direction of causality has been subject to controversy. Another question often raised is what type of financial institution promotes growth. Evidence seems to be

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[6] See McKinnon (1989), p. 30.

less clear-cut for stock markets than for banks. We outline the findings discussed here in Tables A2. and A3. of the Appendix.

As for as broad cross-country analysis is concerned, Goldsmith (1969) reports a rough correlation between financial development and economic activity for a sample of 35 countries covering the period 1860-1963. For roughly 80 countries over the 1960-1989 period King and Levine (1993 a, b) find strong evidence that a large set of financial indicators (contemporaneous and initial values) is robustly linked with growth, capital accumulation, productivity growth and investment ratios. Regressions based on pooled cross-section time-series data with and without the use of instruments confirm the findings. King and Levine (1993 c) more specifically state that roughly one-third of the gap between very fast and very slow growing countries can be eliminated by increasing the size of the financial intermediation sector. In another cross-section study De Gregorio and Guidotti (1995) explore the relationship between long-run growth and financial development. They examine a sample of about 100 countries during 1960-1985 in order to conduct growth regressions of the Barro (1991) type. The general finding is that financial development is associated with improved growth performance. As far as the analysis of subsamples in a cross-section context is concerned, the authors find that the impact of financial development increases from high to low-income countries. They subsequently analyse panel data of 12 Latin American countries, using six-year averages for 1950-85. Particularly for the 1970s and 1980s unregulated financial liberalization and expectations of government bailouts explain a reversed relationship between financial development and growth. This result leads to the policy recommendation that financial liberalization requires an appropriate regulatory framework in order to avoid financial crisis. Finally the authors find empirical support for the hypothesis that the main transmission channel from finance to growth is through increasing the efficiency of investment, rather than its volume. Berthélemy and Varoudakis (1995) use a sample of 91 countries for the period of 1960-1985. Using convergence club tests to check for potential poverty traps, the authors come to the conclusion that educational attainment is a priority factor in this respect. But financial factors may also cause high or low growth equilibria, in other words convergence groups with similar long-run growth rates. The empirical results also show that inadequate financial conditions may severely inhibit growth in countries, which already have a sufficient stock of human capital to start a process of economic development from. Ram (1999) finds a positive association between financial factors and economic development only for high growth countries. Applying panel techniques to a sample of four Latin American and South East Asian countries over the period 1965-1985, Benhabib and Spiegel (2000) report that specific financial development variables are associated with specific components of growth (i.e. capital accumulation and productivity growth). Their results are, however, sensitive to the inclusion of country fixed effects. They interpret this finding as an indication that financial factors may proxy for broader country characteristics. Deidda and Fattouh (2002) state that financial depth and

growth are only associated positively for a high income subsample. They offer the explanation that in developing countries the fixed resource cost associated with the provision of financial services inhibits growth. They therefore conclude that there is non-linearity between finance and growth.

A large number of studies are concerned with the question first asked by Patrick (1966): What direction does causality between finance and growth run and in which stage of the development process does which causality prevail ? Fritz (1984) uses the Philippines as a sample economy to conduct causality tests for a time-series of quarterly date from 1969 till 1981. He finds evidence for the hypothesis that in the initial stage of the development process causality runs from financial deepening to growth. In the later stages of the process causality is reversed, with the real economy demanding an increase in financial services. Using annual data on 56 countries, 19 of which are industrialized, Jung (1986) conducts time-series based causality tests for periods with different lengths. Causality is interpreted both as a simple and as a unidirectional concept. He uses two alternative measures of financial development, one is a currency ratio (currency over M 1) and the other one a monetization variable (M2 over GDP). For LDCs he finds a supply-leading more often than a demand-following pattern (this holds for both causality concepts), indicating the importance of financial development for developing countries. The opposite is true for DCs, even though only when the currency measure is used. As far as the temporal causality pattern is concerned, the findings moderately support Patrick's hypothesis. They show a supply-leading pattern first and a demand-following pattern in later stages of the development process when the currency ratio is used. The monetization variable does not distinguish developing from developed countries in terms of a temporal causality pattern. There is also evidence that LDCs with both higher- and lower-than-average growth rates of GDP are more frequently associated with a supply-leading pattern. The difference between the two groups is only that for the high growth subsample the currency variable explains this pattern, while for the low growth countries the monetization variable is crucial. Odedokun (1996) analyses a sample of 71 developing countries over varying periods that generally span the1960s and 1980s in order to generate information about the causality issue. The findings are strongly in favour of the "finance causes growth" hypothesis. Using time-series regression analysis, the author comes to the conclusion that financial intermediation promotes economic growth in roughly 85 Per cent of the countries. Secondly, financial intermediation plays an equally important role in promoting growth as other factors, such as export expansion, capital formation ratio, and is more important in this context than labour force growth. Thirdly, he observes growth-promoting effects of financial intermediation primarily in low-income LDCs. Interestingly he finds that growth-promoting patterns of financial intermediation are practically invariant across various countries and regions. Rousseau and Wachtel (1998) cite historical evidence from five industrialized countries. Their findings suggest that in the period 1870-1929

the USA, the UK, Canada, Norway and Sweden experienced rapid industrialization driven by financial factors. Vector error correction and vector auto regression models both detect a leading role of financial intermediation variables in real sector activity without significant feedback effects. The pattern applies in general, while the nature of the links varies somewhat across countries. Wang (1999) presents a case study of Taiwan for the period 1961-1999. He shows that marginal spillovers from the financial to the real sector are larger on average than vice versa, but decrease over time and relative to marginal spillovers from the real sector. He interprets this as an indication that finance caused growth in earlier stages of Taiwan's economic development while the relationship was reversed later on. Some studies, however, come to a different conclusion with respect to the causality issue. Demetriades and Hussein (1996) also conduct causality tests between financial development and real GDP for 16 less developed countries, using time-series techniques. Their findings provide little support for the hypothesis that financial factors play a leading role in the process of economic development. There is more evidence for the opposite pattern (i.e. growth causing financial development) and for bi-directional causality. Another important finding of their study is that causality patterns vary across countries, indicating a need for case studies and careful time-series analysis. Examples for bi-directional causality are Korea and Thailand, two countries with successful financial reforms. In a case study of India Demetriades and Luintel (1996) show empirical links between banking sector controls and the process of financial deepening, and between financial deepening and growth. Banking sector controls are measured by interest rate controls, reserve and liquidity requirements and directed credit programmes. For a period from 1961 till 1991 the empirical results suggest that, except for lending rate ceilings, these controls had a negative impact on financial development in India. Furthermore the authors also find a bi-directional causality between financial development and economic activity. Luintel and Khan (1999) apply a multivariate vector auto regression framework to a sample of ten mostly developing countries over a period of 36-41 years and find evidence for bi-directional causality for all countries. Harrison, Sussman and Zeira (1999) finally use US state-level data for the period 1965-1995 to show that there is a feedback effect between finance and growth: growth reduces the cost of financial intermediation by attracting new market entrants, by reducing monitoring costs and by promoting specialization. This in turn increases investment and growth.

Some empirical studies are concerned with specific aspects of financial development. Roubini and Sala-i-Martin (1992, s.a.) present evidence on the relationship between financial repression and growth. Using a cross-section of 98 countries for the period 1960-1985, they show that various measures of financial repression affect growth negatively. Inflation rates and reserve ratios are negatively correlated with growth after controlling for other factors. A regional dummy for Latin America tends to be insignificant after controlling for financial repression, suggesting that the latter partly explains the low growth in these countries. They also find

empirical support for the hypothesis that strongly negative real interest rates (below minus 5% per year) are significantly associated with low growth rates. This finding does not hold for moderately negative real interest. The authors interpret this as an indication that only severe financial repression inhibits growth. Jayaratne and Strahan (1996) use US state-level data since 1972 to analyse the impact of intrastate bank branch reform on growth. Banks and bank holding companies used to face restrictions on geographical expansion both within and across state borders. Starting in the middle of the 1970s most states have deregulated these restrictions significantly. The main idea of this study is that the deregulation has reduced the average costs of financial intermediation by increasing the efficiency of banks and by improving the quality of intermediation. The results show that growth accelerated following reforms. The loan quality also improved, whereas there was no impact on saving and investment. Mattesini (1996) uses the lending-deposit spread as a proxy for monitoring cost related to asymmetric information. His estimates refer to the period 1978-1992 and a sample of forty countries. The spread is particularly significant in explaining the growth performance for the whole sample and for the subsample of developed economies. For the low-income subsample, however, there is no significant relation between the spread and growth. The author attributes this to the existence of financial repression in developing countries, which may also affect the size of the spread.

A number of studies deal specifically with stock market indicators. Atje and Jovanovic (1993, s.a.) test the implication of their model empirically for a sample of 40 developing and developed countries. Using two proxies of financial development, one measuring bank intermediation and one approximating stock market activity, only the latter turns out to perform well. They find no evidence for level effects. Therefore the authors conclude that stock markets improve long-run growth in per capita GDP. In contrast to that, Harris (1997) comes to the conclusion that stock market activity has at best weak explanatory power for long-run growth in per capita output. He uses data on 49 of the 60 countries that had official stock markets in 1991, covering the period 1980-1991. The paper is a direct response to Atje and Jovanovic (1993) and criticizes their methodology. Harris uses a specification of the regression equation with current instead of lagged investment. By multiplying the initial level of stock market activity (value traded) with lagged investment and by entering the latter also as a separate variable, Atje and Jovanovic want to account for endogeneity of the variables. Harris essentially uses the same econometric model, but argues that their approach is not appropriate because lagged and current investment are not sufficiently correlated with each other. Instead he proposes the use of instruments to account for the endogeneity of current investment. The effect of stock markets he finds is therefore much weaker. Splitting the sample into developed and developing countries yields a slightly different result. For the developing countries stock markets do not seem to promote long-run growth, whereas for the developed countries they have some explanatory power. Levine and Zervos (1998) use data on a cross-section of 47 countries from 1976 to 1993

to assess the impact of variables measuring stock market activity on growth, capital accumulation, productivity improvements, and private savings. They find a robust positive correlation between stock market liquidity, measured by initial value traded scaled by GDP and initial turnover ratio (value traded scaled by average market capitalization), and current and future rates of GDP growth, capital accumulation, and productivity growth. Other variables, like stock market size, volatility, and integration in world capital markets are not robustly linked with growth. Entering stock market liquidity and banking development (measuring bank loans to the private sector over GDP) simultaneously into a regression yield significant results for both. The authors interpret this as an indication that banks and stock markets provide different services. There is no significant impact of any financial variable on the volume of private savings. Rousseau and Wachtel (2000) confirm these findings using data for 47 countries over the period 1980-1995. To account for potential endogeneity between growth and finance they apply a two-stage least squares regression approach. The findings of their cross-section regressions suggest an impact of value traded, but not of market capitalization, (both scaled by GDP) on growth. Using a panel vector auto regression specification, they find evidence for causality running from both stock market indicators (per capita value traded and market capitalization, scaled by a price index) to economic activity. Value traded turns out to be particularly significant. They eventually show that the adjustment of the stock market indicators with a general price index overstates the effect of market capitalization on economic activity. Instead a share price index should be used to deflate the data, because asset price booms may overstate actual market depth. Arestis, Demetriades, and Luintel (2001) conduct time-series analysis using data on five industrialized countries covering the period 1968-1998. They use measures like stock market capitalization (scaled by GDP) and volatility for all countries, but value traded (scaled by GDP) and turnover ratio only for the UK and the USA. They report that stock markets have made significant contributions to growth in Germany, Japan, and France. The effect of stock markets, however, is weaker than the impact of banking. For the USA and the UK the link between finance and growth is not very robust and rather seems to run from growth to finance.

Summing up the results of the empirical literature it becomes evident that country studies and time-series analysis provide less clear-cut results than cross-section regression techniques. Studies using the latter technique generally yield results that are interpreted in favour of the "finance causes growth" hypothesis. Authors using time-series analysis and causality test methods, however, come to less uniform conclusions: In general the view, that finance causes growth in earlier stages of economic development and vice versa in more advanced stages of industrialization, prevails. This is in line with Patrick's hypothesis. A significant number of studies, however, detect bi-directional causality, which is empirically important in the context of studies about multiple equilibria. The results for stock markets are less clear-cut then for banks.

The existence of a general and significant pattern linking stock markets with growth cannot be concluded from the literature.

7. Summary

In this paper we reviewed the theoretical and empirical literature on links between domestic financial development and economic growth. Patrick first raised the question "what causes what in which stage of the development process ?" in 1966. The causality issue has been crucial ever since. Early pioneers like Goldsmith did not provide a strong enough theoretical fundament to give a satisfactory answer. In the 1970s McKinnon and Shaw developed a theoretical framework that helped to explain growth-inducing effects of financial liberalization in contrast to financial repression. They argued that the financial sector could raise the volume of savings as well as the quantity and quality of investment. This approach found only mixed empirical support and could not explain sustained increases in the growth rate of an economy either. Micro- and macroeconomic concerns added to these empirical findings. The answer economic theory gave to these questions was incorporated in the endogenous growth literature of the 1990s. It emphasizes the role of financial development in generating sustained growth through an external effect on aggregate investment efficiency. Some authors have developed a framework for reciprocal externalities between the financial and the real sector. Much empirical support has been found for the "finance promotes growth" view, but time-series evidence is less clear-cut than broad cross-section analysis. A majority of studies, however, comes to the conclusion that finance induces growth in early stages of economic development and vice versa in more advanced stages. A lot of evidence for bi-directional causality has been found as well. A specific role has been attributed to stock markets, but here in particular, the evidence is mixed. It seems that individual countries have to be studied deliberately and that general conclusions have to be treated with caution. The role of international finance in inducing economic development, not considered here at all, remains an even more controversial issue.

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Appendix A1.

Table A1.: Overview of empirical findings on financial liberalization, savings, and investment

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Boskin	1978	USA time-series data	1929-1969	gross private savings rate	real after-tax rate of return in various definitions	a variety of functional forms and estimation techniques lead to the conclusion of substantial interest elasticity of saving
Fry	1978	pooled time-series data of seven Asian LDCs	1962-1972	domestic savings rate	real interest rate in various definitions	real interest rate exerts positive effect on saving
Giovannini	1983	see Fry (1978)	1964-1980	aggregate domestic savings rate	real interest rate	significantly positive interest elasticity of saving cannot be reproduced even though the specifi-cations are the same as in Fry (1978)
Tybout	1983	Colombia, firm-level data of small and large manufactu-ring firms	1973-1976	firm investment	access to credit market	results suggest financial market fragmentation: large firms have relatively easy access to credit and realize investment plans irrespective of their own earnings, small firms invest only in case of favourable earning shocks, so there is considerable variation in marginal efficiency of investment, financial liberalization may significantly improve the efficiency of credit allocation and thus the efficiency of investment

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
De Melo/ Tybout	1986	Uruguay	1962-1983	total savings rate private investment rate	real interest rate	significant but small positive effect of real interest rate on saving, upward shift of savings rate with implementation of financial liberalization (1973), no effect in post- financial liberalization period, private investment found to be associated positively with interest rates, especially in post-reform period, reform also led to upward shift of investment
Gupta	1986	India, South Korea	1960-1981	various indicators of private savings various indicators of economic activity	nominal interest rate inflation rate	financial liberalization has a positive impact on financial development and growth in the simulations for the two countries, but different policy prescriptions are needed to achieve the same degree of financial liberalization, in India nominal interest rate increases had a stronger impact than a reduction in inflation, Korea exhibited opposite pattern
Gupta	1987	22 Asian and Latin American countries	1967-1976	aggregate real savings	nominal interest rate	pooling across countries is inappropriate, for Asia the nominal interest rate is positively associated with saving, there is no effect for Latin America

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Cho	1988	Korea, 68 manufac-turing sectors	1972-1984	no regression approach, borrowing costs and their variance across sectors are crucial indicator		disparity of borrowing costs across sectors declined following the start of financial liberalization in 1980, this is interpreted as improvement in efficiency of investment
Gelb	1989	34	1965-1985	real GDP growth efficiency of investment (incremental output-capital ratio=IOCR) investment rate (investment/GDP=IGDP) ratio of financial savings to total savings=RFSTS	real interest rate=RR depth (M3/GDP=M3GDP)	real interest rates and GDP growth are positively correlated, efficiency of investment (IOCR) is more strongly correlated with real interest rates than the quantity of investment (IGDP), much of the positive relationship between real interest rates and growth reflects reversed causality, but the effect of the financial sector on growth is still significant, this causal chain operates through the impact of real interest rates on the financialization of savings (RSFTS) and subsequently on the efficiency of investment (IOCR) and growth, depth has additional explanatory power, without weakening the interest rate effect
Laumas	1990	India	1954-1975	private investment ratio	real interest rate	positive relationship between private investment and real interest rate

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Seabright	1991	two Indian villages	1985	various measures of return to investment	credit subsidies to poor for livestock investment	subsidized credit yields lower return than credit at market rates because of price discrimination in livestock market and inability of some subsidy recipients to manage livestock investment economically
Rittenberg	1991	Turkey	1964-1986	various private investment indicators	real interest rate	for negative (below equilibrium) real interest rates: positive effect of real interest rates on investment for positive (above equilibrium) real interest rates: negative effect of real interest rates on investment in liberalization period interest rates may have been too high to foster investment, moreover a structural downward shift of investment may have occurred due to increased uncertainty resulting from liberalization
Athukorala/ Rajapatirana	1993	Sri Lanka	1960-1987	a) financial saving=savings and time deposits (real) held by non-bank private sector b) total saving=real private saving	a) nominal weighted average interest rate on savings and time deposits b) real weighted average interest rate on savings and time deposits	strong effect of interest rates on both financial savings and total private savings for post-liberalization period (1978-1987), private savings rate increased by roughly six percentage points on average for pre- and post- reform periods

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Bayoumi	1993	United Kindom, 11 standard regions	1971-1988	regional household savings rates	national real interest rate regional rates of return on housing	financial deregulation and innovation reduced savings rate by about 2.25 percentage points over the 1980s, the reduction being partly permanent and partly temporary, crucial factor is relaxation of credit constraints as result of financial reforms
Voridis	1993	Greece	1963-1985	various private investment indicators	real user cost	real user cost effects on private investment found to be positive for financially repressed Greek economy of respective period
Morriset	1993	Argentina	1961-1982	incremental output/capital ratio (IOCR) real money stock (M 3) real savings (private investment and government bonds) real foreign assets (capital flight) private investment	real interest rate	significant positive association between investment efficiency (IOCR) and real interest rate, positive impact of real interest rate on real money, negative impact of real interest rate on real savings (bond market collapse result of financialization of savings, government needs bank credit instead), real interest rates negatively associated with capital flight, no significant interest elasticity of private investment because credit to private sector crowded out by public sector due to bond market collapse

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Warman/ Thirlwall	1994	Mexico	1960-1990	financial saving total domestic saving total private saving investment	real interest rate	financial saving is positively related to real interest rates partly through domestic asset substitution and partly through capital flight total and private savings are not significantly associated with interest rates the net effect of interest rates on investment is negative
Athukorala	1998	India	1955-1995	financial saving total domestic saving total private saving private investment	real interest rate	higher real interest rates seem to promote both financial and total saving, and stimulate investment there is no evidence for significant substitution of other assets for financial assets the interest elasticity of total private saving is greater in magnitude compared to that of total domestic saving which includes public sector saving

Table A2.: Overview of empirical findings on banking sector development and economic growth

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Goldsmith	1969	35, all groups	1860-1963	real GNP p.c.	Financial Development FIR (˜domestic credit/GNP)	rough correlation between financial development and growth
Fritz	1984	Philippines	1969-1981	financial development (FD)= composite financial development index with 10 weighted sub-indicators economic development (ED)=composite economic development indicator with 7 weighted sub-indicators	ED FD	early stages of economic development: finance causes growth more advanced stages of economic development: growth causes finance
Jung	1986	56, of which: 37 DCs and 19 LDCs	1950-1980	depth(M2/GDP)=M currency/M1=C real p.c. GDP=Y	Y M C	finance causes growth: more frequently found for LDCs growth causes finance: more frequently found for industrialized countries temporal causality pattern: first finance causes growth, then vice versa (holds only for variable C), in both high and low growth LDCs finance causes growth pattern prevails, but different financial indicators are crucial

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Roubini/ Sala -i - Martin	1992	98, all groups	1960-1985	real p.c. GDP growth	financial repression: finrep (real interest rate distortion: 1=positive, 2=<0 and >-5, 3=<-5) finrep 1= dummy for real interest rate <0 finrep 2= dummy for real interest rate <-5% reserve (ratio of commercial bank reserves to money supply) inflation rate distort (overall price distortions)	coefficients have right sign (negative) significance for most variables, exceptions are: finrep 1(not significant) reserve (weak significance) result: strong financial repression inhibits growth
King/ Levine	1993 a	77 for average values 57 for initial values of depth variable	1960-1989	real p.c. GDP growth growth in capital stock productivity growth investment share (of GDP)	average/initial data for: depth=(M3/GDP), M2 if M3 not avail. bank=(deposit money bank domestic credit / deposit money bank domestic credit + central bank domestic credit) private=(credit to private sector /total domestic credit) privy=(credit to private sector/GDP)	average data: strong significance for all coefficients in cross-section regressions initial data: initial values of depth also highly significant in cross-section regressions in pooled cross-section time-series regressions also strong significance for all four financial indicators, only private has weaker signficance

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
King/ Levine	1993 b	92, case studies: Chile, Korea, Philippines, Argentina, Indonesia	1960-1989	see King/Levine 1993 a	see King/Levine 1993 a cross-section: initial and contemporaneous values of depth three-stage least squares (pooled cross-section time-series): initial values of financial indicators as instruments case studies: no regression, only values for financial development pre and post reforms	initial and average values of depth significant in cross-section regressions, all financial indicators significant in three-stage regressions (refinement of King/Levine 1993 a) case studies: financial sector reforms lead to higher level of financial development
King/ Levine	1993 c	64-88, very rich, rich, poor, very poor	1960-1989	see King/Levine 1993 a	(see King/Levine 1993a for all variables) depth, bank, private	average data: significance for nearly all coefficients initial data: less significant results, strong significance only for depth
De Gregorio/ Guidotti	1995	about 100, panel data of 12 Latin American countries	1960-1985 1950-1985	real p.c. GDP growth	credit (domestic credit to the private sector / GDP)	whole sample: positively related, primarily through increased efficiency instead of volume of investment subsamples: impact of financial development increases significantly from high to low income countries Latin America: credit significantly negatively related with growth because of liberalization in poor regulatory environment

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Berthélemy/ Varoudakis	1995	91, all groups	1960-1985	real p.c. GDP growth	depth (M2/GDP) (initial values)	strong significance, threshold effects result in convergence clubs with similar long-run growth within each group, this implies the existence of poverty traps
Jayaratne/ Strahan	1996	US state-level data	since 1972	real p.c. growth of personal income and gross state product	intrastate bank branch reform (=relaxation of bank branch restrictions)	growth accelerated after intrastate branching reform branch reform led to improvements in loan quality, but not to increased savings and investment
Demetriades/ Hussein	1996	panel data of 16 less developed countries	at least 27 continuous annual obser-vations	real p.c. GDP	bank deposit liabilities to nominal GDP bank claims on private sector to nominal GDP	Evidence from ECM and VAR analysis suggests: finance causes growth: little growth causes finance: :much bi-directionality: very much patterns vary strongly across countries
Mattesini	1996	40 countries subsamples high income low income	1978-1992	real p.c. GDP growth	monitoring costs: lending-deposit spread averaged 78-92	negative association between growth and spreads whole sample: very significant high income subsample: very significant low income subsample: not significant

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Odedokun	1996	71 developing countries	various 60s, 80s	real GDP growth	depth (liquid liabilities over GDP) multiplied by growth rate of real liquid liabilities (=M3/GDP*growth of M3) M2 used where M3 not available	positive and signficant relation in 45 % of panel countries, positive and insignificant relation in 39 % of panel countries, significance especially in low income LDCs
Demetriades/ Luintel	1996	India	1961-1991	financial depth (=bank deposit liabilities/GDP) real p.c. GDP	banking sector controls (interest rate controls, reserve and liquidity requirements, directed credit programmes) financial depth	banking sector controls inhibited financial deepening bi-directional causality between finance and economic activity
Rousseau/ Wachtel	1998	USA, UK, Canada, Norway, Sweden	1870-1929	real p.c. GDP monetary base financial intensity (=various indicators of financial development)	real per-capita GDP monetary base financial intensity (=various indicators of financial development)	VECM and VAR specifications suggest that for all countries similarly: (1) financial intensity measures share long-run features with output and monetary base (2) financial intensity measures Granger-cause real output, with little evidence of feedback effects (3) VECMs suggest positive response of output to increases in financial intensity, not vice versa

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Ram	1999	95, subsamples: high, medium, low growth	1960-1989	real GDP growth	depth (liquid liabilities/GDP)	individual countries (time-series): negative sign and insigificance dominate cross-country: huge parametric heterogeneity across three subgroups, positive association only for high growth subsample
Luintel/Khan	1999	10, nearly all developing countries	36-41 years over 1951 – 1995 period	real p.c. GDP (LYP) real p.c. capital stock (LKP) financial depth (FD) =total deposit liabilities of deposit banks/first lag of GDP real interest rate (R)	R FD LKP LYP	results of multivariate vector auto regression (VAR) suggest bi-directional causality between financial and real sector for all countries
Wang	1999	Taiwan	1961-1999	marginal spillovers (1) finance leading version : $\partial R / \partial F$ (2) real sector leading version: $\partial F / \partial R$ R=real goods sector output F=financial sector output	depth=(liquid liablities/GDP) share of formal financial sector in total financial sector interest rate difference between formal and informal financial sector	finance leading version dominates for Taiwan on average, i.e.(1)>(2), but marginal spillovers from finance decrease over time relative to marginal spillovers from the real sector, this means finance caused growth in earlier stages of Taiwan's economic development, while the relationship was reversed later on

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Harrison/ Sussman/ Zeira	1999	US state-level data	1965-1995	COST/GLL=cost of financial intermediation (banks' operational expenses/gross loans and leases) GSP/CAPITA= real gross state product per capita	GSP/CAPITA COST/GLL set of instruments to isolate the effect of COST/GLL on GSP/CAPITA, i.e. to exogenize GSP/CAPITA	cross-state regressions show a significant negative relation between the cost of financial intermediation and economic development, causality tests and two-stage regressions confirm the hypothesis of feedback effect between finance and growth: growth reduces the cost of financial intermediation and this in turn increases investment and growth
Benhabib/ Spiegel	2000	Argentina, Chile, Korea, Indonesia, panel data	1965-1985	real GDP growth investment share (of GDP) difference in years of schooling per worker (= total factor productivity growth)	depth bank privy (see King/Levine 1993 a for definitions) interactive terms: depth*gdp depth*gini	indicators of financial development are significantly positively associated with growth, different financial variables are associated with different components of growth, results are sensitive to country fixed effects, which may indicate that the financial variables proxy for broader country characteristics
Deidda/ Fattouh	2002	119	1960-1989	real p.c. GDP growth	financial depth (liquid liabilities over GDP), initial and contemporaneous regressions, see King/Levine 1993 a for definition of liquid liabilities	no significant relationship between financial depth and economic growth in low income sample, only for high income sample regressions confirm positive association of finance and growth

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Table A3.: Overview of empirical findings on stock market development and economic growth

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Atje/ Jovanovic	1993	94 (bank variable) 40 (stock market variable), all groups	1966-1988	real p.c. GDP growth	B*I, S*I , I B=public and private credit to GDP S=value traded ratio (=annual value of all stock market trades/GDP) I=investment/GDP ratio initial values of S, lagged values of B, I because of endogeneity	regressions confirm significant impact for stock market variable (S*I), but not for indicator of bank development (B*I)
Harris	1997	49, all groups, subsamples developed and less developed countries	1980-1991	real p.c. GDP growth	S*I, I S=value traded ratio I=investment/GDP difference to Atje/Jovanovic (1993): I=current value S=initial value	whole sample: insignificant less developed subsample: insignificant developed subsample: weak significance, lagged investment is bad proxy for current investment, so current investment with instruments is used in 2SLS regression to solve endogeneity problem
Levine/ Zervos	1998	47 all groups of countries	1976-1993	real p.c. GDP growth growth in capital stock p.c. productivity growth gross private savings rate	stock market liquidity= value traded ratio in 1976 (definition see above) turnover ratio in 1976 (=total value of domestic shares traded/market capitalization)	initial level of stock market liquidity is significant predictor for all components of growth, initial levels of other variables (market capitalization, stock return volatility, stock market integration) are not robustly linked with growth, none of financial indicators is closely associated with savings rate

Author	Year	Countries	Period	Main dependent variable	Main independent variables	Results
Rousseau/ Wachtel	2000	47	1980-1995	cross-section (TSLS): real p.c. GDP growth panel (VAR): real p.c. GDP	market capitalization/GDP value traded/GDP p.c. value traded p.c. market capitalization (both indicators share-price vs. general price-level adjusted) real p.c. M 3	two-stage cross-section estimates suggest impact on growth of value traded, not market capitalization panel VAR results indicate causality running from both stock market indicators to economic activity, in particular value traded, but general price-level adjustment overstates effect of market capitalization, accordingly liquidity of stock markets is more important than size M3 as indicator of banking also significant
Arestis/ Demetriades/ Luintel	2001	Germany, USA, Japan, UK, France	periods covering 1968-1998	real GDP (LY)	stock market capitalization/GDP (LMC) domestic bank credit/GDP (LBY) stock market volatility (SMV) alternative for UK and USA only: stock market value traded/GDP (TRY) stock market turnover ratio (TRMV)	Germany, Japan, France: stock markets have made significant contributions to output growth, but banks were more important USA, UK: link between finance and growth found to be weak and to run from growth to financial development, alternative measures confirm results