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The Financial-Real Sector Nexus: Theory and Empirical Evidence

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The Financial-real Sector Nexus: Theory and Empirical Evidence

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David Blum, Klaus Federmair, Gerhard Fink, Peter Haiss

Abstract
Without doubt a well-developed financial sector is related to efficient resource allocation and growth, but there is modest consensus on the direction of that link, on the notion of what is meant by “well developed”, on which subset of the financial market is crucial and thus which organisational set-up provides optimal returns for both architects and market participants alike. With sluggish growth, torn down market barriers and systemic change in the EU accession countries the direction, magnitude, sustainability, institutional set-up of the finance-growth nexus (and which), becomes one of the core issues of both macroeconomic theory and practice. This paper reviews the economic theory available, provides a well structured overview of 54 empirical studies conducted since 1964, sets the stage for constructing a data base encompassing the major three segments of financial markets (stock, bond and bank credit) and provides the methodological background for combining cross-country production function and time-series approaches in order to answer the following questions: (1) What is the direction of the finance-growth nexus, (2) which segment of the financial sector drives whatever nexus there is, and (3) what are the features of a growth supportive financial architecture.

Keywords: economic growth, financial sector, financial system, banking intermediation, stock market, bond market
JEL classification: G1, G2, G3, O4

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1. Introduction

The suspicion that there may be a relation between the development of the financial and the real sector of an economy is as old as the discipline of economics itself. Already Adam Smith ([1776] 1979: 279) expressed the view that the high density of banks in the Scotland of his times was a crucial factor for the rapid development of the Scottish economy. In the early twentieth century it was Schumpeter ([1911] 1952: 140 ff.) who argued that the creation of credit through the banking system was an essential source of entrepreneurs’ capability to drive real growth by finding and employing new combinations of factor use. The importance of innovation and its determinants is also a focal point of endogenous growth theory. Consequently, it comes as no surprise that recent work on the nexus between the financial and the real sector not only refers explicitly to Schumpeter (e. g. King, Levine, 1993), but tries to base its models on endogenous growth theory (e. g. Levine, 1997).

Reflecting the importance of this research topic for economic development, the direction, magnitude, sustainability and institutional set-up of the finance-growth nexus have become core issues in macroeconomics spilling over into microeconomics.² Theoretical reasoning and empirical evidence, however, are not yet conclusive. Both availability of data and scientific insights have been progressing rapidly, but few questions appear to be resolved or largely undisputed. With regard to the major frame of reference, some studies are bank-centred, others are capital market-centred. With regard to the sample, some studies apply time series while others compare countries in time. A thorough literature review will help to clarify the current empirical evidence and provide a basis for further research and policy-making. This is the aim of our paper. The accumulation of theoretical models and empirical evidence on the finance-growth nexus can serve as an important factual basis for both architects and participants in financial markets.

This paper progresses as follows. In the first section, the theoretical literature is reviewed, partly drawing on previous work by Graff (2000) and Thiel (2001). Possible relationships between finance and real growth, transmission channels and the structure of financial systems are discussed. Section two reviews empirical studies. Both cross-country and time-series analysis are discussed. Section three provides descriptive evidence on the development, structure and dynamics of financial markets in the U.S.A., Japan, the European Union (EU) and the Central and Eastern European Accession Countries (CEEC) to the EU. Policy conclusions are drawn in the final section. A data appendix is provided to facilitate further empirical research.

² To name but two large scale research networks, research teams of the World Bank (http://www.worldbank.org/research/projects/finstructure) specialise on issues on financial structures and CEPR (http://www.cepr.org/research/networks/fertn) on the legal and political framework of finance and their implications for real growth.
2. Review of the theoretical literature

In the following, possible impact patterns, directions of influence in the interplay between the financial and the real sector and their basis are discussed. Transmission channels and both macro and industry-level structural effects are depicted.

2.1. Possible relationships between finance and real growth

The relation between the financial and the real sector can be classified in terms of causality with respect to five possible hypotheses: (1) no causal relation; (2) demand-following; (3) supply-leading; (4) negative causal link from finance to growth; (5) interdependence. In addition, a number of syntheses can be based on the five hypotheses, basically with respect to evolutionary sequencing or different needs on the part of industries or types of enterprises.

The view that financial sector development is not significantly related to real growth is expressed most prominently by Lucas (1988: 6). As Graff (2000: 3) points out, this assertion is consistent with a neo-classical world of zero transaction costs – and perfect information we may add. In such a world the Modigliani-Miller theorem\(^3\) holds and institutions, in particular financial institutions, do not matter. The irrelevance hypothesis has come under attack from various sides: economists increasingly deny the existence of frictionless markets, primarily based on informational and related arguments (such as agency problems, transaction costs etc.); furthermore, the importance of institutions is generally more acknowledged than in the past (Barringer, Harrison 2000: 380; Engerer, Schrooten, 2001); moreover, a large number of empirical studies show strong evidence for the relevance of finance for real growth as depicted below.

Robinson’s (1952: 86) statement that “finance follows where enterprise leads” is often quoted, when it comes to arguing that the causal relation runs from the real to the financial sector (demand-following finance). This hypothesis regards financial development as endogenously determined by the real economy or its needs. This view is consistent with the Coase theorem\(^4\) and much of New Institutional Economics where it is argued that institutions adjust to market imperfections in a way that maximises individual utilities. The demand-following “approach” is often based on empirical evidence and regarded as a temporary situation that may persist only under special circumstances, such as transition to a market economy.

The modern branch of the supply-leading finance literature arguably starts with the works of Mc Kinnon (1973) and Shaw (1973). Since then, the majority of economists occupied with this field of research consider finance as largely supply-leading, i.e. finance positively influences the real

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\(^3\) See Modigliani, Miller (1958).

\(^4\) See Coase (1960).
A minority position is the hypothesis that finance has a detrimental effect to the real development of an economy. Economists supporting this view regularly refer to the danger of financial crises, often in relation with speculative bubbles (Bhatt, 1995) or, more generally, the veiling of fundamentals of the real economy (Stöttner, 1981), particularly through capital market speculation. This strand of the literature is often motivated by the observation of bad real economic performance accompanied by financial market growth in particular world regions, especially Latin America, during the past 20 to 30 years.

Much of the empirical evidence, but also the theoretical discourse suggest that both arguments in favour of supply-leading and demand-following finance are of relevance, i.e. the causal link between finance and real growth runs in both directions. This mutual influence may be exerted at the same time, implying that financial depth (i.e. large financial markets) drives real growth, while the growing economy’s demand for finance is met by the advancing financial sector. Alternatively or, indeed, additionally, it may depend crucially on an economy’s general development stage whether its financial sector is supply-leading or demand-following. The most prominent hypothesis of such a sequential pattern of causation was put forward by Patrick (1966). Patrick argues that underdeveloped countries can gain significantly in real terms from developing their financial sectors (supply-leading finance), whereas in highly developed economies finance becomes increasingly demand-following. This is contrasted by Gerschenkron’s (1962) assertion that developed economies tend to become increasingly supply-leading as production becomes more and more capital intensive.

While there is a low of truth in the above arguments, we consider it important not to lose perspective. Financial institutions and systems – banks and securities markets - are regularly at the centre of attention of research and policy advice. They are, however, not the sole and not even the most important providers of finance for investment. Strikingly, the clearly dominant source of corporate finance is cash flow. Thiel (2001: 9) reports that in Germany more than 50 % of investment is financed through cash flow and depreciation. Graff (2000: 61 ff.) summarises empirical evidence from a number of studies stating that, no matter how developed financial markets may be in a particular country, self-financing is always dominant and above the 50% margin. Ignoring the dominant role of cash flow, sometimes referred to as “financial xenophobia“.

3 He adds the hypothesis of finance negatively affecting real output as a third category of “supply-leading finance“.

4 For an overview of the debate on the potential decoupling of the financial sector from the real economy, see Menkhoff, Tolksdorf (2001).
(Cummins, Nyman, 2001), implies the danger to overemphasise the importance of the financial system’s contribution to real development in theory and to be surprised by a seemingly weak empirical performance of financial market variables. Furthermore, the important role of cash flow financing may lead to a counterintuitive empirical short-run bias, as other sources of finance may serve as substitutes for self-financing and therefore run counter to the business cycle (Thiel, 2001: 12). Generally speaking, the use of internal funds is difficult to quantify which is one reason why they are widely ignored in empirical studies. Interesting exceptions are the recent works of Rivaud-Danset, Dubocage, Salais (2001) and Claessens, Laevens (2002).

### 2.2. Transmission channels

It is generally argued that the financial system plays a growth-supporting role and also takes on additional market functions. Financial institutions develop out of the need to deal with transaction costs and overcome information problems (Levine, 1997: 891). They influence the real economy by enhancing capital accumulation and innovation. Capital accumulation as an endogenous determinant of real growth is in line with the traditional (neo-classical) growth theory. The development of endogenous growth theory focuses on innovation as a determinant of real growth and offers thus a more important role for finance as a driving force of the real economy (Thiel, 2001: 6). Senhadji (2000) estimates a Cobb-Douglas production function and discriminates between growth due to capital accumulation on the one hand and factor productivity growth on the other. He finds large regional disparities and a particularly high contribution of productivity growth to real GDP growth in underdeveloped countries. Claessens, Laeven (2002) construct a model which distinguishes between a “finance effect” and an “asset allocation” effect. The latter influences the ratio of investment in fixed assets relative to investment in intangible assets. According to this model the asset allocation effect is just as important for real growth as the finance effect. Capital accumulation and factor productivity are the major channels through which real growth can be stimulated by the financial system. The financial system mobilises dispersed (hoarded) savings and pools them in order to make them available for investment. This function is fundamental, as many investment projects require larger amounts than one individual is able or willing to provide. It is also performed indirectly by diversifying liquidity and more general risks.

Furthermore, the financial system influences resource allocation with respect to investment productivity, both directly and indirectly. Banks and financial markets specialise in the acquisition and transformation of information on investment projects and supposedly perform these functions more efficiently than savers could, as duplication of efforts is avoided and transaction costs are reduced. In this respect the financial system also deals with agency problems which stem from

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7 This is questioned by Santomero, Seater (2000) whose theoretical model is referred to in section 4 below.
asymmetric information between the borrower and the lender. This implies an investment project evaluation function and an ex post monitoring function of the intermediaries and securities sectors (corporate control).

2.3. **The structure of financial systems**

The discussion on the optimal or the most growth-supportive financial structure focuses very much on the question whether banks or the capital market produce better outcomes. Arguments in favour of either view are reviewed from a macro and a micro/industry perspective. It is argued that there is both competition and functional complementarity of capital markets and financial intermediaries. We suggest to use the terms “bank-oriented” and “securities-oriented” instead of the value-loaded terminology often applied.

2.3.1. **The macro perspective**

The theoretically most important characteristics separating the two systems concern the provision of information and of corporate control (Graff, 2000: 28 ff.). Financial contracts between intermediaries and borrowers regularly take extensive information on particular projects into account. The extent to which information is truly reflected in share prices, however, is much more in doubt (e.g. Stiglitz, 1989). But even in case securities markets reflect information correctly, externalities may hamper the efficient functioning of the market more severely than is the case with intermediaries. Banks are specialised in acquiring and processing information on investment projects. If a project fails, a bank is among the few parties that suffer from the resulting losses. The incentive to engage in serious information management is therefore high. On the capital market there is regularly a large number of financiers with low incentives to acquire information (potential free riders). Information on the worthiness of investment projects is – correctly or incorrectly - incorporated in publicly observable market prices. Consequently the limited incentives are accompanied by information spill-over effects. Standard economic behavioural assumptions concerning self-interest, however, generally lead to the conclusion that negative external effects of non-exclusivity prevail over positive spill-over effects.

On capital markets corporate control is exerted in an impersonal way by (not) buying and selling equity (so-called “arm’s length finance”). The ultimate threat to an arguably bad management is a potential take-over. Bank-oriented systems are characterised by long-term relationships between lender and borrower. This has led to the conclusion that corporate control would be better performed by capital markets due to their harder budget constraints. Yet this assertion fails to take into account the potential benefit of a common effort of saver and lender to save miscalculated projects. This potential benefit should be weighed against the potential costs of a softer ex ante budget constraint.
Corbett (1990) highlights the important role of banks as institutions who have both the potential and the incentives to strive for reorganisation of companies in trouble. She infers from the dominant fraction of external investment that is financed through banks in most countries that capital markets play more of a corrective or residual role within the financial system. Most importantly, capital markets contest credit markets when they fail to allocate capital efficiently to promising projects and they are a means of evaluating the residual real value of corporations when reorganisation has failed (Corbett, 1990: 236).

With reference to the establishment of hard budget constraints in bankruptcy laws of Central and Eastern European EU accession countries, Revoltella (1998: 14f.) highlights the existence of a binding trade-off between flexibility and rigidity. Particularly for some transition countries this trade-off may extend to a trade-off between efficiency and (system) stability, given the fragility of financial systems in some of these countries. Hawkins discusses the question of possible substitution effects between bank credit and bonds. Emphasising on emerging economies including some CEECs he finds that the development of bond markets which typically lags behind the emergence of effective banking systems may have slowed down banking sectors’ growth over the long-term (Hawkins, 2002: 44). Substitution effects also occur in the euro area (ECB, 2002: 20). However, he finds no consequent contraction of the banking sector and concludes “that it is important to have healthy banks to have a sound bond market. And a bond market may improve the health of banks, by improving market discipline.”

Mihaljek, Scatigna, Villar (2002: 24 f.) find empirical evidence for positive correlations between all three financial sectors and constitute various forms of spill-over effects from the banking sector to the other two market segments. Hellwig (1998) argues that financial intermediaries perform an important market making function for capital markets, i.e. there is direct complementarity for both financial segments. Similarly it can be argued that certain products offered by banks, like investment funds, are necessary to help savers access capital markets despite limited information. Building on this idea of complementary relations between the various market segments (and all other parts of the financial system) Schmidt et al. (2001) analyse the financial systems of Germany, France and England. They cannot find any signs of superiority of either of the two and claim that the consistency of a system is much more important than the type of a system itself. Moreover, as smooth transition from one system to another requires temporary inconsistency they also question the possibility and usefulness of a smooth convergence of financial systems.

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8 See. p. 18, ibid.
9 See p. 44, ibid.
10 See p. 42, ibid.
We find that caution has to be applied with regard to terminology. A considerable part of the literature emphasising the design of financial systems is preoccupied with the classification of systems as either “market-based” or “bank-based”. We consider this terminology misleading, because the provision of finance through banks and other intermediaries also involves markets. Porter (1992) replaced the terms “market-based” by “fluid” and ”bank-based” by “dedicated”. This terminology reflects the main features of both systems more accurately and was adopted by other researchers (e.g. Haiss, 1994). However, much of the literature keeps sticking to the traditional terminology. We suggest to use two different, unbiased and self-explanatory terms in further research: “securities-oriented” and “bank-oriented”. This terminology is also used in publications of the European Central Bank (e.g. ECB, 2001).

2.3.2. The micro/industry perspective

While in our research context the above mentioned institutional factors accounting for differences between financial systems are more important, a branch of the literature analyses capital structures from a micro-perspective. This approach builds on the fact that markets and intermediaries perform very different functions reflecting the heterogeneous needs of the respective clients and client industries willing to invest. Borrower characteristics are of particular importance for potential access to various financing instruments, whereas project characteristics primarily (though not exclusively) influence companies’ financial choices. The organisational structure, the reputation, the availability of collateral or the sheer size of a company may limit its access to certain financial instruments.

Capital markets are said to be superior in processing rather uncertain information about innovative and potentially highly rewarding projects (Thiel, 2001: 30); small companies normally have no access to share or bond markets; banks may provide finance for small, decentralised projects more efficiently than centralised capital markets (Boyd, Smith, 1992); access to trade credit as substitute for bank loans and other forms of credit might be different\(^{11}\) and so forth.

Rajan, Zingales (1995) analyse not only the influence of (cross-country) institutional factors but also of firm characteristics on their financing structure. Size and profitability of a firm, as well as tangibility of assets (ratio of fixed to total assets) or the ratio of book to market value are assumed to be correlated with financial leverage. They find, that tangibility of assets is positively correlated with leverage, while there exists a negative relationship between profitability of enterprises and leverage. Guiso, Sapienza, Zingales (2002) show empirically that small and medium-sized enterprises in Italy rely heavily on local access to bank credit, whereas large Italian-based corporations find finance investment in various ways, notably on international markets. Carlin,

\(^{11}\) Ramb (2000) finds little differences in credit financing structures of listed companies compared to those of other firms.
Mayer (1998) investigate the link between industry activity, financial industry structures, the legal environment and industry characteristics. Among the manifold indicators considered, they find strong evidence that the relations between financial structure and economic activity come through expenditures on R&D rather than fixed capital formation.

Both theoretical and empirical considerations clearly illustrate that various financial instruments serve the heterogeneous needs of heterogeneous companies. From a company’s perspective another vital question concerns the maturity of financial contracts. In bank-oriented systems banks provide both short- and long-term finance on a regular basis to all types of clients, including large corporations. In securities-oriented systems, corporations access long-term finance primarily via capital markets and also raise a considerable proportion of working-capital finance via commercial paper programmes.

Obviously, financial systems react to heterogeneous and changing needs, as is evident from the appearance of new instruments, like e.g. venture capital. This is consistent with the notion of “varieties of capitalism“. At the same time it is clear that other factors, like politics, history, or the legal framework (common law systems vs. civil law systems) influence the financial system (Roe, 1994; Carlin, Meyer, 1998). This variety of determinants is reflected by the heterogeneity of financial systems across countries. While the factors mentioned may play an additional explanatory role, it is very hard to control for the majority of those possibly applied (Carlin, Meyer, 1998:1). We therefore suggest to concentrate on the role of the financial sector directly.

2.4. Theoretical models

Graff (2001: 89) points to the fact that standard works on endogenous growth theory largely ignore the potential influence of financial markets. Yet the finance-growth literature regularly constructs models on the basis of endogenous growth theory. Pagano (1993) uses an AK production function with A being a variable indicating the economy’s general efficiency in using the capital stock K. He then goes on to redefine the closed-economy equilibrium condition by use of a variable indicating the costs associated with the financial system’s activity, i.e. only a fraction of income saved transforms into investment, the rest being used up by the financial system.

In this model the real growth rate can be raised by an increased savings rate, a rise in the overall efficiency parameter A or an increased financial system parameter. As the two efficiency parameters can be assumed to be significantly correlated, however, it becomes difficult to interpret the financial efficiency parameter that is of major interest. A highly developed, capital intensive economy uses a relatively high fraction of real income for running the financial system, which does not necessarily imply that this system is inefficient. To go one step further, by taking into account

the costs of a financial system and its ability to promote real growth, it should be possible to determine the optimal size of an economy’s financial sector (relative to the real economy). Based on a theoretical model of Holmstrom, Tirole (1997) Santomero, Seater (2000) claim the optimal size of a country’s financial sector can be determined. Yet their result that the optimal relative size is independent of an economy’s state and the business cycle does not seem too realistic. Even in the long run and irrespective of the development stage the optimal relative size of a financial sector may vary across economies, e. g. because of differences in capital intensities. Focussing on transition economies Fink, Haiss (1999a:13ff., 1999b) construct a model where the size of a financial market converges to a steady-state in the very long-run. The speed of convergence depends on the savings ratio and real GDP growth.

A number of models have been specified in a fashion similar to Pagano (1993). An excellent overview of this theoretical strand of the literature can be found in Graff (2001: 86 ff.). Several studies attempt to model demand-following and supply-leading finance simultaneously. Greenwood, Jovanovic (1990) describe a real economy with higher growth resulting from improved allocation due to the development of the financial sector which in turn produces a more sophisticated and thus more efficient financial sector. They also take into account the higher costs of a more sophisticated financial sector. In the model of Berthélemy, Varoudakis (1994) reciprocal causality leads to multiple equilibria and the possibility of being caught in a poverty trap. Reciprocity arises due to the assumption of an initially highly concentrated financial sector becoming more competitive with the growing real sector which in turn is boosted by the increasing efficiency of the financial sector. Saint-Paul (1996) models reciprocity as a consequence of learning processes in the financial sector which may also lead to poverty traps, a possibility that exists also in the model of Lee (1996).
3. Evidence from empirical studies

Goldsmith (1969) provided the seminal empirical work linking the performances of the financial sector with that of the real economy. He defines a variable FIR (financial interrelations ratio) by dividing the aggregate value of financial wealth by total wealth or, more operationally, GDP. Amongst his famous twelve stylised facts there is the observation that the finance interrelations ratio is increasing steadily, approaching a certain value asymptotically. According to our findings reported in the section on size, structure and dynamics of financial markets, however, transition economies’ financial interrelations ratios do not generally grow faster than those of more developed ones. One could argue that this may simply reflect non-linearities and the very short observation period (hardly ten years for securities) we have to rely on for these countries. By contrast, Goldsmith’s (1969) observation period ranges from 1860 to 1963. However, a recent study of Rajan, Zingales (2001) reveals that even most industrialised countries relapsed from a peak level of financial development in 1913 and could not return to this level until the 80s of the 20th century. Industrial countries which have lost their function as important financial centres, like Austria, are still far away from their peaks.

Starting with Goldsmith’s (1969) study a vast empirical literature arose and its growth has gained momentum over the decades to follow. Levine (1997), Graff (2000), and Thiel (2001) provide very valuable overviews. We compare and review the findings of three spheres of research: bank-centred, stock-centred and cross-country studies on the finance-growth nexus. We find that bond financing is still widely ignored by the empirical literature.

A limitation that most empirical studies encounter results from the country focus generally applied. Domestic growth and therefore the impact of domestic capital sources usually is a core concern of macroeconomic policy. A point to bear in mind in this respect is globalisation of financial markets. As financial markets continue to integrate, particularly in Europe, the contribution of national financial systems to their national real economies becomes increasingly blurred. It has been shown by Thiel (2001: 7 ff.) that intra-European capital flows have a certain bearing on national savings and investments within member states, a measure frequently applied to demonstrate the degree of international financial integration. However, while this mirrors the somewhat advanced level of integration of the European wholesale financial market, integration in retail financial markets is much less advanced (Schüler, Heinemann: 2002). The European Commission found it necessary to speed up the hitherto slower than expected financial market integration by calling in the Lamfalussy Report and by establishing the Financial Sector Action Task Force. Both provides further evidence that the country financial markets still are of focal concern.
As is evident from the data annex provided below, some of the methodological problems resulting from internationalisation can be reduced, but international division of labour and specialisation cannot be fully in line with analyses based on national data. However, as Guiso, Sapienza, Zingales (2002) show for Italian regions, even differences in financial sector development in various provinces lead to differences in (local) output. This is particularly true for small and medium-sized enterprises (SME) which depend on access to credit from local banks. It is only large corporations who have become independent of local or, indeed, national finance to a large extent. Bearing the above limitations in mind, it appears appropriate to analyse the finance-growth nexus on a country-by-country basis as most empirical studies do.

### 3.1. Variables used in the empirical literature

Most studies focusing on the finance-growth nexus use one or more financial indicators as explanatory variables. Commonly used are various money aggregates, usually related to GDP, credits to non-financial institutions, and bank assets for the banking sector. Market capitalisation and sometimes stock market turnover are taken to observe capital markets. Only recently, researchers have attempted to include internal financing in empirical studies on the finance-growth nexus, notably Rivaud, Dunset, Dubocage, Salais (2001) and, to a lesser extent, Claessens, Laeven (2002).

Control variables and conditioning sets of empirical studies cover a wide range of macroeconomic (particularly inflation and convergence), institutional, educational and other factors. Starting with the seminal work of La Porta, Lopez-de-Silanes, Shleifer, Vishny (1998) the use of legal indicators has increased steadily. It is argued that the legal system (common law vs. civil law) and in particular investor protection influence the ability of financial institutions to mobilise and allocate efficiently finance for investment (Carlin, Mayer, 1998). More generally, questions of governance and corporate governance are attracting rising attention. Methodologically, legal indicators can help to overcome the endogeneity problem of studying the links between financial and real growth in cross-country studies.

The dependent variable in most studies is real national GDP growth, usually per capita. In some cases investment-related variables are used. Studies operating on the industry-level use value added as dependent variable.

To provide the reader with a systematic overview of the large body of empirical literature, we use the following structure. We first consider the most important results of cross-country studies and then briefly discuss time-series studies. For both parts we split the literature into articles which are rooted in banking intermediation and those concentrating on securities or on intermediation and securities. For each of the four categories we provide a table with the most important characteristics.
of the survey approach and results of each individual articles under review. This overview provides an important starting point for further considerations.

### 3.2. Cross-country studies

Adelmann, Morris (1968) provided one of the first cross-country studies involving the relationship between the financial and real sector. Finance is not at the centre of attention from the outset of this work, but among a number of institutional and socio-economic explanatory variables. Financial factors turn out to be among the most significant driving forces of growth. Levine, Renelt (1992) and Sala-i-Martin (1997) perform extreme-bounds analyses of growth determination on an even broader basis, whereby financial variables are just a few of many variables possibly affecting real growth. The result is that a whole range of (non-financial) variables explains real growth to some extent, whereas financial variables are ineffective. However, as Sala-i-Martin (1997: 182) concedes, this holds true for his search for linear relationships, whilst the finance-growth literature regularly postulates non-linearity. Average values over longer periods are frequently used for growth regressions. Increasingly, pooled data are used with five-year steps (King, Levine, 1992, Berthélemy, Varoudakis, 1997, Graff, 2001 etc.).

#### 3.2.1. Cross-country studies concentrating on banking intermediation

The cross-country approach has been criticised for ignoring national and regional differences of economies by Thiel (2001) and others. Odedokun (1996) and Berthélemy, Varoudakis (1997) apply fixed-effect models for large numbers of countries (81 and 82 respectively). Both studies arrive to a considerable extent at results indicating a negative effect of money aggregates on real growth. These results conflict with the majority of cross-country studies which tend to find positive effects of financial intermediation on growth. Berthélemy, Varoudakis (1997) provide a differentiated interpretation of their results, arguing that particularly in poverty traps financial systems cannot perform their otherwise beneficial function.

Fourteen out of 21 articles in our table of studies concentrating on intermediation-related variables find a positive relationship between intermediation and real output. One of them is Levine, Loyaza, Beck (2000) who explicitly tackled the endogeneity problem in their panel analysis by attempting to extract the exogenous part of their intermediation variables by use of legal indicators.
## Overview 1: Cross-country studies: banking intermediation covered only

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Sample coverage: region</th>
<th>Sample coverage: time</th>
<th>Dependent variable: Real GDP growth</th>
<th>Explanatory financial variables: Claims of banks against private sector / total domestic bank claims; (M1+M2)/GDP</th>
<th>Control variables, other variables: Investment rate; income per capita; inflation</th>
<th>Method: Panel regression analysis</th>
<th>Investigated links: Links between banking intermediation and economic growth</th>
<th>Major findings: Positive relationship between intermediation and growth, if investment rate does not enter regression</th>
<th>Additional results: Investment rate is the key factor that links financial with real development</th>
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<tr>
<td>Wallich</td>
<td>1969</td>
<td>43 countries (no details available)</td>
<td>1956-1965</td>
<td>Real GDP growth</td>
<td>Investment rate; income per capita; inflation</td>
<td>Panel regression analysis</td>
<td>Links between banking intermediation and economic growth</td>
<td>Positive relationship between intermediation and growth, if investment rate does not enter regression</td>
<td>Investment rate is the key factor that links financial with real development</td>
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<tr>
<td>Bhattacharyay</td>
<td>1988</td>
<td>45 countries (no details available)</td>
<td>1985/86</td>
<td>Real GDP per capita</td>
<td>Cash / M2</td>
<td>OLS regression analysis</td>
<td>Links between financial deepening and income</td>
<td>Negative relationship between cash/M2 and output</td>
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<tr>
<td>Gelb</td>
<td>1989</td>
<td>34 countries (no details available)</td>
<td>1965-1985</td>
<td>Growth of real GDP per capita</td>
<td>Credit interest rate</td>
<td>OLS regression analysis</td>
<td>Links between credit interest rate (liberalisation) and economic development</td>
<td>Liberalisation inducing higher credit interest rates is positively related to real economic development</td>
<td>High credit interest rates do not harm investment</td>
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<tr>
<td>King, Levine</td>
<td>1992</td>
<td>Up to 80 countries (up to 19 EU+; up to 3 ACC)</td>
<td>1960-1989</td>
<td>Growth of real GDP per capita</td>
<td>(M2-M1) / GDP</td>
<td>Cross-country regressions and panel regression analysis (5-year steps)</td>
<td>Links between banking intermediation and economic growth</td>
<td>Positive relationship between financial and real sector with cross-country-analysis, but weak negative relationship with panel approach</td>
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<tr>
<td>King, Levine</td>
<td>1993a</td>
<td>Up to 80 countries (up to 19 EU+; up to 3 ACC)</td>
<td>1960-1989</td>
<td>Growth of GDP; capital stock; and productivity</td>
<td>Liquid liabilities / GDP; assets of commercial and central banks / GDP; private credit / GDP; credits issued to private enterprises / GDP; credits issued to private and public enterprises and local governments / GDP</td>
<td>Panel analysis (5-year periods)</td>
<td>Links between banking intermediation and economic growth</td>
<td>Positive relationship between financial intermediation and economic growth</td>
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<tr>
<td>King, Levine</td>
<td>1993b</td>
<td>Up to 80 countries (up to 19 EU+; up to 3 ACC)</td>
<td>1960-1989</td>
<td>Output growth; capital stock growth; productivity growth</td>
<td>Liquid liabilities / GDP; assets of commercial and central banks / GDP; private credit / GDP; credits issued to private enterprises / GDP; credits issued to private and public enterprises and local governments</td>
<td>Panel analysis (5-year periods)</td>
<td>Links between banking intermediation and economic growth</td>
<td>Positive relationships between financial intermediation and economic growth</td>
<td>Case studies and firm-level studies: liberalisation of the financial market leads to higher growth rates, but also seems to be related to the financial crisis that occurred in many countries 3-5 years after financial liberalisation</td>
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### Overview 1 (continued): Cross-country studies: banking intermediation covered only

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<tr>
<td>Gertler, Rose</td>
<td>1994</td>
<td>69 developing countries (no details available)</td>
<td>1950-1988</td>
<td>Real GDP per capita</td>
<td>Bank credit to non-financial sector / GDP, (M2-M1)/ GDP</td>
<td>Investment rate; dummies for countries, regions and time</td>
<td>Panel regressions analysis</td>
<td>Links between banking intermediation and state of real economic development</td>
<td>Positive relationship between banking intermediation and real economy</td>
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<tr>
<td>Japelli, Pagano</td>
<td>1994</td>
<td>30 countries (18 EU+; 1 ACC)</td>
<td>1960-1985</td>
<td>Growth of real income per capita</td>
<td>Maximum amount of credit accessible for private households relative to secured assets</td>
<td>Investment rate; convergence; macroeconomic and socio-political variables</td>
<td>Growth regression analysis</td>
<td>Links between access of private households to credit and economic growth</td>
<td>Negative relationship between private households' access to credit and real growth</td>
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<tr>
<td>De Gregorio, Giudotti</td>
<td>1995</td>
<td>95 countries (19 EU+; 3 ACC)</td>
<td>1960-1985</td>
<td>Growth of real income per capita</td>
<td>Bank credit to non-financial sector</td>
<td>Investment rate; school enrolment; size of public sector; political stability</td>
<td>Growth regression analysis</td>
<td>Links between banking intermediation and economic growth</td>
<td>Positive relationship between intermediation and real growth</td>
<td>Positive relationship between intermediation and real growth for whole sample and group of medium income countries</td>
</tr>
<tr>
<td>Andrés , Domenenech, Molinas</td>
<td>1996</td>
<td>24 OECD countries (no details available)</td>
<td>1960-1990</td>
<td>Growth of income per capita</td>
<td>M1</td>
<td>Investment rate; education; convergence; fiscal variables; inflation; export growth</td>
<td>Panel regression analysis (5-year periods)</td>
<td>Links between financial development and economic growth</td>
<td>Positive relationship between financial development and real growth</td>
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<td>Odedokun</td>
<td>1996</td>
<td>81 developing countries (details not available)</td>
<td>1961-1989</td>
<td>Marginal capital productivity</td>
<td>M1/BIP; M2/BIP; M1/(M2-M1)</td>
<td>Cross-country regression analysis</td>
<td>Links between financial depth and marginal capital productivity</td>
<td>Negative relationship between financial depth and marginal capital productivity</td>
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<tr>
<td>Berthélemy, Varoudakis</td>
<td>1997</td>
<td>85 countries (details not available)</td>
<td>1960-1990</td>
<td>Growth of real income per capita</td>
<td>In (M2/GDP)</td>
<td>Convergence; investment rate; inflation; education; etc.</td>
<td>Panel regression analysis (5-year periods)</td>
<td>Links between financial depth and economic growth</td>
<td>Negative relationship between financial depth and real growth</td>
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<tr>
<td>Graff</td>
<td>2000</td>
<td>93 countries (18 EU+; 0 ACC)</td>
<td>1960-1990</td>
<td>Growth of real GDP per capita</td>
<td>Variable composed from bank density, relative banking sector employment and financial sector size</td>
<td>Inflation; regional dummies; variables on trade, public sector, and political stability</td>
<td>Panel regression analysis (5-year periods), path analysis</td>
<td>Links between banking intermediation and economic growth</td>
<td>All possible causality patterns and occasional negative relationships found; supply-leading has become dominant since mid-seventies</td>
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<tr>
<td>Beck, Levine, Loyaza</td>
<td>2000</td>
<td>77 countries (19 EU+; 2 ACC)</td>
<td>1960-1995</td>
<td>Growth of real GDP per capita</td>
<td>Private credit / GDP; liquid liabilities / GDP; credit by deposit money banks / GDP</td>
<td>Various legal indicators; trade exposure; inflation; government size; education; initial GDP per capita; black market premium</td>
<td>Cross-country and dynamic panel regression analysis (legal indicators used as instrumental variables)</td>
<td>Links between banking intermediation, legal framework, and economic growth</td>
<td>Positive relationship between exogenous components of intermediation and real growth</td>
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### Overview 1 (continued): Cross-country studies: banking intermediation covered only

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<tr>
<td>Levine, Loyaza, Beck</td>
<td>2000</td>
<td>71 countries (19 EU+; 2 ACC)</td>
<td>1960-1995</td>
<td>Growth of real GDP per capita</td>
<td>Liquid liabilities / GDP; assets of commercial and central banks / GDP; private credit / GDP (private credit from central bank not included)</td>
<td>Legal origin; Legal indicators to extract external component; inflation; trade exposure; Black market premium</td>
<td>Cross-country OLS and Generalised Method of Moments (GMM)</td>
<td>Links between banking intermediation and economic growth</td>
<td>Exogenous financial sector component correlated with real growth</td>
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<tr>
<td>Jaffee, Levonian</td>
<td>2001</td>
<td>49 countries (19 EU+; 11 ACC); EU+ primarily as benchmark</td>
<td>1995</td>
<td>Real GDP per capita</td>
<td>Asset ratios and bank (density) ratio referring to actual numbers relative to benchmarks given by OECD countries</td>
<td>EBRD banking rating</td>
<td>OLS cross-country regression analysis</td>
<td>Links between economic and banking system development in OECD and transition countries</td>
<td>Significant positive relationship between number of banks and banking sector reform (measured by EBRD banking rating) on the one hand and GDP per capita on the other Convergence of transition economies' banking systems with those of OECD countries is in progress.</td>
<td></td>
</tr>
<tr>
<td>Rousseau, Sylla</td>
<td>2001</td>
<td>17 countries (13 EU+; 0 ACC)</td>
<td>1850-1997</td>
<td>Growth of real GDP per capita</td>
<td>Broad money relative to GDP</td>
<td>Initial real GDP; initial trade exposure; initial government expenditure</td>
<td>Cross-country regression analysis</td>
<td>Links between financial development and economic growth</td>
<td>Strong positive relationship between financial and real sector Positive relationship between finance and real growth is reduced at later stages of development</td>
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<tr>
<td>Rousseau, Wachtel</td>
<td>2001</td>
<td>84 countries (no details available)</td>
<td>1960-1995</td>
<td>Growth of real GDP per capita</td>
<td>M3 / GDP; (M3 - M1) / GDP; total credit / GDP</td>
<td>Initial real GDP; school enrolment</td>
<td>Cross-country regression analysis</td>
<td>Links between financial development and economic growth</td>
<td>Strong positive relationship between financial and real development Relationship disappears at high levels of inflation</td>
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<tr>
<td>Al-Yousif</td>
<td>2002</td>
<td>30 countries (18 EU+; 1 ACC)</td>
<td>1970-1999</td>
<td>Growth of real GDP per capita</td>
<td>M1, M2 / GDP</td>
<td>Panel regression analysis (for time series approach see overview 3)</td>
<td>Links between narrow and broad money respectively and growth</td>
<td>Mostly positive relationship between intermediation and growth Results are country specific; for further additional results see overview 3</td>
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</tr>
<tr>
<td>Guiso, Sapienza, Zingales</td>
<td>2002</td>
<td>Italian provinces</td>
<td>1860-2000</td>
<td>Growth of real GDP per capita; firm creation; mark up; average age of entrepreneurs</td>
<td>Rejection rate of potential borrowers at the local level</td>
<td>Initial GDP per capita; infrastructure; average years of schooling; population growth</td>
<td>Panel regression analysis</td>
<td>Links between access to credit and economic growth on the local level</td>
<td>Positive relationship between local financial development and real development Local financial development is only relevant for SME, but not for large corporations</td>
<td></td>
</tr>
</tbody>
</table>

Remarks: slashes ("/") in table texts are divide symbols, stars ("*") are multiplication symbols. “EU+” refers to our sample coverage of EU plus 5 OECD countries, “ACC” refers to our sample coverage of EU accession countries.
3.2.2. Cross-country studies covering intermediation and securities

Atje, Jovanovic (1993) employ two different cross-country approaches one of which involves the estimation of a constant-returns-to-scale production function with capital, labour, human capital, and financial capital as input factors. Their results show a significant, positive impact of capital markets on growth, whereas intermediation variables remain ineffective. These remarkable results have been quoted on a regular basis, but caveats have been put forward with respect to asymmetries in modelling and data coverage discriminating methodologically between the two financial sectors (Graff, 2000: 176 ff.). Furthermore, Harris (1997) challenged the results of Atje and Jovanovic, using the same methodology and concluded that a significantly higher contribution of capital markets to real growth can at best be determined for very few high-income countries.

Most cross-country studies covering both stock markets and banks find that both sectors are positively related to real output. A superior contribution to real output by stock markets compared to banks is found by more studies than the opposite. However, an overview of the cross-country literature on securities and intermediation markets’ linkage to growth supports the view of two complementary sectors serving different needs of an economy. Only few studies cover transition countries. Fink, Haiss (1999) find some evidence that particularly in this kind of countries stock market expansion can have a detrimental effect to real development. This contributes to the picture arising from other studies that economies at low development stages have a relatively higher need for intermediation than for stock market activity.
## Overview 2: Cross-country studies: financial intermediation and securities covered

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<tr>
<th>Authors</th>
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<tr>
<td>Hodgson</td>
<td>1989</td>
<td>16 OECD countries (no details available)</td>
<td>1960-1984</td>
<td>Growth of real GDP per capita</td>
<td>Proxy variable for institutional flexibility of financial system</td>
<td>Proxy variable for institutional flexibility of financial system</td>
<td>Investment rate; convergence; growth of industry production; political stability</td>
<td>OLS regression analysis</td>
<td>Links between flexibility of financial institutions and economic growth</td>
<td>Positive relationship between financial institutions flexibility and real growth</td>
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<td>Artus</td>
<td>1995</td>
<td>20 OECD countries (no details available)</td>
<td>1965-1989</td>
<td>Average growth rate 1965-1989</td>
<td>Shares / credit ratio</td>
<td>Investment rate; population growth; growth of real interest rate</td>
<td>Average investment rate; population growth; growth of real interest rate</td>
<td>OLS regression analysis</td>
<td>Links between financial system structure and economic growth</td>
<td>No significant relationship between financial structure and growth</td>
<td></td>
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<tr>
<td>Harris</td>
<td>1997</td>
<td>49 countries (appr. 19 EU+; appr. 2 ACC)</td>
<td>1980-1991</td>
<td>Growth of real GDP per capita</td>
<td>Investment ratio stock market turnover / GDP</td>
<td>Investment rate; population growth</td>
<td>2SLS regression analysis</td>
<td>Links between financial sectors and economic growth</td>
<td>Very limited positive relationship between capital markets and growth only for high-income countries, contrasting to Atje, Jovanovic (1993)</td>
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<tr>
<td>Demirgüc-Kunt, Maksimovic</td>
<td>1998</td>
<td>30 countries (14 EU+; 1 ACC)</td>
<td>1980-1985</td>
<td>Additional firm growth due to external and long-term finance</td>
<td>Bank deposits / GDP and stock market Capitalisation</td>
<td>Inflation; various GDP variables; legal indicators; government subsidies</td>
<td>Panel regression analysis (industry level)</td>
<td>Links between financial sectors and firm growth</td>
<td>Positive relationships between availability of external finance and firm growth</td>
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<tr>
<td>Levine, Zervos</td>
<td>1998</td>
<td>47 countries (17 EU+; 1 ACC)</td>
<td>1976-1993</td>
<td>Growth of real GDP; capital stock and productivity; savings</td>
<td>Bank credit / GDP (bank credit = loans by commercial banks and other deposit-taking banks)</td>
<td>Capitalisation of Domestic listed Companies / GDP; value traded / GDP; Volatility of share returns</td>
<td>Initial output; enrolment; number of revolutions and other social and political variables</td>
<td>Cross-country regression analysis</td>
<td>Links between financial sectors and economic growth</td>
<td>Strong positive relationship between both financial segments and economic growth; no negative effects caused by share volatility or international capital market integration</td>
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<tr>
<td>Authors</td>
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<td>Rajan, Zingales</td>
<td>1998</td>
<td>41 countries (15 EU+; 1 ACC)</td>
<td>1980-1990</td>
<td>Growth of real value added</td>
<td>Total capitalisation (domestic credit + stock market capitalisation / GDP); accounting standards</td>
<td>Variables reflecting country-specific and industry-specific characteristics</td>
<td>Panel regression analysis (industry level)</td>
<td>Links between financial development and growth of companies dependent on external finance</td>
<td>Companies depending on external finance grow faster in economies with developed financial systems</td>
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<td>Andrés, J., Hernando, I., Lopez-Salido</td>
<td>1999</td>
<td>21 OECD countries (19 EU+)</td>
<td>1960-1990</td>
<td>Real output growth per capita</td>
<td>Liquid liabilities and credit to non-financial sector / GDP</td>
<td>Stock market capitalisation / GDP</td>
<td>Investment rate; export growth; inflation; variables for education and convergence</td>
<td>Growth regression analysis + VAR</td>
<td>Links between financial sectors and economic growth</td>
<td>Positive relationship only for stock market</td>
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<td>Carlin, Mayer</td>
<td>1999</td>
<td>27 industries in 14 OECD countries (no details available)</td>
<td>1970-1995</td>
<td>Industry growth rate; investment ratio; R&amp;D ratio</td>
<td>Interaction variables linking financial variables with industry-specific characteristics</td>
<td>De-meaning for country- and industry-specific characteristics</td>
<td>Panel regression analysis (industry level)</td>
<td>Links between the interaction of industry-specific characteristics and industry growth</td>
<td>Industries with heavy dependence on R&amp;D are very positively affected by financial development</td>
<td>Investment in R&amp;D is more important for growth than capital accumulation</td>
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<tr>
<td>Demirgüc-Kunt, Levine</td>
<td>1999</td>
<td>150 countries (no details available)</td>
<td>1990-1998</td>
<td>Real GDP per capita</td>
<td>Various variables covering the financial structure, size and efficiency of intermediaries</td>
<td>Various variables covering financial structure, size and efficiency of stock markets</td>
<td>Correlation analysis</td>
<td>Links between financial sectors, financial structure and economic growth</td>
<td>Positive relationship between legal environment, financial market development and growth</td>
<td>Relatively stronger development of capital markets in developed countries and of intermediaries in developing countries</td>
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<td>Fink, Haiss</td>
<td>1999</td>
<td>27 countries (17 EU+; 10 ACC)</td>
<td>1996</td>
<td>GDP</td>
<td>Bank assets</td>
<td>Stock market capitalisation</td>
<td>Bonds</td>
<td>Population</td>
<td>OLS regression analysis</td>
<td>Links between financial sectors and real sector</td>
<td>Positive relationship between banking and real growth</td>
<td>Bonds are substitutes for bank credit; stock markets have a weak or even negative impact on real growth, particularly in some EU accession countries</td>
</tr>
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<td>Year</td>
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<td>Sample coverage: time</td>
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<td>Method</td>
<td>Investigated links</td>
<td>Major findings</td>
<td>Additional results</td>
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<tr>
<td>Beck, Demirgüc-Kunt, Levine, Maksimovic</td>
<td>2000</td>
<td>48 countries (18 EU+; 0 ACC)</td>
<td>Various sub-periods of1980-1995</td>
<td>Company; industry and national output growth</td>
<td>Combined indicators of intermediation and capital markets referring to financial structure, financial development market depth etc.</td>
<td>Legal indicators</td>
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<td></td>
<td>Link between financial structure, legal framework and economic growth</td>
<td>Link between legal factors and output, but no link between financial system structure and output</td>
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<tr>
<td>Demirgüc-Kunt, Maksimovic</td>
<td>2000</td>
<td>40 countries (18 1989-1996 EU+; 0 ACC)</td>
<td>Additional firm growth due to external and long-term finance</td>
<td>Bank assets</td>
<td>Stock market turnover</td>
<td>Financial structure dummy</td>
<td>GDP variables; inflation; average company size; legal indicators</td>
<td>Panel regression analysis (industry level)</td>
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<td>Links between financial system structure and firm growth</td>
<td>Finance-friendly legal rules positively influence positive relationship between financial sectors and growth of firms depending on external finance</td>
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<td>Singh, Singh, Weisse</td>
<td>2000</td>
<td>63 countries (no details available)</td>
<td>Technological development indicators</td>
<td>Stock market capitalisation and number of listed corporations</td>
<td>Technological development indicators</td>
<td>Cross-country regression analysis</td>
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<td></td>
<td></td>
<td>Links between stock market development and technological development</td>
<td>No links between stock market development and technological development</td>
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<tr>
<td>Bassanini, Scarpetta, Hemmings</td>
<td>2001</td>
<td>21 countries (18 1971-1998 EU+; 0 ACC)</td>
<td>Growth of real GDP per capita; growth of real private non-residential investment</td>
<td>Liquid liabilities / GDP; private credit from deposit banks / GDP</td>
<td>Stock market capitalisation / GDP</td>
<td>Investment; human capital; population growth; inflation; public sector size; trade exposure etc.</td>
<td>Panel regressions analysis</td>
<td></td>
<td></td>
<td>Links between financial depth and real variables</td>
<td>Positive relationship between financial (particularly stock market) and real sector</td>
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<tr>
<td>Cetorelli, Gambera</td>
<td>2001</td>
<td>41 countries (16 1980-1990 EU+; 1 ACC)</td>
<td>Growth of real value added in manufacturing industries</td>
<td>Domestic credit; banking concentration</td>
<td>Industry size; legal indicators; Stock market capitalisation</td>
<td>Panel regression analysis</td>
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<td></td>
<td></td>
<td>Links between financial sectors and growth at the industry level</td>
<td>Positive relationship between financial development and growth of value added in manufacturing industry</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Negative relationship between banking sector concentration and industry growth as a whole, but positive relationship between concentration and growth of young, innovative companies depending strongly on external finance</td>
<td></td>
</tr>
</tbody>
</table>
### Overview 2 (continued) : Cross-country studies: financial intermediation and securities covered

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Sample coverage: region</th>
<th>Sample coverage: time</th>
<th>Dependent variable</th>
<th>Explanatory financial variables I: banking intermediation</th>
<th>Explanatory financial variables II: securities</th>
<th>Explanatory variables III: others</th>
<th>Control variables, other variables</th>
<th>Method</th>
<th>Investigated links</th>
<th>Major findings</th>
<th>Additional results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leahy, Schich, Wehinger, Pelgrin, Thorgeirsson</td>
<td>2001</td>
<td>19 countries (16 EU+, 0 ACC)</td>
<td>1970-1997</td>
<td>Gross investment</td>
<td>Private credit from deposit banks / GDP, liquid liabilities / GDP</td>
<td>Stock market capitalisation / GDP</td>
<td>Real long-term interest rate; output growth; inflation and its variation; public revenue and spending; trade exposure; legal indicators</td>
<td>Panel error correction approach building on an autoregressive distributed lag (ARDL) model +</td>
<td>Links between financial development, financial system, innovation and economic growth via innovation</td>
<td>Financial development and finance-friendly legal framework enhancement grow via innovation</td>
<td>All financial sectors have a positive impact on growth, but shares do more so</td>
<td></td>
</tr>
<tr>
<td>Rivaud-Dumet, Dubocage, Salais</td>
<td>2001</td>
<td>9 countries (9 EU+)</td>
<td>1990-1996</td>
<td>Mark-up; value added; return on investment</td>
<td>Own funds; leverage; financial debt structure; liquid capital</td>
<td>Variables controlling for company size</td>
<td>Cluster analysis</td>
<td>Links between companies’ financing structures and performance</td>
<td>No correlation between financial variables and industry performance</td>
<td>Companies’ financing structures depend on country characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Claessens, Laeven</td>
<td>2002</td>
<td>Up to 51 countries (18 EU+; 6 ACC)</td>
<td>1980-1989</td>
<td>Growth of real value added</td>
<td>Private credit / GDP</td>
<td>Cash flow</td>
<td>Various legal indicators, especially dealing with property rights; country-specific and industry-specific characteristics; stock market capitalisation</td>
<td>Panel regression analysis (industry level)</td>
<td>Links between financial development and property rights on one hand, and growth of companies depending on external finance on the other</td>
<td>Companies depending on external finance grow faster in economies with developed financial systems and high property protection</td>
<td>Asset allocation effect as important as finance effect. Poor (intellectual) property protection leads to less investment in intangible assets</td>
<td></td>
</tr>
<tr>
<td>Fisman, Love</td>
<td>2002</td>
<td>42 countries (15 EU+, 1 ACC)</td>
<td>1980-1989</td>
<td>Country-pairwise correlation of industry growth</td>
<td>Private and credit / GDP</td>
<td>Stock market capitalisation / GDP</td>
<td>Relative importance of government ownership of banks, trade openness, other variables on education, society, law</td>
<td>Panel regression analysis (industry level)</td>
<td>Link between financial variables and the correlation of same-industry growth across countries</td>
<td>Growth opportunities can only be exploited (indicated by highly correlated industry growth across countries), when the financial sector is well developed</td>
<td>Banking sector plays a particularly positive role for growth</td>
<td></td>
</tr>
<tr>
<td>Hahn</td>
<td>2002</td>
<td>23 countries (19 EU+; 1 ACC)</td>
<td>1970-2000</td>
<td>Gross investment</td>
<td>Bank credit to the private sector / GDP, liquid liabilities / GDP</td>
<td>Stock market capitalisation / GDP</td>
<td>Value traded and turnover (in order to control for forward-orientation of financial markets)</td>
<td>Panel error correction approach building on an autoregressive distributed lag (ARDL) model +</td>
<td>Links between financial development, financial system and economic growth controlling for forward-looking price effects of financial markets</td>
<td>Only minor causal links between financial development and economic growth, but a strong relationship because of forward-looking price effects</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remarks: slashes (“/”) in table texts are divide symbols, stars (“*”) are multiplication symbols; “EU+” refers to our sample coverage of EU plus 5 OECD countries, “ACC” refers to our sample coverage of EU accession countries

* method builds on time series methods, but a panel is analysed → could also be classified as a time-series analysis
3.3. Time-series studies

Whilst cross-country studies usually assume that a possible link between the financial and the real sector must run from finance to the real economy, time-series analyses prominently address the question of causality. This is mostly done by use of Granger causality tests. Uni-directional causality patterns relatively stable over several decades under research has been found very rarely through time-series research. Empirical evidence in favour of the Patrick (1966) hypothesis that a supply-leading pattern characterises early stages of financial and more general economic development is weak. The same is to be noted about the Gerschenkron (1962) hypothesis which states the opposite pattern in the very long-run.

3.3.1. Time-series studies concentrating on banking intermediation

The study of Hannson, Jonung (1997) is unique in that it examines a country (Sweden) over a very long time period which is suitable to test long-term causal patterns in the sense of Patrick (1966) or Gerschenkron (1962). Their cointegration analysis shows bi-causality between bank credit and real GDP per capita for most of the time from 1834 to 1991 and supply-leading for 1890-1934. Al-Yousif (2002) who applies both a cross-country and a time-series approach in his contribution also finds bi-directional causality to be the dominant, yet not the only observable pattern. Rousseau, Wachtel (1998) find evidence for supply-leading finance in USA, Canada, UK, Sweden, Norway for the period of 1871 to 1929. Most other studies find very unstable causality patterns across countries and time. Overall, time-series studies concentrating on intermediation produce rather mixed pictures, as regards causality. Supply-leading patterns tend to occur somewhat more frequently than demand-following.
### Overview 3: Time series studies: banking intermediation covered only

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Sample coverage: region</th>
<th>Sample coverage: time</th>
<th>Economic growth variable</th>
<th>Financial variables I: banking intermediation</th>
<th>Method</th>
<th>Investigated links</th>
<th>Major findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gupta</td>
<td>1984</td>
<td>14 developing countries</td>
<td>Various periods between 1959-1980</td>
<td>Index of industrial production</td>
<td>M1; M2; M3; private credit</td>
<td>Granger causality tests</td>
<td>Links and causality between banking intermediation and industrial production in developing countries</td>
<td>Supply-leading in 8 out of 14 developing countries, bi-directional causality in 6 countries</td>
</tr>
<tr>
<td>Jung</td>
<td>1986</td>
<td>56 countries (no details available)</td>
<td>Various periods between 1950 and 1992</td>
<td>Growth of real GDP per capita</td>
<td>Cash/M2; M2/GDP</td>
<td>Granger causality tests</td>
<td>Links and causality between financial deepening, financial structure and economic growth</td>
<td>No general causality pattern, supply-leading more likely to occur in developing countries, demand-following more likely in developed countries (for cash / M2)</td>
</tr>
<tr>
<td>St. Hill</td>
<td>1992</td>
<td>37 developing countries</td>
<td>Various periods between 1950-1990</td>
<td>Real GDP per capita</td>
<td>Cash/M2; M2/GDP</td>
<td>Granger causality tests</td>
<td>Links and causality between financial deepening, financial structure and income in developing countries at different financial development stages</td>
<td>Supply-leading more likely in developing countries with lower financial development</td>
</tr>
<tr>
<td>Thornton</td>
<td>1994</td>
<td>9 Asian developing and transition countries</td>
<td>Various periods between 1951-1992</td>
<td>Real GDP per capita</td>
<td>M3/GDP; (M3-Cash)/GDP</td>
<td>Granger causality tests</td>
<td>Links and causality between financial deepening and growth</td>
<td>No general causality pattern</td>
</tr>
<tr>
<td>Demetriades, Hussein</td>
<td>1996</td>
<td>16 countries (3 EU+; 1 ACC)</td>
<td>1960-1995</td>
<td>Real GDP per capita</td>
<td>Bank deposit liabilities / GDP; bank claims on private sector /GDP</td>
<td>Granger causality tests</td>
<td>Causality between banking intermediation and economic growth</td>
<td>Little evidence for supply-leading, some for demand-following, bi-directional causality for most countries</td>
</tr>
<tr>
<td>Hansson, Jonung</td>
<td>1997</td>
<td>Sweden</td>
<td>1834-1991</td>
<td>Real GDP per capita</td>
<td>Bank credit to non-financial sector per capita</td>
<td>Cointegration analysis and Granger causality tests (investment per capita as conditioning variable)</td>
<td>Co-evolution of banking intermediation and real income</td>
<td>Mostly unstable relationship between intermediation and output; supply-leading 1890-1934; positive influence of education on supply-leading pattern</td>
</tr>
<tr>
<td>Rousseau, Wachtel</td>
<td>1998</td>
<td>USA; Canada; UK; Sweden; Norway</td>
<td>1870-1929</td>
<td>Growth of real GDP per capita</td>
<td>Money base; various proxies for intermediation based on bank deposit and credit</td>
<td>Granger causality tests</td>
<td>Links and causality between banking intermediation and economic growth</td>
<td>Supply-leading in early phase of economic development</td>
</tr>
<tr>
<td>Al-Yousif</td>
<td>2002</td>
<td>30 developing countries</td>
<td>1970-1999</td>
<td>Growth of real GDP per capita</td>
<td>M1, M2 / GDP</td>
<td>Granger causality tests in error correction model (for panel data analysis see overview 1)</td>
<td>Links and causality between banking intermediation and economic growth</td>
<td>Strong evidence for bi-directional causality; limited evidence for other patterns; for further additional results see overview 1</td>
</tr>
</tbody>
</table>

**Remarks:** slashes ("/" ) in table texts are divide symbols, stars (" * " ) are multiplication symbols; "EU+" refers to our sample coverage of EU plus 5 OECD countries, “ACC” refers to our sample coverage of EU accession countries.
3.3.2. **Time-series studies covering intermediation and securities**

Time-series analysis covering both banking intermediation and stock markets provide some particularly heterogeneous evidence on the links between the financial and the real sector. Arestides, Demetriades (1997) apply Granger causality tests to Germany and the USA. Whereas the former country shows supply-leading finance, no uni-directional causality pattern can be found for the latter.

## Overview 4: Time series studies: banking intermediation and securities covered

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Sample coverage: region</th>
<th>Sample coverage: time</th>
<th>Economic growth variable</th>
<th>Financial variables I: banking intermediation</th>
<th>Financial variables II: securities</th>
<th>Method</th>
<th>Investigated links</th>
<th>Major findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arestides, Demetriades</td>
<td>1997</td>
<td>USA, Germany</td>
<td>1979-1991 (quarterly data)</td>
<td>Real GDP per capita</td>
<td>M2/GDP (Germany); domestic bank credit / GDP (USA)</td>
<td>Stock market capitalisation / GDP; Stock market volatility (16-month standard deviation of share prices)</td>
<td>Granger causality tests and system exogeneity analysis</td>
<td>Links and causality between financial sectors and economic growth</td>
<td>Cross-country analysis oversimplifies results; links between financial sectors and growth are different in Germany and USA; causality from financial to real sector for Germany; no evidence for unidirectional causality for USA</td>
</tr>
<tr>
<td>Neusser, Kugler</td>
<td>1998</td>
<td>13 countries (13 EU+)</td>
<td>1960-1997</td>
<td>GDP of manufacturing industry (MGDP); total factor productivity of manufacturing industry (MTFP)</td>
<td>Financial sector GDP (FGDP)</td>
<td>Financial sector GDP (FGDP)</td>
<td>Granger causality tests</td>
<td>Causality between financial sector and growth</td>
<td>MGDP and FGDP are cointegrated in 7 countries; MTFP and FGDP are cointegrated more often; evidence for causal relationships from the financial to real sector only for USA, Japan and Germany; and evidence for the inverse direction in some other countries; no evidence for causal relationships in small countries</td>
</tr>
<tr>
<td>Shan, Morris, Sun</td>
<td>2001</td>
<td>10 countries (6 EU+; 0 ACC; China)</td>
<td>1960-1998 (maximum time span); 1982-1998 (minimum time span)</td>
<td>Growth of real GDP per capita</td>
<td>Bank credit / GDP (bank credit = loans by commercial banks and other deposit-taking banks)</td>
<td>Granger causality tests (VAR framework) with conditioning set</td>
<td>Links and causality between banking intermediation and economic growth</td>
<td>5 countries show bi-causality, 3 demand-following, 2 no causality</td>
<td></td>
</tr>
</tbody>
</table>

Remarks: slashes (’/’) in table texts are divide symbols, stars (”*”) are multiplication symbols; ”EU+” refers to our sample coverage of EU plus 5 OECD countries, ”ACC” refers to our sample coverage of EU accession countries
3.4. Summary of empirical evidence

The possible relations between the financial and the real sector can be categorised by the following five basic hypotheses (see section 2):

(1) no causal relation
(2) demand-following
(3) supply-leading
(4) negative causal link from finance to growth
(5) interdependence

Hypothesis (1) appears to be falsified by the majority of empirical studies under review. Evidence for the existence of some kind of relationship between finance and growth is high. Hypotheses (2) and (3) have been tested by a number of time-series studies, distinguishing between different countries and different time periods. Both supply-leading and demand-following patterns have been observed. The evidence found, however, is strikingly heterogeneous in both the regional and the time dimension. To date we have little insight in which factors cause the different causality patterns observed. Further research is necessary to solve this issue.
4. Descriptive statistics: size, structure and dynamics of financial markets

In this section we analyse the size, structure and dynamics of financial markets in 32 countries (EU-15, USA, Japan, Norway, Switzerland plus 13 countries seeking for accession to the EU). Rationales for the measures of the different market segments (financial intermediation, stock and bond markets) as well as a detailed description of data sources and other aspects of the data set compilation are to be found in the data annex. Financial markets within the euro zone seem to have reached only a minor level of structural convergence\(^{13}\). According to the classification scheme developed, many EU countries are less bank-oriented than frequently argued.

4.1. Development of financial markets

Table 1 reports the size of financial markets in 1999. Total financial assets are calculated as the sum of domestic credit (financial intermediation), the amount of bonds outstanding (bond markets) and stock market capitalisation. Total financial assets are very high in the US (bn € 46,893) compared to much lower levels in the EU (bn € 27,969) and Japan (bn € 26,920). In accession countries financial markets are much smaller. With total financial assets of bn € 592 accession countries together would rank 10\(^{th}\) within the EU. Even small countries such as Belgium and Sweden have larger financial markets than the group of accession countries taken together. Germany (bn € 6,493) and the UK (bn € 6,161) have by far the largest financial markets within the EU. Together their markets make up for almost half of the EU-15 financial assets.

The importance of the Japanese banking sector is best illustrated by absolute figures: Japanese domestic credit (~bn € 16,000) even exceeds the amount found for the USA (~bn € 15,000). Moreover, when using bank assets instead of domestic credit as an alternative measure (see Table 2) the Japanese banking sector is twice as big (bn € 15,000 compared to bn € 7,900). In the EU bank assets (bn € 15,250) were even higher than in Japan.\(^{14}\)

\(^{13}\) Schmidt, Hackethal, Tyrell (2001) question the possibility of a smooth convergence of financial systems in general.

\(^{14}\) These figures reflect an important difference between bank assets and domestic credit as measures of the size of financial intermediation. Because of different structures of the banking systems in the US, Japan and Europe size relations of financial intermediation sectors change completely when using bank assets instead of domestic credit (see Table 2). The second main difference between the two indicators may be illustrated using the example of Luxembourg. Because foreign assets are included in bank assets but not in domestic credit, total bank assets are about 30 times higher than domestic credit. Therefore, depending on which measure one uses, the size of total financial markets in Luxembourg is either bn € 110 or bn € 640. For a more detailed discussion see section 6.
<table>
<thead>
<tr>
<th>Country</th>
<th>Total Financial Assets I (in mm €)</th>
<th>Domestic Credit (in mm €)</th>
<th>Bonds (in mm €)</th>
<th>Shares (in mm €)</th>
<th>GDP (in mm €)</th>
<th>Population (in mm pers.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>46,893,054.5</td>
<td>14,954,807.9</td>
<td>15,371,988.9</td>
<td>16,566,257.8</td>
<td>8,716,747.0</td>
<td>273.1</td>
</tr>
<tr>
<td>JPN</td>
<td>26,920,865.3</td>
<td>15,945,703.0</td>
<td>6,540,215.0</td>
<td>4,434,947.3</td>
<td>4,075,076.5</td>
<td>126.5</td>
</tr>
<tr>
<td>SUI</td>
<td>1,322,816.4</td>
<td>448,007.5</td>
<td>184,849.7</td>
<td>689,959.2</td>
<td>243,051.4</td>
<td>7.1</td>
</tr>
<tr>
<td>NOR</td>
<td>243,094.0</td>
<td>85,623.1</td>
<td>94,067.3</td>
<td>63,403.6</td>
<td>143,432.1</td>
<td>4.4</td>
</tr>
<tr>
<td>GER</td>
<td>6,493,316.4</td>
<td>2,917,100.0</td>
<td>2,150,607.2</td>
<td>1,425,609.2</td>
<td>1,982,329.8</td>
<td>82.1</td>
</tr>
<tr>
<td>UK</td>
<td>6,160,787.4</td>
<td>1,820,501.5</td>
<td>1,498,009.2</td>
<td>2,842,276.7</td>
<td>1,351,525.1</td>
<td>58.7</td>
</tr>
<tr>
<td>FRA</td>
<td>4,234,908.0</td>
<td>1,363,863.0</td>
<td>1,374,975.1</td>
<td>1,496,069.9</td>
<td>1,349,800.4</td>
<td>59.1</td>
</tr>
<tr>
<td>ITA</td>
<td>3,228,950.4</td>
<td>1,059,390.0</td>
<td>1,444,654.6</td>
<td>724,905.8</td>
<td>1,107,769.1</td>
<td>57.3</td>
</tr>
<tr>
<td>NL</td>
<td>1,891,725.1</td>
<td>526,310.0</td>
<td>673,402.3</td>
<td>692,012.7</td>
<td>373,912.2</td>
<td>15.8</td>
</tr>
<tr>
<td>SPA</td>
<td>1,469,930.4</td>
<td>648,460.0</td>
<td>391,797.7</td>
<td>429,672.7</td>
<td>559,349.9</td>
<td>39.4</td>
</tr>
<tr>
<td>SWE</td>
<td>966,788.3</td>
<td>263,545.5</td>
<td>331,674.3</td>
<td>371,568.5</td>
<td>223,769.2</td>
<td>8.9</td>
</tr>
<tr>
<td>BEL</td>
<td>876,633.5</td>
<td>326,628.0</td>
<td>366,713.1</td>
<td>183,292.4</td>
<td>233,590.1</td>
<td>10.2</td>
</tr>
<tr>
<td>FIN</td>
<td>535,802.0</td>
<td>70,449.0</td>
<td>117,559.2</td>
<td>347,793.7</td>
<td>121,430.0</td>
<td>5.2</td>
</tr>
<tr>
<td>AUT</td>
<td>506,297.8</td>
<td>246,470.0</td>
<td>226,956.0</td>
<td>32,871.8</td>
<td>197,090.9</td>
<td>8.2</td>
</tr>
<tr>
<td>DNK</td>
<td>486,535.8</td>
<td>93,849.4</td>
<td>287,875.8</td>
<td>104,810.6</td>
<td>163,576.5</td>
<td>5.3</td>
</tr>
<tr>
<td>GRE</td>
<td>418,635.9</td>
<td>108,913.8</td>
<td>113,776.6</td>
<td>195,945.6</td>
<td>116,928.2</td>
<td>10.6</td>
</tr>
<tr>
<td>POR</td>
<td>276,339.1</td>
<td>131,060.0</td>
<td>77,443.8</td>
<td>67,835.4</td>
<td>106,993.1</td>
<td>10.0</td>
</tr>
<tr>
<td>IRL</td>
<td>256,512.8</td>
<td>93,589.0</td>
<td>94,465.5</td>
<td>68,458.3</td>
<td>87,678.0</td>
<td>3.8</td>
</tr>
<tr>
<td>LUX</td>
<td>110,356.6</td>
<td>16,649.0</td>
<td>57,934.0</td>
<td>35,774.1</td>
<td>14,831.1</td>
<td>0.4</td>
</tr>
<tr>
<td>TUR</td>
<td>238,258.8</td>
<td>68,543.7</td>
<td>57,515.4</td>
<td>112,199.7</td>
<td>194,328.7</td>
<td>64.4</td>
</tr>
<tr>
<td>POL</td>
<td>115,965.4</td>
<td>58,055.0</td>
<td>28,469.0</td>
<td>29,441.4</td>
<td>145,749.0</td>
<td>38.7</td>
</tr>
<tr>
<td>HUN</td>
<td>68,542.9</td>
<td>23,645.1</td>
<td>28,767.7</td>
<td>16,130.1</td>
<td>45,106.4</td>
<td>10.1</td>
</tr>
<tr>
<td>CZ</td>
<td>67,226.3</td>
<td>31,825.9</td>
<td>24,885.5</td>
<td>10,514.9</td>
<td>51,258.5</td>
<td>10.3</td>
</tr>
<tr>
<td>CYP</td>
<td>35,987.3</td>
<td>15,979.3</td>
<td>-</td>
<td>20,008.0</td>
<td>8,658.1</td>
<td>0.8</td>
</tr>
<tr>
<td>SLK</td>
<td>14,579.5</td>
<td>11,560.3</td>
<td>2,560.7</td>
<td>458.5</td>
<td>18,229.1</td>
<td>5.4</td>
</tr>
<tr>
<td>SLO</td>
<td>14,455.6</td>
<td>7,992.4</td>
<td>3,622.3</td>
<td>2,840.9</td>
<td>18,861.0</td>
<td>2.0</td>
</tr>
<tr>
<td>MLT</td>
<td>10,637.9</td>
<td>4,872.4</td>
<td>1,921.6</td>
<td>3,843.9</td>
<td>3,414.9</td>
<td>0.4</td>
</tr>
<tr>
<td>ROM</td>
<td>9,012.9</td>
<td>5,334.7</td>
<td>3,364.7</td>
<td>313.4</td>
<td>33,570.1</td>
<td>22.5</td>
</tr>
<tr>
<td>BUL</td>
<td>8,658.6</td>
<td>2,166.5</td>
<td>6,390.2</td>
<td>101.9</td>
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* Total financial assets I = domestic credit + bonds + shares

Source: IFS, BIS, FIBV, national sources
Table 2: Comparison of domestic credit and total bank assets in 1999

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<th>Bank assets</th>
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<td>(in mn €)</td>
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* total financial assets I = domestic credit + bonds + shares
** total financial assets II = bank assets + bonds + shares

Source: IFS, BIS, FIBV, national sources
### Table 3: Comparison of financial assets per person in 1999

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<th>Shares</th>
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<th>Population</th>
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* total financial assets I = domestic credit + bonds + shares

Source: IFS, BIS, FIBV, OECD, national sources
### Table 4: Comparison of financial assets in % of GDP in 1999

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<th>Shares</th>
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<td>263%</td>
<td>116%</td>
<td>70%</td>
<td>77%</td>
</tr>
<tr>
<td>POR</td>
<td>258%</td>
<td>122%</td>
<td>72%</td>
<td>63%</td>
</tr>
<tr>
<td>AUT</td>
<td>257%</td>
<td>125%</td>
<td>115%</td>
<td>17%</td>
</tr>
<tr>
<td>CYP</td>
<td>415%</td>
<td>184%</td>
<td>-</td>
<td>231%</td>
</tr>
<tr>
<td>MLT</td>
<td>303%</td>
<td>139%</td>
<td>55%</td>
<td>109%</td>
</tr>
<tr>
<td>TUR</td>
<td>160%</td>
<td>46%</td>
<td>39%</td>
<td>76%</td>
</tr>
<tr>
<td>HUN</td>
<td>153%</td>
<td>53%</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>CZ</td>
<td>129%</td>
<td>61%</td>
<td>48%</td>
<td>20%</td>
</tr>
<tr>
<td>POL</td>
<td>79%</td>
<td>39%</td>
<td>19%</td>
<td>20%</td>
</tr>
<tr>
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<td>20%</td>
<td>15%</td>
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<tr>
<td>SLK</td>
<td>76%</td>
<td>60%</td>
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<td>2%</td>
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<tr>
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<td>75%</td>
<td>36%</td>
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<td>37%</td>
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<td>BUL</td>
<td>74%</td>
<td>19%</td>
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<td>1%</td>
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<tr>
<td>LIT</td>
<td>38%</td>
<td>16%</td>
<td>12%</td>
<td>11%</td>
</tr>
<tr>
<td>ROM</td>
<td>31%</td>
<td>18%</td>
<td>11%</td>
<td>1%</td>
</tr>
<tr>
<td>LAT</td>
<td>28%</td>
<td>19%</td>
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<td>121%</td>
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<td>113%</td>
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<tr>
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<td>326%</td>
<td>120%</td>
<td>114%</td>
<td>91%</td>
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<td>438%</td>
<td>125%</td>
<td>122%</td>
<td>191%</td>
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<td>194%</td>
<td>149%</td>
<td>145%</td>
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<td>29%</td>
<td>36%</td>
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<td>42%</td>
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<td>18%</td>
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<tr>
<td>Baltic countries</td>
<td>45%</td>
<td>22%</td>
<td>8%</td>
<td>16%</td>
</tr>
</tbody>
</table>

*total financial assets I = domestic credit + bonds + shares

Source: IFS, BIS, FIBV, OECD, national sources
While absolute figures provide some very interesting first insights, they are not suitable for comparing various countries’ financial market developments. Financial assets per capita (Table 3) and the size of financial markets with respect to GDP (Table 4) allow for more meaningful interpretations.

Comparing the major economic areas shows that Japan (558% of GDP) and the USA (507% of GDP) have much larger financial markets than the EU (350% of GDP). While financial markets in the group of euro-outs are relatively large (UK, Sweden and Denmark with 438% of GDP), total financial assets in the euro zone (326% of GDP) are below the EU level. Financial markets in accession countries are far less developed (107% of GDP) than in the EU.

Within the EU Luxembourg has by far the largest financial market (744% of GDP). Only a minor fraction of total financial business is domestic, reflecting Luxembourg’s important position as an international financial centre within the EU relative to its small domestic GDP. Among domestic EU financial markets, the Netherlands has the highest financial depth (506%), followed by Finland (441%) and the UK (430%). On the other hand the southern countries Italy (291%), Spain (263%) and Portugal (258%) as well as Austria (257%) are at the lower end of this ranking.

Among the group of accession countries this ranking yields three groups with respect to their financial market depth:
° Countries at EU level: Cyprus, Malta
° Intermediate size of financial markets (70-160% of GDP): Turkey, Hungary, Czech Republic, Poland, Slovenia, Slovak Republic, Estonia, Bulgaria
° Countries with very small financial markets (less than 40% of GDP): Lithuania, Romania, Latvia

Table 5: Non-performing loans in % of total loans

<table>
<thead>
<tr>
<th>Year</th>
<th>BUL</th>
<th>CYP</th>
<th>CZ</th>
<th>EST</th>
<th>HUN</th>
<th>LAT</th>
<th>LIT</th>
<th>MLT</th>
<th>POL</th>
<th>ROM</th>
<th>SLK</th>
<th>SLO</th>
<th>TUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>12%</td>
<td>20%</td>
<td>1%</td>
<td>6%</td>
<td>5%</td>
<td>13%</td>
<td>9%</td>
<td>11%</td>
<td>72%</td>
<td>44%</td>
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<td>7%</td>
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<td>1999</td>
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<td>8%</td>
<td>22%</td>
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<td>6%</td>
<td>13%</td>
<td>14%</td>
<td>14%</td>
<td>53%</td>
<td>41%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>2000</td>
<td>11%</td>
<td>8%</td>
<td>25%</td>
<td>1%</td>
<td>2%</td>
<td>5%</td>
<td>11%</td>
<td>14%</td>
<td>15%</td>
<td>5%</td>
<td>15%</td>
<td>5%</td>
<td>9%</td>
</tr>
</tbody>
</table>


Although this grouping provides some insight, caution has to be applied in its interpretation. Within the Central and Eastern European (CEE) accession countries one has to consider the share of non-performing loans that inflate “domestic credit” and “total assets” for some countries and – once removed from the banks into governmental consolidation agencies – distort time series every time such a consolidation occurs, as was the case in Slovakia (1999, 2001), Romania (2000) and the Czech Republic (2001). Repeated governmental equity injections into the banking sector and take-overs by foreign banks have similar effects. However, restructuring has seen considerable progress in all countries within the last years (Wagner, Iakova, 2001: 7). Similar to the development in the
EU in the second half of the 1990s (ECB, 1999: 10), banking sectors in CEECs currently experience increasing competition, narrowing interest rate spreads and falling profitability. All these trends indicate a further consolidation of CEE banking sectors (Wagner, Iakova, 2001: 9). The same issue applies to stock market capitalisation. In case of the Czech Republic, stock market capitalisation was initially inflated by listings resulting from voucher privatisation and then cramped by massive delistings forced upon by the implementation of EU capital market standards. Other qualitative characteristics referred to above also apply. This opens room for further research. In the bond market, the issuer mix is skewed in most CEECs. Similar to Greece, in most CEECs the total bond market also corresponds to the public bond market (see Chart 3) or is dominated by it as in Italy, Spain and Japan. The exception is the Czech Republic, where the corporate bond market is about as large as public issues. In 1999, corporate bond issuance grew strongly across the CEECs (Haiss, Marin, 2002a). Given these distortions, it has been argued (Haiss, 2002) that economic growth in the CEECs was so far generated rather by factors outside the financial system, with foreign direct investment (FDI) partly substituting domestic intermediation and domestic savings. Further empirical research is necessary to solve this important issue for the reconstruction of CEECs.

4.2. Structure of financial markets

As we argued in the theoretical section above not only the size of financial markets, but also their structure has to be analysed and taken into account. Comparing the size of market segments and the financial market structure of different countries (Table 4 and Table 6) yields some interesting results.

In the EU all financial market segments are of almost the same size with financial intermediation being the largest (35% of total financial market) followed by bond (33%) and share markets (32%). Despite a seemingly similar size of all market segments bank loans and trade credits are by far the most important sources of external finance in the European Union (ECB, 2001: 42 ff.). Shares and bonds only play a minor role in financing investment, although bonds have largely been ignored in the finance-growth literature so far, presumably also due to difficulties in accessing the data.

While in Japan banking intermediation dominates (331% of GDP, almost 60% of total financial assets), in the USA stock markets seem to be the largest segment (35% of total financial assets). However, even in the USA whose system is commonly classified as “market-based” (securities-oriented) external financial transactions of non-financial corporations tend to be dominated by credits and loans (ECB, 2001: 44).

Both in the USA and in the EU price effects have to be considered when assessing the role of stock markets (ECB, 2001: 41). While in Japan share prices were low in 1999, they were on a high level in the USA and Europe at the same time. Taking the resulting overvaluation of stock market size (see also Chart 2) into account our results are even more in line with the analysis of the ECB (2001: 44).
41), which builds not only on price-sensitive stock data, but also on flow data on the role of financing instruments.

In Europe the recent growth in importance of financial intermediation and to some extent of the corporate bond market was influenced by temporary factors. One factor is the decline in lending rates in the Euro area relative to US-dollar denominated debt. This interest rate differential made it very attractive for international borrowers to raise capital in euro denomination, for example via bonds (Fink, Fenz, 2002). Secondly, UMTS auctions evoked particularly high financing needs resulting in an issuance hike on the European corporate bond markets in the late 90s (Haiss, Marin 2002b). The role of bond markets and their structures are discussed in more detail below. Although the just described temporary effects favoured financial intermediation, they are opposed to a worldwide long-run trend towards securitisation and disintermediation (ECB, 1999: 3). However, banks might also be able to benefit from this long-run trend by refocusing their strategies, e.g. by supplying a broader range of financial services (Galati, Tsatsaronis, 2001: 34).

Within the EU structure and size of different market segments vary considerably. The size of financial intermediation is between 58% of GDP in Finland and 147% in Germany. Not taking Luxembourg into account, the size of bond markets varies between 70% (Spain) and 180% of GDP (Netherlands). The smallest stock market in relative terms has a capitalisation of 17% of GDP (Austria), the largest one has 286% (Finland).

In Luxembourg domestic credit (92% of GDP) is even below the average of EU15+4 group (121%). Hence using total bank assets instead of domestic credit would drive up total financial assets even more. The bond market is by far the largest financial market segment (53% of total financial assets) and stock market capitalisation (179% of GDP) is also above the average.

In accession countries domestic credit is the most important market segment (43% of GDP), followed by stock markets (36% of GDP). Together with the very limited role of the bond market this reflects the typical situation of an underdeveloped market economy with an “intermediate financial structure” (Shirai, 2002: 35). Data on single accession countries also display huge structural differences. Cyprus and Malta show rather high financial intermediation ratios (domestic credit of 184% and 139% of GDP respectively) and stock market capitalisation (231% and 109% of GDP), in both cases influenced by their function as offshore financial centres. In the majority of accession countries financial intermediaries dominate. But one has to be cautious with these figures, because as Table 5 reports in many of the CEE countries a considerable part of total loans is non-performing (e.g. in 2000 25% of total loans in Czech Republic were estimated to be non-performing, prior to a sizeable transfer to Consolidacna Agentura in 2001; 15% in Slovakia and – according to Deutsche Bank Research (2001b) - even 35% in Romania). In Slovakia (2% of GDP), Bulgaria (1% of GDP) and Romania (1% of GDP) domestic stock markets were of almost no
importance, while Turkey (76% of GDP), Estonia (37% of GDP) and Hungary (36% of GDP) seem to have better developed stock markets.

It has already been outlined that financial structures vary considerably both from one major group of countries to another and within these groups. It is common to classify countries in terms of whether financial intermediaries or securities markets dominate a system. If intermediation is relatively important, the financial system is classified as “bank-oriented”, otherwise it is referred to as “securities-oriented” (ECB, 2001: 40).

In order to distinguish between bank-oriented and securities-oriented financial systems we use the ratio of the size of financial intermediation over the size of stock markets and bond markets (B/S-ratio). A high ratio indicates a relatively important banking sector, a low ratio comes with a relatively large securities market. The fact that usual classification schemes do not consider bond markets could be a reason why these indicators provide “no conclusive evidence that the type of system matters for growth performance” (Wagner, Iakova, 2001: 6).

In Table 7 the results of this analysis are reported. We use three different critical values in order to decide on a the country’s financial system. The first critical value (0.584) is the median of the B/S-ratio of all 32 countries. Results are reported in column 3 of Table 7. As a second critical value we use the median of all EU15+4 countries (0.488).

The majority of countries in our sample are European. Since they are said to tend towards a bank-oriented system, one may argue that using a median yields too high a critical value and therefore classifies too many countries as securities-oriented. In order to check for this “European bias” we take the B/S-ratio of the total sample (which equals a weighted average of the individual countries’ B/S-ratios) as an additional critical value. However, this third critical value is even higher (0.661) than the first two are. This is due to the relatively high weight of Japan, which has by far the highest B/S-ratio of all industrial countries.

As expected, financial structures in the USA, Luxembourg\(^{15}\) and UK are classified as securities-oriented, while Japan, Germany or Austria have bank-oriented financial systems. Surprisingly Italy and France as well as (in two out of three cases) Switzerland are classified as securities-oriented. In Italy and France this is basically due to the size of (public) bond markets, while in Switzerland not only the banking sector is huge, but also the stock market is highly capitalised. Analogous arguments hold true for Finland. Most of the accession countries are classified as having bank-oriented systems. Only the financial systems of Bulgaria, Turkey and (in two out of three cases) Hungary are classified as securities-oriented.

\(^{15}\) However, in the case of Luxembourg this result critically depends on the measure for banking intermediation. Using bank assets instead of domestic credit would lead to the opposite result.
Table 6: Structure of financial markets in 1999

<table>
<thead>
<tr>
<th></th>
<th>Domestic credit</th>
<th>Bonds</th>
<th>Shares</th>
</tr>
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<td>16.5%</td>
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<td>NOR</td>
<td>35.2%</td>
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</tr>
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<td>48.7%</td>
<td>44.8%</td>
<td>6.5%</td>
</tr>
<tr>
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<td>28.0%</td>
<td>24.5%</td>
</tr>
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<td>33.1%</td>
<td>22.0%</td>
</tr>
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<td>26.7%</td>
<td>29.2%</td>
</tr>
<tr>
<td>BEL</td>
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<td>41.8%</td>
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</tr>
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<td>Baltic countries</td>
<td>48.6%</td>
<td>16.6%</td>
<td>34.8%</td>
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</tbody>
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* total financial assets I = domestic credit + bonds + shares

Source: IFS, BIS, FIBV, national sources
## Table 7: Bank- or securities-oriented financial systems

<table>
<thead>
<tr>
<th>Country</th>
<th>B/S</th>
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<th>Critical value 3: 0.661</th>
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<td>0.178</td>
<td>securities-oriented</td>
<td>securities-oriented</td>
<td>securities-oriented</td>
</tr>
<tr>
<td>SLK</td>
<td>3.829</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>LAT</td>
<td>1.946</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>ROM</td>
<td>1.450</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>SLO</td>
<td>1.237</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>POL</td>
<td>1.002</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>EST</td>
<td>0.907</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>CZ</td>
<td>0.899</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>MLT</td>
<td>0.845</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>CYP</td>
<td>0.799</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>LIT</td>
<td>0.704</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
<td>bank-oriented</td>
</tr>
<tr>
<td>HUN</td>
<td>0.527</td>
<td>securities-oriented</td>
<td>bank-oriented</td>
<td>securities-oriented</td>
</tr>
<tr>
<td>TUR</td>
<td>0.404</td>
<td>securities-oriented</td>
<td>securities-oriented</td>
<td>securities-oriented</td>
</tr>
<tr>
<td>BUL</td>
<td>0.334</td>
<td>securities-oriented</td>
<td>securities-oriented</td>
<td>securities-oriented</td>
</tr>
</tbody>
</table>

*B/S ...................... ratio of domestic credit over outstanding amount of bonds plus stock market capitalisation
Critical value 1 ... median B/S of all 32 countries
Critical value 2 ... median B/S of EU15+4
Critical value 3 ... weighted average of B/S of all 32 countries

Source: IFS, BIS, FIBV, national sources, own calculations
4.3. Financial centres

In some cases the data seem to contain sizeable international components in spite of the labelling “domestic”. To a considerable extent this is the case for Luxembourg. Minor distortions may be encountered with regard to the United Kingdom, Cyprus and Malta. We generally use only “domestic” liabilities in our analysis, because these are funds provided to domestic companies and persons, who directly determine an economy’s output. For funds raised by foreigners such direct growth effects do not exist. For example an Austrian company listed in Frankfurt does not induce direct growth effects on German GDP.

However, there could be indirect growth effects when foreigners raise funds on financial markets. The Austrian company mentioned above might contribute to German growth indirectly via an increase in efficiency of German financial markets.

Having this idea in mind we provide some (vague) idea of the dimensions of internationalisation on some financial markets. A systematic analysis of the internationalisation of financial markets and possible links to economic growth may be an interesting field of future research.

Examples:

- In Luxembourg domestic stock market capitalisation was bn € 35.9 compared to bn € 554.3 of the total market in 1999.\textsuperscript{16} As already mentioned bank assets in Luxembourg are 30 times higher than domestic credit.

- In London domestic market capitalisation was bn 1,523.6 GBP in 2001, while capitalisation of international companies was bn 2,580.4 GBP.

4.4. Dynamics of financial markets

Chart 2 shows the development of financial markets and their segments relative to GDP. While in the USA, the EU and Japan the average size of all financial market segments has grown over the past 20 years, one cannot easily detect the same long-run tendency for the group of accession countries. With respect to the size of financial markets these graphs do not show a general (size) convergence of the accession countries' financial markets. There is an ambiguous development of financial markets in accession countries. While some countries such as Bulgaria and Hungary experienced a negative development of the size of financial markets relative to GDP, in some others (e.g. Slovakia) financial markets have grown considerably.

Chart 2: Development of total financial markets and their segments

* total financial assets I = domestic credit + bonds + shares

Source: IFS, BIS, FIBV, OECD, national sources, own calculations
The development of stock market capitalisation relative to GDP indicates the drawbacks of this indicator caused by valuation effects. Japanese stock market capitalisation reached a peak in 1989 and fell by more than 50% within the next few years. Price changes therefore may cause severe over- or undervaluation of stock markets compared to other financial market segments.

4.5. Structure of bond markets

A closer look at the size and structure of bond markets seems to be necessary. In contrast to financial intermediation and stock markets a large part of debt securities is related to the public sector in many countries. Depending on the focus of the analysis (total size financial markets vs. corporate finance approach) bond markets play an important or just a minor role. This is especially true for most of CEE countries where almost no corporate bond markets exist. Exceptions are the Czech Rep. where corporate and financial institutions issued 25% of all outstanding domestic debt securities and to a much lesser extent Hungary (Haiss, Marin, 2002a). Apart from institutional and legal requirements such as international accounting standards, the main reasons for this lack of corporate bond financing of large companies are easy access to bank credit at low interest rates and the importance of external financing through foreign parent companies (Wagner, Iakova, 2001: 10, 30).

Chart 3 shows the structure of outstanding debt securities in different countries. Surprisingly the importance of public bonds is smaller in the EU than in Japan and the USA. To some extent this may be an artefact caused by data aggregation. Aggregation of data for smaller countries usually leads to a higher fraction of international debt securities, which may also contain international public debt.

Within the EU the importance of bond market segments varies extremely from one country to another. In some countries, such as Spain, Italy or Greece, the public sector issues more than two thirds of all outstanding debt securities. While in Germany, Denmark or Austria financial institutions and in the UK corporations are of some importance, in many EU member states international bonds dominate the market (Ireland, Finland, Luxembourg17).

The dynamic analysis in Chart 4 shows the development of domestic bond markets in the EU, the USA and Japan between 1990 and 2000. It becomes apparent that in contrast to the EU in the USA corporate issuers have always been of some importance. While other financial institutions have traditionally played a major role in the EU and Japan, there is evidence that a corporate bond market is just evolving in Europe. As mentioned above, this recent increase in corporate debt securities was partly due to financing needs of telecommunication enterprises (ECB, 2001:44). This upward trend was supported by the introduction of the Euro and the subsequent increase in the number of

---

17 In our data set international debt securities amount to 100% of the Luxembourg bond market, because BIS does not report any figures on domestic debt securities. However, because the amount of international bonds outstanding (391% of GDP) is that large, distortions should be rather small in size.
investors operating in the same currency (ECB, 1999: 12). To a considerable extent the corporate bond market served to finance mergers and acquisitions occurring due to restructuring of industries in an increasingly integrating market (ECB, 2002: 20ff). While there was a boost in European corporate bond markets, the stability criteria caused a (relative) decline of the government bond markets (Galati, Tsatsaronis, 2001: 7). Finally, we want to point to the striking fact that in Japan the share of public issuers has grown again within the last decade.
Chart 3: Structure of outstanding bonds by issuer (1999)

Source: BIS (http://www.bis.org/statistics/secstats.htm)
Chart 4: Development of outstanding domestic bonds in USA, EU, Japan

Domestic securities - USA

Domestic securities - EU-15 (without Luxembourg)

Domestic securities - Japan

Source: BIS (http://www.bis.org/statistics/secstats.htm)
5. Summary and conclusion

The nexus between the financial and the real sector has been attracting a lot of attention recently, reflecting the importance of this issue for economic development. In reviewing selected pieces of theory, empirical and descriptive studies, we try to answer the following questions: (1) What is the direction of the finance-growth nexus, (2) which segment of the financial sector drives the link, and (3) what are the features of a growth supportive financial setup. In the first section, theoretical considerations on the finance-growth nexus are reviewed. We find that the discussion on the optimal or the most growth-supportive financial structure focuses very much on the question whether banks or stock markets produce better outcomes. We argue that there is both competition and functional complimentarity among them. We also suggest to use the terms “bank-oriented” and “securities oriented” instead of the value-loaded terminology often applied. While international finance is important and while globalisation makes its impact on financial flows, we argue that a country focus is an appropriate level of analysis. We also conclude that the impact of the bond market is not given appropriate attention in theoretical reasoning.

The majority of economists occupied with the finance-growth-nexus consider finance as largely supply-leading, i.e. finance positively influencing the real economy. Even opposing views of neo-classical “benign neglect” (with finance restricted to assistance in the accumulation of capital) and endogenous growth theory (where finance is thought to direct incentives) agree that there is some link, but the direction and size impact is heavily disputed. Theoretical discourse suggests that the causal link between finance and real growth runs in both directions. This mutual influence may be exerted at the same time, implying that financial depth (i.e. large financial markets) drives real growth, while the growing economy’s demand for finance is met by the advancing financial sector. If the two efficiency parameters can be assumed to be significantly correlated, however, it becomes difficult to interpret the financial efficiency parameter that is of major interest. A highly developed, capital intensive economy uses a relatively high fraction of real income for running the financial system. By taking into account the costs of a financial system and its ability to promote real growth, it should be possible to determine the optimal size of an economies’ financial sector relative to the real economy. Financial systems react to heterogeneous and changing needs. Besides the provision of information and corporate control, institutional aspects, maturity of financial contracts, borrower characteristics and other finance-centred issues, more general factors like politics, history, or the legal framework (common law systems vs. civil law systems) also are argued to influence the financial system in the literature. Assumptions behind the level of development, transaction costs, agency problems and institutional issues drive the answer. This variety of determinants is reflected by the heterogeneity of financial systems across countries. While the factors mentioned may play an
additional explanatory role, it is very hard to control for the majority of those possibly applied. We therefore conclude to concentrate on the role of the financial sector directly.

The second part of the paper reviews empirical evidence. We compare and review the findings of three spheres of research: bank centred (20 studies identified) and stock-centred (19 studies) cross-country comparisons and time-series analyses (12 studies) on the finance-growth nexus. As is the case on the theoretical side, we conclude that bond markets are only given a very minor role in empirical research. We provide tables that facilitate the comparison of both the variables used, methodology applied and the major findings of empirical studies we could identify in that growing body of research. Cross-country studies usually assume a supply-leading pattern and often find a positive relationship between finance and real growth. A superior contribution to real output by stock markets compared to banks is found by the majority of studies. In emerging markets, however, stock market expansion may result in detrimental effects to the real economy. Our overview of the cross-country literature on securities and bank markets’ linkage to growth supports the view of two complementary sectors serving different needs of an economy.

Time-series analyses address the question of causality, usually by Granger causality tests. Among the 12 studies reviewed, the results are ambiguous, with unstable causality patterns across countries and time. Several studies attempt to model demand-following and supply-leading finance simultaneously, reciprocal causality receiving growing support.

In the third part, we analyse the size, structure and dynamics of financial markets in 32 countries. A data set is suggested to facilitate the comparability of further independent research efforts. We conclude that financial markets within the euro zone seem to have reached only a minor level of structural convergence, especially on the retail side. According to a classification scheme we provide, many EU countries are less bank-oriented than frequently argued.

Across theoretical, empirical and descriptive investigations, five possible relationships between the financial and the real sector were identified: (1) no causal relation; (2) demand-following; (3) supply-leading; (4) negative causal link from finance to growth; (5) interdependence. Hypothesis (1) appears to be falsified by the majority of empirical studies we reviewed. Evidence for the existence of some kind of relationship between finance and growth is high. Hypotheses (2) and (3) have been tested by a number of time-series studies, distinguishing between different countries and different time periods. Both supply-leading and demand-following patterns have been observed. The evidence found, however, is strikingly heterogeneous in both the regional and the time dimension. To date we have little insight in which factors cause the different causality patterns observed. Further research is necessary to solve this issue. More emphasis should be given to analysing all three major financial market segments (bank credit, stock and bond finance) in their interplay with real economy growth.
6. Data annex

Our data set provides panel information on financial, economic and other variables for a sample of 32 countries. One group of countries consists of the 15 member states of the EU plus USA, Japan, Switzerland and Norway (EU15+4 countries). The second part of the sample includes all countries seeking accession to the EU: Bulgaria, Czech Republic, Slovakia, Estonia, Latvia, Hungary, Lithuania, Slovenia, Poland, Romania as well as Turkey, Malta and Cyprus (accession countries). The time span covered is quite different between the two groups. While for the 19 countries of the first group sufficiently long time series (up to 40 years) do exist, availability of reasonable data is much worse for the 10 CEE countries. Hence the time span covered for accession countries is much shorter (the last 5 to 10 years).

We organise the data set in three different currency versions covering the same sample:
- national currencies
- US-Dollar
- Euro: In order to convert data we proceed along the following lines. For the period after 1999 we convert by market Euro/US-Dollar exchange rates. For the period 1974 to 1998 it is standard to use the ECU/US-Dollar exchange rate. Additionally we construct a synthetic ECU-rate using the initial weights (1974) of the ECU-currencies for the period 1960 to 1974 in order to convert older data. The exchange rates for data conversion are also provided in the data set.

For stock data we use end-of-period exchange rates, while flow data are converted by period-averages. In some cases this may lead to considerable differences in ratios of stock and flow variables when calculating them in different currencies. Unless stated differently, we use euro data for our descriptive statistical overview.

We continue with a short description of the sources, construction and application of the indicators in our data set. This section is divided into three subsections. First we present indicators to describe the development and structure of a country’s financial sector. Then we describe other economic series in our data set. Finally, we briefly discuss other parts of the data set such as human capital indicators.

6.1. Data on financial markets

6.1.1. Total financial assets

In order to analyse the development of financial markets we construct an aggregate measure of financial depth by summing up the size of the major market segments. With such a measure of financial depth we follow previous approaches of e.g. King, Levine (1993a), Gertler, Rose (1994),...
De Gregorio, Giudotti (1995), Rajan, Zingales (1998), Beck, Levine, Loyaza (2000) or Bassanini, Scarpata, Hemmings (2000). While these previous studies are concerned with stock and banking intermediation only, we also consider the third important segment of financial markets, i.e. bond markets (Fink, Haiss, 2000). By taking bond markets into account we can provide a more complete analysis of the development and structure of financial markets.

Financial development has to be analysed at two different levels: apart from a quantitative aspect (the amount of external finance available in a country referred to here as “total financial assets” in the following), qualitative features determine the development of a financial system. These qualitative notions include price distortions, the level of governmental interference, agency problems, efficiency of intermediation, product market complexity, underlying structures of the real sector, the level of sour credits and several features frequently referred to in the corporate governance literature (see Buch, Heinrich, 2002 for an overview). Although our quantitative indicators do not explicitly take quality into account, a high correlation between quantity and quality can be expected. However, there are some exceptions from these close positive links of quality and quantity in financial markets. As examples from some CEE countries show, high amounts of outstanding credit may go hand in hand with a high degree of bad loans. Nevertheless there is no better aggregate indicator of financial development than the sum of the sizes of all major market segments.

We measure the depth of financial markets by summing up the amounts of banking intermediation, share and bond markets. A detailed description of the indicators used to measure the size of market segments is given below. As we use two different indicators for the size of banking intermediation, there are two different indicators for the size of financial markets:

\[
\text{Total financial assets I} = \text{domestic credit} + \text{amount of bonds outstanding} + \\
+ \text{stock market capitalisation}
\]

\[
\text{Total financial assets II} = \text{bank assets} + \text{amount of bonds outstanding} + \\
+ \text{stock market capitalisation}
\]

Unless stated differently, we use the first measure of total financial assets (with domestic credit). While domestic credit usually accounts for the largest fraction of bank assets encompassing liabilities of domestic persons or institutions, the remaining parts of banks’ total assets are considerable. They might inflate total financial assets and skew the relative importance of the three modes of finance in the mix. This is further discussed in the following.
6.1.2. Financial intermediation

Table 8: Sources of data on banking intermediation

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>TYPE OF DATA PROVIDED</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFS</td>
<td>Domestic credit</td>
<td>Almost complete time series on domestic credit for all countries (minor adjustments for Japan, Belgium, France, Luxembourg, Italy, Sweden)</td>
</tr>
<tr>
<td>IFS</td>
<td>Bank assets</td>
<td>Assets of deposit money banks (section 20) and of other banking institutions (section 40)</td>
</tr>
<tr>
<td>EBRD</td>
<td>Bad loans in % of total loans</td>
<td>For CEE countries</td>
</tr>
<tr>
<td>DBResearch</td>
<td>Non-performing loans in % of total loans</td>
<td>For CEE countries</td>
</tr>
</tbody>
</table>


International Financial Statistics (International Monetary Fund) - from WIFO (Austrian Institute of Economic Research) database (http://www.wifo.at/db/index.html)

We use two different measures of financial intermediation:

- DOMESTIC CREDIT: Following King, Levine (1993a), Gertler, Rose (1994), Beck, Levine, Loyaza (2000) and others we use domestic credit as an indicator for the development of a country’s financial intermediation sector. Domestic credit are claims of deposit money banks and monetary authorities on all residents. Data on domestic credit are taken from International Financial Statistics (IFS). In general we use line 32 of the IFS monetary survey, which only contains deposit money banks and monetary authorities. For some countries (USA, Japan, Sweden) a banking survey is available, which additionally contains “other banking institutions” and non-bank financial institutions”. In our data set we report both series (for these three countries), because as Table 9 indicates, domestic credit reported in the banking survey is much higher than domestic credit in the monetary survey. In this paper we refer to domestic credit figures according to the banking survey.

18 Some of the studies mentioned use only domestic credit to the non-financial sector.
Table 9: Comparison of domestic credit (monetary survey vs. banking survey)

<table>
<thead>
<tr>
<th>Domestic credit in bn. of n.c.</th>
<th>USA</th>
<th>Japan</th>
<th>Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of monetary survey (line 32)</td>
<td>7690.2</td>
<td>712820.0</td>
<td>1440.9</td>
</tr>
<tr>
<td>Of banking survey (line 52)</td>
<td>15023.6</td>
<td>1637940.0</td>
<td>2283.0</td>
</tr>
<tr>
<td>Line 32/line 52</td>
<td>51.19%</td>
<td>43.52%</td>
<td>63.12%</td>
</tr>
</tbody>
</table>

Source: IFS

° BANK ASSETS: A second measure of financial intermediation are bank assets. As total bank assets we define the higher of either total claims or total liabilities of all banking institutions. Total claims and total liabilities of deposit money banks are calculated by summing up lines 20 to 22 (total claims) and lines 24 to 28 (liabilities) respectively of section 20 (‘deposit money banks’) in IFS. In case of the USA, Japan and Sweden, where “other banking institutions” are important, we include assets and liabilities of banking institutions contained in section 40 (‘Other banking institutions and non-bank financial institutions’). In contrast to domestic credit we only include claims or liabilities of ‘other banking institutions’, but not of ‘non-bank financial institutions’ in this measure. As already mentioned, in case of differences between claims and liabilities, we use the higher figures. Other studies using total bank assets as an indicator for the size of the banking sector are provided by, e.g., King, Levine (1993a), Fink, Haiss (1998), Demirgüc-Kunt, Maksimovic (2000).

Both domestic credit and bank assets are reasonable indicators of the size of financial intermediation and therefore the development of the banking sector. The suitability of one or the other indicator depends on the particular research interest. The first important difference between the two indicators is that domestic credit does not include foreign assets. This may cause huge differences, as the example of Luxembourg shows (see Table 2). There are additional differences between these two measures in the USA, Japan and Sweden due to the fact that not all financial institutions (e.g. insurance companies and pension funds) integrated in the banking survey need to be banking institutions. Hence the size of non-bank financial institutions influences domestic credit, but not bank assets.

6.1.3. Stock markets (SHARES)

Similar to Demirgüc-Kunt, Maksimovic (1998), Levine, Zervos (1998) and Singh, Singh, Weisse (2000) we use market capitalisation of domestic companies on stock exchanges as an indicator for the size of share markets. Apart from considerations concerning the availability of data, the point in using domestic instead of total market capitalisation is that links between funds raised by domestic companies on stock exchanges and economic growth seem to be more direct and closer than for...
funds raised by foreign companies. Additionally, these figures are comparable to domestic credit and the indicator on the size of bond markets, because only liabilities of domestic institutions are measured.

The World Federation of Exchanges (FIBV) provides capitalisation data for all countries of the EU15+4 group and some of the accession countries. These figures do not include investment funds and listed foreign shares. Additional sources are national stock exchanges. For three countries (Switzerland, Greece and Portugal) we use capitalisation/GDP data from the Worldbank Financial Structure Database.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>TYPE OF DATA PROVIDED</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIBV</td>
<td>Stock market capitalisation</td>
<td>Data include shares of domestic companies, but not: 1.) investment funds; 2.) rights, warrants, convertible instruments; 3.) options, futures; 4.) listed foreign shares; 5.) companies whose only business goal is to hold shares of other listed companies. Additionally over-the-counter (OTC) markets or national electronic markets not operated and supervised by a stock exchange are not included in FIBV statistics.</td>
</tr>
<tr>
<td>WB - Financial Structure Database</td>
<td>Stock market capitalisation</td>
<td></td>
</tr>
<tr>
<td>National stock exchanges</td>
<td>Stock market capitalisation</td>
<td>Additional data of national stock exchanges are used for Luxembourg, Germany, Great Britain, Slovakia, Estonia, Hungary, Romania, Cyprus, Turkey</td>
</tr>
<tr>
<td>IFS</td>
<td>Stock market indices</td>
<td>Line 62</td>
</tr>
<tr>
<td>National stock exchanges</td>
<td>Stock market indices</td>
<td>Additional data used for Germany</td>
</tr>
</tbody>
</table>

The use of stock market capitalisation as an indicator for the size of equity markets may be criticised on the ground that capitalisation contains not only a quantity component, but also a price component. However, these two components are closely linked. Thiel (2001: 12) states that “nominal stock market capitalisation is closely related to the issuance of new capital on the stock markets in most economies [...] thereby suggesting that the former could be a useful proxy despite the impact of changes on the prices of shares”.
As Table 12 shows, nominal stock market capitalisation and share price indices are strongly correlated in most countries. Therefore we use share price indices to extend time series on stock market capitalisation in the few cases where capitalisation data are not available. Share price indices are taken from IFS and national sources.

Time series of market capitalisation are very short for CEE countries, because most stock exchanges were just (re)established in the first half of the 1990s. Table 11 shows the year of stock market foundation in CEE countries and the availability of capitalisation data. In the context of growth-related questions one should also bear in mind that the effective ability to raise capital is doubtful in many CEE countries, because stock exchanges were just a “venue for mandatory listing of shares during the mass-privatisation of state-owned companies” (Deutsche Bank Research 2001b: 17). In the early years of transition, stock markets in those countries have been an instrument of ownership allocation in connection with privatisation and not of mobilisation of capital or enterprise valuation (Gligorov, 1998).

<table>
<thead>
<tr>
<th>STOCK EXCHANGE</th>
<th>ESTABLISHED IN</th>
<th>DATA STARTING IN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgarian Stock Exchange</td>
<td>1990</td>
<td>1995</td>
</tr>
<tr>
<td>Prague Stock Exchange</td>
<td>1993</td>
<td>1995</td>
</tr>
<tr>
<td>Tallinn Stock Exchange</td>
<td>1996</td>
<td>1996</td>
</tr>
<tr>
<td>Budapest Stock Exchange</td>
<td>1990</td>
<td>1995</td>
</tr>
<tr>
<td>Riga Stock Exchange</td>
<td>1995</td>
<td>1995</td>
</tr>
<tr>
<td>Bucharest Stock Exchange</td>
<td>1995</td>
<td>1995</td>
</tr>
<tr>
<td>Bratislava Stock Exchange</td>
<td>1993</td>
<td>1995</td>
</tr>
<tr>
<td>Ljubljana Stock Exchange</td>
<td>1989</td>
<td>1994</td>
</tr>
</tbody>
</table>

Source: Deutsche Bank Research (2001a:17), FIBV (http://www.world-exchanges.org), national stock exchanges

\[20\] However, in order to rule out spurious regression a more sophisticated analysis of this link would be useful.
Table 12: Correlation between nominal stock market capitalisation and share price index

<table>
<thead>
<tr>
<th>Country</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>POR</td>
<td>0.571</td>
</tr>
<tr>
<td>LUX</td>
<td>0.683</td>
</tr>
<tr>
<td>FIN</td>
<td>0.913</td>
</tr>
<tr>
<td>SWE</td>
<td>0.917</td>
</tr>
<tr>
<td>AUT</td>
<td>0.922</td>
</tr>
<tr>
<td>ITA</td>
<td>0.952</td>
</tr>
<tr>
<td>IRL</td>
<td>0.959</td>
</tr>
<tr>
<td>JPN</td>
<td>0.961</td>
</tr>
<tr>
<td>BEL</td>
<td>0.967</td>
</tr>
<tr>
<td>GER</td>
<td>0.969</td>
</tr>
<tr>
<td>FRA</td>
<td>0.974</td>
</tr>
<tr>
<td>SUI</td>
<td>0.980</td>
</tr>
<tr>
<td>SPA</td>
<td>0.981</td>
</tr>
<tr>
<td>NOR</td>
<td>0.983</td>
</tr>
<tr>
<td>UK</td>
<td>0.988</td>
</tr>
<tr>
<td>USA</td>
<td>0.993</td>
</tr>
<tr>
<td>NL</td>
<td>0.993</td>
</tr>
</tbody>
</table>

Source: FIBV (http://www.world-exchanges.org), IFS, Worldbank Financial Structure Database, national sources, own calculations
6.1.4. Bond markets (BONDS)

Table 13: Sources of data on bond markets

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>TYPE OF DATA PROVIDED</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIS</td>
<td>Outstanding amounts of bonds</td>
<td>Data on outstanding amounts of both domestic and international debt securities starting in 1990; BIS does not provide data for most of the CEE countries.</td>
</tr>
<tr>
<td>IFS</td>
<td>Outstanding amount of bonds issued by deposit money banks (section 20)</td>
<td></td>
</tr>
<tr>
<td>GFS</td>
<td>Public debt (by type of instrument)</td>
<td>For some countries public debt is classified by debt instruments</td>
</tr>
<tr>
<td>National sources</td>
<td>Public debt (by type of instrument)</td>
<td>Central banks and ministries of finance</td>
</tr>
</tbody>
</table>

* BIS ... Bank for International Settlement - Securities Statistics (online: http://www.bis.org/statistics/secstats.htm)
* GFS ... IMF, Government Finance Statistics Yearbook, Washington, diverse issues
* IFS ... International Financial Statistics (International Monetary Fund) WIFO database (http://www.wifo.at/db/index.html)

As an indicator for the size of bond markets we use outstanding amounts of debt securities (BONDS). Methodologically, this indicator is consistent with indicators of the banking sector’s and stock market’s size, as they are used in many other studies. However, up to now only Fink, Haiss (1999a, 1999b), Fink, Haiss, Orlowski, Salvatore (1998) and Beck, Demirgüç-Kunt Levine (1999) seem to have considered bond markets when analysing financial markets.

The Bank for International Settlement (BIS) provides data on outstanding amounts of debt securities for the period 1990-2001 for at least the EU15+4 group. Outstanding amounts of domestic debt securities (BIS securities statistics: table 16A) and international debt securities by country of residence (BIS securities statistics: table 14A and table 14B) are available for all 19 countries.

In order to approximate the size of bond markets before 1990 we construct an indicator building on the BIS data for the 1990s:
• For the USA BIS provides data on outstanding amounts of securities starting in 1960.

• For the rest of the EU15+4 group we build the indicator on disaggregated BIS data on outstanding amounts of bonds. We construct the indicators according to the following rules:
  - We link the size of the public sector bond market with GFS data on outstanding amounts of government debt securities or – if these are not available – an index of total public debt.
  - We link the size of financial, corporate and international bond sectors with IFS data on outstanding amounts of bonds issued by financial institutions.
  - If only data on either public bond markets or financial institutions bond markets are available, we use them as an index to approximate the development of total bond market size.
  - If possible, we link data in levels, otherwise we use one time series as index to construct a longer time series.

The BIS also provides data on outstanding amounts of debt securities for some accession countries (Poland, Hungary, Czech Republic and Turkey). For the other accession countries only data on the size of public bond markets are available. Nevertheless, it seems to be a realistic assumption, that total bond markets in these countries are (almost) identical with public bond markets, either because a private bond market has not yet developed (CEECs) or because the country is so small that a private bond market cannot develop (Malta, Cyprus). We therefore use data on outstanding amounts of government debt securities as a proxy measure for the size of total bond markets in these countries.

21 Our data on outstanding amounts of bonds are available on the following disaggregation level: 1.a) domestic bonds issued by the public sector, 1.b) domestic bonds issued by financial institutions, 1.c) domestic bonds issued by corporate and 2. international bonds (not classified with respect to issuer).
6.2. Economic data

Table 14: Sources of economic data

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>TYPE OF DATA PROVIDED</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFS</td>
<td>Nominal GDP, real GDP</td>
<td>Nominal GDP data are provided in levels, real GDP as index</td>
</tr>
<tr>
<td>OECD – NA</td>
<td>Real GDP, real gross fixed capital formation (GFCF)</td>
<td>Data real GDP and real GFCF are provided in levels</td>
</tr>
<tr>
<td>OECD – HS</td>
<td>Real GDP, real GFCF</td>
<td>Index data on real GDP and real GFCF</td>
</tr>
<tr>
<td>ECE</td>
<td>Real GDP, real GFCF</td>
<td>Index data on real GDP and real GFCF for all CEE countries</td>
</tr>
</tbody>
</table>

IFS ... International Financial Statistics (International Monetary Fund) WIFO database (http://www.wifo.at/db/index.html)
OECD NA... OECD, National Accounts of OECD Countries, Volume 1 - Main Aggregates, Paris, diverse issues

6.2.1. GDP

In general GDP data are from IFS. For EU15+4 we additionally use OECD data. For accession countries time series are completed with data the Economic Commission for Europe (2000) provides in the Economic Survey of Europe.

6.2.2. Physical capital stock

Time series on physical capital stock are generated by use of a perpetual inventory method:

\[ K_{(t+1)} = K_{(t)} \times (1-d) + I_{(t+1)} \]

\[ K_{(t)} \quad \text{... physical capital stock at the end of period } t \]
\[ d \quad \text{... constant rate of depreciation} \]
\[ I_{(t)} \quad \text{... gross fixed capital formation (GFCF) in period } t \]

In order to estimate the initial capital stock we follow Easterly, Levine (2001). Assuming that a country is its steady state capital/output ratio physical capital stock (K) relative to GDP is:

\[ K/Y = k = i/(g+d), \]

where i is the investment rate (I/Y), g is the real growth rate of output and d is a constant rate of depreciation. In order to reduce influences of outliers we use average growth and investment rates to estimate the initial capital stock. For EU member states, USA, Japan, Norway, Switzerland, Turkey, Malta and Cyprus we use averages of the period 1961-1970. Since in CEE countries data
are not available for sufficiently long periods, we use the average longest period available for each country.

Table 15: Physical capital stock with respect to GDP (1999)

Source: ECE, IFS, OECD, own calculations
Assuming a constant rate of depreciation of 7%\textsuperscript{22} we then estimate capital stock data for all 32 countries in national currencies and 1995 prices. Table 15 reports 1999 ratios of physical capital stock to GDP. One big advantage of this method is the cross-country comparability of data. Yet one has to be cautious when comparing results for EU15+4 countries to accession countries, because of the differences in estimating the initial capital stock. For EU15+4 countries as well as for Turkey, Malta and Cyprus data on gross fixed capital formation (GFCF) are taken from OECD, while for CEE countries we use an index on real GFCF provided by ECE combined with an initial value from IFS.

6.3. Other data

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>TYPE OF DATA PROVIDED</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFS</td>
<td>Population</td>
<td></td>
</tr>
<tr>
<td>Barro, Lee</td>
<td>Education attainment rates</td>
<td></td>
</tr>
<tr>
<td>OECD – LFS</td>
<td>Employment</td>
<td></td>
</tr>
<tr>
<td>OECD – MEI</td>
<td>Employment</td>
<td></td>
</tr>
<tr>
<td>ECE</td>
<td>Employment</td>
<td>Index on employment growth</td>
</tr>
<tr>
<td>IFS</td>
<td>Exchange rates</td>
<td>Year-end and average US$-national currency exchange rates</td>
</tr>
</tbody>
</table>

Population data are provided by IFS, work force statistics are both from IFS and OECD. Data on education are based on Barro, Lee (2000).\textsuperscript{23} Their data contain primary, secondary, and higher education attainment rates. Following Maddison (1996) we combined the data with weights of 1.0 for primary, 1.4 for secondary and 2.0 for post-secondary education which reflects the empirically observable earnings potential associated with each level of education.\textsuperscript{24}

\textsuperscript{22} When using a perpetual inventory method, we have to make assumptions on the constant rate of depreciation. Following Easterly, Levine (2001: 56) we use a constant depreciation rate of 7%. Other authors assume different rates, e.g. de la Fuente, Donenec (2000: 47) fix annual depreciation at 5%.

\textsuperscript{23} To download from \url{http://web.korea.ac.kr/~jwlee/}

\textsuperscript{24} For data availability reasons our weights refer to fractions of the population, whereas Maddison uses them for assigning weights to the time spent on each level of education.
Apart from creditor rights and shareholder rights, the origin of legal systems and indicators of law enforcement are of particular interest (Roe, 1994; Carlin, Mayer, 1998; Buch, Heinrich, 2002). The major sources are the works of La Porta, Lopez-de-Silanes, Shleifer, Vishny (1998) for EU15+4 and Pistor, Raiser, Gelfer (2000) for accession countries. Several institutions (EBRD, McKinsey, Standard & Poors) provide international comparisons of the legal environment for financial markets and governance, albeit with quite different indicators (EBRD 2000:114ff; Newell, Wilson, 2002; Westlake, 2002). Providing fairly consistent data for the whole range of countries in our sample over an extended period is beyond the core focus of this research project. We will therefore concentrate on selected countries over defined periods of time in the analysis. A major problem is that changes in creditor and shareholder rights are not documented over longer time periods. It is transition countries for which such changes tend to be covered at least to some extent (e.g. Pistor, Raiser, Gelfer, 2000).

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