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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

*David Blum, Klaus Federmair, Gerhard Fink, Peter Haiss<sup>1</sup>*

### 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.<sup>2</sup> 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.

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<sup>2</sup> 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<sup>3</sup> 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<sup>4</sup> 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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<sup>3</sup> See Modigliani, Miller (1958).

<sup>4</sup> See Coase (1960).

economy. Graff (2001) distinguishes between actively causing and permissive supply-leading finance.<sup>5</sup>

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),<sup>6</sup> 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 lot 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“

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<sup>5</sup> He adds the hypothesis of finance negatively affecting real output as a third category of “supply-leading finance“. We prefer to distinguish a negative causal link from finance to growth from the concept of supply-leading for semantic reasons.

<sup>6</sup> 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).<sup>7</sup> 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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<sup>7</sup> 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,<sup>8</sup> 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<sup>9</sup> 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."<sup>10</sup> 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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<sup>8</sup> See. p. 18, *ibid.*

<sup>9</sup> See p. 44, *ibid.*

<sup>10</sup> 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<sup>11</sup> 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,

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<sup>11</sup> 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<sup>12</sup> 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

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<sup>12</sup> See, e. g., Barro, Sala-i-Martin (1995).

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 20<sup>th</sup> 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**

Authors	Year	Sample coverage: region	Sample coverage: time	Dependent variable	Explanatory financial variables I: banking intermediation	Control variables, other variables	Method	Investigated links	Major findings	Additional results
Wallich	1969	43 countries (no details available)	1956-1965	Real GDP growth	Claims of banks against private sector / total domestic bank claims; (M1+M2)/GDP	Investment rate; income per capita; inflation	Panel regression analysis	Links between banking intermediation and economic growth	Positive relationship between intermediation and growth, if investment rate does not enter regression	Investment rate is the key factor that links financial with real development
Bhattacharyay	1988	45 countries (no details available)	1985/86	Real GDP per capita	Cash / M2		OLS regression analysis	Links between financial deepening and income	Negative relationship between cash/M2 and output	
Gelb	1989	34 countries (no details available)	1965-1985	Growth of real GDP per capita; coefficient of marginal capital; investment rate	Credit interest rate	Convergence; population growth; inflation; etc.	OLS regression analysis	Links between credit interest rate (liberalisation) and economic development	Liberalisation inducing higher credit interest rates is positively related to real economic development	High credit interest rates do not harm investment
Ghani	1992	52 developing countries	1965-1989	Real growth per capita	M3/GDP	Various variables; on political, social and economic circumstances	Growth regression analysis	Links between financial depth and economic growth	Positive relationship between initial financial depth and real growth	
King, Levine	1992	85 countries (up to 19 EU+; up to 3 ACC)	1960-1989	Growth of real GDP per capita	(M2-M1) / GDP	Convergence; population growth; school enrolment; investment rate; government spending / GDP; regional dummies	Cross-country regressions and panel regression analysis (5-year steps)	Links between banking intermediation and economic growth	Positive relationship between financial and real sector with cross-country-analysis, but weak negative relationship with panel approach	
King, Levine	1993a	Up to 80 countries (up to 19 EU+; up to 3 ACC)	1960-1989	Growth of GDP; capital stock; and productivity	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	Initial GDP; school enrolment; trade exposure; government spending / GDP; inflation	Panel analysis (5-year periods)	Links between financial intermediation and economic growth	Positive relationship between financial intermediation and economic growth	
King, Levine	1993b	Up to 80 countries (up to 19 EU+; up to 3 ACC)	1960-1989	Output growth; capital stock growth; productivity growth	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	Initial income; school enrolment; trade exposure; government spending / GDP; inflation	Panel analysis (5-year periods)	Links between banking intermediation and economic growth	Positive relationships between financial intermediation and economic growth	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

## Overview 1 (continued): Cross-country studies: banking intermediation covered only

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

**Overview 1 (continued): Cross-country studies: banking intermediation covered only**

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

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**

Authors	Year	Sample coverage: region	Sample coverage: time	Dependent variable	Explanatory financial variables I: banking intermediation	Explanatory financial variables II: securities	Explanatory variables III: others	Control variables, other variables	Method	Investigated links	Major findings	Additional results
<b>Hodgson</b>	1989	16 OECD countries (no details available)	1960-1984	Growth of real GDP per capita	Proxy variable for institutional flexibility of financial system	Proxy variable for institutional flexibility of financial system		Investment rate; convergence; growth of industry production; political stability	OLS regression analysis	Links between flexibility of financial institutions and economic growth	Positive relationship between financial institutions flexibility and real growth	
<b>Atje, Jovanovic</b>	1993	94 countries in 2 groups (15 EU+; 0 ACC)	1970-1988 and 1980-1988	Growth of real income per capita	Private credit / GDP	Stock market turnover times investment ratio		Lagged investment rate; population growth	OLS regression analysis	Links between financial sectors and economic growth	Positive relationship between capital markets and growth, no effect of intermediation	
<b>Artus</b>	1995	20 OECD countries (no details available)	1965-1989	Average growth rate 1965-1989			Shares / credit ratio	Average investment rate; population growth; growth of real interest rate	OLS regression analysis	Links between financial system structure and economic growth	No significant relationship between financial structure and growth	
<b>Harris</b>	1997	49 countries (appr. 19 EU+; appr. 2 ACC)	1980-1991	Growth of real GDP per capita		Investment ratio * stock market turnover / GDP		Investment rate; population growth	2SLS regression analysis	Links between financial sectors and economic growth	Very limited positive relationship between capital markets and growth only for high-income countries, contrasting to Atje, Jovanovic (1993)	
<b>Demirgüç-Kunt, Maksimovic</b>	1998	30 countries (14 EU+; 1 ACC)	1980-1985	Additional firm growth due to external and long-term finance	Bank deposits / GDP	Stock market Capitalisation	and stock market turnover	Inflation; various GDP variables; legal indicators; government subsidies	Panel regression analysis (industry level)	Links between financial sectors and firm growth	Positive relationships between availability of external finance and firm growth	
<b>Levine, Zervos</b>	1998	47 countries (17 EU+; 1 ACC)	1976-1993	Growth of real GDP; capital stock and productivity; savings	Bank credit / GDP (bank credit = loans by commercial banks and other deposit-taking banks)	Capitalisation of Domestic listed Companies / GDP; value traded / GDP;		Initial output; enrolment; number of revolutions and other social and political variables	Cross-country regression analysis	Links between financial sectors and economic growth	Strong positive relationship between both financial segments and economic growth; no negative effects caused by share volatility or international capital market integration	

**Overview 2 (continued) : Cross-country studies: financial intermediation and securities covered**

Authors	Year	Sample coverage: region	Sample coverage: time	Dependent variable	Explanatory financial  Variables I: banking intermediation	Explanatory financial variables II: securities	Explanatory variables III: others	Control variables, other variables	Method	Investigated links	Major findings	Additional results
<b>Rajan, Zingales</b>	1998	41 countries (15 EU+; 1 ACC)	1980-1990	Growth of real value added			Total capitalisation (domestic credit + stock market capitalisation / GDP); accounting standards	Variables reflecting country-specific and industry-specific characteristics	Panel regression analysis (industry level)	Links between financial development and growth of companies dependent on external finance	Companies depending on external finance grow faster in economies with developed financial systems	
<b>Andrés, J., Hernando, I., Lopez-Salido</b>	1999	21 OECD countries (19 EU+)	1960-1990	Real output growth per capita	Liquid liabilities and credit to non-financial sector / GDP	Stock market Capitalisation /	GDP	Investment rate; export growth; inflation; variables for education and convergence	Growth regression analysis + VAR	Links between financial sectors and economic growth	Positive relationship only for stock market	
<b>Carlin, Mayer</b>	1999	27 industries in 14 OECD countries (no details available)	1970-1995	Industry growth rate; investment ratio; R&D ratio			interaction variables linking financial variables with industry-specific characteristics	De-meaning for country- and industry-specific characteristics	Panel regression analysis (industry level)	Links between the interaction of industry-specific characteristics and industry growth	Industries with heavy dependence on R&D are very positively affected by financial development	Investment in R&D is more important for growth than capital accumulation
<b>Demirgüç-Kunt, Levine</b>	1999	150 countries (no details available)	1990-1998	Real GDP per capita	Various variables covering the financial structure, size and efficiency of intermediaries	Various variables covering financial structure, size and efficiency of stock markets			Correlation analysis	Links between financial sectors, financial structure and economic growth	Positive relationship between legal environment, financial market development and growth	Relatively stronger development of capital markets in developed countries and of intermediaries in developing countries
<b>Fink, Haiss</b>	1999	27 countries (17 EU+; 10 ACC)	1996	GDP	Bank assets	Stock market capitalisation	Bonds	Population	OLS regression analysis	Links between financial sectors and real sector	Positive relationship between banking and real growth	Bonds are substitutes for bank credit; stock markets have a weak or even negative impact on real growth, particularly in some EU accession countries

**Overview 2 (continued) : Cross-country studies: financial intermediation and securities covered**

Authors	Year	Sample coverage: region	Sample coverage: time	Dependent variable	Explanatory financial variables I: banking intermediation	Explanatory financial variables II: securities	Explanatory variables III: others	Control variables, other variables	Method	Investigated links	Major findings	Additional results
<b>Beck, Demirgüç-Kunt, Levine, Maksimovic</b>	2000	48 countries (18 EU+; 0 ACC)	Various sub-periods of 1980-1995	Company; industry and national output growth			Combined indicators of intermediation and capital markets referring to financial structure, financial development market depth etc.	Legal indicators	Cross-country growth regressions, industry-level and company-level regressions	Link between financial structure, legal framework and economic growth	Link between legal factors and output, but no link between financial system structure and output	
<b>Demirgüç-Kunt, Maksimovic</b>	2000	40 countries (18 EU+; 0 ACC)	1989-1996	Additional firm growth due to external and long-term finance	Bank assets	Stock market turnover	Financial structure dummy	GDP variables; inflation; average company size; legal indicators	Panel regression analysis (industry level)	Links between financial system structure and firm growth	Finance-friendly legal rules positively influence positive relationship between financial sectors and growth of firms depending on external finance	Market structure only important for long-term finance
<b>Singh, Singh, Weisse</b>	2000	63 countries (no details available)	1990-1999	Technological development indicators		Stock market capitalisation and number of listed corporations		Technological development indicators	Cross-country regression analysis	Links between stock market development and technological development	No links between stock market development and technological development	
<b>Bassanini, Scarpetta, Hemmings</b>	2001	21 countries (18 EU+; 0 ACC)	1971-1998	Growth of real GDP per capita; growth of real private non-residential investment	Liquid liabilities / GDP; private credit from deposit banks / GDP	Stock market capitalisation / GDP		Investment; human capital; population growth; inflation; public sector size; trade exposure etc.	Panel regressions analysis	Links between financial depth and real variables	Positive relationship between financial (particularly stock market) and real sector	Relationship stronger for shares than for intermediation
<b>Cetorelli, Gambera</b>	2001	41 countries (16 EU+; 1 ACC)	1980-1990	Growth of real value added in manufacturing industries	Domestic credit; banking concentration			Industry size; legal indicators; Stock market capitalisation	Panel regression analysis	Links between financial sectors and growth at the industry level	Positive relationship between financial development and growth of value added in manufacturing industry	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

## Overview 2 (continued) : Cross-country studies: financial intermediation and securities covered

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

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

Authors	Year	Sample coverage: region	Sample coverage: time	Economic growth variable	Financial variables I: banking intermediation	Method	Investigated links	Major findings
<b>Fritz</b>	1984	Philippines	1969-1981	Variable composed from 7 output indicators	Composition from 10 monetary indicators	Granger causality tests	Links and causality between financial deepening and economic development	Supply-leading 1969-1975 and 1975-1981
<b>Gupta</b>	1984	14 developing countries	Various periods between 1959-1980	Index of industrial production	M1; M2; M3; private credit	Granger causality tests	Links and causality between banking intermediation and industrial production in developing countries	Supply-leading in 8 out of 14 developing countries, bi-directional causality in 6 countries
<b>Jung</b>	1986	56 countries (no details available)	Various periods between 1950 and 1992	Growth of real GDP per capita	Cash/M2; M2/GDP	Granger causality tests	Links and causality between financial deepening, financial structure and economic growth	No general causality pattern; supply-leading more likely to occur in developing countries, demand-following more likely in developed countries (for cash / M2)
<b>St. Hill</b>	1992	37 developing countries	Various periods between 1950-1990	Real GDP per capita	Cash/M2; M2/GDP	Granger causality tests	Links and causality between financial deepening, financial structure and income in developing countries at different financial development stages	Supply-leading more likely in developing countries with lower financial development
<b>Wood</b>	1993	Barbados	1946-1989	Growth of real GDP	M2/GDP	Granger causality tests	Links and causality between financial deepening and economic growth	Falsification of Patrick hypothesis: demand-following 1946-1986, supply-leading 1969-1990
<b>Thornton</b>	1994	9 Asian developing and transition countries	Various periods between 1951-1992	Real GDP per capita	M3/GDP; (M3-Cash)/GDP	Granger causality tests	Links and causality between financial deepening and growth	No general causality pattern
<b>Demetriades, Hussein</b>	1996	16 countries (3 EU+; 1 ACC)	1960-1995	Real GDP per capita	Bank deposit liabilities / GDP; bank claims on private sector /GDP	Granger causality tests	Causality between banking intermediation and economic growth	Little evidence for supply-leading, some for demand-following; bi-directional causality for most countries
<b>Hansson, Jonung</b>	1997	Sweden	1834-1991	Real GDP per capita	Bank credit to non-financial sector per capita	Cointegration analysis and Granger causality tests (investment per capita as conditioning variable)	Coevolution of banking intermediation and real income	Mostly unstable relationship between intermediation and output; supply-leading 1890-1934; positive influence of education on supply-leading pattern
<b>Rousseau, Wachtel</b>	1998	USA; Canada; UK; Sweden; Norway	1870-1929	Growth of real GDP per capita	Money base; various proxies for intermediation based on bank deposit and credit	Granger causality tests (VAR framework)	Links and causality between banking intermediation and economic growth	Supply-leading in early phase of economic development
<b>Al-Yousif</b>	2002	30 developing countries	1970-1999	Growth of real GDP per capita	M1, M2 / GDP	Granger causality tests in error correction model (for panel data analysis see overview 1)	Links and causality between banking intermediation and economic growth	Strong evidence for bi-directional causality; limited evidence for other patterns; for further additional results see overview 1

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.

Neusser, Kugler (1998) use financial sector GDP of 13 OECD countries from 1960 to 1997 as an explanatory variable and find the whole range of possible causality patterns, varying across countries and time. Shan, Morris, Sun (2001) find demand-following, supply-leading, and mostly bi-directional evidence.

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

Authors	Year	Sample coverage: region	Sample coverage: time	Economic growth variable	Financial variables I: banking intermediation	Financial variables II: securities	Method	Investigated links	Major findings
Arestides, Demetriades	1997	USA; Germany	1979-1991 (quarterly data)	Real GDP per capita	M2/GDP (Germany); domestic bank credit / GDP (USA)	Stock market capitalisation / GDP; Stock market volatility (16-month standard deviation of share prices)	Granger causality tests and system exogeneity analysis	Links and causality between financial sectors and economic growth	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
Neusser, Kugler	1998	13 countries (13 EU+)	1960-1997	GDP of manufacturing industry (MGDP) ; total factor productivity of manufacturing industry (MTFP)	Financial sector GDP (FGDP)	Financial sector GDP (FGDP)	Granger causality tests	Causality between financial sector and growth	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
Shan, Morris, Sun	2001	10 countries (6 EU+; 0 ACC; China)	1960-1998 (maximum time span); 1982-1998 (minimum time span)	Growth of real GDP per capita	Bank credit / GDP (bank credit = loans by commercial banks and other deposit-taking banks)		Granger causality tests (VAR framework) with conditioning set	Links and causality between banking intermediation and economic growth	5 countries show bi-causality, 3 demand-following, 2 no causality

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<sup>13</sup>. 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<sup>th</sup> 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.<sup>14</sup>

<sup>13</sup> Schmidt, Hackethal, Tyrell (2001) question the possibility of a smooth convergence of financial systems in general.

<sup>14</sup> 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 1: Comparison of financial markets in 1999

	Total Financial Assets I in mn €	Domestic Credit in mn €	Bonds in mn €	Shares in mn €	GDP in mn €	Population in mn. pers.
USA	46,893,054.5	14,954,807.9	15,371,988.9	16,566,257.8	8,716,747.0	273.1
JPN	26,920,865.3	15,945,703.0	6,540,215.0	4,434,947.3	4,075,076.5	126.5
SUI	1,322,816.4	448,007.5	184,849.7	689,959.2	243,051.4	7.1
NOR	243,094.0	85,623.1	94,067.3	63,403.6	143,432.1	4.4
GER	6,493,316.4	2,917,100.0	2,150,607.2	1,425,609.2	1,982,329.8	82.1
UK	6,160,787.4	1,820,501.5	1,498,009.2	2,842,276.7	1,351,525.1	58.7
FRA	4,234,908.0	1,363,863.0	1,374,975.1	1,496,069.9	1,349,800.4	59.1
ITA	3,228,950.4	1,059,390.0	1,444,654.6	724,905.8	1,107,769.1	57.3
NL	1,891,725.1	526,310.0	673,402.3	692,012.7	373,912.2	15.8
SPA	1,469,930.4	648,460.0	391,797.7	429,672.7	559,349.9	39.4
SWE	966,788.3	263,545.5	331,674.3	371,568.5	223,769.2	8.9
BEL	876,633.5	326,628.0	366,713.1	183,292.4	233,590.1	10.2
FIN	535,802.0	70,449.0	117,559.2	347,793.7	121,430.0	5.2
AUT	506,297.8	246,470.0	226,956.0	32,871.8	197,090.9	8.2
DNK	486,535.8	93,849.4	287,875.8	104,810.6	163,576.5	5.3
GRE	418,635.9	108,913.8	113,776.6	195,945.6	116,928.2	10.6
POR	276,339.1	131,060.0	77,443.8	67,835.4	106,993.1	10.0
IRL	256,512.8	93,589.0	94,465.5	68,458.3	87,678.0	3.8
LUX	110,356.6	16,649.0	57,934.0	35,774.1	14,831.1	0.4
TUR	238,258.8	68,543.7	57,515.4	112,199.7	194,328.7	64.4
POL	115,965.4	58,055.0	28,469.0	29,441.4	145,749.0	38.7
HUN	68,542.9	23,645.1	28,767.7	16,130.1	45,106.4	10.1
CZ	67,226.3	31,825.9	24,885.5	10,514.9	51,258.5	10.3
CYP	35,987.3	15,979.3	-	20,008.0	8,658.1	0.8
SLK	14,579.5	11,560.3	2,560.7	458.5	18,229.1	5.4
SLO	14,455.6	7,992.4	3,622.3	2,840.9	18,861.0	2.0
MLT	10,637.9	4,872.4	1,921.6	3,843.9	3,414.9	0.4
ROM	9,012.9	5,334.7	3,364.7	313.4	33,570.1	22.5
BUL	8,658.6	2,166.5	6,390.2	101.9	11,641.0	8.2
LIT	4,059.9	1,677.7	1,248.7	1,133.5	9,995.7	3.7
EST	3,568.8	1,697.7	84.6	1,786.5	4,779.6	1.4
LAT	1,894.9	1,251.8	251.8	391.3	6,243.7	2.4
EU15	27,969,363	9,686,778	9,263,687	9,018,897	7,990,574	375
Euro-12	20,355,251	7,508,882	7,146,128	5,700,242	6,251,703	302
Euro-outs	7,614,111	2,177,896	2,117,559	3,318,656	1,738,871	73
EU15+4	103,349,193	41,120,920	31,454,808	30,773,465	21,168,880	786
accession countries	592,849	234,603	159,082	199,164	551,836	170
CEEC	307,965	145,207	99,645	63,112	345,434	105
Baltic countries	9,524	4,627	1,585	3,311	21,019	8

\* 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**

	<b>Total financial assets I in mn €</b>	<b>Domestic credit in mn €</b>	<b>Total Financial assets II in mn €</b>	<b>Bank assets in mn €</b>
USA	46,893,055	14,954,808	39,846,767	7,908,521
JPN	26,920,865	15,945,703	25,873,718	14,898,556
SUI	1,322,816	448,007	2,092,458	1,217,649
NOR	243,094	85,623	337,218	179,747
GER	6,493,316	2,917,100	7,463,916	3,887,700
UK	6,160,787	1,820,501	7,961,062	3,620,776
FRA	4,234,908	1,363,863	4,991,004	2,119,959
ITA	3,228,950	1,059,390	3,393,250	1,223,690
NL	1,891,725	526,310	2,161,585	796,170
SPA	1,469,930	648,460	1,629,110	807,640
SWE	966,788	263,546	1,134,702	431,459
BEL	876,633	326,628	1,158,277	608,272
FIN	535,802	70,449	565,826	100,473
AUT	506,298	246,470	618,388	358,560
DNK	486,536	93,849	564,903	172,216
GRE	418,636	108,914	439,621	129,898
POR	276,339	131,060	340,169	194,890
IRL	256,513	93,589	417,561	254,637
LUX	110,357	16,649	640,238	546,531
TUR	238,259	68,544	272,215	102,500
POL	115,965	58,055	133,807	75,896
HUN	68,543	23,645	71,480	26,582
CZ	67,226	31,826	90,525	55,124
CYP	35,987	15,979	48,572	28,564
SLK	14,580	11,560	18,584	15,565
SLO	14,456	7,992	19,325	12,862
MLT	10,638	4,872	18,079	12,314
ROM	9,013	5,335	11,646	7,968
BUL	8,659	2,167	11,203	4,710
LIT	4,060	1,678	5,076	2,694
EST	3,569	1,698	4,584	2,713
LAT	1,895	1,252	3,839	3,196
<b>EU15</b>	<b>27,969,363</b>	<b>9,686,778</b>	<b>32,262,343</b>	<b>15,252,872</b>
<b>Euro-12</b>	<b>20,355,251</b>	<b>7,508,882</b>	<b>22,980,365</b>	<b>11,028,420</b>
<b>Euro-outs</b>	<b>7,614,111</b>	<b>2,177,896</b>	<b>9,281,978</b>	<b>4,224,451</b>
<b>EU15+4</b>	<b>103,349,193</b>	<b>41,120,920</b>	<b>91,399,690</b>	<b>39,457,345</b>
<b>Accession countries</b>	<b>592,849</b>	<b>234,603</b>	<b>1,101,688</b>	<b>350,688</b>
<b>CEEC</b>	<b>307,965</b>	<b>145,207</b>	<b>615,856</b>	<b>207,310</b>
<b>Baltic countries</b>	<b>9,524</b>	<b>4,627</b>	<b>32,932</b>	<b>8,602</b>

\* *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

in 1000 € per pers.	Total financial assets I*	Domestic Credit	Bonds	Shares	GDP	Population
JPN	212.8	126.0	51.7	35.1	32.2	126.5
SUI	185.5	62.8	25.9	96.8	34.1	7.1
USA	171.7	54.8	56.3	60.7	31.9	273.1
NOR	54.9	19.3	21.2	14.3	32.4	4.4
LUX	256.6	38.7	134.7	83.2	34.5	0.4
NL	119.7	33.3	42.6	43.8	23.7	15.8
SWE	109.1	29.7	37.4	41.9	25.3	8.9
UK	104.9	31.0	25.5	48.4	23.0	58.7
FIN	103.6	13.6	22.7	67.3	23.5	5.2
DNK	91.5	17.6	54.1	19.7	30.7	5.3
BEL	86.4	32.2	36.1	18.1	23.0	10.2
GER	79.1	35.5	26.2	17.4	24.1	82.1
FRA	71.7	23.1	23.3	25.3	22.8	59.1
IRL	68.4	25.0	25.2	18.3	23.4	3.8
AUT	61.9	30.1	27.7	4.0	24.1	8.2
ITA	56.3	18.5	25.2	12.6	19.3	57.3
GRE	39.4	10.2	10.7	18.4	11.0	10.6
SPA	37.3	16.5	9.9	10.9	14.2	39.4
POR	27.7	13.2	7.8	6.8	10.7	10.0
CYP	46.1	20.5	-	25.7	11.1	0.8
MLT	27.3	12.5	4.9	9.9	8.8	0.4
SLO	7.3	4.0	1.8	1.4	9.5	2.0
HUN	6.8	2.3	2.9	1.6	4.5	10.1
CZ	6.5	3.1	2.4	1.0	5.0	10.3
TUR	3.7	1.1	0.9	1.7	3.0	64.4
POL	3.0	1.5	0.7	0.8	3.8	38.7
SLK	2.7	2.1	0.5	0.1	3.4	5.4
EST	2.5	1.2	0.1	1.3	3.4	1.4
BUL	1.1	0.3	0.8	0.0	1.4	8.2
LIT	1.1	0.5	0.3	0.3	2.7	3.7
LAT	0.8	0.5	0.1	0.2	2.6	2.4
ROM	0.4	0.2	0.1	0.0	1.5	22.5
EU15	74.59	25.83	24.71	24.05	21.31	
Euro-12	67.39	24.86	23.66	18.87	20.70	
Euro-outs	104.42	29.87	29.04	45.51	23.85	
EU15+4	131.46	52.31	40.01	39.14	26.93	
Accession countries	3.48	1.38	0.94	1.17	3.24	
CEEC	2.95	1.39	0.95	0.60	3.30	
Baltic countries	1.27	0.62	0.21	0.44	2.80	

\* 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**

<b>in % of GDP</b>	<b>Total financial assets I *</b>	<b>Domestic credit</b>	<b>Bonds</b>	<b>Shares</b>
JPN	558%	331%	136%	92%
SUI	546%	185%	76%	285%
USA	507%	162%	166%	179%
NOR	165%	58%	64%	43%
LUX	744%	92%	391%	197%
NL	506%	141%	180%	185%
FIN	441%	58%	97%	286%
UK	430%	127%	104%	198%
SWE	420%	114%	144%	161%
BEL	375%	140%	157%	78%
GRE	363%	94%	99%	170%
GER	328%	147%	108%	72%
FRA	314%	101%	102%	111%
DNK	297%	57%	176%	64%
IRL	293%	107%	108%	78%
ITA	291%	96%	130%	65%
SPA	263%	116%	70%	77%
POR	258%	122%	72%	63%
AUT	257%	125%	115%	17%
CYP	415%	184%	-	231%
MLT	303%	139%	55%	109%
TUR	160%	46%	39%	76%
HUN	153%	53%	64%	36%
CZ	129%	61%	48%	20%
POL	79%	39%	19%	20%
SLO	78%	43%	20%	15%
SLK	76%	60%	13%	2%
EST	75%	36%	2%	37%
BUL	74%	19%	55%	1%
LIT	38%	16%	12%	11%
ROM	31%	18%	11%	1%
LAT	28%	19%	4%	6%
EU15	350%	121%	116%	113%
Euro-12	326%	120%	114%	91%
Euro-outs	438%	125%	122%	191%
EU15+4	488%	194%	149%	145%
Accession countries	107%	43%	29%	36%
CEEC	89%	42%	29%	18%
Baltic countries	45%	22%	8%	16%

\* *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**

Year	BUL	CYP	CZ	EST	HUN	LAT	LIT	MLT	POL	ROM	SLK	SLO	TUR
1998	12%		20%	1%	6%	5%	13%	9%	11%	72%	44%	5%	7%
1999	18%	8%	22%	2%	3%	6%	13%	14%	14%	53%	41%	5%	10%
2000	11%	8%	25%	1%	2%	5%	11%	14%	15%	5%	15%	5%	9%

Source: European Commission (2002)

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 crunched 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:

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<sup>15</sup> 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.

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<sup>15</sup> 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**

in % of total financial assets I *	Domestic credit	Bonds	Shares
JPN	59.2%	24.3%	16.5%
NOR	35.2%	38.7%	26.1%
SUI	33.9%	14.0%	52.2%
USA	31.9%	32.8%	35.3%
AUT	48.7%	44.8%	6.5%
POR	47.4%	28.0%	24.5%
GER	44.9%	33.1%	22.0%
SPA	44.1%	26.7%	29.2%
BEL	37.3%	41.8%	20.9%
IRL	36.5%	36.8%	26.7%
ITA	32.8%	44.7%	22.5%
FRA	32.2%	32.5%	35.3%
UK	29.5%	24.3%	46.1%
NL	27.8%	35.6%	36.6%
SWE	27.3%	34.3%	38.4%
GRE	26.0%	27.2%	46.8%
DNK	19.3%	59.2%	21.5%
LUX	15.1%	52.5%	32.4%
FIN	13.1%	21.9%	64.9%
SLK	79.3%	17.6%	3.1%
LAT	66.1%	13.3%	20.6%
ROM	59.2%	37.3%	3.5%
SLO	55.3%	25.1%	19.7%
POL	50.1%	24.5%	25.4%
EST	47.6%	2.4%	50.1%
CZ	47.3%	37.0%	15.6%
MLT	45.8%	18.1%	36.1%
CYP	44.4%	-	55.6%
LIT	41.3%	30.8%	27.9%
HUN	34.5%	42.0%	23.5%
TUR	28.8%	24.1%	47.1%
BUL	25.0%	73.8%	1.2%
EU15	34.6%	33.1%	32.2%
Euro-12	36.9%	35.1%	28.0%
Euro-outs	28.6%	27.8%	43.6%
EU15+4	39.8%	30.4%	29.8%
accession countries	39.6%	26.8%	33.6%
CEEC	47.2%	32.4%	20.5%
Baltic countries	48.6%	16.6%	34.8%

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

Source: IFS, BIS, FIBV, national sources

**Table 7: Bank- or securities-oriented financial systems**

	<b>B/S</b>	<b>Critical value 1 : 0.584</b>	<b>Critical value 2: 0.488</b>	<b>Critical value 3: 0.661</b>
JPN	1.453	bank-oriented	bank-oriented	bank-oriented
NOR	0.544	securities-oriented	bank-oriented	securities-oriented
SUI	0.512	securities-oriented	bank-oriented	securities-oriented
USA	0.468	securities-oriented	securities-oriented	securities-oriented
AUT	0.949	bank-oriented	bank-oriented	bank-oriented
POR	0.902	bank-oriented	bank-oriented	bank-oriented
GER	0.816	bank-oriented	bank-oriented	bank-oriented
SPA	0.789	bank-oriented	bank-oriented	bank-oriented
BEL	0.594	bank-oriented	bank-oriented	securities-oriented
IRL	0.574	securities-oriented	bank-oriented	securities-oriented
ITA	0.488	securities-oriented	securities-oriented	securities-oriented
FRA	0.475	securities-oriented	securities-oriented	securities-oriented
UK	0.419	securities-oriented	securities-oriented	securities-oriented
NL	0.385	securities-oriented	securities-oriented	securities-oriented
SWE	0.375	securities-oriented	securities-oriented	securities-oriented
GRE	0.352	securities-oriented	securities-oriented	securities-oriented
DNK	0.239	securities-oriented	securities-oriented	securities-oriented
FIN	0.151	securities-oriented	securities-oriented	securities-oriented
LUX	0.178	securities-oriented	securities-oriented	securities-oriented
SLK	3.829	bank-oriented	bank-oriented	bank-oriented
LAT	1.946	bank-oriented	bank-oriented	bank-oriented
ROM	1.450	bank-oriented	bank-oriented	bank-oriented
SLO	1.237	bank-oriented	bank-oriented	bank-oriented
POL	1.002	bank-oriented	bank-oriented	bank-oriented
EST	0.907	bank-oriented	bank-oriented	bank-oriented
CZ	0.899	bank-oriented	bank-oriented	bank-oriented
MLT	0.845	bank-oriented	bank-oriented	bank-oriented
CYP	0.799	bank-oriented	bank-oriented	bank-oriented
LIT	0.704	bank-oriented	bank-oriented	bank-oriented
HUN	0.527	securities-oriented	bank-oriented	securities-oriented
TUR	0.404	securities-oriented	securities-oriented	securities-oriented
BUL	0.334	securities-oriented	securities-oriented	securities-oriented

*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.<sup>16</sup> 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.

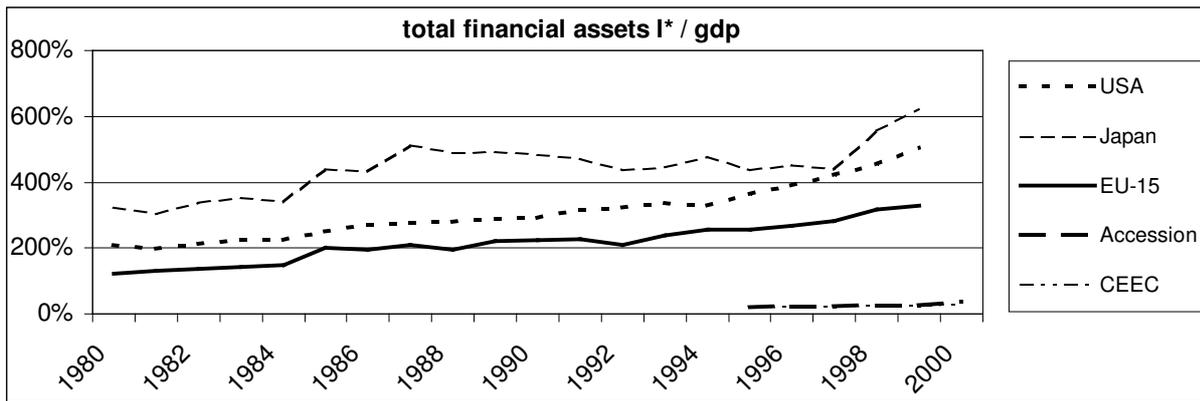
### **4.4. Dynamics of financial markets**

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.

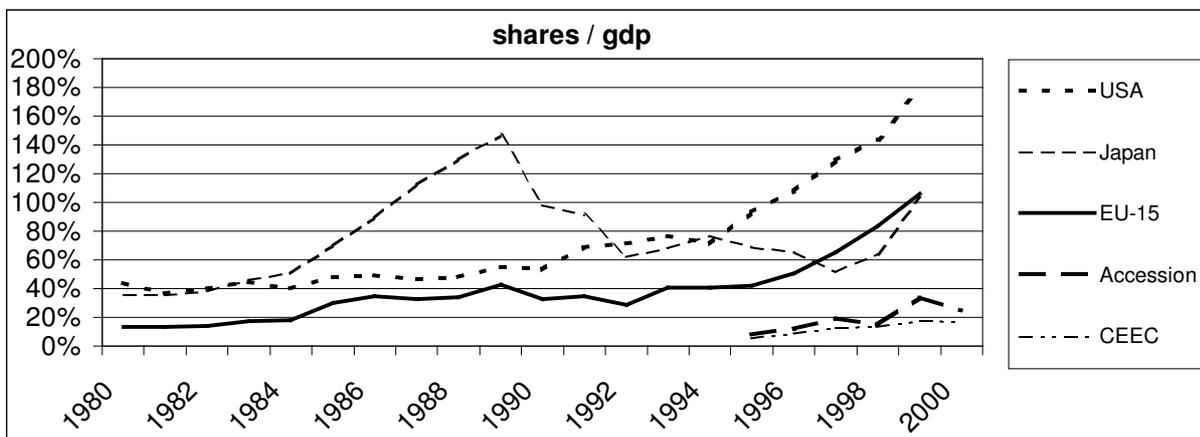
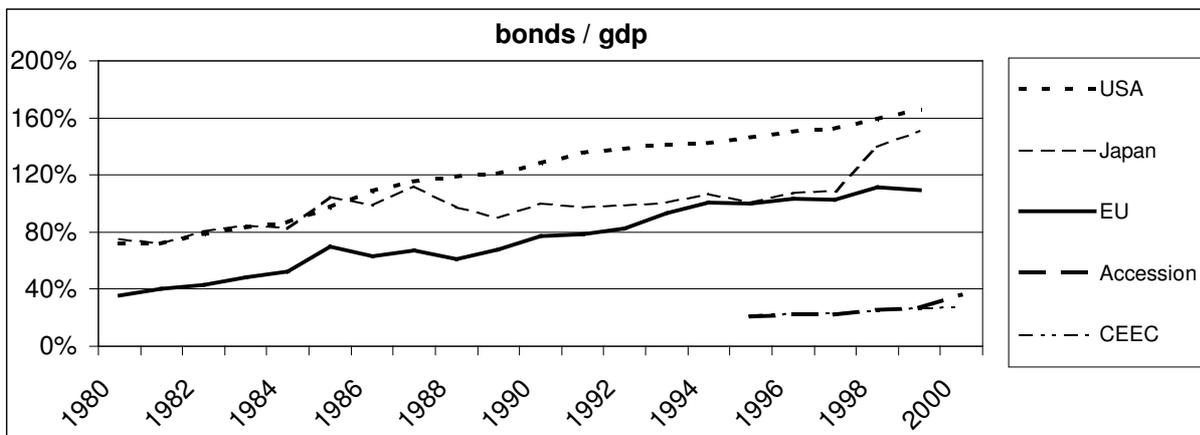
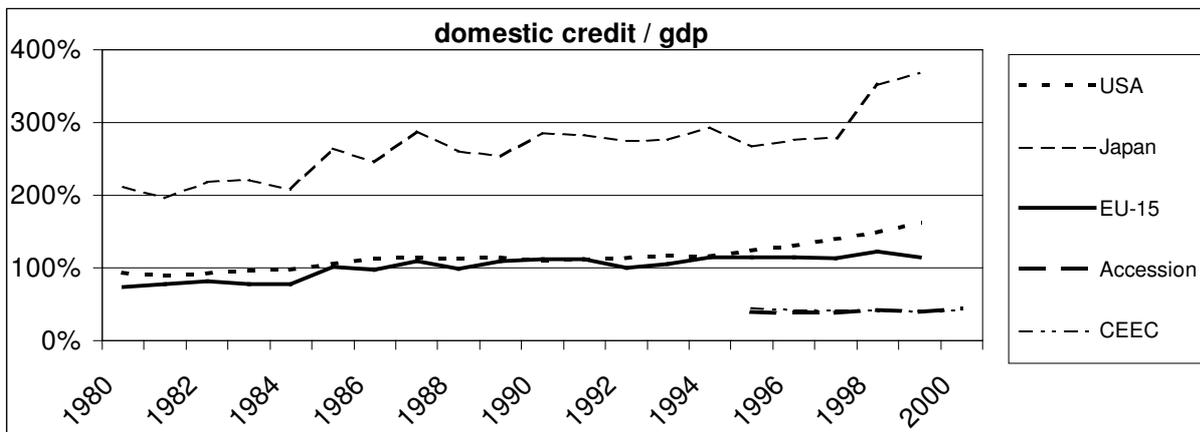
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<sup>16</sup> Source: Luxembourg Stock Exchange (2001): Fact Book II - 2000, [http://www.bourse.lu/english/marche/en\\_statistiques.html](http://www.bourse.lu/english/marche/en_statistiques.html) (downloaded: 4.4.2002)

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, Luxembourg<sup>17</sup>).

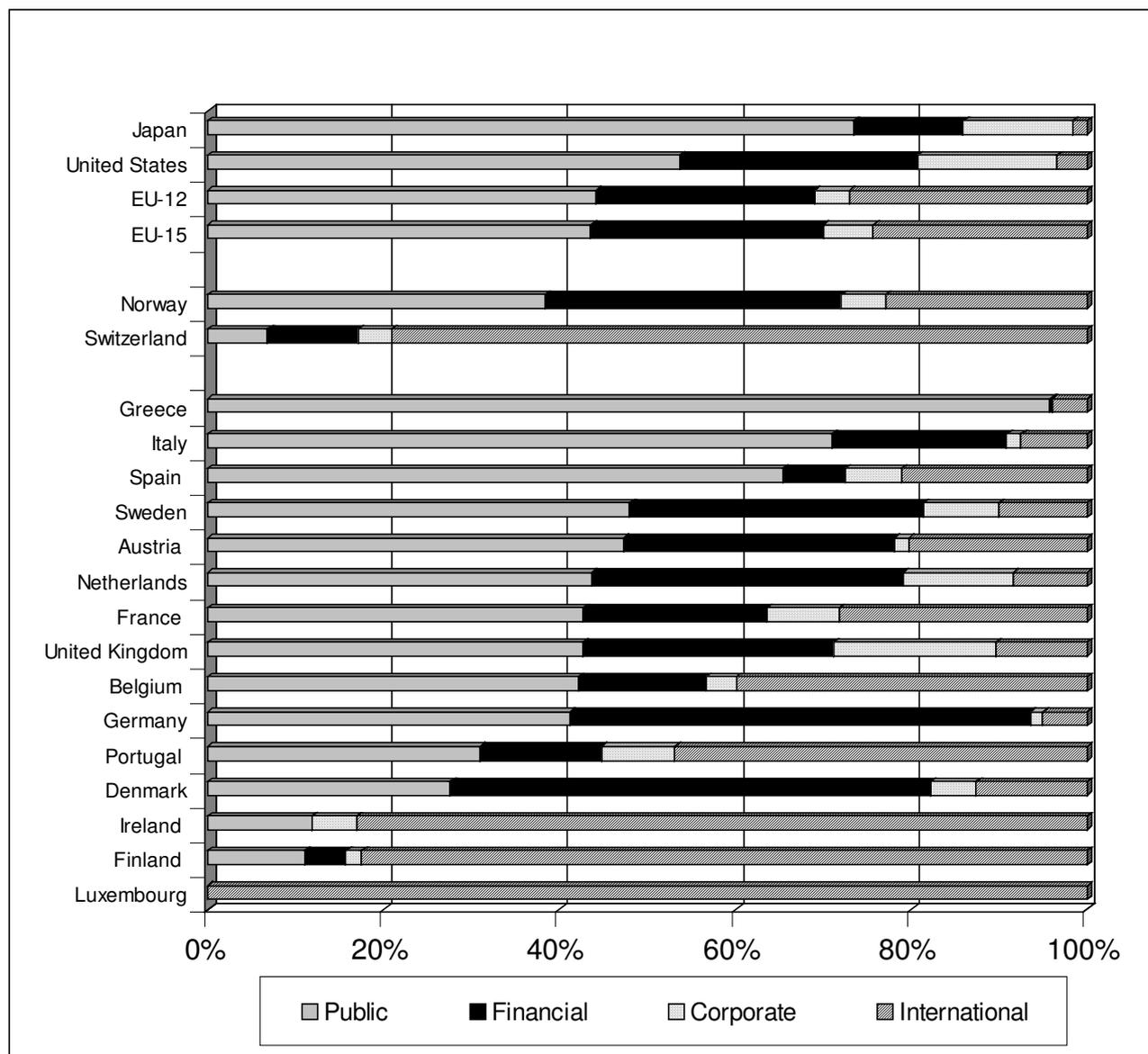
The dynamic analysis in Chart 4 shows the development of domestic bond markets in the EU, the USA and Japan between 1990 and 2000. It becomes apparent that in contrast to the EU in the USA corporate issuers have always been of some importance. While other financial institutions have traditionally played 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

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<sup>17</sup> 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.

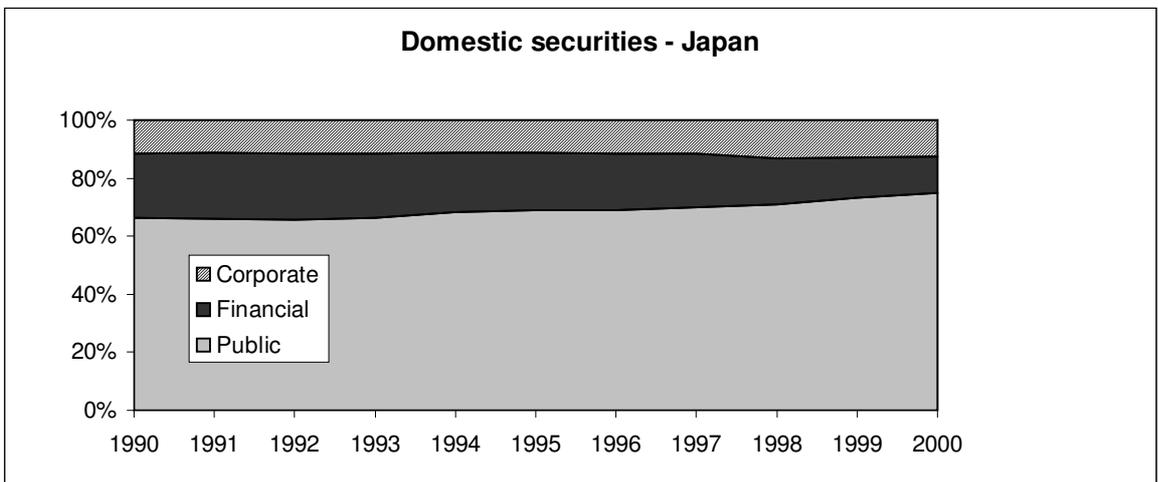
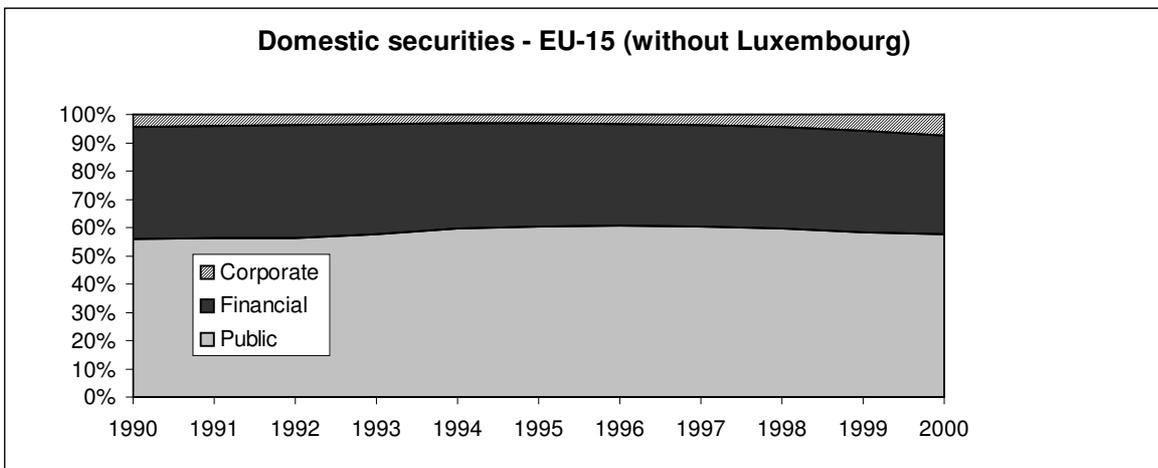
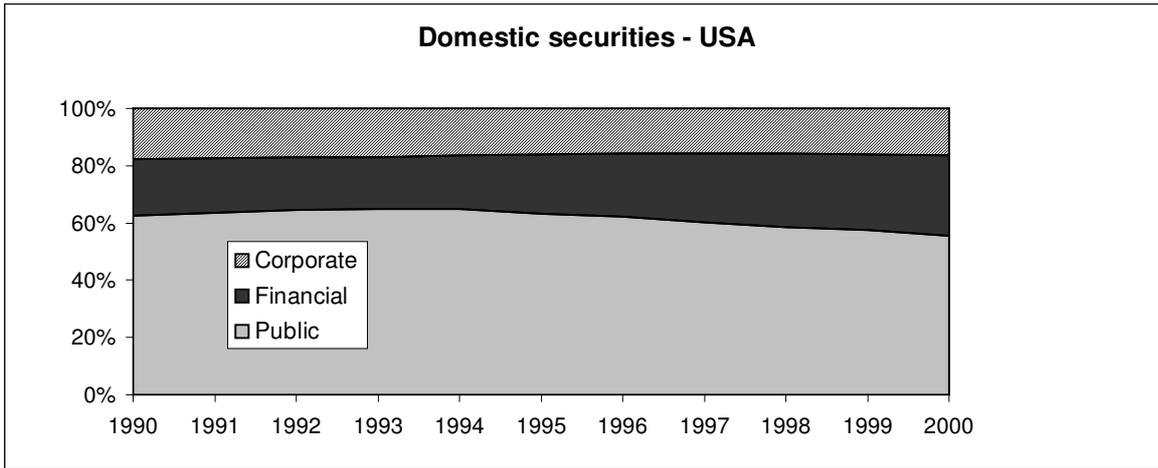
investors operating in the same currency (ECB, 1999: 12). To a considerable extent the corporate bond market served to finance mergers and acquisitions occurring due to restructuring of industries in an increasingly integrating market (ECB, 2002: 20ff). While there was a boost in European corporate bond 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



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 complementarity 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:

Total financial assets I = domestic credit + amount of bonds outstanding +  
+ stock market capitalisation

Total financial assets II = bank assets + amount of bonds outstanding +  
+ 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**

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

*DBResearch ... Deutsche Bank Research(2001b), The Banking Sector: Crucial for Convergence and Integration, in: EU Enlargement Monitor, no. 5, August 2001, [http:// www.dbresearch.com](http://www.dbresearch.com)*

*EBRD ... European Bank for Reconstruction and Development (2000), Transition Report 2000, London*

*IFS ... 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.<sup>18</sup> 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.

<sup>18</sup> 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)**

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

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').<sup>19</sup> 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), Demirgüç-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 Demirgüç-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

<sup>19</sup> In electronic versions almost all banking institutions are now incorporated into section 20. Therefore we have to include section 40 only in few cases.

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 10: Sources of data on stock markets**

SOURCE	TYPE OF DATA PROVIDED	REMARKS
FIBV	Stock market capitalisation	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.
WB - Financial Structure Database	Stock market capitalisation	
National stock exchanges	Stock market capitalisation	Additional data of national stock exchanges are used for Luxembourg, Germany, Great Britain, Slovakia, Estonia, Hungary, Romania, Cyprus, Turkey
IFS	Stock market indices	Line 62
National stock exchanges	Stock market indices	Additional data used for Germany

*FIBV ... Federation of International Stock Exchanges - Market Capitalisation  
(online: <http://www.world-exchanges.org>)*

*IFS ... International Financial Statistics (International Monetary Fund) –  
from WIFO database (<http://www.wifo.at/db/index.html>)*

*WB - Financial Structure Database ... Database of the Worldbank Research Group on Financial Structure:  
<http://www.worldbank.org/research/projects/fstructure/> (Download: 27.3.2002)*

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.<sup>20</sup> 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).

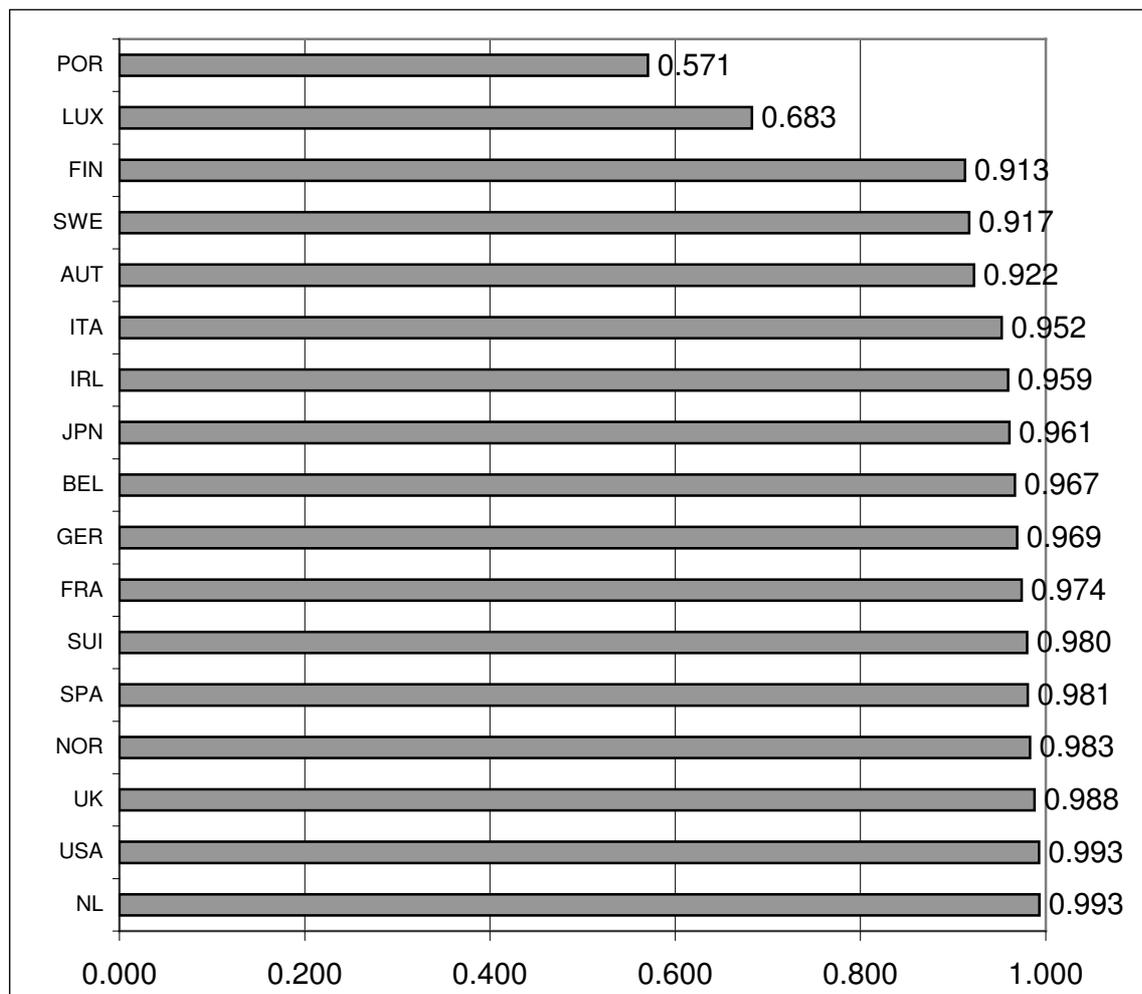
**Table 11: Stock exchanges in CEE**

STOCK EXCHANGE	ESTABLISHED IN	DATA STARTING IN
Bulgarian Stock Exchange	1990	1995
Prague Stock Exchange	1993	1995
Tallinn Stock Exchange	1996	1996
Budapest Stock Exchange	1990	1995
Riga Stock Exchange	1995	1995
National Stock Exchange – Lithuania	1992	1995
Warsaw Stock Exchange	1991	1991
Bucharest Stock Exchange	1995	1995
Bratislava Stock Exchange	1993	1995
Ljubljana Stock Exchange	1989	1994

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

<sup>20</sup> 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**



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**

SOURCE	TYPE OF DATA PROVIDED	REMARKS
BIS	Outstanding amounts of bonds	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.
IFS	Outstanding amount of bonds issued by deposit money banks (section 20)	
GFS	Public debt (by type of instrument)	For some countries public debt is classified by debt instruments
National sources	Public debt (by type of instrument)	Central banks and ministries of finance

*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, Orłowski, 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<sup>21</sup>. 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.

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<sup>21</sup> 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**

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

*ECE ... Economic Commission for Europe (2000) Economic Survey of Europe 2000 No.1, Geneva*

*IFS ... International Financial Statistics (International Monetary Fund)  
WIFO database (<http://www.wifo.at/db/index.html>)*

*OECD HS... OECD, 1998, Historical Statistics 1960-1997, Paris*

*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:

$$K_{(t+1)} = K_{(t)} * (1-d) + I_{(t+1)}$$

$K_{(t)}$  ... physical capital stock at the end of period t

d ... constant rate of depreciation

$I_{(t)}$  ... gross fixed capital formation (GFCF) in period t

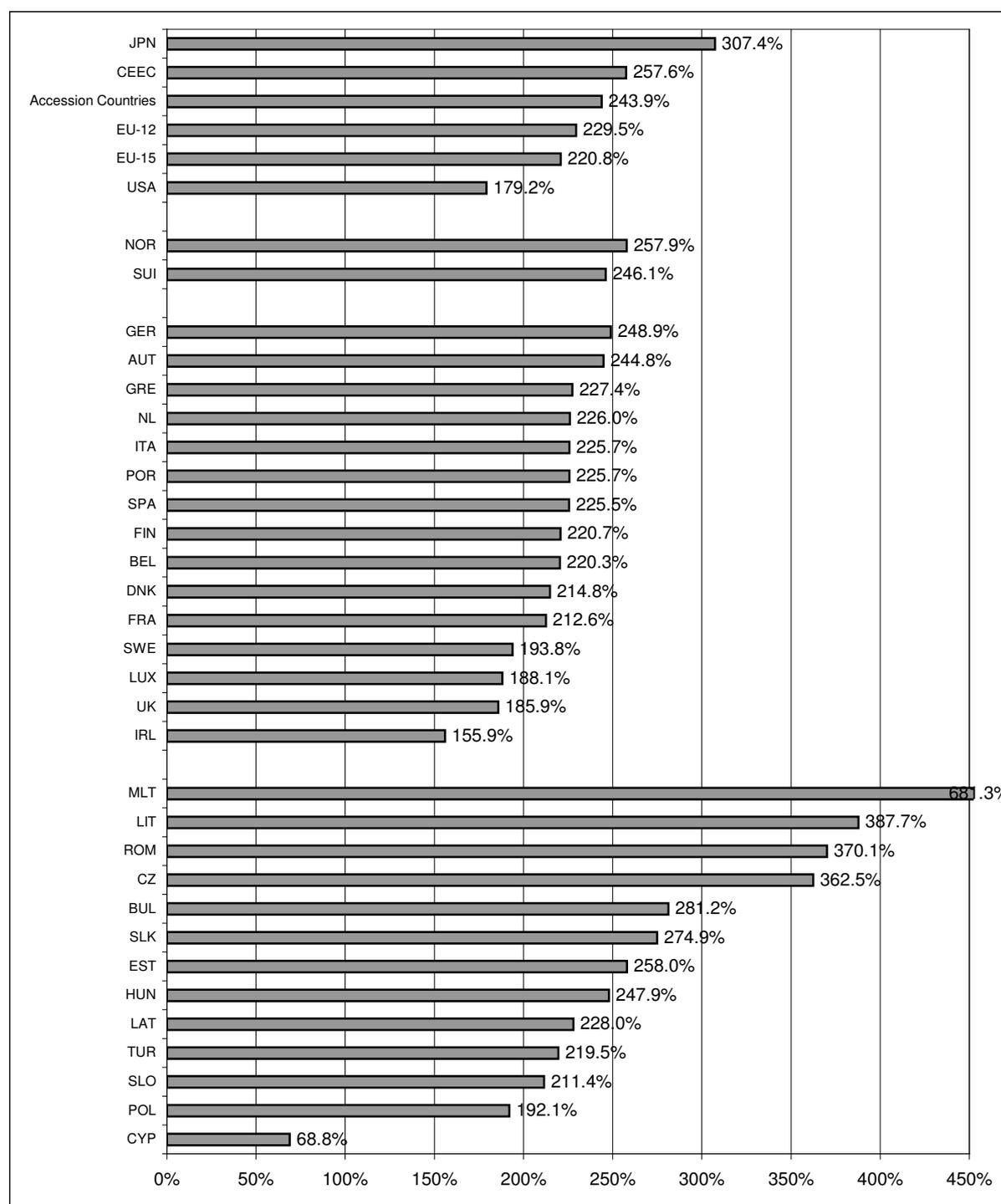
In order to estimate the initial capital stock we follow Easterly, Levine (2001). Assuming that a country is its steady state capital/output ratio physical capital stock (K) relative to GDP is:

$$K/Y = k = i/[g+d],$$

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%<sup>22</sup> 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 16: Sources of other data**

SOURCE	TYPE OF DATA PROVIDED	REMARKS
IFS	Population	
Barro, Lee	Education attainment rates	
OECD – LFS	Employment	
OECD – MEI	Employment	
ECE	Employment	Index on employment growth
IFS	Exchange rates	Year-end and average US\$-national currency exchange rates

*Barro/Lee ... Barro/Lee (2000) International Data on Educational Attainment: Updates and Implications (CID Working Paper no. 42); HUMAN CAPITAL UPDATED FILES (April 2000) – (<http://web.korea.ac.kr/~jwlee/>)*

*ECE ... Economic Commission for Europe (2000), Economic Survey of Europe 2000 No.1, Geneva*

*IFS ... International Financial Statistics (International Monetary Fund)*

*WIFO database (<http://www.wifo.at/db/index.html>)*

*OECD LFS... OECD, Quarterly Labour Force Statistics, Paris, diverse issues*

*OECD MEI... OECD, Main Economic Indicators, Paris, diverse issues*

Population data are provided by IFS, work force statistics are both from IFS and OECD. Data on education are based on Barro, Lee (2000).<sup>23</sup> 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.<sup>24</sup>

<sup>22</sup> 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, Donénech (2000: 47) fix annual depreciation at 5%.

<sup>23</sup> To download from <http://web.korea.ac.kr/~jwlee/>

<sup>24</sup> 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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