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Financial Development and Economic Growth: Evidence from Ten New EU Members

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Abstract

This paper reviews the main features of the banking and financial sector in ten new EU members, and then examines the relationship between financial development and economic growth in these countries by estimating a dynamic panel model over the period 1994-2007. The evidence suggests that the stock and credit markets are still underdeveloped in these economies, and that their contribution to economic growth is limited owing to a lack of financial depth. By contrast, a more efficient banking sector is found to have accelerated growth. Furthermore, Granger causality test indicate that causality runs from financial development to economic growth, but not in the opposite direction.

Keywords: Financial Development, Economic Growth, Causality Tests, Transition Economies

JEL classification codes: E44, E58, F36, P26

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1. Introduction

The relationship between financial development and economic growth has been extensively analysed in the literature. Most empirical studies conclude that the former, together with a more efficient banking system, accelerates the latter (Levine, 1997, 2005; Wachtel, 2001). Levine (2005) suggests that financial institutions and markets can foster economic growth through several channels, i.e. by (i) easing the exchange of goods and services through the provision of payment services, (ii) mobilising and pooling savings from a large number of investors, (iii) acquiring and processing information about enterprises and possible investment projects, thus allocating savings to their most productive use, (iv) monitoring investment and carrying out corporate governance, and (v) diversifying, increasing liquidity and reducing intertemporal risk. Each of these functions can influence saving and investment decisions and hence economic growth. Since many market frictions exist and laws, regulations, and policies differ markedly across economies and over time, improvements along any single dimension may have different implications for resource allocation and welfare depending on other frictions in the economy.

The reform of the financial sector in Central and Eastern Europe (CEE) started from the banking sector. Its transformation has been one of the most important aspects of the transition process from a centrally planned to a market economy. Initially a heavily regulated industry, the banking system has been rapidly turned into one of the most dynamic sectors of the economy. The process started in the early 1990s when foreign banks began investing in the region. From 2004, these have been holding majority shares in all CEE countries. Their entry into the market has resulted in considerable benefits for the sector and the economy in general, but they have had to face various challenges deriving mostly from the underdevelopment of key institutional support for banking growth.

Although accession to the European Union (EU) has helped the reform process in the CEE countries, real convergence in terms of real GDP per capita remains a challenge. The present study investigates whether financial development can be instrumental in reducing the gap vis-à-vis the other EU members. Specifically, after reviewing the main features of the banking and financial sectors in these countries, it examines the empirical linkages between financial development and economic growth by estimating a Barro–type growth regression augmented

with the inclusion of financial variables using panel data for ten transition countries over period 1994-2007. As financial development varies considerably across these countries, we split them into three more homogenous groups: Central and Eastern European countries (CEE-5), Baltic countries (B-3) and Southeastern European countries (SEE-2). We also consider the determinants of credit, given its importance for financing investment projects and its impact on economic growth. We analyse these issues by employing the system GMM method to control for endogeneity and measurement errors and obtain unbiased, consistent and efficient estimates. Finally, Granger causality tests are carried out.

The layout of the paper is the following. Section 2 provides a brief review of the literature on the relationship between finance and growth. Section 3 analyses the evolution of the financial and banking sector in ten transition economies. Section 4 discusses the data and the econometric approach, as well as the panel evidence on the nexus between financial development and economic growth. Section 5 carries out bi-directional causality tests between financial development/efficiency of the banking system and economic growth. Section 6 offers some concluding remarks.

2. Literature Review

The relationship between financial development and economic growth is a controversial issue. Some authors consider finance an important element of growth (Schumpeter, 1934; Goldsmith, 1969; McKinnon, 1973; Shaw, 1973; King and Levine (1993), whilst for others it is only a minor growth factor (Robinson, 1952; Lucas, 1988). Schumpeter (1934) sees the banking sector as an engine of economic growth through its funding of productive investment. On the contrary, Lucas (1988) argues that the role of finance has been overstressed.

Greenwood and Jovanovic (1990) model the dynamic interactions between finance and growth and emphasise the two-way causality between them. Financial intermediaries produce better information and improve resource allocation. An expanded system of financial intermediation is able to allocate more capital to efficient investments and thus to foster economic growth. Bencivenga and Smith (1991) highlight the fact that, by eliminating liquidity risk, banks can raise economic growth. Financial intermediaries boost productivity, capital accumulation and growth by improving corporate governance.

Existing studies typically focus on variables capturing the size, activity or efficiency of specific financial institutions or markets. Early contributions used aggregate data on banks for a large number of developed and developing countries including the ratio to GDP of monetary variables (M2 or M3), or financial depth indicators (credit to the private sector). Later studies on the link between financial development and economic growth have added indicators of the size and liquidity of stock markets, but these are available for fewer countries and shorter time periods. The same applies to indicators of the efficiency and competitiveness of financial institutions. Single-country studies allow researchers to use more extensive micro-based data and/or analyse specific policy measures or reforms.

Goldsmith's paper (1969) was the first to show empirically the existence of a positive relationship between financial development and GDP per capita. King and Levine (1993) used mostly monetary indicators and measures of the size and relative importance of banking institutions and also found a positive and significant relationship between several financial development indicators and GDP per capita growth. Levine and Zervos (1996) included measures of stock market development and found a positive partial correlation between both stock market and banking development and GDP per capita growth. More precisely, they reported a positive and significant link between liquidity of stock markets and economic growth, but no robust relationship between the size of stock markets and economic growth. Levine et al. (2000) found that the development of financial intermediation affects growth positively, and that cross-countries differences in legal and accounting system largely account for different degrees of financial development. More recently, some authors have suggested that there is a positive relationship between financial deepening and per capita income in the transition economies (Égert et al., 2007; Backé et al., 2007). A positive effect of financial development on economic growth through its sources (capital accumulation and productivity), and even on income inequality and poverty, has also been reported (de Haas, 2001; Levine, 2005).

Only a few studies have focused on the transition economies from Central and Eastern Europe (Bonin and Wachtel 2003, Bonin et al., 2005; Hermes and Lensink, 2000; Berglöf and Bolton, 2002; Haas, 2001; Fink et al., 2005, 2008; Kenourgios and Samitas (2007), mostly finding a positive relationship between several financial indicators and economic growth. Hermes and Lensink (2000) provide an overview of the main relevant issues, in

particular the role of stock markets in the process of financial intermediation (with an emphasis on the importance of regulation in these markets), and the role of deposit insurance to improve stability of the banking sector. Berglöf and Bolton (2002) find that the link between financial development and economic growth does not appear to be very strong during the first decade of transition, at least when one looks at the ratio of domestic credit to GDP. Kenourgios and Samitas (2007) examined the long-run relationship between finance and economic growth for Poland and concluded that credit to the private sector has been one of the main driving forces of long-run growth. Hagmayr et al. (2007) investigated the finance-growth nexus in four emerging economies of Southeastern Europe for the period 1995-2005 and found a positive and significant effect of bond markets and the capital stock on growth.

Fink et al. (2005), using a sample of 33 countries (11 transition economies and 22 market economies), found that financial development has positive growth effects in the short run rather that in the long run. Fink et al. (2008) investigated the impact of the credit, bond and stock segments in nine EU-accession countries over the early transition years (1996–2000) and compared these to mature market economies and to countries at an intermediate stage. They found that the transmission mechanisms differ, and that financial market segments with links to the public sector (but not to stock markets) contributed to stability and growth in the transition economies. Winkler (2009) reviews the process of rapid financial deepening and the associated vulnerability and risks for the Southeastern European countries. He argues that the strategy of pursuing financial development through the entry of foreign banks does not guarantee financial stability. Finally, a strong consensus has emerged in the last decade that well-functioning financial intermediaries have a significant impact on economic growth (Bonin and Watchel, 2003).

3. The Banking and Financial Sector in the Transition Economies

In the centrally planned economies, money played only a limited role as a medium of exchange. In the banking sector, the central bank combined the standard functions of monetary authorities with some of those of a commercial bank. Besides, in most economies there were banks specialising in different sectors, namely export trade operations, financing of long-term investment, and the agriculture and food industry. At the time, there was only a state savings bank collecting available resources and household deposits. Thus, banking

activities were characterised by segmentation along functional lines. The transactions within the state sector, including those between state-owned production enterprises, involved no monetary payment while households used cash for transactions.

The first step in the transition process for the financial sector was the development of market-oriented financial institutions, banks being the most visible and often the dominant ones. The transition to a market economy started in the CEE countries in 1991 with reforms of the banking sector. In all transition countries, the first step was the abolition of the mono-bank system. New banking legislation was introduced allowing private banks to develop and foreign financial institutions to enter the domestic banking sector. Banks were allowed to operate as universal trade banks, whilst the new Central Bank remained in charge of monetary policy, including exchange rate policy, and monitoring of the newly created banking sector. The new system was very similar to that already existing in EU. Thus, most transition countries experienced a rapid expansion of the banking sector due to the entry of new (foreign) banks and the decline in state ownership.

The transition generated macroeconomic turbulence and made any new bank lending extremely risky. During the 1990s, the increase in stocks of non-performing loans led to banking crises in many transition countries. The stock of bad loans evolved partly as a result of the gradual recognition of the quality of existing relationships in state-owned banks (the stock issue), and partly because of continuing bad lending practices (the flow problem) (Bonin and Wachtel, 2003). The privatisation of the state-owned banks and the participation of foreign strategic investors in banking represented effective ways to solve these problems. Thus, progress in the banking sector in CEE countries has led to a smaller amount of non-performing loans.

Foreign banks have played an important role in the development of the financial system of the CEE countries by increasing credit availability, technology transfers and competition. They have been more innovative in terms of the number and range of new products offered, some of them already available in the foreign banks' home markets. Besides, they have helped consolidate the CEE's banking systems, producing waves of mergers and acquisitions that have decreased the number of banks. The majority of banks in the newly privatised banking sector are in fact foreign –owned.

Financial indicators of the development of the banking sector in several transition economies are shown in Table 1.

Table 1: Main financial indicators of banking sector development

	Number of total banks		Number of foreign owned banks		Asset share of state owned banks (%)		Asset share of foreign owned banks (%)	
Year / Country	1996	2007	1996	2007	1996	2007	1996	2007
Bulgaria	49	29	3	21	82.2	21.0	29.3	82.3
Czech.Rep	53	37	3	15	69.9	2.4	19.0	84.8
Estonia	15	15	4	13	6.6	0.0	1.6	98.7
Hungary	42	40	26	27	15.3	3.7	46.2	64.2
Latvia	34	25	18	14	6.9	4.2	51.5	63.8
Lithuania	12	14	3	6	54.0	0.0	28	91.7
Poland	81	64	28	54	51.6	19.5	16	75.5
Romania	31	31	10	26	80.9	5.7	10.7	87.3
Slovakia	29	26	14	15	54.2	1.0	12.7	99
Slovenia	36	27	4	11	40.7	14.4	5.3	28.8

Source : EBRD

As can be seen, the majority of banks have been privatised and foreign banks hold the largest share of assets. This has increased sharply in the past decade in all transition countries, while the level of state ownership has fallen below 20 % in each country. Thus, the influence of the state-owned banks has declined substantially. In 2007, no state-owned bank existed any longer in Estonia and Lithuania. The entry of foreign banks into the local market had a positive influence by increasing competition and efficiency of the banking system, encouraging better regulation of the financial sector in the form of banking supervision, and enhancing access to international capital. In addition, the higher efficiency of foreign banks has stimulated economic growth, and the participation of foreign strategic investors in banking is an effective way to avoid bad loans.

Almost all transition countries have experienced a decline in the number of banks. For example, in Bulgaria this has fallen from 49 in 1996 to 29 in 2007. Many smaller banks

became insolvent owing to stricter regulations for banking supervision. An exception is Lithuania, where the number of banks increased from 12 in 1996 to 14 in 2007.

3.1 Liquid Liabilities

The ratio of liquid liabilities to GDP is an indicator of the size of the financial sector. The highest monetisation ratios are found in Slovenia (74.4% in 2007). Romania has recorded a decline in this ratio (from 46% in 1991 to 36% in 2007) and has now the lowest one. Generally, the ratio of broad money to GDP is at least 60% in high-income countries with developed banking sectors. Thus, the banking sectors in the transition economies cannot be considered to be highly developed with a few exceptions.

3.2 Private sector lending growth

Most transition countries have recorded high private sector lending growth in recent years. This expansion of credit has been a feature of the transition countries, foreign banks being the main source of credit for the private sector (see Table 2).

Table 2. The evolution of the ratio of private sector credit to GDP (in percent)

Year / Country	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	12.5	14.8	19.4	26.7	35.2	42.9	47.1	66.8
Czech.Rep	44.0	33.0	29.4	30.7	31.6	35.8	40.0	41.0
Estonia	23.3	24.3	26.0	30.7	39.7	57.0	78.2	89.3
Hungary	29.9	30.9	33.6	41.0	44.6	49.8	54.1	59.2
Latvia	21.5	26.3	29.5	40.2	50.8	68.2	87.5	93.9
Lithuania	11.3	13.5	16.2	22.9	28.8	41.3	50.6	61.2
Poland	26.9	28.0	28.2	29.2	27.5	29.2	33.4	35.2
Romania	7.2	8.7	10.1	13.7	15.7	20.0	26.1	32.9
Slovakia	43.7	33.0	30.8	31.6	30.1	34.7	38.6	42.3
Slovenia	36.7	38.8	38.6	41.3	48.1	56.4	65.9	79.0

Source: EBRD

Empirical studies suggest a positive relationship between credit to the private sector and per capita income in the transition economies (Cottarelli et al., 2005). However, the banking system in the CEE countries appears to be more and more dependent on the activities of foreign banks. These, mainly from the EU countries, control the majority of assets and capital flows in the financial markets. Their entry has indeed boosted economic growth, enhanced competition and contributed to attract foreign direct investment. However, the lack of effective anti-trust legislation and mergers and acquisitions can lead to excessive concentration, while anti-competitive practices and abuse of dominant position may also occur. In most CEE countries the financial architecture has converged towards a bank-based system with substantial foreign ownership.

3.3 Household lending growth

Another feature of the transition economies was the rapid growth of consumer credit resulting from an increase of public confidence in the banking sector as well as in per capita income. Currently, the main business in the banking sector is indeed consumer credit (including credit cards and mortgage loans). Its growth also reflects the anticipation of higher future income and "consumption smoothing". However, this contributes to widening current account deficits through increased demand for imported consumer goods and currency appreciation. One of the reasons for the boom in consumer lending is the relative unattractiveness of wholesale lending owing to institutional weaknesses, above all the poor functioning of the legal system. Table 3 gives some information about the evolution of household lending growth.

Table 3 Evolution of credit to households in percent of GDP

Year / Country	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	2.1	2.8	3.7	7.1	10.0	14.4	16.6	23.0
Czech.Rep	5.6	5.9	7.3	9.1	11.2	13.8	16.5	20.0
Estonia	7.1	8.4	10.6	14.3	19.7	28.1	38.2	43.3
Hungary	3.2	4.7	7.4	10.9	12.8	15.6	18.5	21.7
Latvia	3.3	4.6	7.3	11.6	17.6	26.8	38.0	42.7
Lithuania	1.3	1.5	2.4	4.2	7.1	12.0	17.9	24.4
Poland	7.5	8.7	9.4	10.3	10.6	12.4	15.6	20.0
Romania	1.2	1.7	1.9	3.8	4.8	7.2	11.2	17.7
Slovakia	4.7	5.1	5.5	7.0	8.6	11.2	13.1	16.3
Slovenia	11.3	10.9	10.5	10.8	12.2	14.8	17.0	19.2

Source: EBRD

Widening current account imbalances are a concern for policy-makers, and measures might be necessary to slow down the growth in credit to households and to allocate more resources to productive investments. At the same time, the financial infrastructure should be improved as creditors need protection through the enforcement of bankruptcy and insolvency legislation meeting international standards. In addition, improving corporate governance and

providing better credit information might help banks channel resources towards the productive corporate sector.

3.4 Stock market capitalisation

The market capitalisation ratio measures the size of the stock market and is equal to the value of listed domestic shares divided by GDP. Stock market capitalisation in the transition countries grew due to the privatisation process. However, the development of the stock market was affected by the economic and financial crisis that the transition economies have experienced. At the end of 2007, these countries still displayed different levels of stock market development, its capitalisation ranging from 8.6 % to 57.2 % in the countries covered in this study, being at its lowest in Slovakia and at its highest in Slovenia (see Table 4) .

Table 4 Evolution of stock market capitalisation in percent of GDP

Year / Country	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	4.8	3.7	4.2	7.9	10.4	19.7	31.1	51.3
Czech.Rep	18.9	14.1	19.4	17.6	24.5	31.6	31.6	37.4
Estonia	31.5	24.1	29.9	38.4	47.1	25.2	34.6	26.9
Hungary	25.1	18.7	17.2	18.3	25	31.6	33.8	32.4
Latvia	7.3	8.4	7.3	9.5	11.5	16.5	12.9	10.8
Lithuania	13.9	9.9	9.3	16.9	26.1	31.7	32.6	24.7
Poland	17.4	13.2	13.6	16.5	23	31.1	40.9	44.1
Romania	3.4	5.8	10.1	9.2	13.9	22.2	24.4	27.3
Slovakia	6.3	7.4	6.8	7.4	9.4	9.4	8.8	8.6
Slovenia	16.8	16.8	24.1	22.5	26.2	22	37.2	57.2

Source: EBRD

Despite an upward trend, the figures still remain below the corresponding ones for the EU developed economies. Capital market development is complicated by the need to support the development of institutional infrastructure and regulatory mechanisms. Overall, there has been significant progress in the banking sector, as also indicated by the EBRD index of banking sector reform (see Table A2 in the Appendix).

4. Financial Development and Economic Growth: Empirical Analysis

In this section, we analyse the linkages between financial development/efficiency and economic growth using panel data for ten transition countries during the period 1994-2007. First, we estimate the impact of financial indicators over the whole sample. Second, we split the data into subpanels corresponding to three more homogenous groups of countries and compare the results.

4.1 The Model

To study the relationship between finance and growth we estimate an augmented Barro-growth regression including financial development variables which takes the following form:

$$GROWTH_{i,t} = \alpha_i + \beta_i [FINANCE]_{i,t} + \gamma_i [CONDITIONINGSET]_{i,t} + \varepsilon_{i,t} \quad (1)$$

or

$$g_{i,t} = y_{i,t} - y_{i,t-1} = \alpha_i + \beta_i f_{i,t} + \gamma_i C_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

where y is real GDP per capita, $g_{i,t}$ its growth rate, $f_{i,t}$ an indicator of financial development, $C_{i,t}$ a set of conditioning variables, μ_i and $\varepsilon_{i,t}$ error terms, i (where i = 1,2…,.N) the observational unit (country), and t (where t =1,2,…,T) the time period, while ε is a white noise error with zero mean, and μ a country-specific component of the error term that does not necessarily have a zero mean. The parameter α_i is the country-specific intercept which may vary across countries.

One important issue concerning the link between financial sector development and growth is the difficulty to identify proxies for measuring them. Beck et al. (2000, 2008) discuss different indicators of financial development capturing the size, activity and efficiency of the financial sector, institutions or markets. In our analysis, we consider several indicators, namely: the ratio of credit to the private sector to GDP as a measure of financial depth; indicators of the size of stock markets as stock market capitalisation (as a percentage of GDP); monetisation variables such as the ratio of broad money to GDP as a measure of the size of the financial sector; indicators of the efficiency and competitiveness of the financial system such as the margin between lending and deposit interest rates and the EBRD transition index of financial institutional development. Details are provided below.

Activity of the financial sector:

- The ratio of credit to the private sector to GDP (DCPS), which is the value of loans made by banks to private enterprises and households divided by GDP, is used as a measure of financial depth and banking development. This indicator isolates credit issued by banks, as opposed to credit issued by the central bank, and credit to enterprises, as opposed to credit issued to governments (Levine and Zervos, 1996).

Size of the financial sector

- The stock market capitalisation to GDP ratio (STMC), which is an indicator of the size of the financial sector given by the market value of listed shares divided by GDP. Although large markets do not necessarily function effectively and taxes may distort incentives to list on the exchange, the market capitalisation ratio is frequently used as an indicator of market development.

- Liquid liabilities to GDP ratio (LLG), which equals liquid liabilities of the financial system divided by GDP. It is used as a measure of "financial depth" and thus of the overall size of the financial intermediation sector (King and Levine,1993a).

Efficiency of the financial sector

- The interest rate margin (INT), which measures the difference between deposit and lending rates in the banking market is used to measure the efficiency of the sector.

Levine (1997) suggested several possible indicators for economic growth: real per capita GDP growth, average per capita capital stock growth and productivity growth. Here we use real per capita GDP growth. Other variables influencing economic growth were introduced in our model, including per capita income, average education, political and stability indicators as well as indicators reflecting trade, fiscal and monetary policy such as government consumption or trade openness and inflation.

In the estimation we used real GDP per capita with a one-year lag as initial income per capita to control for the steady-state convergence predicted by the neoclassical growth model. For human capital, we introduced a proxy for educational attainment, more precisely the secondary school enrollment ratio whose expected influence on growth is positive through its effect on productivity. International trade openness is proxied by an international trade policy variable, i.e. the trade to GDP ratio, with an expected positive coefficient. Higher openness enhances growth through higher competition and technological progress (see Winter, 2004). Inflation measures the degree of uncertainty about the future market environment, firms becoming more reluctant to make long-run commitments in the presence of higher price variability; the expected sign of this variable is therefore negative.[1]

The estimated model, which includes a proxy for financial development, is the following:

$$RGDPC_{i,t} = \alpha_i + \beta_1 RGDPC_{i,t-1} + \beta_2 INV_{i,t} + \beta_3 TOP_{i,t} + \beta_4 INFL_{i,t} + \beta_5 GVE_{i,t} + \beta_6 HC_{i,t} + \\ + \beta_7 DCPS_{i,t} + \beta_8 STMC_{i,t} + \beta_9 LLG_{i,t} + \beta_{10} RI_{i,t} + \beta_{11} INT_{i,t} + u_i + \varepsilon_{i,t} \quad (3)$$

where: RGDPC = real per capita GDP growth; RGDPC = initial income per capita; INV = investment/GDP (percentage); TOP = trade/GDP (percentage); INFL = inflation, average consumer prices; GVE = government expenditure/GDP; HC = secondary school enrollment ratio; DCPS = domestic credit to the private sector (as a percentage of GDP); STMC = stock market capitalisation (as a percentage of GDP); LLG = liquid liabilities (as a percentage of GDP); RI = Reform index of financial institutional development (which is the average of the EBRD's indices of banking sector reform and of reform of non-bank financial institutions); INT = interest rate margin.

4.2 Data

Our panel consists of data for ten transition countries from Central and Eastern Europe over the period 1994-2007. The data are annual and the countries included in the sample are:

[1] Other studies on the finance-growth nexus for the transition economies including inflation as a conditioning variable are Rousseau and Wachtel, 2002; Gillman and Harris, 2004.

Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. We also carry out the analysis for three more homogeneous sub-groupings: (a) the Baltic countries (B-3): Estonia, Latvia and Lithuania; (b) the CEE-5: the Czech Republic, Hungary, Poland, Slovakia and Slovenia; (c) Southeastern Europe (SEE-2): Bulgaria and Romania. The data were obtained from the EBRD database and the International Monetary Fund (IFS). For more details on data sources and definitions, see the Appendix.

4.3 Methodology

The most common methods for investigating the finance-growth nexus are cross-country regressions and panel data techniques. Note that the estimates of β_i (financial development indicators) can be biased for a variety of reasons, among them measurement error, reverse causation and omitted variable bias. Therefore, a suitable estimation method should be used in order to obtain unbiased, consistent and efficient estimates of this coefficient. To deal with these biases, researchers have utilised dynamic panel regressions with lagged values of the explanatory endogenous variables as instruments (see Beck et al., 2000; Rioja and Valev, 2004). Such methods have several advantages over cross-sectional instrumental variable regressions. In particular, they control for endogeneity and measurement error not only of the financial development variables, but also of other explanatory variables. Note also that, in the case of cross-section regressions, the lagged dependent variable is correlated with the error term if it is not instrumented (see Beck, 2008).

The dynamic panel regression takes the following form:

$$g_{i,t} = \alpha_i + \beta f_{i,t} + \gamma_1 C^1_{i,t} + \gamma_2 C^2_{i,t} + \delta y_{i,t-1} + \mu_i + \lambda_t + \varepsilon_{i,t} \qquad (4)$$

where C^1 represents a set of exogenous explanatory variables, C^2 a set of endogenous explanatory variables, and λ a vector of time dummies.

In our analysis, we employ the system GMM estimator developed by Arellano and Bover (1995), which combines a regression in differences with one in levels. Blundell and Bond (1998) present Monte Carlo evidence that the inclusion of the level regression in the

estimation reduces the potential bias in finite samples and the asymptotic inaccuracy associated with the difference estimator.

The consistency of the GMM estimator depends on the validity of the instruments used in the model as well as the assumption that the error term does not exhibit serial correlation. In our case, the instruments are chosen from the lagged endogenous and explanatory variables. In order to test the validity of the selected instruments, we perform the Sargan test of over-identifying restrictions proposed by Arellano and Bond (1991). In addition, we also check for the presence of any residual autocorrelation. Finally, we perform stationarity tests belonging to the first- (Levin-Lin-Chu, 2002) and second-generation unit root test (Pesaran, 2007), (see the Appendix for details). The results suggest that all series are stationary (see Table A5 in the Appendix), and consequently no co-integration analysis is necessary. Therefore we proceed directly to the GMM estimation.

4.4 The estimation results

The dynamic panel regressions were run both for the ten transition economies as a whole and the three subgroupings mentioned before. The estimation results are presented in Tables 5 and 6.

Table 5: The financial development and economic growth nexus: dynamic panel regression

Variables	(1) RGDPC	(2) RGDPC
L.RGDPC	0.229	0.201
	(3.40)***	(4.62)***
INV	0.292	0.342
	(4.50)***	(5.50)***
TOP	0.015	0.011
	(2.21)**	(2.33)**
INFL	-0.008	-0.006
	(3.59)***	(4.01)***
GVE	-0.057	-0.066
	(2.56)**	(5.66)***
HC	0.018	0.020
	(3.61)***	(3.61)***
DCPS		0.007
		(0.23)
STMC		0.004
		(2.95)***
LLG		0.013
		(2.42)**
RI		0.493
		(1.82)*
INT		-0.027
		(5.64)***
Constant	0.070	-0.059
	(2.84)***	(0.58)
Observations	140	140
Arellano-Bond AR(2)	-0.17	0.15
Prob > z	(0.867)	(0.878)
Sargan test chi2	27.45	30.94
Prob > chi2	(0.237)	(0.156)
Absolute value of z statistics in parentheses		
* significant at 10%; ** significant at 5%; *** significant at 1%		

The first regression represents a standard growth equation with the GDP per capita growth rate as an endogenous variable. The results suggest that capital accumulation, i.e. investment, is the most relevant determinant of the growth process. As expected, human capital and trade openness have a positive and significant impact on economic growth, the former through improved productivity, and the latter (resulting from the signing of regional agreements) through higher competition and technological progress.

To analyse the link between financial sector development and economic growth we added to the standard growth regression (1) three financial indicators, i.e. the ratio to GDP of private credit, liquid liabilities and stock market capitalisation respectively. We find that credit to the private sector has a positive but insignificant effect on economic growth, possibly as a result of the numerous banking crises caused by the large proportion of non-performing loans (and thus unsustainable credit growth) at the beginning of the transition process in the countries of Central and Eastern Europe (Tang et al., 2000). However, credit granted to private companies is essential for financing investment projects, which in turn affect positively long-run growth.

Further, the stock market capitalisation to GDP ratio has a positive but minor effect on economic growth. Despite an upward trend for this indicator in the CEE countries during the period being investigated, their stock markets still have a small size, and it is therefore very important to attract foreign investors. The ratio of liquid liabilities as a proportion of real GDP has a positive and significant coefficient, consistently with the idea that money supply helps growth by facilitating economic activity.

As the size of the financial sector by itself might not be sufficient to estimate the role of financial development in the growth process, we added to the model two indicators of financial efficiency: the interest margin rates between the lending and deposit as a measure of efficiency in the banking sector, and the EBRD index of institutional development which measures the progress in reforming the financial sector. The former variable measures transaction costs within the sector but may also reflect an improvement in the quality of borrowers in the economy. If the margin declines due to a decrease in transaction costs, the share of saving going to investment increases and economic growth accelerates. Both these variables appear to be highly significant (see column (3) of Table 5). The margin between

lending and deposit interest rates is negatively correlated with economic growth, consistently with theory (see Harrison et al., 1999). This means that a shrinking interest margin rate can increase economic growth. In all transition countries from Central and Eastern Europe efficiency increased over time but reached different levels (see Appendix), depending on the privatisation methods and the influence of more efficient foreign banks (see Matousek and Taci, 2005; Bonin et al., 2005). The other financial efficiency indicator, i.e. the EBRD index, has a positive effect, implying that reforms in the banking and financial sector such as market regulation and monitoring, increase economic growth.

The results for the three subgroups are reported in Table 6. The private credit to GDP ratio is found to have a positive but insignificant effect in all three groups. As for stock market capitalisation, this has a positive, small effect in the case of the CEE-5 countries, and a still positive but insignificant one in the SEE-2 and B-3 countries. In the former group the stock market expanded more rapidly due to early privatisation and the entry of foreign investors, but it is still relatively underdeveloped.

Table 6: The financial sector and economic growth nexus in the tree subgroups: dynamic panel regression

Subgroup / Variables	CEE-5	B-3	SEE-2
	(1)	(2)	(3)
	RGDPC	RGDPC	RGDPC
L1.RGDPC	0.236	0.045	-0.083
	(2.69)***	(0.33)	(0.65)
INV	0.181	0.032	0.089
	(5.85)***	(1.70)*	(6.99)***
TOP	0.025	0.221	0.023
	(3.31)***	(3.96)***	(0.47)
INFL	-0.004	-0.003	-0.016
	(1.84)*	(1.67)*	(2.70)***
GVE	-0.023	-0.034	-0.237
	(1.86)*	(0.68)	(3.30)***
HC	0.022	0.142	0.078
	(2.42)**	(2.97)***	(1.74)*
DCPS	0.042	0.014	0.058
	(1.70)	(0.79)	(1.05)
STMC	0.010	0.015	0.002
	(2.61)**	(0.68)	(1.31)
LLG	0.008	0.006	0.002
	(2.10)**	(2.44)**	(1.81)*
RI	1.046	0.634	0.311
	(4.74)***	(2.62)**	(2.17)**
INT	-0.031	-0.011	-0.067
	(2.85)**	(2.33)**	(4.89)***
Constant	0.098	-0.252	0.267
	(2.31)**	(1.20)	(1.50)
Observations	70	42	28
Arellano-Bond AR(2)	-0.57	0.15	-1.30
Prob > z	(0.570)	(0.878)	(0.193)
Sargan test chi2	10.45	30.94	7.65
Prob > chi2	(0.235)	(0.156)	(0.364)
Absolute value of z statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

The index of financial institutional development also has a positive effect in all three groups, especially so in the CEE-5, followed by the B-3 and the SEE-2, reforms of the financial system being more advanced in the two former groups. Monetisation is also significantly and positively correlated with real per capita GDP growth in all three cases. In most high-income countries with developed banking sectors, the ratio of broad money to GDP is at least 60 percent (Bonin and Wachtel, 2003). In the transition countries, the highest monetisation ratio in 2007 is found in Slovenia (75.4), and the lowest in Romania (36.6). The degree of monetisation can be seen as an indicator of macroeconomic stability, which represents an incentive for foreign investors.

The efficiency of the banking sector has an important role in economic growth. This indicator is negatively correlated with economic growth in all cases. Achieving higher efficiency remains a challenge for these three groups of countries. The CEE-5 have recorded an increase of this indicator due to the early privatisation of the banking sector and the entry of foreign banks. The SEE-2 countries instead have started privatisation later and seen high interest rate margins during the transition period (for example, 20.8 in Romania in 2000 in comparison with 7.2 in Poland and 2.1 in Hungary). Overall, underdevelopment of the stock and credit markets, and therefore lack of financial depth, remains one of the main features of these countries compared with the other EU countries (see Coricelli and Masten, 2004).

4.5 The role of credit in the economy and its determinants

Lending to the private sector is one of the main driving forces of economic growth. Thus, increasing the supply of loans is a key challenge for the CEE countries. Although credit markets are still underdeveloped, in recent years in most of these countries the credit to GDP ratio has risen. At the end of 2007, these countries displayed a heterogeneous private sector credit to GDP ratio ranging from 33% to 94%, the lowest increase being recorded in Romania and the highest in Latvia. This credit expansion has been largely the result of increased mortgage loans to households. Rapid credit growth partly reflects the very low initial level of intermediation and the convergence towards the levels of the developed EU countries, but the figures still remain below those for the euro area (Égert et al., 2007). Some studies have addressed the question whether lending growth has become excessive in the CEE countries (see Boissay et al., 2007; Brzoza-Brzezina 2005; Backé et al, 2007). Given the importance of credit for economic growth, next we investigate econometrically its determinants.

Specifically, we expand the model proposed by Égert et al. (2007) by adding three new variables, namely: non-performing loans (as a percentage of total loans), asset share of foreign-owned banks (in per cent) and domestic credit to households (as a percentage of GDP):

$$DCPS = f(\ GDPC, BCPS, INFL, INT, HCR, LR, IBR, NPL, PCFB) \quad (5)$$

where DCPS is ratio of private sector credit to GDP, and the explanatory variables include: GDP per capita at purchasing power parity (GDPC), bank credit to the public sector as a percentage of GDP (BCPS), producer price inflation (INFL), the margin between lending and deposit interest rates (INT), domestic credit to households as a percentage of GDP (HCR), nominal interest rates (lending rates) (LR), an index of banking reform (IBR), non-performing loans (as a percentage of total loans) (NPL), asset share of foreign-owned banks (in percentage) (PCFB).

The empirical specification is the following:

$$DCPS_{i,t} = \alpha_i + \beta_1 DCPS_{i,t-1} + \beta_2 GDPC_{i,t} + \beta_3 INFL_{i,t} + \beta_4 INT_{i,t} + \beta_5 HCR_{i,t} + \beta_6 LR_{i,t} + \\ + \beta_7 IBR_{i,t} + \beta_8 NPL_{i,t} + \beta_9 PCFB_{i,t} + \beta_{10} BCPS + u_i + \varepsilon_{i,t} \quad (6)$$

Again, the model is estimated first for the whole panel and then for the subgroups using the system GMM method, and the sample period is the same as before. The estimation results are reported in Table 7.

Table 7: The determinants of credit to the private sector: dynamic panel regression

ZONE / Variables	TOTAL	CEE-5	B-3	SEE-2
	(1)	(2)	(3)	(4)
	DCPS	DCPS	DCPS	DCPS
L.DCPS	0.730	0.728	0.737	0.563
	(14.17)***	(16.31)***	(9.29)***	(3.13)***
GDPC	0.187	0.114	0.216	0.079
	(2.13)**	(1.86)*	(1.96)*	(2.10)**
INFL	-0.084	-0.018	-0.028	-0.119
	(3.29)***	(1.93)*	(1.76)*	(2.15)**
INT	-0.023	-0.053	-0.034	-0.293
	(1.74)*	(1.66)*	(1.88)*	(2.45)***
HCR	0.129	0.029	0.167	0.274
	(4.07)***	(3.33)***	(3.83)***	(2.47)**
LR	-0.108	-0.057	-0.098	-0.172
	(1.94)*	(1.86)*	(1.70)*	(2.57)***
IBR	0.717	0.781	0.953	0.526
	(3.04)***	(1.88)*	(3.44)***	(1.76)*
NPL	-0.046	-0.139	-0.034	-0.121
	(2.07)**	(4.55)***	(2.11)**	(1.77)*
PCFB	0.041	0.033	0.028	0.073
	(2.25)*	(2.44)*	(3.45)***	(1.51)
BCPS	-0.160	-0.121	-0.093	-0.143
	(2.32)**	(1.92)*	(1.84)*	(2.25)**
Constant	-0.045	0.589	1.667	0.234
	(0.14)	(1.62)	(3.64)***	(0.06)
Observations	140	70	42	28
Number of country	10	5	3	2
Arellano-Bond AR(2)	-1.28	1.25	-0.62	-1.21
Prob > z	(0.199)	(0.212)	(0.535)	(0.227)
Sargan test chi2	23.67	23.88	16.79	16.51
Prob > chi2	(0.699)	(0.123)	(0.819)	(0.790)
Absolute value of z statistics in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

We note that GDP per capita has a positive effect on private credit, increasing financial depth. Higher disposable income, as well as low foreign interest rates, made it easier for households to finance their expenditure and service their debt. Private credit growth has been largely the result of more loans to households, primarily mortgage-based housing loans (see the Appendix).

The lending rate is negatively linked to private credit. Thus, a decrease in lending rates, i.e. in the cost of borrowing, leads to financial deepening. Inflation also has a negative effect,

leading to macroeconomics instability. Credit is instead positively affected by the asset share of foreign-owned banks. These have become increasingly important for the expansion of domestic credit in these countries. Moreover, in the CEE countries the financial sectors are dominated by private banks where foreign banks (mainly from the EU) hold the largest share of assets. As expected, non-performing loans have a negative effect, as their growth leads to banking crises and therefore slower credit growth. By contrast, the index of banking reform has a positive effect, confirming that reforms to the banking system stimulate credit growth and the development of credit markets. Credit to the public sector has a negative effect. The margin between lending and deposit interest rates also has a negative effect, a more efficient banking sector leading to financial deepening.

Heterogeneity in credit dynamics can have various causes, such as a different degree of economic development and of financial intermediation, and different institutional and regulatory frameworks. The factors that are normally found to stimulate credit growth in the transition countries, such as an increase in income or a decrease in lending rates, inflation and non-performing loans, continue to play an important role in the case of the CEE countries. Progress in their economic and monetary integration can accelerate credit growth, with benefits in terms of financial and economic development, but also with potential risks: a credit boom can have negative repercussions such as sizeable external imbalances, for instance consumption and investment booms leading to economic overheating and banking and currency crises.

5. Financial development and economic growth: the causal linkages

In this section we investigate causality between financial development and economic growth in the ten new EU members included in our panel using Granger-type causality tests.

5.1 Granger causality test

As mentioned above, our series are stationary and therefore it is legitimate to perform standard Granger Causality tests. Consider two stationary variables X and Y observed over T periods and N units. Let $x_{i,t}$, ($y_{i,t}$) denote the variable X (Y) associated with unit i = 1,2 .... N and t = 1,2, ... T. We test the hypothesis of no causality using the following linear models:

$$y_{i,t} = \alpha_i + \sum_{j=1}^{J} \delta_i^j y_{i,t-1} + \sum_{j=1}^{J} \beta_i^j x_{i,t-j} + \varepsilon_{i,t} \qquad (7)$$

$$x_{i,t} = \alpha_i + \sum_{j=1}^{J} \delta_i^j x_{i,t-1} + \sum_{j=1}^{J} \beta_i^j y_{i,t-j} + \varepsilon_{i,t} \qquad (8)$$

with $J \in N^*$ and $\varepsilon_{i,t}$ i.i.d. $(0, \sigma_{\varepsilon,i})$

5. 2 Results

We investigate causality linkages in both directions by estimating equations (7) and (8) to test for causality in both directions for the following pairs of variables in turn: (i) economic growth (RGDPC) and financial development (proxied by domestic credit to the private sector – DCPS); (ii) economic growth (RGDPC) and banking efficiency (INT), and finally (iii) economic growth (RGDPC) and stock market capitalisation (STMC).

The Granger causality test was originally designed for time series (Granger, 1969). However, it has recently been extended to panels (see Granger and Lin, 1995, Granger, 2003). The estimation is carried out here using the system GMM method developed by Arellano and Bover (1995) and Blundell and Bond (1998) which was designed to overcome some of the limitations of the difference GMM. We perform the Sargan/Hansen test for the validity of the additional moment restrictions required by the system GMM estimator. In order to avoid model misspecification three conditions should be satisfied: a significant AR(1) serial correlation, lack of AR(2) serial correlation and a high Sargan test statistic (Arellano and Bond, 1991).

In the AR(2) model (J=2) described in Eq. (7, 8) the joint null $\beta^1=\beta^2=0$ is interpreted as a panel data test for Granger causality and is distributed as a χ^2 with two degrees of freedom (see Casu and Girardone, 2009). A p-value < 0.10 implies a rejection at the 10% significance level of the null hypothesis of no causality.

To establish if there is a long-run linkage between $x_{i,t}$ and $y_{i,t}$, we test the restriction $\beta^1+\beta^2=0$, where the null is "*no long-run effect*". The sign of the causal relationship is given by $T=\beta^1+\beta^2$.

Table 8: Type of causal relationship and interpretation

Equation	**$T=\beta^1+\beta^2$**	**Type of causal relationship**	**Interpretation**
Eq. 7	>0	positive	An increase of $x_{i,t}$ implies an increase of $y_{i,t}$ and vice-versa
Eq. 8	>0	positive	An increase of $y_{i,t}$ implies an increase of $x_{i,t}$ and vice-versa
Eq. 7	<0	negative	An increase of $x_{i,t}$ implies an decrease of $y_{i,t}$ and vice-versa
Eq. 8	<0	negative	An increase of $y_{i,t}$ implies an decrease of $x_{i,t}$ and vice-versa

A positive (negative) T implies that the causal relationship between past $x_{i,t}$ and present $y_{i,t}$ (eq. 7) or between past $y_{i,t}$ and present $x_{i,t}$ (eq. 8) is also positive (negative).

The results of the Granger Causality test are reported in Tables 9a and 9b.

Table 9a: Granger Causality test between domestic private credit sector and economic growth

Variables	RGDPC	Variables	DCPS
L1.RGDPC	0.670	L1.DCPS	1.022
	(3.49)***		(2.31)**
L2.RGDPC	-0.147	L2.DCPS	-0.431
	(0.69)		(2.23)*
L1.DCPS	0.010	L1.RGDPC	9.520
	(0.50)		(1.82)
L2.DCPS	0.027	L2.RGDPC	-0.478
	(1.28)		(0.23)
Constant	-0.010	Constant	0.345
	(0.47)		(0.66)
L1.DCPS + L2. DCPS	0.037	L1.RGDPC + L2.RGDPC	8.042
Granger causality p-value	(0.017)	Granger causality p-value	(0.120)
Arellano-Bond test for AR(1) p-value	0.127	Arellano-Bond test for AR(1) p-value	0.211
Arellano-Bond test for AR(2) p-value	0.412	Arellano-Bond test for AR(2) p-value	0.155
Sargan test of overid. restrictions: p-value	0.752	Sargan test of overid. restrictions: p-value	0.998
Test $(\beta^1 + \beta^2)=0$ Prob>F	0.325	Test $(\beta^1 + \beta^2)=0$	0.206
Observations	140	Observations	140
Number of country	10	Number of country	10
Absolute value of t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

One can see that the relationship between private credit and economic growth is positive but the estimated coefficients are not statistically significant, leading to the conclusion that there are no causal linkages between these two variables. Also, there is no Granger causality in either direction between economic growth and financial depth (DCPS).

Table 9b: Granger Causality test between interest rate margin and economic growth

Variables	RGDPC	Variables	INT
L.RGDPC	0.646	L1.INT	-0.010
	(8.73)***		(0.10)
L2.RGDPC	-0.146	L2.INT	0.274
	(3.09)**		(3.21)**
L1.INT	0.001	L.RGDPC	7.157
	(1.96)*		(1.96)*
L2.INT	-0.003	L2.RGDPC	-17.938
	(2.17)**		(4.29)***
Constant	0.019	Constant	1.382
	(4.90)***		(3.99)***
L1.INT+ L2.INT	-0.002	L.RGDPC + L2.RGDPC	-10.781
Granger causality p-value	(0.035)	Granger causality p-value	(0.13)
Arellano-Bond test for AR(1) p-value	0.151	Arellano-Bond test for AR(1) p-value	0.250
Arellano-Bond test for AR(2)	0.658	Arellano-Bond test for AR(2 p-value)	0.579
Sargan test of overid. restrictions: p-value	0.852	Sargan test of overid. restrictions: p-value	0.901
Test $(\beta^1 + \beta^2)=0$	0.300	Test $(\beta^1 + \beta^2)=0$	0.101
Observations	140	Observations	140
Number of country	10	Number of country	10
Absolute value of t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

Further, causality runs from banking efficiency (INT) to economic growth but not in the opposite direction, i.e. the interest rate margin Granger-causes economic growth. This linkage is negative and significant. Again, there is no evidence of long-run effects of causality from INT to RGDPC (Prob>F = 0.300 , implying that "H_0: no long-run effect" is not rejected).

Table 9c: Granger Causality test between stock market capitalisation and economic growth

Variable	RGDPC	Variable	STMC
L1.RGDPC	0.652	L1.STMC	0.373
	(8.33)***		(2.14)*
L2.RGDPC	-0.092	L2.STMC	0.133
	(1.37)		(1.35)
L1.STMC	0.007	L1.RGDPC	-1.206
	(3.44)***		(0.24)
L2.STMC	-0.005	L2.RGDPC	5.439
	(2.64)***		(2.64)**
Constant	0.012	Constant	0.494
	(5.54)***		(1.94)*
L1.STMC + L2.STMC	0.002	L1.RGDPC + L2.RGDPC	4.233
Granger causality p-value	0.002	Granger causality p-value	0.176
Arellano-Bond test for AR(1) p-value	0.13	Arellano-Bond test for AR(1) p-value	0.151
Arellano-Bond test for AR(2) p-value	0.349	Arellano-Bond test for AR(2) p-value	0.421
Sargan test of overid. restrictions: p-value	0.625	Sargan test of overid. restrictions: p-value	0.836
Test $(\beta^1 + \beta^2)=0$ Prob>F	0.350	Test $(\beta^1 + \beta^2)=0$ Prob>F	0.451
Observations	132	Observations	132
Number of country	10	Number of country	10
Absolute value of t statistics in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

Finally, Granger causality runs from stock market capitalisation (STMC) to economic growth (RGDPC) but not in the opposite direction. There is also no evidence of long-run effects (Prob>F = 0.350, implying that "H_0: no long-run effect" is not rejected).

6. Conclusions

In this paper we have reviewed the main features of the banking and financial sector in ten new EU members, and then investigated the relationship between financial development and economic growth in these economies by estimating a dynamic panel data model over the period 1994-2007. To summarise, financial depth is found to be lacking in all ten countries, and therefore the contribution of the relatively underdeveloped credit and stock markets to growth has been rather limited, with only a minor positive effect of some indicators of

financial development. This might be a consequence of the large stock of non-performing loans and the banking crises experienced by these economies at the beginning of the transition period. In general, the CEE-5 have more developed financial sectors than the B-3 and SEE-2 countries. By contrast, the implementation of reforms, the entry of foreign banks and the privatisation of state-owned banks have reduced transaction costs and increased credit availability. This has improved the efficiency of the banking sector (Fries et al., 2006), which has played an important role as an engine of growth. Better regulation and supervision was partly motivated by the European integration process and the need to adopt EU standards. Thus, many of the banking sector weaknesses traditionally characterising emerging markets have gradually been eliminated. Given the prospect of EU accession, foreign banks, mainly from the euro area, seized the opportunity and established subsidiaries in all CEE countries, seeing them as an extension of the common European market and becoming dominant players in their banking sectors.

However, the massive presence of foreign banks has also increased contagion risks, and the consolidation process (with the majority of banks being foreign–owned) could limit competition. Thus, a financial crisis produced in the mature markets of the euro area could also reach the CEE countries. A strategy of financial development based on foreign entry from the anchor currency area is no guarantee for a smooth process of finance and growth, an example being the current crisis which started in the mature economies in the summer of 2007 and caused a sudden stop of capital flows to Southeastern Europe (Winkler, 2009).

Granger causality test suggest that causality runs from financial development, measured as credit to the private sector and the interest rate margin, to economic growth, but not in the opposite direction. Credit to the private sector has risen rapidly in these countries in recent years but at a different rate, the lending boom being particularly strong in the segment of loans to households, primarily mortgage-based housing loans. The heterogeneity in credit dynamics can have various causes, such as a different degree of economic or financial intermediation development, and different institutional and regulatory frameworks. Our analysis of the determinants of credit to the private sector highlights different factors that stimulate credit growth in the transition countries, such as an increase in income or a decrease in lending rates, inflation and non-performing loans, and the implementation of reforms in the

banking sector. Further, the high growth of credit to households can affect negatively the current account, which might be a serious problem for the transition economies.

Overall, the underdevelopment of stock and credit markets, with the consequent lack of financial depth, remains one of the main features of these economies. However, elements of market-oriented intermediation are now the rule rather than the exception throughout them (Bonin and Wachtel, 2003), and appropriate policies can reduce financial sector instability that could impair growth (Kraft, 2005).The adoption of the euro could have a further positive impact on financial development and economic growth in these countries, but this issue is beyond the scope of the present paper.

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APPENDIX A

Table A1: List of variables

VARIABLE (series)		Source
CODE	**NOM**	
BCPS	Bank credit to the public sector as a percentage of GDP	IFS database
DCPS	Domestic credit to private sector (in per cent of GDP)	EBRD database
GDPC	GDP per capita (in PPP)	EBRD database
GVE	General government expenditure to GDP	EBRD database
HC	Secondary school enrollment ratio	UNESCO database
HCR	Domestic credit to households (in per cent of GDP)	EBRD database
IBR	EBRD index of banking sector reform	EBRD database
INFL	Inflation, average consumer prices	IMF database
INV	Investment/GDP (in per cent)	EBRD database
INT	Interest margin rates between lending and deposit (in per cent)	Authors' calculation using EBRD database
LLG	Liquid Liabilities (in per cent of GDP)	EBRD database
LR	Lending rate (average)	EBRD database
NPL	Non-performing loans (in per cent of total loans)	EBRD database
PCFB	Asset share of foreign-owned banks (in per cent)	Authors' calculation using EBRD database
RGDPC	Real GDP per capita growth	Authors' calculation using EBRD database
RI	Reform index of financial institutional development	Authors' calculation using EBRD database
STMC	Stock market capitalisation (in per cent of GDP)	EBRD database
TOP	Trade openness to GDP	EBRD database

Table A2. EBRD indicators of reform

Indicator	EBRD index of banking sector reform		EBRD index of reform of non-bank financial institutions	
Year / Country	1996	2007	1996	2007
Bulgaria	2.0	3.7	2.0	2.7
Czech.Rep.	4.3	4.3	2.7	3.0
Estonia	4.0	4.3	2.0	3.7
Hungary	4.3	4.3	3.0	3.3
Latvia	4.0	4.3	2.0	3.0
Lithuania	4.0	4.3	2.0	3.3
Poland	4.3	4.3	2.7	3.3
Romania	3.0	4.3	1.0	2.7
Slovakia	4.3	4.3	3.0	3.3
Slovenia	4.3	4.3	2.0	2.7

Source EBRD

Table A3 : Interest rate margin (%)

Year / Country	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	8.4	8.2	6.6	5.9	5.8	4.9	4.9	6.3
Czech.Rep	3.8	6.1	4.8	4.8	4.8	4.5	4.3	4.6
Estonia	2.1	5.6	2.9	2.7	4.1	6.2	3.6	4.1
Hungary	2.9	2.6	2.3	2.5	1.9	2.2	1.8	2
Latvia	7.7	5.5	2.3	2.4	4	2.7	3.7	4.8
Lithuania	9.7	7.4	5.8	4.8	5.4	5.3	5.2	5.3
Poland	7.2	8.8	7.4	6.7	7.4	4.2	4.1	4.5
Romania	20.8	19.5	16.2	14.4	14.1	13.2	9.2	6.7
Slovakia	4.5	5	3.6	3.2	5	4.3	4.1	4.2
Slovenia	5.7	5.3	5	4.8	4.9	4.6	4.6	2.3

Source: EBRD

Table A4: Mortgage lending (as a percentage of GDP)

Year / Country	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria	-	-	-	1.2	2.7	4.8	7.2	10.4
Czech.Rep	2.0	2.4	3.0	4.2	5.9	7.7	10.0	12.5
Estonia	2.3	3.5	5.5	9.5	14.6	22.6	33.0	37.7
Hungary	1.1	1.7	4.1	8.0	9.5	11.5	13.9	16.4
Latvia	1.6	2.4	4.1	7.6	12.4	19.5	28.9	33.7
Lithuania	-	-	1.9	3.4	5.5	9.0	12.6	17.2
Poland	-	-	2.4	3.4	3.8	5.0	7.2	9.9
Romania	-	-	-	0.3	0.5	0.6	0.9	1.4
Slovakia	0.1	0.4	1.0	2.2	2.9	3.6	4.1	4.5
Slovenia	1.7	1.8	2.0	2.3	2.8	4.2	4.5	6.2

Table A5: Levin-Lin-Chu stationarity test

Series	Coefficient	t-value	t-star	P > t	Level
BCPS	-0.54670	-7.485	-4.53383	0.0000	I(0)
DCPS	-0.24590	-5.356	-2.25883	0.0119	I(0)
GDPC	-0.15040	-5.358	-3.71969	0.0001	I(0)
GVE	-0.52960	-7.119	-4.00032	0.0000	I(0)
HC	-0.25120	-6.727	-4.99531	0.0000	I(0)
HCR	-0.14939	-3.812	-1.71353	0.0433	I(0)
IBR	-0.47511	-7.459	-4.42017	0.0000	I(0)
INFL	-0.46330	-6.384	-2.61235	0.0045	I(0)
INT	-0.63380	-8.358	-5.17992	0.0000	I(0)
INV	-0.19084	-3.633	-1.26133	0.0136	I(0)
LLG	-0.19990	-5.282	-3.15713	0.0008	I(0)
LR	-0.65490	-8.049	-4.40804	0.0000	I(0)
NPL	-0.21493	-3.994	-1.29016	0.0985	I(0)
PCFB	-0.55450	-9.596	-7.97387	0.0000	I(0)
RGDPC	-0.58719	-8.584	-5.15507	0.0000	I(0)
RI	-0.43460	-8.835	-5.78175	0.0000	I(0)
STMC	-0.89160	15.682	-13.67317	0.0000	I(0)
TOP	-0.28015	-8.240	-6.20488	0.0000	I(0)

The Levin-Lin-Chu (LLC) test

The LLC test is based on estimating the following equation:

$$\Delta y_{i,t} = \alpha_i + \delta_i t + \theta_t + \rho_i y_{i,t-1} + \varsigma_{i,t} \quad \text{i = 1,2,…N, t = 1,2,…T}$$

This model allows for two–way fixed effects (α and θ) and unit–specific time trends. Because the coefficient of the lagged dependent variable is restricted to be homogeneous across all units of the panel, the unit–specific fixed effects are an important source of heterogeneity. The test involves the null hypothesis $H_0 : \rho_i = 0$ for all *i* against the alternative $H_A : \rho_i = \rho < 0$, with auxiliary assumptions about the coefficients of the deterministic components also being required under the null. The LLC test assumes that the individual processes are cross–sectionally independent. Given this assumption, conditions (and correction factors) are derived under which the pooled OLS estimate of ρ will have a standard normal distribution under the null hypothesis. Levin et al. (2002) analyse the asymptotic distribution of this pooled panel estimate of ρ under different assumptions on the existence of fixed effects and homogeneous time trends. This test can be viewed as a pooled Dickey–Fuller (or ADF) test, potentially with differing lag lengths across the units of the panel.

The Pesaran (2007) test

The Pesaran (2007) test is based on estimating the following equation:

$$\Delta y_{i,t} = \alpha_i + \rho y_{i,t-1} + \sum_{j=1}^{\rho_i} \beta_{i,j} \Delta y_{i,t-j} + \varepsilon_{i,t} \quad \text{i = 1,2,…N, t = 1,2,…T}$$

It is essentially a t-test for unit roots in heterogeneous panels with cross-sectional dependence. Similarly to the Im, Pesaran and Shin (IPS, 2003) test, it is based on the mean of individual DF (or ADF) t-statistics of each unit in the panel. The null hypothesis is that all series are non-stationary. To eliminate cross-sectional dependence, the standard DF (or ADF) regressions are augmented with the cross-sectional averages of lagged levels and first-differences of the individual series (CADF statistics). This avoids size distortions, especially in the case of models with residual serial correlations and linear trends. When T is fixed, in order to ensure that the CADF statistics do not depend on the nuisance parameters the effect of the initial cross-sectional mean must also be eliminated; this can be achieved by applying

the test to the deviations of the variable from the cross-sectional mean. Lags of the dependent variable can be introduced to control for serial correlation in the errors. The order of augmentation can be estimated using model selection criteria such as Akaike or Schwartz applied as usual to the underlying time series specification.

The exact critical values of the t-bar statistic are given by Pesaran (2007). The Z[t-bar] statistic is distributed standard normal under the null hypothesis of nonstationarity. Pesaran (2007) suggests that a generalisation of the test to unbalanced panels can be made straightforwardly as IPS (2003) show. In the case of unbalanced panels only standardised Z[t-bar] statistics can be computed.