# Expected effects of Euro adoption on financial development and growth in new EU member countries

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**Abstract**

This paper analyses the effects of development of national financial markets and international financial integration on economic growth in Europe using industry-level data. Results reveal convincing evidence of non-linear effects. In this respect, poorer European countries have more to gain from financial development, since the benefits gradually vanish as countries become more developed. The benefits of international financial integration, however, appear to be larger for more developed countries, indicating the importance of macroeconomic stability and quality of institutional framework. As the main catalyst of such change the process of Euro adoption may be seen as offering significant potential benefits to new EU members.

*JEL* codes:
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## 1. Introduction

The aim of the paper is to analyze the likely effects of the process of fulfilling the Maastricht criteria and Euro adoption on financial development and growth in new EU member countries. About two decades ago the new EU members started the process of transition to market economies that also led to creation of previously non-existent financial markets. Starting with Slovenia in 2007 it is now evident that in a relatively short period, most advanced countries in the group are soon about to join the Economic and monetary union. Because this process is and will be the strongest driving force of further financial integration of these countries with the rest of the "old" EU, the likely economic consequences of this process represent a challenging subject of investigation and is of immense policy value.

Two decades of European monetary integration lead to a process of significant liberalization of capital flows and integration of financial markets. An additional impetus was provided by the introduction of the Euro (Beal et al, 2004). Important changes that have already attracted important attention in the literature occurred also in the transition economies. Starting from a very low initial level of financial development, transition countries witnessed a significant progress. Even though still not complete according to standards of developed countries (Cotarelli et al., 2003; Fries and Taci, 2002), empirical evidence tends to suggest development of national financial markets contributed to growth performance of transition countries (Guiso et al., 2004; Coricelli, Jazbec and Masten, 2007).

It can be heuristically argued that significant progress in financial integration from the outset of transition already brought some benefits. It allowed transition countries to run quite significant current account deficits, facilitating faster growth and convergence of living standards. Large share of capital inflows in the form of FDI implies favorable risk sharing and transfer of technology that may represent one of the most important factors of catching up (Lane and Milesi-Ferretti, 2006b). It must be noted, however, that the process resulted in levels of negative foreign asset positions that are by international standards relatively high. As a consequence, future adjustments in the current account will be necessary (Lane and Milessi-Ferretti, 2006b). However, drawing from a recent experience of European countries and the stimulus creation of EMU gave to further financial integration[1], we may also expect an even increased dynamics in terms of financial integration as most of CEE progress on their path of Euro adoption. This may

[1] Lane and Milessi-Ferretti (2006) show that while the international financial integration (measured by the share of the sum of total foreign assets and liabilities in GDP) doubled in CEE countries in the period 1994 - 2004, it virtually tripled in EU-15 over the same period (see Figure 4 below).

increase the sustainability of observed net foreign asset position on its own, and to the extent that it promotes further financial development also increase the ability to generate surpluses in the future. Investigation of whether such theoretical predictions are justified also empirically is in the centre of our analysis.

Literature reports important effects of national financial development on growth (King and Levine, 1993a, b and c; Levine and Zervos, 1998; Beck et al., 2000, Rajan and Zingales, 1998; Guiso et al., 2004). Evidence of the effect of financial integration is somehow mixed, emphasizing the need of development of appropriate institutional framework to accompany financial integration (Edison et al., 2002; Prasad et al., 2003). In the context of European financial integration Guiso et al. (2004) apply the framework of Rajan and Zingales (1998) to estimate the effect of financial development on growth using a cross country panel of industry data (3-digit ISIC level).[2] They use the model to simulate the likely growth effects of financial development on EU and Central and Eastern European (CEE) countries. Their analysis, however, rest on rather strong prior assumptions about the effects of financial integration on growth and may thus give an incomplete picture about the likely effects of further financial integration stimulated by euro introduction both for the current and future members of EMU (see section 4 for details). For this reason, we improve over their analysis in four ways. First is a more explicit modeling of the growth effects of financial integration in a similar empirical framework by including aggregate measures of international financial integration or stocks of cross-border borrowing.[3] This allows us to identify explicitly and more clearly the channels through which financial integration affects economic growth. Second, since development of national financial markets and financial integration are very dynamic phenomena our analysis explicitly exploits time variation in the data. Third, since we focus on the likely effects of euro adoption on financial integration and growth in new EU member countries (and Europe in general), we use a large database of firm-level data in European countries to construct the industry-level growth rates of output also for transition economies. Such data are otherwise unavailable from other sources. A more homogenous and representative set of countries (exclusively European countries) than used in previous studies allows us to provide a better estimate of the likely effect of enlargement of the Euro zone. Finally, we devote particular

[2] A more common approach in the literature is to use macroeconomic data, but this can have important drawbacks.

[3] Our analysis does not consider more specific measures of financial integration such as restrictions on equity transaction (see Levine and Zervos, 1998b; Henry, 2000; and Bekaert, Harvey and Lundblad, 2001).

attention to the presence of threshold effects of financial integration that have been reported also by other authors (see Prasad et al., 2003, for example). Threshold effects are analyzed indirectly by partioning countries in our sample to more homogenous groups according to a general degree of economic development, and also directly estimated with the methodology proposed by Hansen (1999).

Our estimations show that the effect of financial integration on growth depends on the overall level of financial and institutional development of countries. In this respect, we find that less developed countries in our sample (transition countries) would benefit more from development of domestic financial markets relative to financial integration as financial integration per se does not have an obvious positive effect. Conversely, it is shown that financial integration is beneficial for financially more developed countries. This follows from finding that in EU15 development of national financial-market depth is considerably less important for growth while financial integration gains in relative importance. Financial integration thus stimulates economic growth to the extent it stimulates the development of domestic financial markets both in terms of depth and institutional quality.

We infer from these results that the process of Euro adoption as a catalyst of financial integration could have a stimulating effect on growth in new EU members if it stimulates the development of national financial markets. Benefits will be larger if financial integration is accompanied by fostering of institutional framework. The process of Euro adoption may again be seen as the main source of stimulus for institutional development that makes financial integration beneficial for growth.

The paper is structured as follows. Section 2 offers a theoretical discussion of the link between development of national financial markets and growth on one hand, and financial integration and growth on the other. Section 3 compares the current state and recent development in financial market development between EU15 and CEEC. Section 4 describes our empirical methodology, while section 5 described the data used. Section 6 contains the discussion of estimation results. Section 7 concludes.

## 2. The effect of financial development and international financial integration on growth

The predominant view in the literature exploring the relationship between financial development and economic growth is that increased availability of financial instruments and

institutions reduces transaction and information costs in an economy. Well-developed financial markets help economic agents to trade, hedge and pool risk, rising investment and economic growth. Since the seminal work by Goldsmith (1969) numerous empirical studies have analyzed the relationship between the level of financial markets development and the rate of growth making use of large cross-country data sets. A strong positive correlation between growth and indicators of financial development has been recurrently obtained, even after controlling for most of the factors that have been usually considered as determinants of growth.[4]

An important issue in estimation the growth effect of financial development is potential nonlinearity of the effect across the levels of financial development as many studies showed that the effect of finance on growth is not uniform and linear. De Gregorio and Guidotti (1995) showed that financial development leads to improved growth performance. This effect, however, varies across countries and over time and can also become negative. Odedokun's (1996) findings are that the growth-promoting effects of financial intermediation are more predominant in low-income than in high-income less developed countries. Rioja and Valev (2004) identified three different regions of financial development and showed that the relationship between finance and growth changes depending on in which region the country belongs. Clear signs of nonlinearity are documented also in Coricelli, Jazbec and Masten (2007), indicating the positive effect of financial development on growth documented by Rajan and Zingales (1998) and Guiso et al. (2004) may actually vanish at levels of financial market depth characterizing most advanced economies. For developing economies like transition economies, however, the positive effect may be considerable. Based on the results of Coricelli, Jazbec and Masten (2007) this paper also explicitly addresses the issue of nonlinearity, focusing on nonlinearities associated to the effect of financial integration.

From theoretical point of view financial integration may positively affect growth in several ways. Direct positive effect could come through facilitating risk sharing. Higher macroeconomic stability may stimulate demand. More importantly, it improves on allocation of capital (Obstfeld, 1994). Financial integration can stimulate growth also through the effect on development of national financial markets. This occurs in two ways. Increased competition from foreign financial intermediaries leads to reduced cost of intermediation and higher efficiency (Levine, 2001). This stimulates demand for funds and increases the size of domestic

[4] See King and Levine (1993a, b and c), Levine and Zervos (1998), Beck et al. (2000), Atje and Jovanovic (1993), Rajan and Zingales (1998) among others.

financial markets. Consequently, the effect of financial integration should reflect through size-based measures of financial development. Financial integration affects domestic markets also through improvements in institutional framework, i.e. improved regulation and corporate governance that improves the overall stability and reduces the problems related to asymmetric information. Demand for finance may increase as a result.

The second channel through which financial integration affects financial development is access to foreign financial markets in the form of direct lending by foreign financial intermediaries and listing on foreign stock markets. These financial flows do not show up in the size-based measures of financial development.

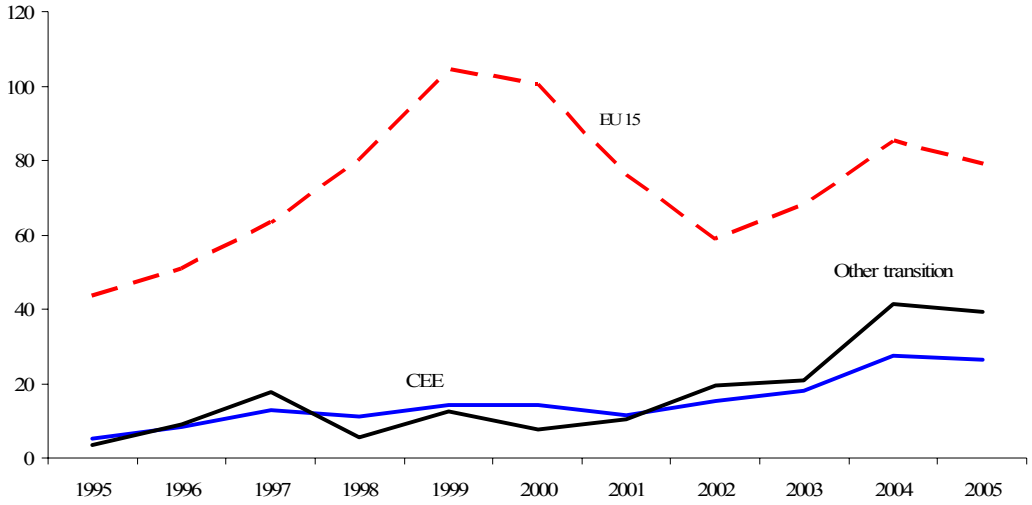
Whether a positive effect of financial development on growth materializes depends on market imperfections and distortions, with weak financial institutions and legal system playing a key role (Boyd and Smith, 1992). Empirically these considerations seem to matter considerably. Some authors find that financial market integration is beneficial for growth in developed countries and potentially detrimental for poorer countries (Edwards, 2001), and that sufficient financial development also seems to play a key role (Alfaro et al., 2001). Acknowledging many difficulties providing robust results in various studies and measurement of international financial integration, Edison et al. (2001) use various measures of financial integration with different econometric techniques to test how the effect of financial development on growth may depend on financial, institutional and policy factors of economic development. Their battery of tests does not produce robust results, which indicates that international financial integration does not cause higher growth per se, even though it should not be overlooked that higher openness is accompanied by economic success. Similar conclusions are offered also by Prasad et al. (2003). The presence of threshold effects of financial integration both for growth and macroeconomic volatility in their view demonstrates that sound macroeconomic policies and improved institutions are crucial for a country to attract less volatile and growth enhancing capital flows.

## 3. Financial markets and degree of financial integration in transition economies

Transition countries started the transition process with levels of development of financial markets at levels much lower than in comparable emerging markets. Similar finding applies to degree of international financial integration (Lane and Milesi-Ferretti, 2006). A fast pace of

development from the onset of transition was for this reason expected. Figures 1 - 3 present market capitalization, domestic credit and private credit as shares of GDP for EU15, CEE countries and some other selected transition countries (Russian Federation, Croatia, Bosnia and Herzegovina, Macedonia and Serbia and Montenegro). These measures are the most widely used size-based measures of financial development. First noticeable observation is that the level of financial development in transition countries more than fifteen years from the start of transition still remains well below the corresponding levels in EU15.

Figure 1: Evolution of market capitalization as % of GDP in EU15, CEE countries and other transition countries, 1995 - 2005 (simple averages)




Note: CEE countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithiania, Poland, Romania, Slovak Republic, Slovenia; Other transition: Russian Federation, Croatia, Bosnia and Herzegovina, Macedonia and Serbia and Montenegro

Such low degree of financial depth cannot be explained by large incomes per capita differentials. Countries involved in previous EU enlargements, like Portugal, Spain and Greece, had income per capita at the time of entry not higher than some of the most advanced NMs, as Slovenia for instance, but their credit-to-GDP ratios were more than twice as large as those of NMs.

The reasons for the underdevelopment of financial markets has probably to do with the initial design of liberalization and reform policies and with objective difficulties in developing financial markets in the midst of enormous structural change and transformation of the economy. Partly stimulated by the literature on transition, it is now acknowledged that

institutional development plays a key role in macroeconomic performance, both on growth rates and on their volatility (Roland, 2000; Acemoglu et al., 2002 among others). One of the main channels through which institutions affect growth and volatility is that of financial markets. The latter are indeed extremely sensitive to institutional design.[5] During the period following the reforms of the beginning of 1990-91, NMs experienced major difficulties in developing financial markets. The result is that financial markets remain largely underdeveloped. Recent estimates by the IMF (Cottarelli et al., 2003) derive "equilibrium" levels for the size of the banking sector, taking into account several indicators explaining the development of the banking sector (Table 1).

For NMs, the gap between predicted and actual credit-to-GDP ratios is extremely large, ranging from 25 to 54 percentage points of GDP. Similar conclusions are reached by Fries and Taci (2002), who emphasize the insufficient effort made by NMs to spur the development of their financial sector. Figure 1 - 3 corroborate this conjecture as we may observe that in the period 1995 - 2005 the pace of development of financial markets (measured in terms of size) has not exceeded that of EU15 countries, implying that no significant convergence occurred during this period.

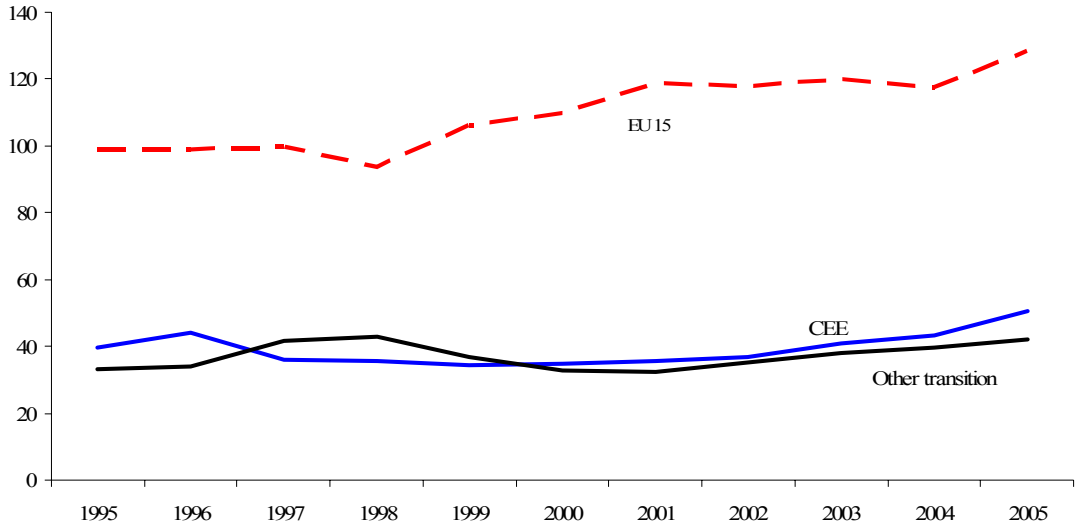
Table 1: Actual and predicted value of Credit-to-GDP ratios

| | **Actual BCPS ratio, 2002** | **Predicted values** | **Absolute deviation** |
|---|---|---|---|
| **Bulgaria** | 15.6 | 52.6 | -37.0 |
| **Czech Republic** | 42.6 | 69.3 | -26.7 |
| **Estonia** | 46.0 | 75.4 | -29.4 |
| **Hungary** | 29.3 | 70.5 | -41.2 |
| **Latvia** | 24.8 | 76.7 | -51.9 |
| **Lithuania** | 14.2 | 68.1 | -53.9 |
| **Poland** | 28.1 | 70.4 | -42.3 |
| **Romania** | 8.3 | 58.0 | -49.7 |
| **Slovak Republic** | 31.5 | 59.9 | -28.4 |
| **Slovenia** | 38.4 | 63.8 | -25.4 |

BCPS = bank credit to private sector
*Source: Cottarelli et al. (2003)*

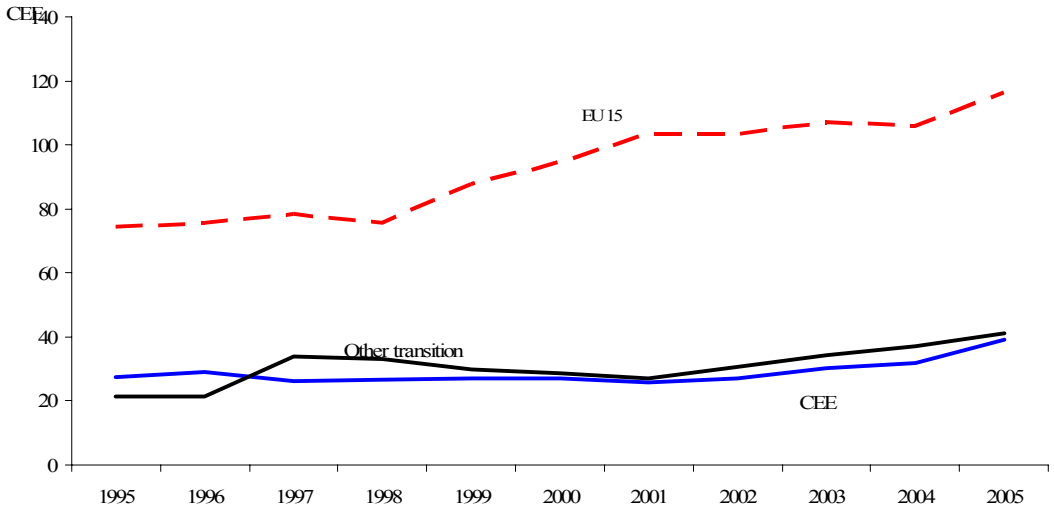
[5] See for instance EBRD, Transition Report 2003.

Figure 2: Evolution of domestic credit as % of GDP in EU 15, CEE countries and other transition countries, 1995 - 2005 (simple averages)




Note: See notes to Figure 1.

Figure 3: Evolution of private credit as % of GDP in EU 15, CEE countries and other transition countries, 1995 - 2005 (simple averages)




Note: See notes to Figure 1.

However, the depth of financial markets, as summarized by credit-to-GDP ratios, is a highly imperfect measure of financial development. Institutional variables are increasingly used as a more significant measure of financial development (Beck et al., 2001). Looking at the indicators of progress in transition constructed by the European Bank for Reconstruction and Development, one notes that there is still a gap between the score for NMs and the advanced market economy benchmark (Table 2). A score of 4+ indicates completion of transition. Although on average NMs display significantly higher scores than countries of the Former Soviet Union, there is still a significant gap to be eliminated in several areas. While transition has been completed in the area of price liberalization and trade and foreign exchange liberalization, transition is not over in the areas of financial market reform, privatization, competition policy and infrastructure reform.

Table 2: Progress in transition (Cumulative EBRD indices, 2003)

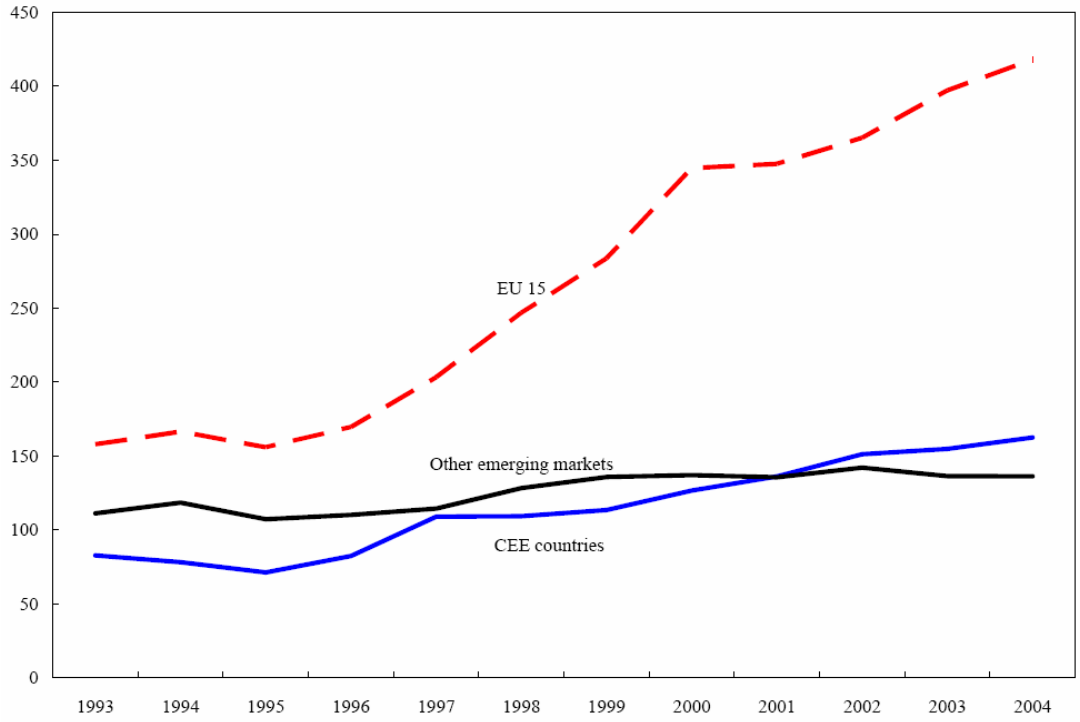
| | Large scale privatization | Small scale privatization | Governance and enterprise restructuring | Price liberalization | Banking reform and interest rate liberalization | Securities markets & non-bank financial institution | Infrastructure |
|---|---|---|---|---|---|---|---|
| Bulgaria | 4- | 4- | 3- | 4+ | 3+ | 2+ | 3- |
| Czech Rep. | 4 | 4+ | 3+ | 4+ | 4- | 3 | 3 |
| Estonia | 4 | 4+ | 3+ | 4 | 4- | 3+ | 3+ |
| Hungary | 4 | 4+ | 3+ | 4+ | 4 | 4- | 4- |
| Latvia | 3+ | 4+ | 3 | 4+ | 4- | 3 | 3- |
| Lithuania | 4- | 4+ | 3 | 4+ | 3 | 3 | 3- |
| Poland | 3+ | 4+ | 3+ | 4+ | 3+ | 4- | 3+ |
| Romania | 3+ | 4- | 2 | 4+ | 3- | 2 | 3 |
| Slovakia | 4 | 4+ | 3 | 4+ | 3+ | 3- | 2+ |
| Slovenia | 3 | 4+ | 3 | 4 | 3+ | 3- | 3 |
| Russia | 3+ | 4 | 2+ | 4 | 2 | 3- | 2+ |
| Ukraine | 3 | 4 | 2- | 4 | 2+ | 2 | 2 |

Source: EBRD Transition Report 2004

We argue in this paper that such gap in institutional reforms may be one of the main factors behind the slow development of financial markets in NMs. Accession to the European Union provided a strong impetus for such institutional change. Indeed, in recent years we see a faster increase in credit-to-GDP ratios. An even more important stimulus may come from the process of Euro adoption that is an institutional obligation of all new EU members. Figure 4 demonstrates that introduction of the euro has most likely been the reason for a marked increase

in the degree of international financial integration (measured by the share of the sum of total foreign assets and liabilities in GDP) in EU15. It virtually tripled in the period 1993 - 2004, while it only roughly doubled in CEEC even though CEEC started from a considerably lower initial position and had a significant margin to close.[6] Dynamics of direct cross-border borrowing of the private sector, presented in Figure 5, offer a similar conclusion as it can be clearly observed that especially after 1998 - the year in which it was already known which countries will form the euro zone - growth of credit provided by foreign financial intermediaries was much larger in EU15.

Figure 4: International financial integration in EU-15, CEE countries and other emerging markets, 1993 - 2004



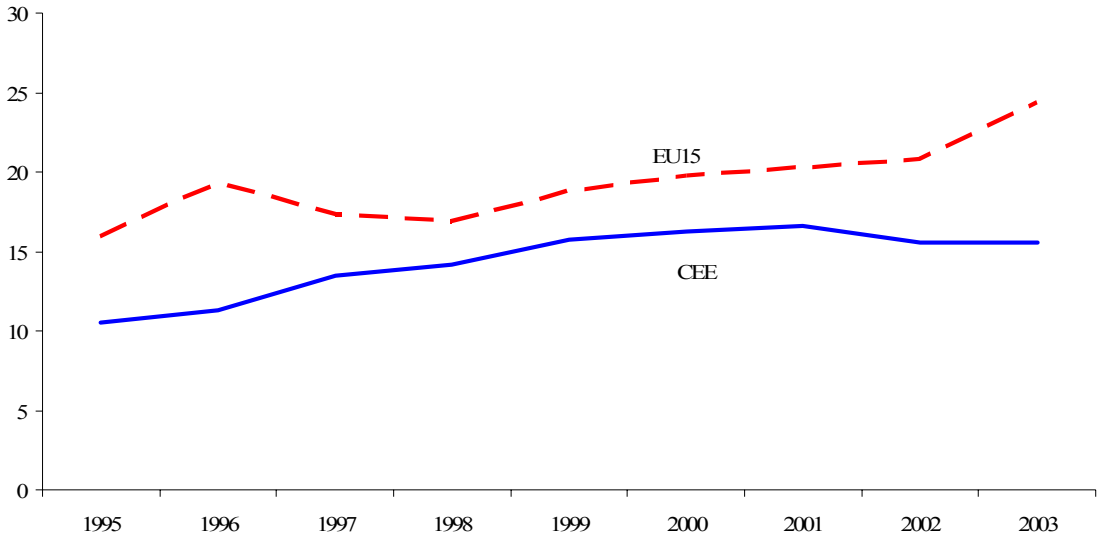

Source: Lane and Milesi-Ferretti (2006a)

Empirical evidence thus suggests that CEE countries in development of financial markets did not yet achieve the degree of convergence we observe for income levels. On the contrary, in some respects the gap even widened. The discussion in the next section argues that further

[6] See Milessi-Ferreti (2006) for details about the composition of these flows. The most pronounced difference is in the shares of FDI and portfolio investment. The first is dominant in CEEC, while the latter dominates in EU15.

development of national financial markets and higher degree of international financial integration may be seen as one of the very important sources of future growth and a factor of further real convergence. The process of euro adoption can in this respect be seen as an important catalyst, fostering both the size of national financial markets and development of a better institutional framework.

Figure 5: Private cross-border borrowing as % of GDP in EU15 and CEE countries, 1995 - 2003




## 4. Methodology

The major challenge in the literature on financial development and growth is how to address the potential endogeneity problem between growth rate of firm-level output and the degree of financial development. Using industry-level data Rajan and Zingales (1998) (RZ hereafter) propose a solution to the problem by using the dependence on external finance by different sectors in the US as the benchmark, which makes it perhaps the most influential recent empirical analysis of the relationship between finance and growth. The idea is that the financial market in the US can be assumed to be close to perfect and thus the financial structure of firms is determined by an optimal choice that is not constrained by supply factors. In addition, Rajan and Zingales argue that differences across firms of the same sectors are minor, and thus sectoral indicators are a good proxy for firm level dependence on external finance. The US indicators can be considered exogenous indicators of financing needs. Cross-country analysis of growth of

real sales of firms, excluding the US, can then be used to determine the role of financial development on growth. The sectoral US financial dependence indicator is multiplied by the level of financial sector development in different countries to construct what is by now a familiar indicator in the literature, the Rajan-Zingales indicator. In our estimations we interact the RZ measure of external finance dependence with the share of total finance (market capitalization of listed firms and private credit) in GDP. We concentrate on this measure of financial development because it is the most general among the measures used in the literature.

If the coefficient on the RZ indicator in a cross-country regression with the growth of real sales as dependent variable turns out to be positive this indicates that financial sector development affects the growth rates of firms. Financial sector development is measured by the sum of credit to the private sector and the stock market capitalization in percent of GDP. A positive coefficient on the RZ indicator implies that firms that need more external finance grow faster in countries with a more developed financial sector.

As Fisman and Love (2003) pointed out, this raises the issue of sufficient financing for the firms with high returns in the countries with less developed financial market. From RZ it follows that the additional financing needed could be collected from internal financing. Petersen and Rajan (1997) argued that alternative funds could be raised by the borrowing from suppliers. FL made a natural extension of Petersen and Rajan's reasoning by constructing a measure of trade credit using similar approach as RZ. In order to obtain an industry-level measure of trade credit usage, they employ the ratio of accounts payable to total assets, calculated for the US firms for different sectors. Also this measure is multiplied by the level of financial sector development in different countries. Negative sign of the coefficient is consistent with the hypothesis that firms that are more dependent on trade credit have a relative advantage in countries with less developed financial intermediaries, which implies a substitutability between trade credit and bank credit. On the other hand, if the coefficient is positive, there is a complementarity between the two forms of financing.

Even if RZ solve the problem of endogeneity of the financial indicator, there is still a problem of possible reverse causality from growth of output to the level of financial development. As emphasized by Guiso et al. (2004), a potential problem of RZ is that financial development may affect both the growth rate of firms and industries and the pattern of industry specialization. As a consequence, firms in financially less developed market may adopt technologies that make them less dependent on external finance. When estimating the effect of financial development

on growth using industry-level data, RZ tackle this endogeneity problem by including in the estimated equations the beginning-of-period industry share in value added. This has been used also by other authors, including Guiso et al. (2004).

For the sample of countries in our analysis inclusion of industry shares in total value added was not possible because of limited coverage of transition economies in the UNIDO database. We tackle the problem by exploiting the panel structure of our data. Allowing explicitly for time-variation in variables implies that initial period industry shares in total value added are simple fixed effects.[7] The same holds for institutional determinants of financial development (legal origin, protection of creditor rights, financial market regulation, etc.) that many authors considered as instrumental variables in estimation (Rajan and Zingales, 1998; Guiso et al., 2004). This means that a simple within estimator corrects for the potential bias induced by the correlation between industry specialization pattern and financial development. However, it must be noted that by allowing for time variation in the panel i.e. by analyzing the contemporaneous relation between financial development and growth (in contrast to RZ who use the initial-period level of financial development to explain average growth) induces an additional potential bias simply because financial development may be demand and not only supply determined. It may be argued that in our case this problem is not pernicious since our original units of observation on sales are firms who may have only a very limited effect on aggregate supply of finance. The aggregate effect of all firms together may also be limited since we concentrate on manufacturing sector only, and that normally accounts for less that half of aggregate value added. In addition, a significant share of credit may be supplied to households. These are all indications that the endogeneity problem in our estimations may be very limited, if present at all. Nevertheless we provide also the results obtained with GMM estimation method that uses lagged values of variables as the only valid set of instruments presently at hand.

Our baseline empirical model is

$$\Delta y_{ict} = \alpha_{ic} + \beta\left(RZ_i \times FD_{ct}\right) + \gamma\left(FL_i \times FD_{ct}\right) + \delta_t + u_{ict} \qquad (1)$$

where $\Delta y_{ict}$ denotes growth of real sales in industry $i$, country $c$ and year $t$. $RZ_i$ represents the Rajan and Zingales (1998) measure of external finance dependence, while $FL_i$ stands for the corresponding measure of the use of trade credit assembled by Fisman and Love (2003). $FD_{ct}$ is a measure of financial development (sum of stock market capitalization and private credit as

[7] Edison et al. (2002) us the same argument in favor of using panel data techniques.

percentage share of GDP). $\alpha_{ic}$ is a full set of industry-country fixed effects, while $\delta_t$ denote common time effects.[8]

Guiso et al. (2004) argue that such a specification is convenient to study the effects of international financial integration on growth.[9] First, statistical insignificance of coefficient $\beta$ indicates the presence of high degree of financial integration. Secondly, the model can be used to identify countries and industries that benefit more from financial integration. However, there are a number of reasons why the reasoning of Guiso et al. (2004) does not so firmly apply to the process of financial integration. In relation to their first point note that significance or insignificance of coefficient $\beta$ more generally signals only whether development of domestic financial markets is causal for growth or not. Financial integration may be only one, albeit very important, reasons of why it should not matter. This is also why they notice that finding a significant and positive $\beta$ does not imply absence of financial integration, but only that domestic financial development affects growth. In addition, their second conjecture is valid only to the extent international financial integration leads to development of domestic financial markets since this is essentially the variable used in their regressions. This view does not embed cross-border borrowing as one of the very important channels through which financial integration affects growth.

For this reasons we extend model (1) to explicitly contain measures of international financial integration in two ways. The first model explicitly includes the stock of cross-border borrowing of private sector (share in GDP), denoted by *FF*, as an additional source of external finance. As the measure of the depth of national financial markets, also this variable is interacted with the Rajan and Zingales (1998) measure of external finance dependence.

$$\Delta y_{ict} = \alpha_{ic} + \beta\left(RZ_i \times FD_{ct}\right) + \mu\left(RZ_i \times FF_{ct}\right) + \gamma\left(FL_i \times FD_{ct}\right) + \delta_t + u_{ict} \qquad (2)$$

In this way, coefficient $\mu$ directly measures the effect of cross-border provision of finance as opposed to coefficient $\beta$ that measures the effect of development of national financial markets. Such a specification may still inadequately capture all of the effects of financial integration, which may stimulate also the development of national financial markets in a complex manner

[8] Note that the Rajan and Zingales (1999) in their original specification estimated a different model. Growth of output was measured as the average over a period, while financial development was taken from the initial period.

[9] In contrast to ours, their specification does not include the effect of trade credit, which is an important alternative source of external finance.

(see section 3 for a discussion). For this reason the second model augments model (1) with the measure of international financial integration (denoted by *FI*). We use the sum of total foreign assets and liabilities as constructed by Lane and Milessi-Ferretti (2006a).[10]

$$\Delta y_{ict} = \alpha_{ic} + \beta\left(RZ_i \times FD_{ct}\right) + \kappa\left(RZ_i \times FD_{ct} \times FI_{ct}\right) + \tau FI_{ct} + \gamma\left(FL_i \times FD_{ct}\right) + \delta_t + u_{ict} \qquad (3)$$

Since the effect of financial integration may be heavily influenced by global driving trends (in the European context the process of monetary unification represents such a trend) financial integration *FI* enters the model as a deviation from the average level of financial integration of developed European countries. *FI* enters the model directly and interacted with the standard Rajan and Zingales term. In this respect coefficient $\tau$ measures a direct effect of financial integration on growth as in Edison et al. (2002). Interaction term is needed due to the fact that financial integration may indirectly affect domestic financial markets (increased efficiency in presence of higher competition, improved regulatory framework and corporate governance in financial institutions). In addition, the interaction term effectively captures potential non-linearities in the effects of financial integration on growth. Evidence in the literature suggests that financial integration may be even harmful if not accompanied by necessary financial and institutional development. It can be argued that the latter is successfully proxied by the size-based measures of development of national financial markets (*FD*).

In each of the models above we consider an additional extension. Each of the variables is interacted with a dummy variable that partitions the countries in our sample into the group of transition countries (ten transition economies that became members of the EU (Bulgaria and Romania entered in 2007), Croatia, Ukraine and Russian federation) and other countries (EU-15, Malta, Norway and Iceland). The two groups of countries differ importantly both in terms of development of national financial markets and international financial integration. As demonstrated by Coricelli, Jazbec and Masten (2007) significant differences in the effect of financial development on growth between two groups of countries may thus in a simple way reflect non-linearities in effects of financial development on growth.

A more systematic approach to modeling non-linearities in the effect of financial development conditional on the level of financial development itself without resorting to the use of country dummies can be performed by allowing for explicit threshold effects. Following Hansen (1999) we allow for a multiple threshold model, using the measure of financial development as the

[10] They measure international financial integration as the share of the sum of total foreign assets and liabilities in GDP.

threshold variable. To compactly write the multiple threshold model, let $\Gamma X_{cit}$ generically denote the right hand side of (1), (2) or (3) (without deterministic terms). Then we have

$$\Delta y_{ict} = \alpha_{ic} + \delta_t + \sum_{j=1}^{4} \Gamma_j X_{cit} I\left(\tau_{j-1} < FD < \tau_j\right) + u_{ict} \qquad (4)$$

This corresponds to a triple threshold model with $\tau_0$ and $\tau_4$ unspecified. The threshold model corresponding to (1), i.e. with $\Gamma X_{cit} = \beta\left(RZ_i \times FD_{ct}\right) + \gamma\left(FL_i \times FD_{ct}\right)$ was estimated in Coricelli, Jazbec, and Masten (2007) where it is shown that significant threshold effects in the relation between financial development and growth exist. A natural threshold variable that can be used in present context is the measure of financial development, which must be assumed exogenous to comply with the assumption behind the econometric model in Hansen (1999). Estimation of threshold levels and their confidence regions follows the multi-step procedure described in Hansen (1999).[11]

One important advantage of the threshold model is that it allows for simulation of the likely effects of financial integration on growth in the spirit of Guiso et al. (2004) in presence of the nonlinearity of the growth effect. As we show that significant non-linearities are in fact present, this may give us a much more reliable estimate of the likely effect of euro adoption on growth in new EU members.

## 5. Data

Our sample of data covers 30 European countries and 26 three-digit ISIC Rev. 2 manufacturing industries for the period 1996 – 2004. The countries in the sample are EU 25 countries to which we added also data for Iceland, Norway, Croatia, Russian Federation and Ukraine. Since the time span of data is not uniform across countries we are dealing with an unbalanced panel of data.

Data on external finance dependence at industry level (three and four-digit ISIC Rev. 2 level) are taken from Rajan and Zingales (1998). They define external finance dependence as the share of capital expenditure that a given industry cannot finance through internal cash-flow. Data on financial market development (market capitalization of listed firms, domestic credit, bank credit

[11] Hansen's (1999) method is designed for balanced panels, while we operate with an unbalanced panel. In such a case it must be noted that it is unknown whether all the Hansen's results regarding inference carry completely through.

to private sector, all expressed as share in GDP) are taken from WDI database. These variables are then interacted with the RZ measure of external finance dependence to obtain the variable that measures the effect on growth of external financial funds provided through financial market. Similarly, Fisman and Love (2003) (FL hereafter) construct a variable that measures the dependence on trade credit in the benchmark US case as another source of external finance. We use their indicator in addition to the one by Rajan and Zingales. Not only trade credit is likely to play a major role in transition countries, but, more generally, it seems more appropriate to consider external finance not only for capital expenditure, but also for working capital, that is the main determinant of enterprise debt.

Growth of industry output is calculated from firm-level data on sales drawn from the Amadeus database of the Bureau Van Dijck, which includes also small and medium-sized firms. Sales are deflated with the producer price index obtained from the IMF IFS database. All observations with growth of real sales that exceeded 100 % were treated as outliers and thus excluded from the database. Industry-level growth of output was calculated as a simple average. This resulted in a final dataset of 4449 observations, comprising of 638 country-industry units with 7 years of time observations on average.

Data on stocks of foreign assets and liabilities needed to construct the measures of financial integration are taken the dataset constructed by Lane and Millessi-Ferretti (2006a), while data on cross-border borrowing of private sector are taken from the IFS database.

## 6. Results

Estimation results of models (1), (2) and (3) are reported in Table 3. Column 2 contains the estimates of (1). It is immediately noticeable that a positive effect of financial development on growth found by Guiso et al. (2004) - applying the Rajan and Zingales (1998) methodology - is not confirmed on our dataset, not even when we control for trade credit as another source of external finance.[12] As argued by Coricelli, Jazbec and Masten (2006) this may be due to nonlinearities of the effect. Namely, transition and EU15 countries are sufficiently differently financially developed to expect considerably different effects of financial development on

[12] Note, however, that empirical specifications in Guiso et al. (2004) and here differ. While they follows closely Rajan and Zingales (1998) and use initial period values of financial development as explanatory variable, thus essentially estimating a cross-section, we allow for contemporaneous time variation. However, Coricelli, Jazbec and Masten (2006) demonstrate that replicating their specification on our data leads to the same conclusion.

growth. Remaining columns of Table 3 confirm this finding. We allow the coefficients to differ between transition and other countries by interaction of all variables with transition and non-transition dummies.

Column (3) reveals that allowing for varying coefficients considerably improves the estimation results. The effect of financial development on growth turns out to be significant and, contrary to the findings of Guiso et al. (2004), is considerably different across the two groups of countries. As expected, for transition countries, which are still characterized with considerably lower levels of financial development, the effect is much higher, in fact higher than previously found in the literature. As shown by the smaller coefficient for developed countries the effect may decline quickly as development progresses. The coefficients of trade credit (bottom two lines) are significantly negative. Trade credit thus acts as a substitute to external finance provided by financial intermediaries, but significantly more so in transition countries. This result can be again attributed to lower level of financial development.[13]

Models that augment the basic specification with measures of financial integration are presented in columns (4) - (9). Columns (4) and (5) contain the results for specification (2) that adds direct cross-border lending by financial intermediaries as an additional source of external finance. First we note that GMM estimates point to much higher effect of financial development across both groups of countries and sources of external finance. Second, within and GMM estimates result in insignificant effect of cross-border borrowing. The result could be expected to some extent as we can see from comparison of Figures 4 and 5 that the process of intense financial integration exhibits considerably weaker dynamics in the segment of direct cross-border borrowing. This leads to two conjectures. First, it is an indication that national financial markets crucially matter for growth also in the presence of significant financial integration. Second, it also implies that more important sources of growth effects of international financial integration may come through the stimulus it gives to development of domestic markets both in term of depth and institutional framework. We test this hypothesis with specification (3) and results reported in columns (6) and (7). Including measures of financial integration directly and interacted with domestic supply of finance through the RZ term leaves the effects of development of national markets broadly unchanged. The coefficients are still far apart and both significant with GMM estimator.

[13] The results obtained with GMM estimator are not reported for compactness, but available from the authors upon request.

Table 3: Effects of financial development and financial integration on growth

| | Estimation method | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Within | Within | Within | GMM - diff | Within | GMM - diff | Within | GMM - diff |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| $RZ \times FD \times D_{tran}$ | -0.0430! | 0. 245** | 0.264*** | 0.594*** | 0.282*** | 0.367*** | 0.285*** | 0.377*** |
| | (0.037) | (0. 076) | (0.106) | (0.143) | (0.081) | (0.126) | (0.113) | (0.123) |
| $RZ \times FD \times D_{ntran}$ | | 0. 014*** | 0.010 | 0.029* | 0.015 | 0.041*** | 0.013 | 0.037*** |
| | | (0.002) | (0.014) | (0.018) | (0.020) | (0.016) | (0.014) | (0.016) |
| $RZ \times FF \times D_{tran}$ | | | 0.226 | 0.041 | | | | |
| | | | (0.226) | (0.319) | | | | |
| $RZ \times FF \times D_{ntran}$ | | | 0.006 | -0.018 | | | | |
| | | | (0.029) | (0.031) | | | | |
| $RZ \times FD \times FI \times D_{tran}$ | | | | | 0.021 | 0.028 | 0.013 | 0.036 |
| | | | | | (0.017) | (0.031) | (0.032) | (0.040) |
| $RZ \times FD \times FI \times D_{ntran}$ | | | | | 0.005** | 0.011* | 0.011** | 0.028* |
| | | | | | (0.002) | (0.006) | (0.005) | (0.011) |
| $FI \times D_{tran}$ | | | | | -2.392*** | -2.223** | -2.362** | -5.000** |
| | | | | | (0.53) | (1.074) | (0.973) | (1.685) |
| $FI \times D_{ntran}$ | | | | | -0.372 | -0.311 | 0.059 | -0.248 |
| | | | | | (0.282) | (0.726) | (0.366) | (0.707) |
| $RZ \times FD \times FI \times D_{tran} \times D_{99}$ | | | | | | | 0.010 | -0.012 |
| | | | | | | | (0.022) | (0.053) |
| $RZ \times FD \times FI \times D_{ntran} \times D_{99}$ | | | | | | | -0.004 | -0.025 |
| | | | | | | | (0.004) | (0.017) |
| $FI \times D_{tran} \times D_{EUR}$ | | | | | | | 0.405 | 4.170* |
| | | | | | | | (0.540) | (2.221) |
| $FI \times D_{ntran} \times D_{EUR}$ | | | | | | | 0.025 | 0.961 |
| | | | | | | | (0.435) | (1.528) |
| $FL \times FD \times D_{tran}$ | -0. 461*! | -0. 688* | -0.893* | -3.578*** | -0.827** | -2.259*** | -0.878* | -2.332*** |
| | (0. 190) | (0. 375) | (0.485) | (0.803) | (0.376) | (0.667) | (0.517) | (0.666) |
| $FL \times FD \times D_{ntran}$ | | -0. 395*** | -0.302*** | -0.606*** | -0.364** | -0.654*** | -0.367*** | -0.669*** |
| | | (0. 103) | (0.077) | (0.118) | (0.103) | (0.128) | (0.079) | (0.129) |
| # obs | 4400 | 4400 | 4087 | 3477 | 4400 | 3769 | 4400 | 3769 |
| N | 631 | 631 | 610 | 631 | 631 | 631 | 631 | 631 |

Notes: Standard errors in parentheses. Constant not reported. Tests reveal significant presence of fixed effects in all specifications. Time dummies included in all models. Dummy variables $D_{tran}$ and $D_{ntran}$ denote transition and non-transition countries respectively. GMM-diff estimator differences the equation to eliminate fixed effects and uses lagged values of all values as instruments. 1st step results reported. $D_{EUR}$ is a dummy variable taking values one after 1999 i.e. corresponding to the introduction of the euro.

! The coefficients refer to variables that are not interacted with $D_{tran}$ and $D_{ntran}$ respectively.

The effects of trade credit are also very similar to the ones reported in columns (4) and (5). Interesting findings, however, emerge from the coefficients pertaining to the measure of international financial integration. Its direct effect seem to be significantly negative in transition countries, but it is also true that it has a positive indirect effect, which despite a smaller point estimates appears to be significant only for developed (mainly EU15) countries in our sample. This finding corroborates the findings of the unclear and potentially non-linear effects of financial integration in developing countries (Prasad et al., 2003). We see that it may have a negative direct effect if not coupled by necessary measures that foster a development of national financial markets and a proper and stability-oriented institutional framework. Taking the coefficients for transition economies at face value we see that the effect of financial integration on growth becomes positive when the depth of national financial market passes the threshold of 115% of GDP (2.393/0.021) (within estimates) and roughly 80 % of GDP (2.223/0.028) (GMM estimates). The latter threshold has already been passed by the most advanced CEEC. However, it is also true that as financial development progresses and institutional standards progress to the ones observed in developed economies the insignificant negative coefficient of $FI \times D_{ntran}$ and significant positive coefficient of $RZ \times FD \times FI \times D_{ntran}$ tell us that the positive effect of international financial integration on growth increases. Indeed, in such a case the positive effect of financial integration on growth occurs already at the level of national financial development of roughly 30 % of GDP (GMM estimates).

To investigate this issue further we checked whether periods of significant financial distress may have influenced the results. Namely, the Czech Republic and Bulgaria had a financial crisis in 1997, while the Russian financial crisis in 1998 spread to the whole region. We interacted the variables containing the measure of international financial integration with a dummy variable $D_{99}$ that takes value one after 1999. This period overlaps also with the introduction of the euro that provided an important impetus for further financial integration and financial stability in Europe. Results are presented in columns (8) and (9). Little significant changes can be observed to most coefficients, but GMM estimates nevertheless indicate there has been a significant break in the coefficient of direct effect of financial integration for transition economies (see the line labeled $FI \times D_{tran} \times D_{EUR}$). It indicates that once we abstract from period of considerable financial instability the negative direct effect of financial integration observed before 1999 virtually disappears, again confirming the conclusion that institutional development that

strengthens the stability of financial markets is a crucial ingredient in development of financial markets. For CEE countries, the process of euro adoption may in this respect play a key role

## 7. Concluding discussion

This study analyses potential effects enlargement of the Euro area may have on growth in acceding countries through increased financial integration and development of national financial markets. We use the augmented empirical approach by Rajan and Zingales (1998) and apply it to industry level data of European countries that cover both the group of developed "old" EU and several transition countries, among them virtually all of the new EU members and hence future members of EMU. Such a homogenous and representative dataset has not been used in previous studies. Rajan and Zingales (1998) methodology has been augmented in two ways. First is the inclusion of measures of financial integration, which makes our approach better suited for the analysis of the effect of financial integration than the study by Guiso et al. (2004). In line with theoretical predictions, we additionally check for potential threshold effects.

Our results confirm a positive effect on growth both from development of national financial markets and financial integration. The effects are highly non-linear though. First we observe that the positive effect on growth of development of domestic markets is considerably higher in less developed countries, represented by a group of transition countries in our case. The effect may virtually vanish as development progresses to the levels characterizing EU15. In addition, we find that financial integration may not have a positive effect on growth per se. It rather appears the effect to be heavily conditioned by development of national financial markets, macroeconomic stability and quality of institutions. This reflects the facts that our estimates confirm a significant positive effect of financial integration on general financial development and growth only for more developed EU15 countries. Lack of the effect for transition economies can be attributed to lower level of financial development, institutional design and macroeconomic volatility as we see that potential adverse effects of financial integration in transition economies can be linked to the period of financial distress in 1997 - 98.

Overall, these results show that the process of euro adoption may indeed have positive effect on growth in new EU member countries. Besides ensuring higher degree of macroeconomic stability it leads also to improved institutional design. Ensuing increase in financial integration

can then be expected to contribute to development of national financial markets and also stimulate growth through access to foreign financial markets.

Our plans for future work on the matter include several extensions. First, robustness of results will be checked against other measures of international financial integration most commonly used in the literature. Second, estimates of the Hansen (1998) threshold model will be included. Finally, because of the non-linearity of growth effects the threshold model should enable to simulate the expected growth dividend the process of euro adoption could bring to new EU members through international financial integration.

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