

Financial development and economic growth in Central and Eastern Europe

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Abstract. *The objective of this paper is the empirical analysis of the relationship between financial development and economic growth in Central and Eastern Europe. Financial development is measured by broad money growth (annual%), domestic credit to private sector (% GDP), domestic credit to private sector (% GDP) annual growth, interest rate spread (lending rate minus deposit rate,%) and nonperforming loans (% total loans) and annual growth in GDP growth rates. Methodologically, we used a panel model for eight countries in Central and Eastern Europe for the period 1996 - 2011 (the date panel approach). The main conclusions of the paper are: (1) increase nonperforming loans and interest rate spreads negatively affect economic growth, (2) increase in domestic credit to private sector negatively affect GDP growth, but increase its growth rate positively affects GDP (3) broad money growth is less relevant for economic growth.*

Keywords: financial development; economic growth; Central and Eastern Europe; nonperforming loans; interest rate spread.

JEL Classification: E51.

REL Classification: 10D, 11B, 16E, 18B.

1. Introduction

The influence of the financial sector on economic growth is widely debated in economic literature for over a hundred years. The banking system is the one that prevents information asymmetry between lenders and borrowers, reduces transaction costs, monitors the managers and provides financial resources in an inherently uncertain economic environment. Meanwhile, in the absence of an adequate institutional framework and/or in a specific economic context, in turn the banking system can develop opportunistic behavior manifested by moral hazard and adverse selection, which is reflected in non-performing loans and inefficient allocation of resources.

The objective of this paper is the empirical analysis of the relationship between financial development and economic growth in Central and Eastern Europe. Importance of the topic is shown by the scale and speed with which financial problems have spread to the real economy after 2007. Financial development is measured by indicators related to banking system as banks in transition economies have absolute majority in financial intermediation. Research methodology is explained in the third part of the paper. Part two summarizes the literature reference underlying this study. The fourth part presents the analysis model and its results. The last part is devoted to discussions and conclusions.

2. Theoretical references

Numerous empirical studies are focused on the relationship between financial development and economic growth. Since this paper's topic is Central and Eastern, will be further synthesized reference studies that have investigated these countries.

To measure financial development, these studies are using both (1) quantitative indicators such as the rate of monetization, financial intermediation ratio, the ratio deposits/GDP, ratio loans to private enterprises/total domestic credit, etc., and (2) qualitative indicators such as interest margin, the ratio of loan/deposit, the level of nonperforming loans in total loans, etc.

Thus, King and Levine (1993) study the relationship between financial development and economic growth for a number of 80 countries for the period 1960 to 1989. The indicators built to measure financial development are: the ratio of liquid liabilities of the financial system/GDP (the ratio of liquid liabilities of the financial system to GDP), the ratio of deposit money bank domestic assets/ domestic assets of deposit money bank domestic assets of the bank + central (the ratio of deposit money bank domestic assets to deposit money bank plus central bank domestic assets), the report of claims on non-financial private sector/total domestic credit (the ratio of claims on nonfinancial private sector to the total domestic credit) and report of claims on non-financial private sector/GDP (the

ratio of claims on nonfinancial private sector to GDP the). Economic growth is measured by: real GDP per capita growth (real per capita GDP growth), the rate of accumulation of physical capital (the rate of physical capital accumulation), the report of domestic investment/GDP ratio (the ratio of domestic investment to GDP) and a residual measure which includes all the other factors that may influence real GDP growth (mainly capital allocation efficiency). The two researchers concluded that financial development indicators are strongly correlated with indicators of economic growth.

Graff (1999) tests on a sample of 93 countries for the period between 1970 to 1990 (divided into subperiods of five years), the hypothesis that financial development is a determinant of economic growth. Financial development is measured by the share of resources that society spends for its financial operation ("the share of resources a society devotes to run its financial system"). That percentage is a composite indicator constructed from the perspective that organizational mechanisms of financial transactions have as main purpose saving transaction costs. The indicator construction was done by transforming specific methods as explained in the article, the information on the proportion of workers employed in the financial sector in the GDP share of the financial system and the number of banks and branches per capita, so that they become comparable between different countries and periods. The author concludes that the financial sector is important, especially for less developed countries. In addition, the impact on growth of the financial sector can be both positive and negative, depending on the period.

Jaffee and Levonian (2001) in their paper assess the state of banking system development in 23 transition economies of Central and Eastern Europe and the former USSR. Level of development is measured by reference to 26 developed countries from OECD, considered to be reached the effective balance (for 1995). Compared to OECD countries, the authors conclude that "the banking systems in the transition countries have too many generally banks and relatively low total banking assets". In studying the relationship between banking structure and GDP per capita, both are based on the assumption that GDP increases more quickly as economies in transition are closer to the developed countries. The study convergence with developed countries in terms of number of banks (bank called ratio) and EBRD banking rating (measured by the EBRD Bank Reform Index) positively affects GDP growth.

Koivu (2002) conducted an empirical study on 25 transition economies, including Romania, for the period 1993 to 2000, and showed that there is a strong negative relationship between interest margin, on one side, and the annual GDP growth, on the other hand. Private credit growth was not found relevant for growth, finding explained by the author by crises crossed by the banking systems in transition economies over the period analyzed and soft lending criteria that led to contaproductive loans.

Fink, Haissam and Vukšić (2005) used the model of the production function to study the relationship between financial development and economic growth on the example of nine transition countries, including Romania, during 1996 to 2000. They built two aggregate indicators of total financial development as the sum of domestic credit/private credit, stock market capitalization (stock market capitalization) and total issuance of bonds (bonds outstanding). According to them, both indicators of financial development are significant (at a 5% or 10% level) and positively correlated with GDP growth, if they are introduced in the regression with a delay of one or two years. Domestic credit is also found relevant and positively correlated, the significance level is best for the delay of two years, except for the one year. Instead, the authors show that private credit growth is not significant. They explain intuitively meaningful difference between private credit and domestic credit in that the latter includes loans to public entities, characterized by a very low rate of cessation of payments.

Haissam and Kichler (2009) conducted a comprehensive study in which they "investigated the interdependence of the financial sector - growth" ("the finance-growth nexus") in a sample of 10 countries in Central and Eastern Europe, including Romania, along period 1999 to 2006. The two have added to financial development indicators used by Fink, Haissam and Vukšić (2005) the volume of leasing. Using annual data in a panel model, the authors show that bad loans have a strong and significant negative impact on the growth of GDP per capita. In addition, other indicators identified as slightly but significantly negatively correlated with economic growth are M3 and two aggregate indicators of financial development. Domestic credit and private credit were found to be slightly positively correlated with economic growth if they are introduced in the regression with a delay of two years, meaning the higher domestic credit.

Cojocaru, Hoffman and Miller (2011) demonstrated in 25 CEE and CIS countries (including Romania) for the period 1990 to 2008, that there is a significant positive relationship between credit to the private sector (as a percentage of GDP) and GDP growth and a negative correlation between interest rate spread and GDP.

3. Methodology

This paper empirically examines the relationship between financial development (independent variables) and economic growth (dependent variable) in the countries of Central and Eastern States. We chose the study of Central and Eastern considered emerging economies characterized by the transition. These are: Bulgaria, Estonia, Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania. Slovenia and Slovakia were excluded from analysis due to incompleteness of data series available. To measure financial development it's used quantitative indicators

as broad money growth (annual%), domestic credit to private sector (% GDP), interest rate spread quantitative indicators (lending rate minus deposit rate,%) and nonperforming loans (% total loans) as they are defined in the World Bank statistics. For economic growth we used the rate of economic growth (annual%).

The relationships between dependent variable and independent variables are analyzed following periods (annual data series):

- 2000 - 2011 for the impact of nonperforming loans to GDP growth due to lack of data for 1996 to 1999.
- 1996 - 2011 for the other independent variables, on the one hand, and GDP growth, on the other. Limiting the analysis to 1996 was imposed by the absence of comparable data for the variable domestic credit to private sector (% GDP).

Assumptions that starts are:

(H1) Nonperforming loans have a negative impact on economic growth.

(H2) Interest rate spread has a negative impact on economic growth.

(H3) Broad money growth has a positive impact on economic growth.

(H4) Domestic credit to private sector has a positive impact on economic growth.

Data are taken from the World Bank website, with two exceptions. In Poland for the period 2007 - 2011, data on interest rate spreads come from the Central Bank of Poland. For Lithuania, the interest rate spread data for the period 2010 - 2011 come from the Central Bank of the country.

The used method of analysis is that of econometric modelling with EViews 7.0. programme. This software allows the analysis of data into a pannel type system, involving a mix of periods of time and series of data for different entities. More exactly, we associate independent variables specified dependent variable. Equation which is based on this model is:

$$\text{GDPcap}_{i,t} = \beta + \alpha_{i,t} X_{i,t} + \delta_{i,t} + \gamma_{i,t} + \varepsilon_{i,t},$$

where

$\text{GDPcap}_{i,t}$ is the dependent variable and shows the real growth in country i at time t ;

β is the coefficient for constant term;

$X_{i,t}$ is the vector of explanatory variables of the model;

$\alpha_{i,t}$ is the coefficient of explanatory variables (NonperformantCR, Private_credit, M2_growth, Interest_rate_spread);

$\varepsilon_{i,t}$ are error terms, random variables;

$\delta_{i,t}$ and $\gamma_{i,t}$ are the values of cross-section or period specific effects (random or fixed);

i indicates country on which to make regression (EU members countries of Central and Eastern Europe: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania);

t indicates the year (2000-2011 for NonperformantCR and 1996-2011).

We opted for the construction of four scenarios to better capture the dependence relationship between economic growth and financial development for the eight countries selected for the study. Difficulties may arise in the analysis of the statistical system transition countries studied due to the introduction of market concepts, and to several methodological changes. Another reason for the difficulty is that the analyzed data series is not very long.

First we tested whether the model is valid using T test and F test. Another test used is R^2 which tests on whether the regression model is well specified. It shows what percentage of the total variance of the dependent variable is due to the independent variables. Then we resorted to testing the chosen method: the fixed effects method and random effects method. To do this we used the Hausman test which tests if the orthogonality assumption is violated in the case of fixed effects method. If the regressors are correlated with the error term, then the estimation of fixed effects method is consistent while the method of random effects estimation is not. Free term using fixed effects may vary across countries but vary over time, while slope coefficients are assumed to be constant across countries. This method assumes that the free term is deterministic that means it is correlated with covariates (regressors vector) and is based on internal estimation that means each observation is inside the country "i" over the entire period. In contrast, random effects method assumes that the free term is stochastic (random), that means it is uncorrelated with the variables and it is included in the error term. This test compares the estimates made in the case of fixed effects and random effects. If there are fixed effects, Hausman test tests the hypothesis H_0 : fixed effects approach would be consistent and efficient versus H_1 : random effects method would be inconsistent. Test is a vector of dimension k which will be distributed chi-square (k). If the test statistic is large, then the fixed effects method should be chosen, and if the test statistic is small then you must choose random effects method. Another test used is AIC. AIC is a measure of the relative "goodness" of a model compatibility. It provides a relative measure of loss of information when a model is used to describe reality. The results of the model are described in the next section.

4. Scenarios for testing dependency relationship between economic growth and financial development

As shown in the previous section, four scenarios were conducted to better capture the dependence relationship between economic growth and financial development for the eight countries selected for the study. Analysis results are presented in Table 1.

Table 1. Scenarios for testing dependency relationship between economic growth and financial development

Variable	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Non-performant CR	-0.32 (-5.123***)	X	X	X
Private_credit_% GDP	X	-0.066 (-2.63***)	-0.066 (-2.68***)	X
Private_credit_growth%GDP	X	X	X	0.052 (2.86***)
M2_growth	X	0.0011 (0.08)	X	0.027 (1.84*)
Interest rate_spread	X	-0.055 (-2.73***)	-0.0545 (-3.89***)	-0.088 (-4.50***)
Constant	6.05 (12.11***)	6.98 (4.40***)	7.01 (6.41***)	2.95 (5.59***)
R ²	0.284	0.287	0.288	0.2927
Ajustat R ²	0.21	0.226	0.234	0.2322
AIC	4.98	5.270	5.25	5.25
Chi-squared	4.97 (0.0258)	3.69 (0.29)	1.36 (0.50)	2.38 (0.49)
F-statistic	4.3269 (0.0000)	4.71 (0.0000)	5.31 (0.0000)	4.8423 (0.0008)
Number of observations	96 ⁽²⁾	128	128	128 ⁽³⁾
Number of groups	8	8	8	8

Source: own processing.

Notes: * significant at $p < 0.1$, ** $p < 0.05$, *** $p < 0.001$.

⁽²⁾ period is 2000-2011.

⁽³⁾ period is 1996-2011.

Scenario 1 tests the dependency relationship between economic growth and bad loans. Period is relatively short, 2000 – 2011, due to lack of data. The data analysis showed that the model is valid. The dependent variable of the model which is growth rate is explained of 28.4% by nonperforming loans, between the two variables being an inverse relationship which shows that an increase of one unit of the non-performing loan credit the economic growth falls by 0.32 units. All other tests show that the dependence relationship is statistically significant as well as Hausman test method showed fixed effects across countries and random effects method at level of the years. The same result has been obtained for Hausman test and for the following three scenarios. That hypothesis H1 is true for the eight countries surveyed.

Scenario 2 tests the dependency relationship between growth and the share of private credit to GDP, money supply growth and interest rate spread. Due to data availability for the following three scenarios we chose the study period 1996-2011. According to T test the the share of private credit to GDP and interest rate spread have a high degree of significance (p -value $< 1\%$) and M2 growth is not

significant, so we opted for its elimination in the third scenario. Private credit and economic growth are in an inverse relationship that means that an increase in private credit by one unit leads to a decrease of 0.066 units of the dependent variable which contradicts the hypothesis H4. Direct relationship exists for broad money growth and shows that an increase of one unit of this variable leads to an increase of 0.0011 units of the dependent variable for the model but this variable is not significant, so H3 is not checked. Between interest rate spread and economic growth rate the model shows an inverse relationship which shows that an increase in interest rate margin with a unit drives a decrease of economic growth by 0.055 units. That hypothesis H2 is true for the eight countries surveyed. We then went on to analyze the data from the third scenario.

Scenario 3 tests the dependency relationship between growth and the share of private credit to GDP and interest rate spread. We chose testing this relationship because we wanted to eliminate every hypothesis that the variable given by the increase in money supply can cause errors in the model and for this reason the share of private credit to GDP could be negatively correlated with growth variable, but the results contradict this given hypothesis H4. Although in this case we found that having a high significance for model variables "private credit growth" and "interest rate spread" because the results contradict the hypothesis we opted to replace in the scenario 4 the variable "share of private credit to GDP" with the variable "private credit to GDP percentage growth".

Scenario 4 tests the dependency relationship between economic growth and private credit growth, money growth and interest rate spread. This scenario shows a coefficient of determination of 29.27% which indicates that the dependent variable of the model, economic growth, is explained in the proportion of 29.27% by the independent variables. AIC test has a good value compared to other scenarios. T and F test show that the model is well specified. According to T test variables private credit growth and interest rate spread have a high degree of significance (p-value <1%) and money growth is significant but with a higher model weak (p-value <10%). In terms of economic theory and of econometrics, this scenario is preferable to other scenarios. At the level of this scenario, private credit growth is directly related to economic growth which shows that an increase of one unit of private credit increases the dependent variable by 0.052 units. The same direct relationship exists between the growth of money supply and economic growth and a change of one unit of money supply leads to a change in the same direction and of 0.027 units of the economic growth. Regarding the interest rate spread the relationship is negative and a change of it by one unit leads to a change in an opposite direction of economic growth with 0.088 units. Compared with the other scenarios, this one records the best values on tests used.

5. Conclusions and discussions

This paper analyzes the relationship between the banking sector and economic growth in Central and Eastern Europe, using public data available on the website of the World Bank for the period 1996-2011 and 2000-2011 for the independent variable nonperforming loans. The main conclusions of the study are: (1) bad loans have a significant negative impact and rather large on economic growth, (2) interest rate spread is significant for growth and negatively correlated with it, (3) increasing the share of domestic credit to the private adversely affects negatively the GDP growth, (4) the rate of growth of private credit (as a percentage of GDP) is significantly and positively correlated with GDP growth, (5) when the indicator the increase in private credit to GDP is replaced with its growth rate, the variable money supply growth (M2) becomes partially significant for economic growth and correlated slightly positive with it.

Some of the conclusions of the paper are similar to the results of the studies cited in the literature reference. Thus, Haissam and Kichler (2009) identifies as well a strong negative relationship between growth and bad loans. Koivu (2002) and Cojocaru, Hoffman and Miller (2011) find a significant negative relationship between interest rate spread and GDP growth. However, the studies investigated are not converging regarding the influence of private sector credit and broad money to GDP. Contrary to other studies (such as Cojocaru, Hoffman and Miller, 2011), this one highlights the fact that economic growth is negatively influenced by credit growth to the private sector, comparing data for the same year. A first explanation may come from the potential endogenous nature of private credit, especially since the data were correlated for the same year without any delay. For example, Haissam and Kichler (2009) have found that there is a positive influence of private credit to GDP if it is introduced in regression with two-year lag. The fact that the result might change if entered for this indicator lags by one or two years is suggested by the results obtained when he was replaced with its annual growth (scenario 4). On the other hand, another explanation for the negative relationship may lie in banking crises crossed by countries in the region during 1996 - 2000 and the effective allocation and use of loans to/private sector.

For example, Mehl et al. (2006), cited by Cojocaru, Hoffman and Miller (2011), identifies also a significant negative effect of private credit easier for the countries of South-Eastern Europe and argues that the influence of the financial sector depends on the quality of the economic environment. Hagmayr and Haissam (2007), quoted in Haissam and Kichler (2009), identified the example of four transition countries of South-Eastern significant negative impact on the growth of private credit to GDP. In contrast, in the same work, the impact on growth of domestic credit changes sign from negative to positive when switching from 0 lag

delays of one or two years. A third explanation for the negative effect may be low level of financial intermediation in the countries analyzed. For example, D'Alfonso and Moretti (2012) show in their paper that the ratio private credit/GDP exerts a statistically significant negative influence on economic growth in that countries in which this independent variable is low (below 40%). Therefore, a natural continuation of this research is to introduce lags banking development indicators. In addition, another future research development refers to the introduction of additional indicators such as domestic credit, the share of foreign banks in total assets, the annual number of changes in banking laws rules (as an indicator of institutional stability of the banking system) and the extension research on a larger number of countries grouped by level of development.

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