Financial Intermediation and Economic Growth: Evidence from the Baltic countries[¤]

Albina Soultanaeva
Department of Economics, Umeå University
SE-901 87 Umeå, Sweden

Abstract

The hypothesis that financial development promotes economic growth is largely supported by empirical studies. This hypothesis is tested for the three Baltic countries using a time series approach that allows for interactions between the three countries. We find that economic growth is a positive function of financial development, proxied by banking credit available to private sector, in the long run. The results also show that there are long run interactions between the three Baltic countries.

Key Words: Cointegration; Spillovers; Financial development; Emerging markets
JEL Classification: O16; C32; F43

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1 Introduction

The relationship between financial development and economic growth has essentially become a commonly accepted fact. In general, there are several channels through which financial development can affect economic growth (for a survey see, e.g., Pagano 1993; Levine, 1997). First, the financial sector promotes accumulation of capital, which is an important condition for economic growth. In practice, this means that a more efficient financial system reduces the loss of resources required to allocate capital, i.e. lowers the transaction costs. Second, along with its effect on capital accumulation, there are a number of channels through which financial development can raise the productivity of capital, i.e. contribute to technological progress. These channels are related to the function of financial intermediaries: (i) to evaluate and select the most profitable investment projects; (ii) to provide liquidity, which creates incentives to invest a larger share of savings in more profitable long term projects; and (iii) to provide a possibility for portfolio diversification, which allows individual agents to undertake riskier and more specialized investment projects.

Even though, the existence of a finance-growth relationship is generally recognized, the empirical results vary considerably across countries, depending on the institutional characteristics, market size, and the level of initial development (e.g., Rousseau and Wachtel, 1998; Fink et al., 2005).[1] The findings on the contribution of financial developments to economic growth in Central and Eastern Europe (CEE) are ambiguous (cf. Fink et al., 2009, for a survey). However, many previous studies used cross-country analysis that don't necessarily take into account the different country characteristics. According to Arestis et al. (2001), time series methods can provide useful insights into the differences in the finance-growth relationship across individual countries and may highlight important details that are hidden in averaged-out results from cross-country regressions. Also, Rousseau and Wachtel (2005) call for more studies on individual countries' experiences to gain insight into the role financial development plays for economic growth.

The purpose of this study is to contribute to the empirical evidence on the finance-growth relationship in the CEE countries. In particular, this study focuses on the three Baltic states that have received little attention in the previous literature; this being despite the fact that they experienced a period of high economic growth and rapid credit expansion

[1] The results on the finance-growth relationship may also vary due to estimation methods, variables, and data sets for different periods and countries; see, e.g., Levine (1997), Thiel (2001), and Beck (2008) for a review of the earlier literature.

facilitated primarily by foreign-owned banks during the several years prior to the financial crises of 2007-2008. We utilize a time-series approach to examine the relationship between financial sector development, proxied by the level of bank credit to the private sector, and economic growth in the Baltic countries over the period 1995-2008. In addition, since all three Baltic countries are likely to be closely interrelated, through, for example, trade between the countries and exposure to the same (primarily foreign-owned) banks, we allow for cross-country (i.e. cross-sectional) dependence in the empirical analysis.

2 Econometric Method and Data

Following Arestis et al. (2001) the empirical investigation is carried out using the Johansen method, see Johansen (1988, 1995). It is based on the vector error correction representation of a VAR(p) model:

$$\Delta \mathbf{X}_t = \Pi \mathbf{X}_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta \mathbf{X}_{t-i} + \Phi \mathbf{D}_t + \varepsilon_t, \qquad (1)$$

where $\mathbf{X}_t$ is an $n \times 1$ vector of I(1) variables, Δ is the first difference operator, Γ_i for $i = 1, \ldots, p-1$, is an $n \times n$ parameter matrix, and $\mathbf{D}_t$ is a set of I(0) deterministic variables such as a constant and seasonal dummies. The ε_t is a vector of i.i.d. errors with zero mean and constant variance. The variables employed in the empirical analysis are measured as in Arestis et al. (2001). That is, real economic growth is measured by the logarithm of real GDP ($\ln Y$). The banking system's development, used as a proxy for financial development or financial depth, is measured by a logarithm of the ratio of commercial bank credit to the private sector to nominal GDP ($\ln C$).[2] We employ quarterly data on output and indicators for credit growth for Latvia, Estonia, and Lithuania during 1995Q1 -2008Q1.[3] Seasonality in data is dealt with using (centered) seasonal dummies.[4]

Also, evidence from the panel unit root/cointegration literature suggests that ignoring

[2] Several other indicators of financial sector depth have been utilized in the previous literature, including, for instance, deposit based measures that are primarily applicable for countries in their first stage of development (e.g., Hondroyiannis et al., 2005). Credit-based variables are chosen in this study since in many emerging countries, including the Baltic states, the banking sector is often the only provider of financial intermediation, in contrast to the developed economies that have a wide range of market oriented institutions (e.g., Wachtel, 2003).

[3] In view of the small data sample, other explanatory variables are not included to save degrees of freedom.

[4] For instance, let $d_{j,t}$ be a centered seasonal dummy, then it takes on the value of 0.75 in quarter j and -0.25 in the other quarters, and has therefore mean zero over a full year.

cross-sectional dependence can have a major influence on the statistical properties of the estimators and test statistics, see, e.g., Breitung and Pesaran (2008). Hence, we allow for cross-country (i.e. cross-sectional) dependence. In the empirical analysis the three countries are modelled jointly, i.e. $\mathbf{X}_t = [\ln Y_t^{Lat}, \ln Y_t^{Est}, \ln Y_t^{Lit}, \ln C_t^{Lat}, \ln C_t^{Est}, \ln C_t^{Lit}]'$, where the superscripts stand for Latvia, Estonia, and Lithuania, respectively.

The Johansen (1988) test procedure can be used to test the null hypothesis of r cointegration relations. If $r = 0$, then $\Pi = 0$, and the variables are not cointegrated. If there exists r cointegration relations, $0 < r < n$, it implies that Π is rank-deficient and can be decomposed into two matrices, α ($n \times r$) and β ($r \times n$), such that $\Pi = \alpha\beta'$. Equation (1) can be rewritten as:

$$\Delta \mathbf{X}_t = \alpha\beta' \mathbf{X}_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta \mathbf{X}_{t-i} + \Phi_t \mathbf{D}_t + \varepsilon_t, \qquad (2)$$

where the rows of β can be interpreted as the distinct cointegrating vectors, i.e. the long run relationships between the variables in $\mathbf{X}_t$. The coefficients in the α matrix indicate the speed of adjustment toward the long run equilibrium. Finally, if $r = n$ then Π is of full rank, and the variables in $\mathbf{X}_t$ are stationary, i.e. $I(0)$.

Using the above framework we test also whether there are any causal flows in the long run relationship between the variables in $\mathbf{X}_t$. A test of zero restrictions on the α in Equation (2) corresponds to a test of weak exogeneity, which in a cointegrated systems equals the long run causality.[5] Due to the small data sample a bootstrap procedure is utilized for inference purposes.[6]

3 Results

The examination of the long run relationship between the variables is carried out in several steps. First, since a VAR framework depends on the time series characteristics of the data set, we test for the presence of a unit root. The Augmented Dickey-Fuller (ADF) tests suggest that all variables are $I(1)$. Second, a VAR (4) model in levels is estimated and Schwarz Information Criterion (SC) is used to decide upon lag length. In order to allow for any deterministic seasonality, centered quarterly dummies are included throughout the

[5] The null hypothesis of $\alpha_{ij} = 0$ can be tested by an LR test which follows a standard χ^2-distribution in large samples. If the null hypothesis of $\alpha_{ij} = 0$ is rejected, then there is long run causality, see, e.g., Granger and Lin (1995).

[6] See, e.g., Li and Maddala (1997), who demonstrate that the bootstrap can provide significant improvement, as the cointegration test has poor small sample properties.

estimation. SC indicates that the second-order VAR model (in levels) is appropriate, which implies one lag in differences. A visual inspection of the autocorrelation functions of the estimated VAR residuals show no remaining serial correlation, indicating the adequacy of the VAR lag length.

Second, the existence and number of cointegration vectors is tested using the Johansen maximum likelihood approach. The results of the sequential likelihood ratio (LR) tests are presented in the Table 1, where recursive bootstrap p-values (as in Li and Maddala, 1997) are displayed. The LR test results and the bootstrap p-values indicate that there exist three cointegrating vectors.

Table 1: Test statistics and cointegration results (the p-values are the recursive bootstrap p-values as in Li and Maddala, 1997).

Null	Alternative	LR	p-value
$r = 0$	$r = 6$	220.75*	<0.001
$r \cdot 1$	$r = 6$	143.34*	<0.001
$r \cdot 2$	$r = 6$	80.42	0.003
$r \cdot 3$	$r = 6$	38.44	0.128
$r \cdot 4$	$r = 6$	17.46	0.193
$r \cdot 5$	$r = 6$	23.29	0.376

r indicates the number of cointegrating vectors.

* indicates rejection of the null hypothesis at 5% level.

Next, we estimate the long run relationship in all three countries simultaneously. In order to find the long run relationship, each cointegrating vector is normalized on the economic growth variables ($\ln Y$). As noted earlier, during the modelling procedure we allow for cross-country effects in the long run relationship. However, we exclude parameters that are close to zero and not significantly different from zero. The final specification for the $^{-}$ matrix, as favored by an LR test is presented in Equation (3) below.[7] The LR test is χ^2 distributed with 3 df with the bootstrapped p-value of 0.185.

[7] Other model specifications, including the block diagonal β, were tested, but rejected using the asymptotic and the bootstrapped p-values.

$$\Pi = \alpha\beta' = \begin{pmatrix} -0.90 & 1.01 & -0.57 \\ (0.08) & (0.12) & (0.06) \\ 0 & 0 & 0 \\ -0.48 & 0.94 & -0.49 \\ (0.14) & (0.19) & (0.09) \\ 0 & 1.64 & 0 \\ & (0.28) & \\ 0.56 & 0 & 0 \\ (0.10) & & \\ 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ -0.32 & -0.22 & 0 \\ (0.02) & (0.01) & \\ -0.30 & -0.15 & 0 \\ (0.03) & (0.02) & \\ 0.26 & 0 & -0.44 \\ (0.02) & & (0.03) \end{pmatrix} \quad (3)$$

Finally, given the estimated β matrix we evaluate the causal relationship between the financial development and economic growth by weak exogeneity tests. The results are reported in Table 2. Note that for each country, we test the weak exogeneity of economic growth (financial development) in all three countries. For example, if the null hypothesis of weak exogeneity of $\ln Y$ is rejected for Latvia, then financial development in all three Baltic countries affects the economic growth in Latvia in the long run. The bootstrap p-values for the weak exogeneity test of $\ln C$ for Latvia and Estonia are 0.02, indicating that some of the parameters may be zero. Hence, in the final specification we exclude parameters that are not significantly different from zero. The final specification (without presenting deterministic terms, short run dynamics and error terms), as favored by the LR test is displayed in Equation (3). The joint LR test of all the restrictions on α yields a test statistic of 29.53, which is asymptotically χ^2 with 10 df. The bootstrap p-value is 0.113, which indicates that the restrictions cannot be rejected.

Table 2: Results of weak exogeneity tests (the p-values are the recursive bootstrap p-values as in Li and Maddala, 1997).

Null hypothesis:	$\ln Y$ is weakly exogenous		$\ln C$ is weakly exogenous	
	LR	p-value	LR	p-value
Latvia	34.88*	0.01	20.79*	0.02
Estonia	1.60	0.78	16.42	0.02
Lithuania	24.07*	$<$0.001	12.80*	0.06

* indicates rejection of the null hypothesis at 5% level.

For the long run relationship, the estimation results yield negative parameter estimates of the diagonal elements in the β matrix (i.e. β_{11}, β_{22} and β_{33}). This is consistent with the theoretical reasoning and several empirical studies (e.g., Arestis et al., 2001; Hondroyiannis

et al., 2005) that found a positive long run relationship between economic growth and the level of financial intermediation. Also, the results indicate that there is some long run interaction between the three Baltic countries, as indicated by the o¤-diagonal elements in the $^{-}$ matrix. However, the long run relationship in Lithuania seems to be autonomous with respect to two other Baltic countries. This fact is supported by the findings of Fadejeva and Melihovs (2008) who find that even though Baltic countries share a common pattern in GDP growth, Lithuania exhibits some discrepancies in the economic structure. Economic growth in Estonia is, on the other side, a¤ected by the credit development in the own country as well as in Latvia in the long run. Economic growth in Latvia is determined in the long run by the level of credit in all three countries.

Turning to weak exogeneity tests, our results show that the null hypothesis of weak exogeneity of economic growth ($\ln Y$) in Latvia and Lithuania is rejected at the 5 percent significance level. This means that the level of credit in all three Baltic states a¤ects economic growth in the long run in those two countries. The results are consistent with several previous studies that found evidence for the "finance causes growth" view (e.g., Calderon and Liu, 2003; Kenourgious and Samitas, 2007; Caporale et al., 2009). However, in Estonia, economic growth is not a¤ected by the credit growth in the three Baltic countries (i.e. is determined outside the model). Our findings of no causality from credit growth to the economic growth in Estonia could, in part, depend on the fact that compared to Latvia and Lithuania. the credit to private sector consisted to a greater extent of household lending (primarily mortgages) rather than resources allocated to productive investments (see Caporale et al., 2009, for more details).

For the weak exogeneity of credit variables, the null hypothesis of weak exogeneity of financial intermediation cannot be rejected at the 5 percent significance level for Lithuania. Thus, the results suggest that economic growth in the Baltic States does not cause financial development in Lithuania in the long run. In other words, for Lithuania, we find only a unidirectional causal relationship from financial development ($\ln C$) to economic growth ($\ln Y$) in the long run.

Next, in order to illustrate the e¤ect of the economic integration (i.e. spillovers) between the three Baltic countries and short run dynamics in more detail, we consider impulse responses. In Figure 1, some selected impulse responses based on Equation (3) are displayed. These are responses to non-factorized one unit standard deviations shock in economic growth, $\ln Y,$ in Estonia. According to the impulse responses, economic growth in Latvia and Lithuania reacts positively to a shock in economic growth in Estonia. This

could in part depend on the trade pattern between the countries. For instance, by the end of 2008, about 17 percent of the Estonian exports was to the other two Baltic countries. The corresponding number for Lithuania was 19 percent, whereas for Latvia about 30 percent of exports was to the two neighboring countries. Also the credit development in Latvia and Lithuania responds positively to a shock in economic growth in Estonia, where the impact on credit development in Latvia is the largest. This can be explained by the fact that foreign-owned banks reallocate capital over di¤erent geographical regions on the basis of expected returns and risks. Since economic growth in Latvia and Lithuania reacts positively to a shock in economic growth in Estonia, such a shock may induce the subsidiaries of foreign banks to expand their activity in the other two countries as well.

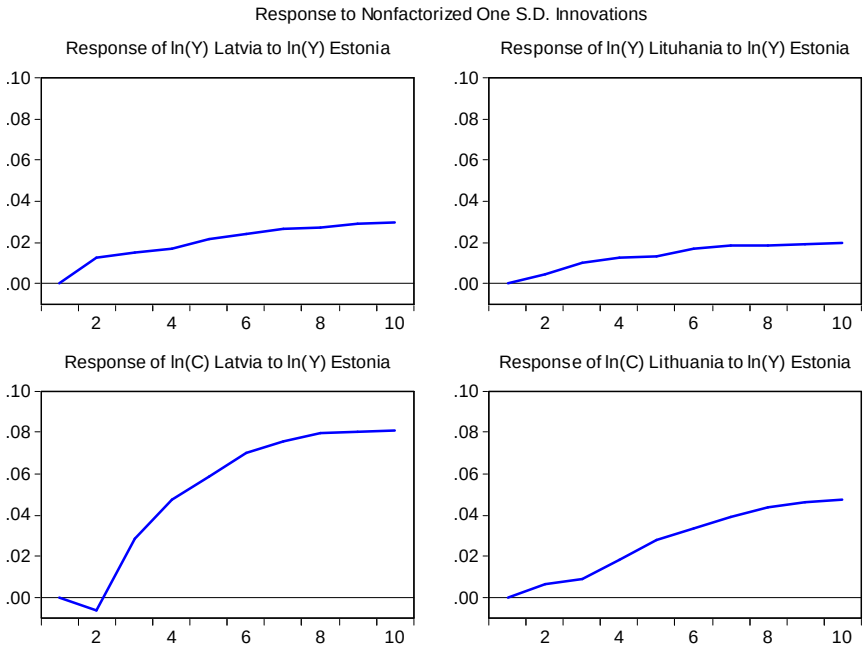

Figure 1: Impulse responses to one unit standard deviation shock in economic growth in Estonia.

4 Concluding Remarks

Previously, several studies found that there is no strong relationship between financial development and economic growth for economies in transition during the early 1990s (e.g., Berglöf and Bolton, 2002; Dawson, 2003). However, this relationship can vary depending on the level of financial development in a county or region (e.g., Rioja and Valev, 2004). During the several years prior to the financial crises of 2007-2008, many of the Central

and Eastern European (CEE) countries, including the Baltic countries, experienced a period of high economic growth and a rapid expansion of credit facilitated primarily by foreign-owned banks. Considering the economic development in the Baltic countries during 1995-2008, we find support for the view that the banking sector development can cause economic growth in the long run (cf. Kenourgious and Samitas, 2007; Caporale, et al., 2009, for similar results for a selection of CEE countries). This is also consistent with the findings of Bonin et al. (2005), that suggest that in transition countries foreign-owned banks provide better service and are more cost-efficient than other banks, and hence, can have a larger impact of capital accumulation or productivity of capital.

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