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Article

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Central European Economic Journal

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The Effect of Financial Development on Economic Growth among the Central and Eastern European Countries

Abstract
To control for the endogeneity problem, this study applies the two-stage least squares technique to examine the impact of bank and stock market development on economic growth in the thirteen Central and Eastern European (CEE) countries in the European Union (EU) during 2001-2020. The first hypothesis states that the higher bank development has not contributed to higher growth in the CEE countries. The overall results only support the hypothesis for the subperiod of 2001-2009. The second hypothesis states that the higher stock market development has not spurred growth in the CEE countries. The overall results support the hypothesis over the entire period of 2001-2020. Finally, despite the CEE integration with the EU developed countries for the past decades, there is a very limited number of empirical studies on the finance–growth relationship in the CEE countries. This study contributes to the relevant literature by examining the bank and stock market development's relationship with growth in the CEE developing countries.

Keywords
economic growth | bank | financial market

JEL Codes
O40; G21; G10

1. Introduction

Previous studies found a strong relationship between financial development and economic growth in the European Union (EU) developed countries. Both banks and stock markets have played a crucial role in contributing to their high growth for decades. Since the EU accession in 2004, the Central and Eastern European (CEE) countries have restructured their banking sectors and stock markets to attract more investment from the EU developed countries. In particular, they have experienced a surge in bank capital inflows because of the extensive EU bank entry (Raguideau-Hannotin, 2023). Meanwhile, the eight CEE countries that joined the eurozone membership during 2007-2023 have further transformed their financial markets through major regulatory changes (Georgantopoulos et al., 2015). More efficient banks and stock markets have provided more financing for productive investment to boost growth. It is important to examine whether the strong finance–growth relationship for the EU developed countries has existed in the CEE countries.

The objective of this study is to examine the relationship between financial development and growth among the thirteen CEE developing countries during 2001-2020. There are two hypotheses of this study. The first hypothesis states that the high bank development has not contributed to high growth in the CEE countries. Previous studies (King & Levine, 1993; Beck et al., 2000; Levine et al., 2000) found a positive relationship between bank development and growth. However, since five out of the thirteen CEE countries are not eurozone countries, they have not implemented a substantial banking sector transformation to meet the euro requirements. They should join the eurozone membership to undertake deeper bank reforms to improve their banking sector efficiency. The slow banking sector development has undermined its impact on growth. Moreover, the second hypothesis states that the high stock market development has not spurred growth in the CEE countries. Earlier studies (Levine & Zervos, 1998; Beck & Levine, 2004) confirmed a positive relationship between stock market development and growth. The CEE stock markets have become more integrated with those of the EU developed

countries since the EU accession. Despite this, their stock markets have remained less developed as they have not pursued much deeper reform to establish an effective regulatory and supervisory system. The lagging stock market development has weakened its effect on growth. The results of these hypotheses would convey whether more legal, regulatory, and policy reforms are necessary to boost the bank and stock market development's effect on growth.

This study contributes to the literature by examining the finance–growth relationship in the CEE developing countries. Most of the existing studies focus on the growth effects of bank and stock market development in the EU developed countries. For the past decades, banks and stock markets have become the crucial sources of growth for the CEE developing countries as they have become more integrated with their EU counterparts (Beck & Stanek, 2019). Both of these sectors have provided financing for productive investments. This in turn has accelerated their growth. Nonetheless, very few empirical studies have investigated the finance–growth linkage in the CEE countries. This study attempts to fill the literature gap by examining whether the higher bank and stock market development after the EU accession have facilitated growth in the CEE countries. Specifically, it improves on the previous studies by resolving the endogeneity problems of the explanatory variables for bank and stock market development. Moreover, the estimation includes more bank and stock market variables than previous studies to accurately measure their impact on growth.

The rest of the paper is organised as follows. The next section provides a literature review on the relationship between financial development and growth. Section 3 describes the estimation model and methodology for examining the finance–growth relationship. It also describes data sources. Section 4 presents the empirical results and discusses their relevance to the previous studies. Section 5 provides policy implications for financial development policies to boost growth. Section 6 summarises the main results and policy implications.

2. Literature Review

2.1 Relationship Between Financial Development and Economic Growth

A number of important empirical studies found the positive effects of bank and stock market development on growth. King and Levine (1993) argue that higher bank development is positively associated with higher current and future rates of growth, physical capital accumulation, and economic efficiency improvements in 80 countries during 1960-1989. They note that bank credit to private sectors and the commercial-central bank asset ratio are positively associated with growth, the rate of physical capital accumulation, and improvements in the efficiency of capital allocation. To improve the work by King and Levine (1993), Beck et al. (2000) reexamine the relationship between bank development and growth in 63 countries during 1960-1995. They resolve the potential biases problem caused by simultaneity or omitted variables including country-specific effects. As expected, both private credit and the commercial-central bank asset ratio have a large positive effect on long-term growth through boosting total factor productivity growth. Additionally, Levine et al., (2000) conduct a similar study on the bank development relationship with growth in 74 countries during 1960-1995. The results suggest that the three bank development indicators—the commercial-central bank asset ratio, private credit, and liquid liabilities—are positively correlated with growth. Arestis et al. (2001) shift the focus to the stock market development effect on growth in five developed countries (the United Kingdom, the United States, France, Germany, and Japan) during 1973-1998. They investigate the relationship between stock market development and growth by controlling for the effect of the banking system and stock market volatility. The results are rather mixed as the positive growth effect of stock market development is not confirmed among all five countries.

Levine and Zervos (1998) investigate both the stock market and bank development effect on current and future rates of growth in 47 countries during 1976-1993. They find that bank credit, stock market capitalisation, and liquidity indicators have a positive effect on growth. Further study by Beck and Levine (2004) examines the impact of stock market and bank development on growth in 40 countries during 1976-1998. To resolve the estimation problems in the previous studies, Beck and Levine (2004) use the new panel econometric techniques to reexamine the finance–growth relationship by controlling for simultaneity bias and omitted variable biases. Both stock market development measured by turnover and bank development measured by bank credit show a large positive effect on growth. In sum, the majority of these empirical studies confirm that bank and stock market development are crucial determinants

of growth. These results are very consistent with the assumption that well-functioning banks and stock markets can reduce information and transaction costs and thereby enhance efficient resource allocation and growth.

2.2 Relationship between Financial Development and Economic Growth in the EU Countries

Recent studies find both bank and stock market development to have a positive growth effect in the EU countries. Afonso and Blanco-Arana (2022) note a positive relationship between financial development and growth in the EU countries. A higher level of bank credit and stock market capitalisation would lead to higher growth. Further studies conclude that the stock market rather than the banking sector plays a more crucial role in driving EU growth. Both Sotiropoulou et al. (2019) and Asteriou et al. (2023) find that larger stock market size has a positive effect on EU growth. But the magnitude of this effect depends on the income level of the EU countries. In particular, Benczúr et al. (2019) confirm that higher levels of stock market financing would boost growth in high-income EU countries. Specifically, high stock market capitalisation would have substantial growth-enhancing effects in the EU countries with less developed stock markets. In contrast to stock market development, banking sector development has very limited effects on EU growth because of a lack of credit supply for enterprises. Prochniak and Wasiak (2017) found that higher levels of bank credit would contribute to higher EU growth. But an excessive supply of bank credit after financial liberalisation would likely be allocated to risky and unproductive investments. This in turn would lower growth in the long run.

Previous studies show very inconclusive evidence of bank and stock market development effects on growth in the CEE countries. An earlier study notes that financial development has an insignificant and weak growth effect in the EU countries including the CEE countries (Haiss et al., 2016). This can be explained by the short time frame of the study as it only covered the early stage of the CEE membership in the EU during 2004-2009. Since their financial markets have remained very underdeveloped during this period, the positive finance–growth relationship may not exist in these countries. Fetai (2018) confirms a positive finance–growth relationship as it covers a longer study period for 2004-2015. High financial development would boost growth because of substantial institutional improvement and higher competition (Fetai, 2018). Despite this, a few recent studies reported very mixed results for the finance–growth relationship. The stock market development has a very weak effect on growth in the CEE countries because their stock markets have remained rather underdeveloped. In contrast, the banking sector development has played a crucial role in promoting growth in the CEE countries due to the EU membership effect. They have experienced the massive bank entry from the EU developed countries since the late 1990s. This has led to a huge increase in the bank capital inflows (Raguideau-Hannotin, 2023). This, in turn, has provided more financing for productive investment to boost growth.

This study attempts to fill the literature gap by investigating the finance–growth relationship in the CEE developing countries during 2001-2020. Most of the previous studies include very large country samples of developed and developing countries. The results may not be applicable to all countries because of their different levels of economic development. To address this concern, this study only focuses on growth effects of bank and stock market development in the CEE developing countries. The results would provide very practical policy implications for financial development policies to further boost growth.

3. Econometric Specification

3.1 Estimation Model

The estimation model of this study examines the relationship between financial development and growth in the thirteen CEE developing countries. It investigates whether the higher banking sector and stock market development facilitated by the EU accession has promoted growth during 2001-2020. The estimation model is based on the gravity model developed by Linnemann (Linnemann, 1966). It states that bilateral trade flows are directly proportional to the product of the trading countries' gross domestic product (GDP) and inversely proportional to the distance between them. The estimation model modifies the gravity model to include the major bank and stock market development variables to measure their impact on CEE growth.

The regression equation is given as follows:

$$\log(GDPGrowthit) = \alpha + \beta_1 \log(Major\ Bank\ Developmentit) + \beta_2 \log(Major\ Stock\ Market\ Developmentit) + \beta_3 \log(Dbacbait) + \beta_4 \log(Bconcenit) + \beta_5 \log(Nploanit) + \beta_6 \log(Spvolit) + \beta_7 \log(Piedgdpit) + \beta_8 \log(Tradeit) + \beta_9 \log(Govdebtit) + \beta_{10} \log(Schenrit) + \beta_{11} \log(Fixcapfit) + \beta_{12} \log(Labparit) + \varepsilon it \quad (1)$$

where *GDPGrowthit* is the dependent variable measuring the growth rate of real GDP per capita of the CEE country *i* at year *t* (2001-2020). All variables are measured in US dollars adjusted for inflation to the base year 2005. The thirteen CEE countries in this study include Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, and Slovenia. In particular, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia joined the EU in 2004. While Bulgaria and Romania joined the EU in 2007, Croatia followed suit in 2013. The euro currency was adopted by eight CEE countries, namely Croatia in 2023, Cyprus in 2008, Estonia in 2011, Latvia in 2014, Lithuania in 2015, Malta in 2008, Slovakia in 2009, and Slovenia in 2007.

Previous studies suggest that well-functioning banks and stock markets would reduce information and transaction costs and thereby promote efficient resource allocation. This in turn would boost growth (King & Levine, 1993). This study proposes two hypotheses to assess the growth effects of bank and stock market development in the CEE countries. The first hypothesis states that the high bank development has not accelerated growth in the CEE countries. Previous studies (King & Levine, 1993; Beck et al., 2000; Levine et al., 2000) show a positive relationship between bank development and growth. However, the CEE countries have yet to build effective banking systems to facilitate higher growth since the EU accession in 2004. The estimation model of this study uses the bank development variable in Levine et al. (2000) to measure their relationship with growth. The model extends these studies by adding other bank development variables to better examine this relationship.

The second hypothesis states that the high stock market development has not spurred growth in the CEE countries. The relevant literature (Levine & Zervos, 1998; Beck & Levine, 2004) confirms a positive relationship between stock market development and growth. The CEE stock markets have become more integrated with those of the EU developed countries since the EU accession. Nonetheless, their stock market size and efficiency have not substantially increased for the past two decades. The estimation model of this study uses the stock market development variables in Levine and Zervos (1998) and Arestis et al. (2001) to measure their relationship with growth. The model also includes other stock market development variables to better assess this relationship.

To improve on the previous studies, the estimation model of this study addresses the endogeneity concerns of the independent variables in equation (1). As explained in Section 3.5 below, the model applies the two-stage least squares method to re-estimate the independent variables who are endogenous. The instrumental variables would replace the endogenous variables for re-estimation of equation (1). Second, to assess for the robustness of the results, the model includes additional bank and stock market variables that can predict growth. The results would indicate whether the finance–growth relationship remains very robust to the inclusion of different bank and stock market development variables in the estimations.

3.2 Description of the Bank Development Variables

The major bank development variables (*Major Bank Developmentit*) in equation (1) include the domestic credit (*Dcpriv*) and private credit (*Pcdmb*) variables. The model uses the domestic credit variable in Levine et al. (2000) to measure the bank development effect on growth. *Dcpriv* is equal to the amount of domestic credit being provided to the private sector divided by GDP. It excludes private credits issued by central banks to be provided to the public sector. It also excludes private credits provided to the public sector. Higher level of credit indicates high level of financial services and hence reflects high bank development (Levine et al., 2000). To test for robustness of the results, the model also includes another bank development variable, namely the private credit variable (*Pcdmb*). It refers to the amount of private credit provided by deposit money banks divided by GDP. It measures the credit allocation by private banks relative to the size of the economy (Compton & Giedeman, 2011). The banking sectors in the CEE countries have undergone transformation through the privatisation of state-owned banks and the extensive EU bank entry since the EU accession. More efficient banking sectors have provided a sufficient amount of bank

capitals for productive investment (Seven & Yetkiner, 2016). Similarly, the eight CEE countries joining the eurozone have received more bank capital inflows from the eurozone countries in Western Europe (Kalaitzoglou & Durgheu, 2016). Therefore, the high level of bank development as measured by *Dcpriv* and *Pcdmb* variables would have a positive effect on growth.

To provide better measures of bank development effect on growth, equation (1) also includes the three bank development variables, namely the ratio of commercial-central bank assets (*Dbacba*), bank concentration (*Bconcen*), and nonperforming loan (*Nploan*) variables. *Dbacba* indicates the ratio of deposit money bank assets divided by deposit money bank assets and central bank assets. The model uses the ratio of commercial-central bank asset variable in Levine et al. (2000) as it reflects the degree to which commercial banks versus the central banks allocate society's savings. Commercial banks are more effective than the central banks in allocating savings to productive investments. An increase in this ratio indicates an expansion of the banking sector (Levine et al., 2000). A higher value of this ratio would have a positive effect on growth. Second, the model also includes the bank concentration variable (*Bconcen*) to measure the level of bank development. It measures the share of bank assets controlled by the five largest banks. It reflects the degree of competition in the banking sector. Since the 1990s, the massive EU bank entry into the CEE countries has made the local banking markets much less concentrated. This has been facilitated by more EU bank entry into these countries after the EU accession in 2004. Foreign banks can provide more bank credits to developing countries which have rather limited availability of bank capitals (Mueller & Uhde, 2013). The lower level of bank concentration can boost growth as it would offer greater access to lower-cost financing. Conversely, the high level of bank concentration would have a negative effect on growth. Finally, the model includes the nonperforming loan variable (*Nploan*). It refers to the amount of bank nonperforming loans relative to the total amount of gross loans. The high level of nonperforming loans would result in lower spending and therefore hinder growth (Prochniak & Wasiak, 2017). It is worth pointing out that financial crisis would increase the amount of nonperforming loans which would further reduce the bank lending for profitable investment. This, in turn, would diminish growth. Therefore, the high level of nonperforming loans would have a negative effect on growth.

3.3 Description of the Stock Market Development Variables

The major stock market development variables (*Major Stock Market Developmentit*) in equation (1) include the stock traded value (*Stkval*), stock market turnover (*Stkturn*), and stock market capitalisation (*Stkcap*) variables. These three variables are drawn from Levine and Zervos (1998). Both the stock traded value (*Stkval*) and stock market turnover (*Stkturn*) variables measure the level of stock market liquidity, whereas the stock market capitalisation (*Stkcap*) variable measures the stock market size. The stock traded value variable (*Stkval*) captures trading relative to the size of the economy. In contrast, the stock market turnover variable (*Stkturn*) measures trading relative to the size of the stock market (Levine & Zervos, 1998). *Stkval* represents the ratio of the value of shares traded in the stock market to GDP. It measures the stock market liquidity. Higher value of *Stkval* reflects higher confidence of both individual and portfolio investors in stock markets (Seven & Yetkiner, 2016). Second, *Stkturn* is equal to the value of the traded shares in the domestic stock market divided by the total value of shares in the market. It measures how liquid the stock market is relative to its size. The high stock market liquidity indicates low transaction costs which would facilitate fund transfers and increase the number of firms and traded shares (Rousseau & Wachtel, 2000). Finally, *Stkcap* refers to the product of share price and the number of shares outstanding for all stocks traded on the stock markets. It measures the stock market size. It reflects the importance of financing through equity issues in the capital mobilisation and resource allocation process (Peia & Roszbach, 2015).

Most previous studies find that higher stock market development would boost growth in developed countries rather than developing countries because the former tends to have more liquid and larger stock markets (Seven & Yetkiner, 2016). These stock markets can provide more financing for profitable investment (Rapp & Udoieva, 2018). Hence, higher stock market development as measured by stock market liquidity and size would boost growth in the high-income EU countries (Asteriou et al., 2023). After the EU accession, the stock markets in the CEE developing countries have become more integrated with those in the EU developed countries. Nonetheless, they have experienced a very limited amount of capital inflows from the EU countries. The EU integration has not led to very substantial increase in their stock market liquidity and size. Therefore, the high level of stock

market development as measured by *Stkval*, *Stkturn*, and *Stkcap* would not have a positive effect on growth in the CEE countries.

The other stock market development variable in equation (1) includes the stock market volatility variable *(Spvol)*. The model uses the stock market volatility variable in Arestis et al. (2001) to measure the impact of stock price volatility on growth. *Spvol* reflects the stock price volatility. It is defined as the average of the 360-day volatility of the stock market index. Excessive stock price volatility would likely result in inefficient allocation of resources and upward pressures on interest rates. The reduction in the supply of capital flows to finance profitable investment would reduce growth (Arestis et al., 2001). Therefore, the high level of stock price volatility would have a negative effect on growth.

3.4 Description of the Control Variables

In addition to the bank and stock market variables, equation (1) includes three control variables that are often used in the finance–growth studies. These variables include *Piedgdp*, *Trade*, and *Govdebt*. First, *Piedgdp* is the portfolio investment variable. It refers to the total amount of portfolio investments in equity and debt divided by GDP. The increase in both portfolio equity and debt would provide greater access to capital funding. This would improve the quality of capital allocation and in turn boost growth (Orlowski, 2020). Hence, increase in the amount of portfolio investments would have a positive effect on growth. Second, *Trade* is the trade flow variable. It is equal to the sum of exports and imports of goods and services divided by GDP. It measures the degree of country openness. A country that is more open to international trade can grow more rapidly through expanding its markets and production efficiency. Hence, high trade flows would have a positive effect on growth. As a country becomes richer, the positive growth effect of trade would diminish. Therefore, the growth effect of trade may become negative for developed countries (Sotiropoulou et al., 2019). Finally, *Govdebt* is the government debt variable. It indicates the total government debt divided by GDP. A high level of government debt would crowd out private investment by diverting funds from capital markets for productive activities. This would also raise long-term interest rates. Moreover, governments with a high level of debt accumulation would likely raise distortionary taxes to fund debt payments and future liabilities (Salmon, 2021). Both higher interest rates and taxes would hinder growth. Therefore, high levels of government debt would have a negative effect on growth.

Finally, equation (1) includes four conventional variables (*Schenr*, *Fixcapf*, and *Labpar*) to explain their impact on growth. *Schenr* is the school enrolment variable. It is the proportion of the labour force that has a secondary school education as a percentage of the total labour force. It measures human capital investment in a country. Countries with a higher proportion of the labour force with secondary school enrolment would experience higher growth because these skilled labour forces would be favourable to development of advanced technology industries. Hence, high levels of school enrolment would have a positive effect on growth. Second, *Fixcapf* is the fixed capital formation variable. It refers to the gross fixed capital formation as a percentage of GDP. It measures the physical capital accumulation of a country. High domestic investment in capital accumulation would lead to improvement in production of goods and services. This would result in higher income and stimulate consumer demand. Hence, high levels of gross fixed capital formation would have a positive effect on growth. Finally, *Labpar* is the labour participation variable. It indicates the ratio of employed people to the total potential workforce of the economy. The labour force participation reflects the size of the labour supply available for production relative to the population at working age. High levels of labour supply for production would increase household income. This in turn would boost growth. Therefore, high levels of labour force participation would have a positive effect on growth.

3.5 Methodology

First, this study uses the Jarque Bera method to check whether the panel data are normally distributed. The results indicate that the panel data for the subperiods 2001-2009 and 2010-2020 are normally distributed. The p-values are larger than 0.05. This indicates that we cannot reject the null hypothesis of normal distribution. We conclude that the panel data for 2001-2009 and 2010-2020 are normally distributed. Second, this study applies the White Test to check whether heteroskedasticity problem exists in the panel data. The result shows no evidence of heteroskedasticity. The p-value is larger than

0.05. This indicates that we cannot reject the null hypothesis of no heteroskedasticity. We conclude that heteroskedasticity does not exist in the panel data. Third, this study conducts the correlation analysis to examine whether there is multicollinearity problem in the explanatory variables of equation (1). The results suggest that the population growth and liquid liabilities variables have multicollinearity problems. The variance inflation factors for the population growth and liquid liabilities variables are greater than 10. To resolve this problem, equation (1) is re-estimated by excluding both the population growth and liquid liabilities variables. The results are shown in Tables 1 to 3. Fourth, the estimation model would control for endogeneity problems in the explanatory variables of equation (1). To test whether the explanatory variables in equation (1) are endogenous, we estimate each explanatory variable as dependent variable and save the residual value. The estimation then includes the residual value as an independent variable. The results indicate that the portfolio investment and trade flow variables are endogenous because their p-values are significant (i.e., less than 0.05). The results indicate that the portfolio investment and trade flow variables are endogenous. To address this problem, this study uses the two-stage least squares (2SLS) method to re-estimate the portfolio investment and trade flow variables. The instrumental variables (IV) would replace the endogenous variables for re-estimation of equation (1). First, the IV for the portfolio investment variable (*Piedgdp*) include *Taxes* and *Savegdp*. *Taxes* refers to taxes on income, profits, and capital gains as a percentage of total taxes. Investors consider favourable tax rates in the CEE countries as a crucial factor for their portfolio investments. Lower tax rates would boost more portfolio investment inflows. *Savegdp* represents gross domestic savings divided by GDP. Domestic savings can complement portfolio investments as they can help finance domestic investment. More domestic savings would increase the demand for portfolio investment. A high level of domestic savings would have a positive impact on portfolio investment. Second, the IV for the trade flow variable (*Trade*) include *Labedu* and *Popsize*. *Labedu* refers to the labour force with an advanced education as a percentage of total working age population with an advanced education. It reflects the potential amount of skilled labour available for conducting advanced research in technology-intensive manufactured exports. A more educated labour force would facilitate higher production for such exports. Moreover, this would mean higher demand for imports as more educated labour force tends to be more receptive to imports with new product features. A higher proportion of educated labour force would have a positive impact on trade. *Popsize* refers to the total population size of a country which includes all residents regardless of their citizenship. A larger country can develop a comparative advantage in its export industry than a smaller country. Thus, a larger country can absorb more imports than a smaller country and experience economies of scale in production (Venables, 1987; Krugman, 1993). Hence, a larger population size would have a positive effect on trade. Finally, to test for the robustness of the 2SLS results, the estimation model includes two bank development variables (i.e., the domestic credit and private credit variables) and three stock market variables (i.e., the stock traded value, stock market turnover, and stock market capitalisation variables). Moreover, as mentioned in Sections 3.2 and 3.3 above, the model also includes additional bank and stock market development variables that can predict growth. The results would indicate whether the finance–growth relationship is robust to the inclusion of different bank and stock market development variables. The 2SLS results are shown in Tables 1 to 3.

3.6 Data Sources

All the data on the dependent, independent, and instrumental variables are obtained from the World Bank's World Development Indicators database. This study uses various data sources to complement the missing data for the bank development variables. The data on bank concentration variables are available at the International Monetary Fund (IMF)'s International Financial Statistics (IFS) and Global Financial Development (GFD) databases, respectively. The data on the nonperforming loan variable are drawn from the IMF's Global Financial Stability. Thus, the missing data of the government debt variables are obtained from the IMF's Historical Public Debt database. This study complements the data for the stock traded value and stock market capitalisation variables by using the data from the IMF's IFS. Finally, the data on the portfolio investment variables are available at the GFD database.

Table 1. Two-Stage Least Squares Results of the Financial Development Effects on Economic Growth in the CEE Countries

	(1)	**(2)**	**(3)**	**(4)**
	2001-2009	2010-2020	2001-2009	2010-2020
Stkval	0.0279	-0.0437	-0.1408**	-0.0491
	(0.4315)	(-0.9391)	(-1.9426)	(-1.0231)
Dcpriv	0.0606	-0.4499***		
	(1.0175)	(-3.4248)		
Pcdmb			-0.3248**	-0.4570***
			(-2.3032)	(-3.3549)
Dbacba	-1.9999	1.4189	-0.0855	1.5980*
	(-1.6025)	(1.6024)	(-0.0804)	(1.7710)
Bconcen	-0.0296	0.5550	-0.1422	0.5530***
	(-0.1770)	(2.5672)	(-1.0072)	(2.5406)
Nploan	-0.3140***	0.0599	-0.2237***	0.0819
	(-3.8467)	(0.6923)	(-3.0232)	(0.9310)
Spvol	0.0851	0.0079	-0.0994	0.0020
	(0.4024)	(0.0578)	(-0.5533)	(0.0144)
Piedgdp	-0.5334***	0.6957***	0.0127	0.7167***
	(-2.8929)	(2.4213)	(0.0574)	(2.3979)
Trade	-0.2776	-0.7259***	-0.2188	-0.7423***
	(-1.3819)	(-2.7822)	(-1.3293)	(-2.7770)
Govdebt	-0.2141**	-0.7115***	-0.2295***	-0.7201***
	(-2.0652)	(-2.5452)	(-2.7487)	(-2.5068)
Schenr	0.8366	0.3149	0.8428	0.3022
	(1.1637)	(0.4889)	(1.5320)	(0.4643)
Fixcapf	-1.1159***	-0.6334**	-0.0125	-0.6588**
	(-2.5669)	(-1.9972)	(-0.0261)	(-2.0638)
Labpar	0.3069	-2.4848**	-0.1845	-2.2212**
	(0.4463)	(-2.1713)	(-0.3457)	(-1.9387)
R^2	0.6034	0.3046	0.7324	0.2902
F-statistics	13.0521	4.9827	14.3749	4.8681
(p-value)	0.0000	0.0000	0.0000	0.0000
Observations	117	143	117	143

Notes: All variables are in logarithm. T-statistics are reported in parentheses.
***, **, and * indicate significance at 1%, 5%, and 10%.

Table 2. Two-Stage Least Squares Results of the Financial Development Effects on Economic Growth in the CEE Countries

	(1)	**(2)**	**(3)**	**(4)**
	2001-2009	2010-2020	2001-2009	2010-2020
Stkturn	-0.0421	-0.1669**	-0.1365**	-0.1688**
	(-0.6569)	(-1.9715)	(-2.1306)	(-1.9355)
Dcpriv	0.0292	-0.6210***		
	(0.3820)	(-3.6391)		
Pcdmb			-0.2684*	-0.6199***
			(-1.8761)	(-3.4461)
Dbacba	-2.3207*	1.5291*	-1.2782	1.6555*
	(-1.8469)	(1.7282)	(-1.2248)	(1.7873)
Bconcen	-0.0880	0.5349**	-0.2117	0.5275**
	(-0.4830)	(2.2907)	(-1.3767)	(2.1936)
Nploan	-0.3289***	-0.0043	-0.2616***	0.0391
	(-3.7076)	(-0.0419)	(-3.3350)	(0.3820)
Spvol	0.2725	0.2460	0.1383	0.2323
	(1.1714)	(1.3731)	(0.7102)	(1.2828)
Piedgdp	-0.5824***	1.0291***	-0.2131	1.0873***
	(-2.6631)	(2.9048)	(-0.9115)	(2.8358)
Trade	-0.0946	-0.9435***	-0.1065	-0.9925***
	(-0.4584)	(-3.2113)	(-0.6725)	(-3.1771)
Govdebt	-0.2286**	-0.9908***	-0.2667***	-1.0405***
	(-1.9251)	(-3.0541)	(-2.8137)	(-2.9811)
Schenr	1.2104	0.7771	1.2925**	0.7311
	(1.5523)	(1.0838)	(2.1729)	(0.9845)
Fixcapf	-1.2422***	-0.2267	-0.5105	-0.2152
	(-2.6364)	(-0.6125)	(-1.0345)	(-0.5599)
Labpar	0.3173	-4.1458***	0.0221	-3.8925***
	(0.4166)	(-2.6724)	(0.0374)	(-2.4641)
R^2	0.5980	0.1535	0.7372	0.1080
F-statistics	13.3954	5.0189	15.6597	4.8587
(p-value)	0.0000	0.0000	0.0000	0.0000
Observations	117	143	117	143

Notes: All variables are in logarithm. T-statistics are reported in parentheses.
***, **, and * indicate significance at 1%, 5%, and 10%.

Table 3. Two-Stage Least Squares Results of the Financial Development Effects on Economic Growth in the CEE Countries

	(1)	**(2)**	**(3)**	**(4)**
	2001-2009	2010-2020	2001-2009	2010-2020
Stkcap	-0.3487***	-0.1235	-0.1334	-0.1244
	(-2.6255)	(-1.5157)	(-0.9490)	(-1.5388)
Dcpriv	0.0471	-0.2831**		
	(1.3954)	(-2.1534)		
Pcdmb			-0.0025	-0.2977**
			(-0.0239)	(-2.2465)
Dbacba	0.2206	1.5690*	-1.5770	1.7145*
	(0.1735)	(1.6791)	(-1.1244)	(1.8427)
Bconcen	-0.0715	0.5517***	-0.0087	0.5590***
	(-0.4985)	(2.3732)	(-0.0623)	(2.4272)
Nploan	-0.1063	0.0758	-0.2479**	0.0954
	(-1.1055)	(0.8857)	(-2.2236)	(1.0746)
Spvol	-0.3972	-0.0401	0.0549	-0.0441
	(-1.2801)	(-0.2633)	(0.1739)	(-0.2912)
Piedgdp	0.0518	0.6731**	-0.3951	0.6792**
	(0.1937)	(1.9946)	(-1.4863)	(2.0039)
Trade	-0.4520**	-0.8234***	-0.1897	-0.8195***
	(-2.2328)	(-2.7134)	(-0.8415)	(-2.7134)
Govdebt	-0.3833***	-0.6982**	-0.2566**	-0.6961**
	(-3.8960)	(-2.1396)	(-2.2875)	(-2.1367)
Schenr	0.5663	0.3445	1.1472*	0.3540
	(0.9403)	(0.4370)	(1.6308)	(0.4891)
Fixcapf	-0.2781	-0.4979	-0.9430*	-0.5126
	(-0.6322)	(-1.4624)	(-1.8088)	(-1.5171)
Labpar	-1.3454	-3.4630**	-0.2028	-3.2586**
	(-1.5838)	(-2.1460)	(-0.2146)	(-2.0491)
R^2	0.7354	0.2136	0.6789	0.2158
F-statistics	14.9345	3.9624	14.1721	3.9704
(p-value)	0.0000	0.0000	0.0000	0.0000
Observations	117	143	117	143

Notes: All variables are in logarithm. T-statistics are reported in parentheses.
***, **, and * indicate significance at 1%, 5%, and 10%.

4. Estimation Results

4.1 Bank Development Effect on Economic Growth

The 2SLS results are presented in Tables 1 to 3. The overall results indicate that the high bank development has very mixed effects on growth during 2001-2020. The two main bank development variables [i.e., the domestic credit (*Dcpriv*) and private credit (*Pcdmb*) variables] have a negative effect on growth during the entire period of 2001-2020. In contrast, the other bank development variables [i.e., the ratio of commercial-central bank asset (*Dbacba*) and bank concentration (*Bconcen*) variables] show a positive effect on growth during the subperiod 2010-2020. The results remain very robust to the inclusion of different stock market development variables [i.e., stock traded value (*Stkval*), stock market turnover (*Stkturn*), and stock market capitalisation (*Stkcap*) variables] in the estimation models.

First, as presented in column (2) of Tables 1 to 3, the coefficients on *Dcpriv* are negative and statistically significant at the 1% and 5% levels during 2010-2020. The results suggest that the high level of domestic credit has a negative effect on growth during the subperiod 2010-2020. This is not consistent with the previous studies by Beck et al. (2000) and Levine et al. (2000) which strongly confirm the positive growth effect of domestic credit. Second, as noted in columns (3) and (4) of Tables 1 and 2, the coefficients on *Pcdmb* are negative and statistically significant at the 1%, 5%, and 10% levels during the entire period 2001-2020. The same results are found in column (4) of Table 3 but the negative coefficient on *Pcdmb* is only statistically significant at the 5% level during the subperiod 2010-2020. The results indicate that the high level of private credit has a negative effect on growth during 2001-2020. This totally contradicts the previous study by Beck and Levine (2004) which finds a positive growth effect of private credit.

The overall results suggest that the high level of bank development measured by domestic and private credits has a negative effect on growth in the CEE countries especially during the subperiod 2010-2020. This fails to support the assumption that more developed banking sectors would reduce information and transaction costs and promote efficient resource allocation and growth (King & Levine, 1993). There may be an explanation why high bank development can lead to lower growth. Bank development that can enhance resource allocation and return to saving may lower saving rates. However, if there are sufficiently externalities associated with saving and investment, bank development would eventually slow growth (Beck & Levine, 2004). This explains the negative growth effect of domestic and private credits during 2010-2020.

In contrast to the negative effect of the domestic credit (*Dcpriv*) and private credit (*Pcdmb*) variables, the other bank development variable [i.e., the ratio of the commercial-central bank asset variable (*Dbacba*)] shows the expected positive effect on growth during the subperiod 2010-2020. As presented in column (4) of Table 1, the coefficient on *Dbacba* is positive and statistically significant at the 10% level during the subperiod 2010-2020. The same results are obtained in columns (2) and (4) of Tables 2 and 3. This suggests that the high ratio of commercial-central bank assets definitely has a positive effect on growth during the subperiod 2010-2020. This is very consistent with the previous studies by King and Levine (1993) and Levine et al. (2000). Compared to the central banks, commercial banks are more likely to identify profitable investments by better monitoring managers' decisions and mobilising savings. This can facilitate risk management and better mobilise savings than the central banks. Therefore, high bank development as measured by the ratio of commercial-central bank asset variable would have a positive effect on growth (Levine et al., 2000). This coincides with the positive growth effect of the ratio of commercial-central bank assets during 2010-2020.

Finally, the remaining bank development variable is the bank concentration variable (*Bconcen*). As seen in column (4) of Table 1, the coefficient on *Bconcen* is positive and statistically significant at the 1% level during 2010-2020. The same results are obtained in columns (2) and (4) of Tables 2 and 3 as the coefficients on *Bconcen* are positive and statistically significant at the 1% and 5% levels during 2010-2020. This indicates that the high level of bank concentration actually has a positive effect on growth during the subperiod 2010-2020. Since joining the EU membership in 2004, the CEE countries have undergone banking transformation through the privatisation of the state-owned banks and the foreign bank entry from the EU countries (Seven & Yetkiner, 2016). This has somewhat boosted the bank competition and therefore decreased the degree of bank concentration in these countries. This can explain why the higher bank concentration has a positive effect on growth during 2010-2020.

The overall results provide very mixed support for the first hypothesis which states that the higher bank development has not accelerated growth in the CEE countries. Contrary to the previous studies, the bank development measured by the domestic credit and private credit variables has a negative effect on growth during the entire period 2001-2020. In contrast, the bank development measured by the ratio of commercial-central bank asset and bank concentration variables shows a positive effect on growth during the subperiod 2010-2020. To a certain extent, the lack of the bank development effect on growth can be attributed to the banking sector underdevelopment. Since the EU accession in 2004, the CEE banks have experienced a surge in bank credit inflows due to the EU bank entry. However, these banks have not established effective monitoring systems to facilitate efficient credit allocation for productive investment. The excessive government interventions have slowed the creation of a strong regulatory and supervisory banking system (Saci et al., 2009). The increase in loan default has reduced the amount of loans for profitable investment. This problem is also found in the CEE eurozone countries which have yet to implement appropriate banking regulation and credit allocation processes (Georgantopoulos et al., 2015). By and large, the lack of well-developed banking infrastructures has substantially limited the supply of domestic and private credits to growth-enhancing activities in the CEE countries. This can explain why the bank development has a negative effect on growth during 2001-2020.

4.2 Stock Market Development Effect on Economic Growth

The 2SLS results are presented in Tables 1 to 3. The overall results suggest that the high stock market development has a negative effect on growth during 2001-2020. The two stock market development variables [i.e., the stock traded value (*Stkval*) and stock market turnover (*Stkturn*) variables] have a negative effect on growth during the entire period 2001-2020. Similarly, the other stock market development variable [i.e., the stock market capitalisation variable (*Stkcap*)] also shows a negative effect on growth during 2001-2009. The results are robust to the inclusion of different bank development variables [i.e., the domestic credit (*Dcpriv*) and private credit (*Pcdmb*) variables] in the estimation models.

First, as shown in the column (3) of Table 1, the coefficient on *Stkval* is negative and statistically significant at the 5% level during the subperiod 2001-2009. This suggests that the high level of stock traded value has a negative effect on growth during 2001-2009. Moreover, as presented in columns (2) to (4) of Table 2, the coefficients on *Stkturn* are negative and statistically significant at the 5% level during the entire period of 2001-2020. This indicates that the high level of stock market turnover has a negative effect on growth during 2001-2020. In sum, the high level of stock market liquidity measured by *Stkval* and *Stkturn* has a negative effect on growth. This is not in line with the previous studies (Levine & Zervos, 1998; Beck & Levine, 2004). Both of these studies note that a high level of stock market liquidity has a positive effect on growth. Arestis et al. (2001) provide the explanation for the negative stock market liquidity effect on growth. High stock market liquidity through increasing the returns to investment may reduce saving rates and therefore hinder growth. Moreover, highly liquid stock markets may reduce the incentive for investors to exert tight corporate control which may adversely affect the quality of corporate governance. This in turn would slow growth (Demirguoc-Kunt & Levine, 1996). This can explain the negative stock market liquidity effect on growth during 2001-2020.

Second, the other stock market development variable [i.e., the stock market capitalisation variable (*Stkcap*)] also shows a negative effect on growth during the subperiod 2001-2009. As seen in column (1) of Table 3, the coefficient on *Stkcap* is negative and statistically significant at the 1% level during 2001-2009. This suggests that the high level of stock market capitalisation has a negative effect on growth during 2001-2009. This result is consistent with the previous study (Levine & Zervos, 1998) which shows that stock market capitalisation is not correlated with growth. Finally, the remaining stock market development variable is the stock market volatility variable (*Spvol*). As shown in Tables 1 to 3, all of the coefficients on *Spvol* are never statistically significant during the entire period 2001-2020. This suggests that the high level of stock market volatility has no impact on growth during 2001-2020. This is not consistent with the previous study (Arestis et al., 2001) which finds the stock market volatility to have a negative growth effect. Excessive stock market volatility would likely result in inefficient resource allocation and increase in interest rates due to higher uncertainty. This would limit the amount of investment and therefore reduce growth (Arestis et al., 2001). In contrast, the result shows no impact on growth during the entire period of 2001-2020.

The overall results provide support for the second hypothesis which states that the higher stock market development has not spurred growth in the CEE countries. Contrary to the previous studies, the high stock market liquidity measured by the stock traded value and stock market turnover variables has a negative effect on growth during the entire period of 2001-2020. Similarly, the larger stock market size measured by the stock market capitalisation variable also shows a negative effect on growth during the subperiod of 2001-2009. The lack of the positive growth effect of stock market liquidity and size may be attributed to the lagging stock market development. The CEE countries have expanded their stock markets through the privatisation process after the EU accession in 2004. Moreover, the eight CEE eurozone countries have met the euro requirement to facilitate the stock market transformation during 2007-2023. This has improved the stock market efficiency (Georgantopoulos et al., 2015). Despite this, most of the CEE stock markets have remained less developed than their EU counterparts. The reason is that the CEE stock markets have not pursued much deeper reform to establish an effective regulatory and supervisory system (Giofre, 2017). The majority of capital flows cannot be better allocated to finance the growth-enhancing investment. Meanwhile, these stock markets have achieved a low level of integration among themselves (Tilfani et al., 2020). This has substantially limited the amount of cross-border capital flows in the stock markets. The low stock market liquidity has reduced investors' incentives to make long-run investments (Beck & Levine, 2004). Therefore, the lack of the deeper stock market reform has undermined the positive stock market liquidity and size effect on growth over 2001-2020.

4.3 Other Explanatory Variables Affecting Economic Growth

Most of the other explanatory variables that can affect growth show the expected results. First, the higher portfolio investment has a positive effect on growth during the subperiod 2010-2020. As shown in columns (2) and (4) of Tables 1 to 3, the coefficients on the portfolio investment variable (*Piedgdp*) are positive and statistically significant at the 1% and 5% levels during 2010-2020. This confirms that the higher level of portfolio investment in equity and debt has the expected positive effect on growth in 2010-2020. The EU portfolio investment in the CEE countries substantially increased after the deepening of the CEE integration with the EU developed countries during 2000-2018 (Beck & Stanek, 2019). The increase in portfolio investment has provided greater access to various types of capital funding. This has improved the quality of capital allocation for growth-enhancing investment (Orlowski, 2020). Hence, the higher level of portfolio investment has a positive effect on growth during 2010-2020.

Second, contrary to expectations, the higher trade flow has a negative effect on growth during 2010-2020. As seen in columns (2) and (4) of Tables 1 to 3, the coefficients on the trade flow variable (*Trade*) are negative and statistically significant at the 1% level during 2010-2020. This indicates that the higher level of trade flows has actually resulted in lower growth during the subperiod 2010-2020. The possible explanation is that the CEE countries have yet to develop a long-term trade policy to promote growth (Hamdi et al., 2017). Trade can help promote growth through product specialisation and foreign technology acquisition through imports (Apergis et al., 2007). However, most of the CEE countries have not developed more effective trade policy to boost growth after the EU accession. This can explain the lack of the positive trade effect on growth during 2010-2020.

Finally, the higher government debt has a negative effect on growth during the entire period of 2001-2020. As presented in Tables 1 to 3, the coefficients on the government debt variable (*Govdebt*) are consistently negative and statistically significant at the 1% and 5% levels during the subperiods 2001-2009 and 2010-2020. This suggests that the high level of government debt would lead to lower growth. As the governments in the CEE countries need to compete with the private sector for funds to finance debts, this would crowd out a large amount of private investment for growth-enhancing activities. This in turn would reduce growth. This can explain why the higher level of government debt has a negative effect on growth during 2001-2020.

5. Policy Implications for Financial Development Policies to Boost Economic Growth

The overall results provide three policy implications for financial development policies to boost growth.

First, the results indicate that the bank development measured by the domestic credit and private credit variables has a negative effect on growth during 2001-2020. The lack of the positive growth effect of bank development can be attributed to the banking sector underdevelopment. Since five out of the thirteen CEE countries are not eurozone countries, they still have not implemented substantial banking sector transformation to meet the euro requirements. To develop more efficient banking sectors in the long run, these countries should consider joining the eurozone membership to undertake deeper bank reforms. Moreover, eight CEE eurozone countries have not adequately improved their banking regulatory and supervisory system (Georgantopoulos et al., 2015). This has hindered the efficient allocation of bank credit flows to growth-enhancing investment. To address this problem, they should implement deeper reforms to substantially modify the existing banking regulations. They should improve their institutional and legal frameworks that can strengthen creditor and investor rights and contract enforcement (Durusu-Ciftci et al., 2017). The highly regulated banking sectors can better protect the interests of investors and facilitate more bank capitals to the CEE banks. The increase in capital supply would be very favourable for financing more growth-enhancing activities. This would enable these countries to achieve sustainable high growth in the long run.

Second, the CEE countries should further improve the bank credit allocation process through the implementation of macroprudential policy to stabilise the credit supply. The financial system can better mitigate the systemic risk by curbing excess credit growth that may follow after financial liberalisation (Hodula & Ngo, 2022). More efficient credit allocation would help these countries to maintain steady growth in the long run. Moreover, another reason for the lack of positive bank credit effect on growth can be explained by the high government debt problems. To resolve this problem, these countries should tightly control their total government spending to alleviate the high debt repayment burden. This would release more bank credits for private investment. Even further, the banks should focus on re-allocating more credit supply from consumer lending to enterprise lending for productive investment (Seven & Yetkiner, 2016). The substantial increase in physical and human capital investments would contribute to high growth in the long run.

Third, the results suggest that the stock market liquidity measured by the stock traded value and stock market turnover variables has a negative effect on growth during 2001-2020. Thus, the larger stock market size measured by the stock market capitalisation variable also shows a negative effect on growth during the subperiod 2001-2009. These results may be explained by the lagging stock market development. Despite the EU accession, the stock markets in the CEE countries have remained less developed than their EU counterparts. The reason is that the CEE stock markets have not pursued much deeper reform to establish a more effective regulatory and supervisory system (Giofre, 2017). The majority of capital flows cannot be efficiently allocated to finance growth-enhancing investment. To facilitate higher stock market development, the CEE countries should pursue deeper stock market reforms over the long run. The appropriate reforms should include further improvement of their legal and supervisory system (Nyasha & Odhiambo, 2016). Specifically, these countries should strengthen the auditing and reporting standards of company financial performance. They should also provide greater protection to the legal interests of minority shareholders and their property rights (Durusu-Ciftci et al., 2017). The better regulated stock markets would facilitate more foreign capital inflows from the EU developed countries. The increase in the stock market liquidity and size would facilitate more financing for productive investment to boost long-term growth.

6. Conclusion

The objective of this study is to examine the relationship between financial development and growth among the thirteen CEE countries during 2001-2020. Two hypotheses are proposed in this study. The first hypothesis states that the higher bank development has not contributed to higher growth in the CEE countries. The results indicate that contrary to the previous studies, the bank development measured by the domestic credit and private credit variables has a negative effect on growth during 2001-2020. In contrast, the bank development measured by the ratio of commercial-central bank assets and bank concentration variables has a positive effect on growth during the subperiod 2010-2020. The overall results provide very mixed support for the first hypothesis. The high bank development has only boosted growth in the CEE countries during the subperiod period of 2010-2020.

The second hypothesis states that the higher stock market development has not spurred growth in the CEE countries. The results show that contrary to the previous studies, the high stock market liquidity measured by the stock traded value and stock market turnover variables has a negative effect on growth during the entire period 2001-2020. Thus, the larger stock market size measured by the stock market capitalisation variable only shows a negative effect on growth during the subperiod 2001-2009. The overall results support the second hypothesis as the high stock market development has not promoted growth in the CEE countries during the entire period of 2001-2020.

As mentioned in Section 5 above, the overall results provide three important policy implications for financial development policies to promote growth. First, to address the banking sector underdevelopment problem, the CEE countries should implement deeper reforms to substantially modify the existing banking regulations. They should improve their institutional and legal frameworks that can strengthen creditor and investor rights and contract enforcement (Durusu-Ciftci et al., 2017). The highly regulated banking sectors can better protect the interests of investors and facilitate more bank capitals to the CEE banks. The increase in capital supply would be very favourable for financing growth-enhancing activities. Second, the CEE countries should further improve the bank credit allocation process through the implementation of macroprudential policy to stabilize the credit supply. The financial system can better mitigate the systemic risk by curbing excess credit growth that may follow after financial liberalisation (Hodula & Ngo, 2022). More efficient credit allocation would help these countries to maintain steady growth in the long run. Finally, to facilitate higher stock market development, the CEE countries should pursue deeper stock market reforms over the long run. The appropriate reforms should include further improvement of their legal and supervisory system (Nyasha & Odhiambo, 2016). Specifically, these countries should strengthen the auditing and reporting standards of company financial performance. They should also provide greater protection to the legal interests of minority shareholders and their property rights (Durusu-Ciftci et al., 2017). The better regulated stock markets would facilitate more foreign capital inflows from the EU developed countries. The increase in the stock market liquidity and size would facilitate more financing for productive investment to boost long-term growth.

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