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Time-varying Effects of Public Debt on the Financial and Banking Development in the Central and Eastern Europe

Karel Janda* – Oleg Kravtsov**

Abstract. In this paper we investigate the time varying effects of domestic public debts on the financial development, private credit and banking performance in the countries of the Central Eastern Europe, Balkan and Baltics region. By analyzing the empirical relationships among indicators and ratios of financial development and banking performance, we test their time-varying responses to changes in public debt through the described transmission channels. The econometric results suggest that the most significant determinant of private debt is the growing public debt over the short-midterm horizon. This might imply the crowding-out effect of public debt on private credit in the region. The growth of public debt positively impacts the banking sector efficiency only over the short-term period, while we observe only minor time effects in responses to changes in public debt on the financial stability indicators.

Keywords: sovereign debt, private credit, financial development, Central Eastern Europe

JEL Classification: B22

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1 Introduction

In theory, domestic public debt can bring many benefits to the countries. It plays an important role for growth and raising funds for long-term development projects and supports financial systems in credit intermediation and during crisis periods. In contrast, excessive public debt can have long-term negative consequences. As a result of the previous global financial and economic crises, recent government deficit and debt ratios skyrocketed in many countries and represent potential threat to financial stability, especially in the low interest rate environment. Even though the effects of the public debt on financial development and economic growth have been widely explored, the empirical studies show rather mixed results across geographies and with different responses in long and short run. In our paper we investigate the effects of public debt on the financial development and performance of banking sector in the Central Eastern European (CEE) countries. The other subject of our interest is an examination of time-varying effects of domestic public debt on the financial development of the countries. We contribute to the existing literature in two ways. Firstly, we focus specifically on the economies and banking sector of the CEE, the Balkan and Baltics region and secondly we analyze the magnitude of effects over the long and short term horizons.

The rest of this article is organized as follows. In Sections 2 and 3 we present the topic and brief review of the existing empirical literature. Section 4 describes the data and the econometric methodology. The empirical results and our conclusions are presented in Section 5 and 6 respectively.

2 Literature review

Public spending plays an important role in supporting economic growth and is a key variable in influencing of the sustainability of financial development and public finance (Izák 2011a). The government is an important intermediary in the allocation of capital and resources in the economy. The easiness in access to financial sources for private businesses improves their financial stability (Jakubík and Teplý 2011) and contributes to higher stability of the financial sector as whole (Teplý and Tripe 2015). Public debt shocks have positive and persistent influence on economic activity (Guerini et al. 2017). Their empirical study of the U.S. economic data further suggests that in contrast, rising private debt has a milder positive impact on GDP. The analysis of the possible transmission mechanisms reveals that public debt “crowds in” and facilitates private consumption and investment in the US. Respectively, the development of

local financial markets facilitates domestic public debt and may lower the cost of government borrowing (Ilgün 2016), thus impacting the financial systems positively.

On contrary, the growth of the government debt raises concerns about the “crowding-out” effect, when the public debt reduces the credit supply to private sector. Emran and Farazi (2009), Ayadi et al. (2015), Ilgün (2016) find empirical evidences supporting the negative effects of government borrowing on private credit in developing countries. Ismihan and Ozkan (2012) suggest that in countries where credit to government makes up a major share of the total bank lending, public debt is likely to harm financial development, with unfavorable implications for economic activity. Their results show a potential contractionary effect of fiscal expansions especially in countries with limited financial depth and financial development, for example in case of developing countries. Azzimonti and Francisco (2012) investigated the casual relation between government borrowing and financial liberalization. The evidence obtained in their study indicates that government debt increases when financial markets become internationally integrated. Since the government is an important contributor to the financing of the small and medium enterprises (SME) segment in less developed countries, Janda and Zetek (2013, 2015) point out that the growing government debt might decrease the supply of SME’s funding sources on the market and in general impacts negatively price of financing, either due to the supply-demand consideration or because of higher country risks.

By studying the relation between public debt and financial development, Kutivadze (2011) finds a positive correlation between the development of the domestic debt market and financial development. The results of the analysis provide strong evidence which supports the key role of the financial development on the development of the domestic debt market. In contrast, Altayligil and Akkay (2013) find a negative relationship between domestic indebtedness and financial development in the Turkish economy. The impact of public debt on the banking sector performance was explored by Hauner (2008; 2009). His results indicate that the banking sector which primary lends to the public sector tend to grow more slowly. The public debt raises the profitability of the banking sector and reduces the efficiency of banks in developing countries in the short-run. In advanced economies, there appears to be no impact on profitability but a positive one on efficiency.

Most studies agree that the level of a country’s economic development and the nature of the government debt are important factors among others to be evaluated. Moreover, the size and the composition of the government debt have important direct and indirect effects on the financial sector. However, the direction and its time-varying nature of impacts are ambiguous and

scarcely an issue addressed in the related literature. The short and long-run effects of relationship between the public debt and the aggregate output were by Gómez-Puig et al. (2015) based on the sample of the 10 EU countries. The empirical findings indicate a negative effect of public debt on output in the long-run. But they admit the possibility of a positive effect in the short run depending on the characteristics of the country and of the final allocation of public debt. Afonso and Jalles (2017) also point on the fiscal sustainability as a time-varying reality. They find that the time-varying coefficients of fiscal sustainability increase with the share of foreign currency debt, the share of longer-term debt, the share of debt held by the central bank, and the share of marketable debt.

3 Domestic public debt and financial system

It is widely believed that the financial development and stability of the countries' economies can be effected by public debt through several channels. From macroeconomic view, a fiscal tightening may have a negative impact on the credit supply. It may hinder the output and the capacity of the businesses and households to borrow from banks and as a consequence, the volume of private debt may decrease (Andrés et al. 2016).

On a microeconomic level, public debt might affect private debt through liquidity and risk channels (Klinger and Teplý 2014; Altavilla et al. 2016). The liquidity channel works through the exposure of banks to risky governmental bonds. A large investment of domestic banks in their own government also known as "home bias" amplifies the link between banks and the sovereign. Although in such situation it is possible for the banks to reduce the borrowing costs and provide liquidity during times of stress, but it could create incentives for countries to postpone fiscal adjustments until the stock of debt reaches very high levels (IMF 2015). The countries with high home bias tend to experience the debt distress at higher levels of debt than countries with low home bias. Furthermore, banks' exposure to sovereign debt potentially reinforces the negative feedback loop between weak public finances and financial instability in a country (Stádník 2013; Acharya et al. 2014; IMF 2016).

The other channel is the risk transmission channel. It refers to the risks existing in concentration of large sovereign exposures, primarily governmental bonds that could lead to large balance sheet losses and potentially to shortage in funding and liquidity. This situation might create a precautionary motive for banks to deleverage their balance sheet and thus it will reduce credit supply to private firms and households. Most of the studies indicate that the financial sector and governmental debt are closely related. When vulnerabilities build up in the banking

sector, for example in form of a high leverage or financial distress, markets expect eventual government bailouts (Šútorová and Teplý 2014a). It might have a pass-through or contagion effects on the banks holding significant sovereign exposure due to the increase in sovereign risk premiums. In such situation, usually the banking supervision authority steps in with tighter regulatory measures, for example to increase the liquidity buffer, capital or lower bank leverage, which reduces the private credit as a consequence (Šútorová and Teplý 2014b; Altavilla et al. 2016; IMF 2016).

The globalization effect and the overall development of financial markets intensifies the international transmission of financial shocks. The strength and speed of contagions in such terms can vary over the time and largely depends on how liquid are the financial markets (Fungáčová and Jakubík 2012; Stádník 2014) and how cross-sectionally they are correlated (İlgün 2016). Furthermore, the empirical study by Afonso and Jalles (2017) reveals that the composition and characteristics of the sovereign debt do have various time effects. The financial system of countries becomes more sustainable if they contract a higher share of long-term public debt and if it is held by the central banks or if it is easily marketable. These facts motivate us to examine further the time-varying effects of the public debt with focus on the Central Eastern Europe.

4 Data and methodology

In order to analyse the effects of domestic public debt on the financial development of the banking sector in the CEE countries, we apply the conceptual framework developed by the World Bank. It provides a comprehensive means to benchmark various aspects of the financial development of the economies. The four main areas that characterize a well-functioning financial system are: financial depth, access, efficiency and stability. These categories are represented by the set of corresponding proxy variables which are applied in our empirical analysis. In our analysis we use the World Bank's Global Financial Development Database that provides a detailed set of historical macroeconomic country data. Van Dijk Bankscope data is used for evaluating the economic performance of the banking sector. Our dataset consists of historical ratios for the period from 1995 to 2014 from a sample of the 26 countries of the Central Eastern Europe, the Balkan and the Baltic regions. The summary of variables for the regression model is provided in Table 1.

Table 1: Summary statistics

Variables	Obs	Mean	Std	Min	Max
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Private debt to GDP (%)	520	35.40	25.81	1.17	135.96
Credit to government and state owned enterprises to GDP (%)	520	8.29	8.20	0.02	48.57
Average return on assets (%)	520	1.74	3.76	- 51.54	20.69
Bank credit to bank deposits (%)	520	125.72	178.44	8.64	2861.07
Liquid assets to deposits and short term funding (%)	520	39.44	16.73	6.01	101.41
Bank deposits to GDP (%)	520	32.81	21.35	1.94	100.20
Consumer price index (2010=100, average)	520	76.90	32.36	0.43	325.36
GDP per capita (log)	520	8.39	1.06	5.83	10.63
Banking crisis dummy (1=banking crisis, 0=none)	520	0.14	0.35	0	1

Source: Global Financial Development Database June 2016; Bankscope; IMF; World Bank; own calculations

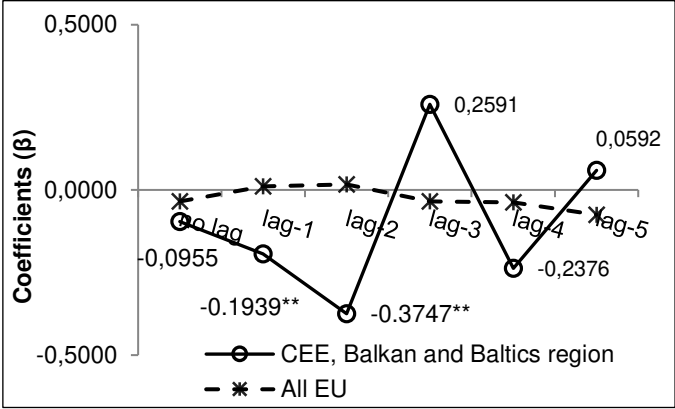
The subject of our interest is domestic public debt that is measured by the ratio of credit to government and state owned enterprises to GDP. In the first step, we identify the time lags of the independent variable “public debt” in equation (1). This procedure enables us to assess the strength of sensitivity and responsiveness of the public debt over time in relation to the financial system represented by variable private credit. These results serve as an input for the more comprehensive analysis that incorporates the time-varying components in the regression model in equation (2). In equation (1) we apply the finite distributed lag model (Wooldridge 2008) as below:

$$Y_t = \alpha + \delta Y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + \beta_n X_{t-s} + \varepsilon_t \quad (1)$$

where Y_t denotes private debt as a main indicator of the financial development with most impact on the banking sector. X_t is a variable of public debt and s is the number of lag years (maximum 5 years). The coefficients are depicted in Figure 2. The most impact of public debts on the financial system we observe only for the CEE region with time lags over a two years period (as coefficients show the statistical significance with P-values <0.05, denoted as **). The R-square (0.80) and F test (0.000) prove the significance of the results explained by the regression model set up. For EU countries, the time effect of public debt on private credit is obviously not so

strong visible within the 5 year horizon (coefficients are small and statistically significant only in a few cases).

Figure 2: A lag distribution of the impact of public debt on the private credit



Source: World Bank’s Global Financial Development Database and own calculations

The results for the CEE region are notable because the parameter $\beta_t < 0$ for the lag $t-1$ and $t-2$ points to the short term crowding-out effect on private credit by government borrowing similarly indicated by Emran and Farazi (2009). Noting the results of the equation (1), we consider the three years lag in the regression model in equation (2) with an additional lag of three years to cover the entire response range. This regression model identifies the growth of the level of financial development as a function of the initial level of financial development and other time-variant explanatory variables. The econometric model is similar to (Ayadi et al. 2015) and can be defined as follows:

$$\frac{Y_{i,t}}{Y_{i,t-s}} - 1 = \alpha_0 + \delta Y_{i,t-s} + \beta_n X_{i,t-s} + \varepsilon_{i,t} \tag{2}$$

where Y is one of the financial development indicators according to the World Bank definitions: a) the depth measurement refers to the private debt that is denoted by the domestic credit to private sector as a percentage of GDP; b) banking sector efficiency is a ratio of bank return after tax on total assets (ROA); c) the access to financial system and its stability indicator is represented by the ratio of liquid assets to deposits and short term funding in %. Liquidity ratio is a proxy for the pass through channel between sovereign exposure and financial system under assumption of the financial market distribution and liquid financial markets (Stádník 2014); d) the ratio of total saving deposits in banking system to the GDP refers to the access to the financial system and the country’s banking sector development (Janda and Turbat 2013).

X is a vector of control variables and s is the number of lag years. To avoid problems of endogeneity and remove the impact of short-term cyclicalities, the model is specified as a growth rate over regression variables for the non-overlapping periods comprised of $s+1$ year. Our specification uses three-year non-overlapping periods for bank-related variables that serve as a proxy for the analysis of financial development.

Three control variables are included in the regressions in order to avoid possible variable biases. Real GDP per capita is used as a proxy of economic development (Izák 2009; Fungáčová and Jakubík 2012). The ratio of total bank credit as a share of total deposits refers to the financial resources provided to the private sector by domestic money banks. We use the consumer price index (CPI) to capture the inflationary impacts on the financial development of economies (Izák 2011b; Janda and Zetek 2013). High inflation rate is considered to be an adverse factor to the economic growth in developing countries. However, the picture can be different for the advanced economies with a lack of economic growth, where the moderate inflation is expected to have generally positive effects. The ratio of the bank deposits to GDP (in %) is applied to measure how accessible the financial systems are to households and corporates. It also indicates the overall development and the size of financial systems in the countries.

The dummy of banking crisis is applied (1=banking crisis, 0=none) for the corresponding years. The banking crisis affects significantly the sovereign debt through the governmental support or bailouts (Janda et al. 2013) and pricing of sovereign risk premiums. In addition, there might be time-invariant fixed effects due to the countries profiles captured in ε_{it} and the unknown intercept a_o . The estimations are based on fixed-effects panel regressions. Hausman tests show the appropriateness of the fixed-effects model in comparison to the random-effects and pooled OLS regressions.

5 Results

The results for the financial development variables are reported in Table 2 for the public debt effects on the financial depth and banking stability and in Table 3 for the public debt effects on the banking sector efficiency and access. In each table, the columns I, II, III and IV provide the results of the regression model with respective time lags, from variables with no time lag in column I ($t=0$) and up to three year lag of variables in columns II ($t-1$), III ($t-2$) and IV ($t-3$) correspondingly. The robust p-values and the t-statistics for individual significance are indicated in both tables.

Our findings suggest that the most significant determinant of private debt in our analysis setup seems to be the growth of public debt over the short-midterm horizon. These results support the evidences of ‘crowding-out’ effect of public debt on private credit, similarly noted by Emran and Farazi (2009) and Ayadi et al. (2015). The coefficients of bank credit to government are negative and statistically significant at the 5% level in the regression models (II, II and IV) with time lags on variables up to the three years.

As for the variables of banking efficiency (ROA), our study shows that the growth of public debt impacts the banking sector performance and efficiency positively, but only for the short term period of one to two years in the CEE region. The coefficients are positive and statistically significant in the models (II and III). In contrast, Hauner (2008) suggests that the public sector borrowing from the domestic banking system increases the profitability but reduces the efficiency of banks in developing countries. The differences of the regions in terms of institutional and economic factors could give an explanation of the origin of such deviations in banking efficiency. Another reason could be that the countries are at different stages of financial and banking development.

The banking stability indicators - the liquidity ratio and the ratio of bank loans to deposits are not evidently influenced by changes in public debt over the examined time horizon. The regression coefficients of the explanatory variable “public debt” for both ratios are only in a few cases statistically significant (II) that indicates rather only minor time effects in response to changes in public debt. Obviously, more specific and sophisticated analysis will be required to capture the closer links and to confirm the strength of the risk and liquidity transmission channels in the financial system of the CEE region. As expected, the dummies of banking crisis are negatively related to the banking performance and financial stability indicators.

6 Conclusions

In this article we investigated the time-varying impacts of domestic public debts on the financial development, private credit and banking performance in the countries of the Central Eastern Europe, Balkan and Baltics region over the period 1995 to 2014. We tested the time varying effects of public debt on financial system and banking sector performance focusing on main financial development areas according to the conceptual framework of the World Bank i.e. financial depth, access, efficiency and stability. Our econometric results suggest that the growth of public debt has negative impact on private credit over the short-midterm horizon in

case of the CEE, the Balkan and the Baltics countries. On opposite, we do not find clear evidences of it for all EU countries. Our findings could imply possible crowding-out effects of public debt on supply of private credit in the CEE region. The growth of public debt positively impacts the banking sector efficiency only for a short-term period. We do not observe a strong response to changes in public debt over the studied period for the banking stability indicators represented by the liquidity ratio and the bank loans to deposits ratio. This motivates us to develop further the methodological approach to the empirical analysis of responses for the liquidity and risk channels.

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Table 2: Public debt effect on financial system depth and banking stability

Variables	Growth of private debt (%)				Bank credit to bank deposits (%)			
	I (t=0)	II (t-1)	III (t-2)	IV (t-3)	I (t=0)	II (t-1)	III (t-2)	IV (t-3)
Public debt to GDP (%)	-0.001 (-0.25)	- 0.007*	- 0.014*	-0.009* (-1.99)	-0.006 (-1.17)	0.014 (1.04)	0.001 (0.75)	0.001 (0.85)
Lag of dependent variable	0.020* (-12.58)	- 0.005*	- 0.008*	-0.017* (-8.43)	- 0.097*	- 0.523*	-0.910* (-2.38)	- 1.037*
Private debt to GDP	- 0.019*	- 0.005*	- 0.008*	-0.017* (-1.06)	0.009* (5.21)	- 0.001*	-0.004* (-4.64)	- 0.003*
Consumer price index (2010=100, average)	-0.001 (0.60)	-0.002 (-1.68)	-0.002 (-1.27)	-0.002 (-1.06)	0.001* (3.74)	-0.001 (-1.69)	-0.001 (-1.65)	-0.001 (-0.99)
GDP per capita (log)	0.032 (0.66)	0.192* (3.76)	0.191* (2.69)	0.165* (2.11)	- 0.682*	0.002* (2.11)	0.003* (2.84)	0.002* (2.76)
Bank deposits to GDP (%)	-0.001 (-0.48)	-0.001 (-0.12)	- 0.008*	-0.006 (-1.57)	- 0.012*	0.014 (0.61)	0.017 (0.8)	0.001 (0.03)
Banking crisis dummy (1=banking crisis, 0=none)	-0.028 (-1.00)	-0.029 (-0.79)	-0.058 (-1.02)	0.041 (0.58)	0.079 (1.11)	0.010 (0.51)	0.028 (1.27)	0.027* (1.25)
_cons	0.427 (1.14)	0.364 (1.58)	-0.679 (-1.26)	-0.176 (-0.29)	-0.979 (-5.79)	-0.100 (-0.58)	-0.093 (-0.59)	0.028 (0.2)
Observations	520	520	520	520	520	520	520.	520
F test	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000
R-sq	0.29	0.21	0.24	0.34	0.40	0.33	0.43	0.48

Table 3: Public debts effect on the banking sector efficiency and stability

Variables	Average return on assets (%)				Liquid assets to deposits and short term funding (%)			
	I	II	III	IV	I	II	III	IV
	(t=0)	(t-1)	(t-2)	(t-3)	(t=0)	(t-1)	(t-2)	(t-3)
Public debt to GDP (%)	0.033 (1.06)	0.008* (3.19)	0.003* (2.23)	0.002 (0.97)	0.007 (0.06)	0.006* (1.9)	0.001 (0.4)	0.002 (0.97)
Lag of dependent variable	- 2.845* (-7.83)	- 1.103* (-24.54)	- 1.077* (-23.85)	- 1.007* (-22.15)	- -0.472* (-14.13)	- 0.014* (-11.5)	- 0.012* (-9.89)	- 0.008* (-7.3)
Private debt to GDP (lag)	- 0.088* (-0.84)	- -0.000 (-0.42)	- -0.000 (-0.86)	- -0.000 (-0.31)	- -0.089* (-2.41)	- 0.001 (-0.72)	- -0.001 (-1.03)	- -0.001 (-0.31)
Consumer price index (2010=100, average)	0.030 (0.48)	-0.001 (-0.67)	-0.001 (-1.53)	0.000 (0.74)	0.009 (0.41)	0.001 (-1.26)	0.001* (-2.27)	0.001 (0.74)
GDP per capita (log)	-0.593 (-0.08)	0.001 (-0.33)	0.002 (1.33)	0.001 (0.92)	-6.378* (-2.51)	0.005* (-2.76)	-0.002 (-0.89)	0.092* (-3.09)
Bank deposits to GDP (%)	-0.133 (-0.71)	-0.029 (-0.75)	-0.044 (-1.32)	0.092* (3.09)	-0.254* (-3.96)	- 0.059 (-1.13)	-0.050 (-1.14)	0.001 (0.92)

Banking crisis dummy (1=banking crisis, 0=none)	-1.955 (-0.46)	- 0.090*	- 0.085 *	- 0.081 *	0.008*	0.018 (0.41)	0.016 (0.36)	0.081 *
_cons	12.61 1 (0.22)	0.221 (0.73)	0.348 (1.38)	0.677 * (3.01)	12.356*	1.249 *	1.091*	0.676 *
Observations	520	520	520	520	520	520	520	520
F test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-sq	0.50	0.48	0.50	0.51	0.43	0.53	0.52	0.47

Source: Global Financial Development Database; World Bank; IMF; Bankscope; own calculations. * denotes p - values below <0.05 In parentheses, we show the t –statistics.

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