2 ASSESSING THE FISCAL IMPLICATIONS OF THE DEVELOPMENT OF THE BANKING SECTOR. EVIDENCE FROM OECD COUNTRIES

Ionel LEONIDA[1]
Cosmin – Octavian CEPOI[1]
Bogdan – Andrei DUMITRESCU[1,2,*]
Carmen OBREJA[2]
Andrei STĂNCULESCU[3]

Abstract

In this study, we examine the connection between fiscal policy and banking activity. Over recent decades, the budget balance, a key fiscal indicator, has faced deterioration, prompting concerns about the factors influencing its fluctuations. We investigate this relationship by analyzing fiscal and monetary variables, including public debt, inflation, foreign direct investments, remittances, and bank credit, across 34 OECD countries from 2005 to 2020. Employing a Panel Smooth Transition Regression (PSTR) model, our findings reveal that the budget deficit responds to banking profitability, measured by Return on Assets, and a country's banking system's probability of default (Z-Score). The impact varies based on the preceding year's public debt level, with higher sensitivity observed in heavily indebted countries.

Keyword: Budget Deficit, Public Debt, COVID-19, Smooth Transition, OECD countries

JEL Classification: C58; H30

1. Introduction

The link between financial intermediation and fiscal deficits is a topic of great relevance and interest. The COVID-19 pandemic, in particular, caused a rise in global budget deficits as countries implemented massive stimulus packages in order to mitigate the economic impact of the crisis. Indeed, while governments around the world were focused on taking concrete measures to combat negative health effects, budget deficits reached unprecedented levels (Dornean and Onea, 2022).

Understanding the complex interactions between financial intermediation, fiscal deficits and economic challenges caused by the pandemic is a topic of utmost importance for public policymakers, financial analysts and more generally, for all those interested in sustainable economic growth. This aspect not only highlights the factors that shape policy decisions, but also

[1] *"Victor Slăvescu" Centre for Financial and Monetary Research, Romanian Academy, Bucharest*
[2] *Department of Money and Banking, Faculty of Finance and Banking, Bucharest University of Economic Studies*
[3] *Department of Finance, Faculty of Finance and Banking, Bucharest University of Economic Studies*
**Corresponding author: bogdan.dumitrescu@fin.ase.ro*

provides broader insights into the implications for economic stability, financial markets and overall macroeconomic performance. As the world is still dealing with the negative and lasting effects of the COVID-19 pandemic and high inflation rates caused by, among other things, the Russian invasion of Ukraine, the link between financial intermediation and fiscal policy takes on even greater importance in the actions of states to ensure sustainable economic growth.

In this article, we use a panel smooth transition regression (PSTR) model to identify the nature of the interaction between fiscal policies and banking activity. The estimated results show that the budget deficit, a fiscal indicator of maximum interest to the general public and policymakers, is directly influenced by the performance of the banking sector, as captured by Return on Assets (ROA) and the probability of default within the banking system of a country, represented by the Z-Score. Moreover, we observe that the impact of these variables associated with the banking sector on the budget deficit varies significantly depending on the level of public debt from the previous year, highlighting in this sense the complex interdependence between fiscal policy, banking development and the real economic environment. As we analyze the results of this study in more detail, it becomes clear that understanding these interactions is crucial not only for policymakers, but also for the economists and financial analysts who often fund their day-to-day decisions considering the nature of fiscal and banking dynamics in a post-pandemic world.

The remainder of the paper is structured as follows: Section 2 is sumarizes the previous findings of the literature associated with our paper, Section 3 is devoted to data description, the PSTR model is explained in Section 4 and Section 5 is dedicated to the estimation results and the political implications derived from them. Section 6 is intended for general conclusions.

2. Literature Review

In general, the research on fiscal adjustments in European countries (Ghosh et al., 2013) suggests that the link between debt level and primary balance progresses through three phases. When debt levels are low, the main balance remains unaffected by debt growth, as certain levels deem debt increases insignificant. Second, once growing debt reaches a point at which markets react and price with a higher probability of failure, sovereigns will initiate a fiscal consolidation process aimed at stabilizing the debt-to-GDP ratio. Fiscal fatigue occurs in the third phase of fiscal adjustment when debt exceeds a certain level, notwithstanding the adjustment. The sovereign may stop adapting, resulting in continued rises in the debt-to-GDP ratio.

As we well know, the global financial crisis that started in 2008 had some long-lasting repercussions, especially in the 2009-2011 period in the EU, being known as the sovereign debt crisis. Consequently, extensive research has delved into FRF and fiscal fatigue, particularly with regard to EU Member States. Medeiros (2012) for example simulates debt ratios for 15 EU Member States using vector auto-regression (VAR) models andface a panel fiscal reaction function (FRF). The simulations rely on four regimes, each with two types of errors and two assumptions on the structural primary balance (unchanged at the last observed value or endogenously determined using the panel FRF). Results indicate that debt ratio trajectories are positively skewed, and main balances exhibit "fiscal fatigue" and partial mean reversion to historical patterns.

Furthermore, Legrenzi and Milas (2013) use non-linear fiscal response functions with endogenously determined state adjusting thresholds to analyze the behaviour of fiscal policy authorities during "good" and "bad" times, building on earlier research on fiscal policy sustainability. The boundaries change depending on debt levels, economic cycles, and a financial pressure index. Their sample centered on Greece, Ireland, Portugal, and Spain. The study revealed that these countries only exhibited corrective actions to regulate budget imbalances when their debt ratios were considerably high. Specifically, the estimated debt thresholds for initiating these corrective measures were found to be 69% for Greece, 49% for Ireland, 47% for

Portugal, and 43% for Spain. Moreover, Greece's fiscal position differs from the Maastricht Treaty's 60% reference value due to a higher threshold, slower fiscal adjustment, and non-cyclical primary surplus. Furthermore, under pressure from financial markets, all governments reduced the debt level above which corrective action is taken. In addition, Small et al. (2020) study the budgetary reactions of 53 developing nations to changes in their debt-to-GDP ratios. According to them there is a positive link between debt and the primary surplus, and nations adjust along both the revenue and spending margins at nearly the same rate.

In addition, Everaert and Jansen (2018) investigate whether fiscal fatigue is a robust property of the fiscal response function in a panel of OECD nations from 1970 to 2014, or if it is just an artifact of disregarding crucial characteristics of the data's panel dimension. The findings demonstrate a large heterogeneous response of the primary balance to lagged debt, with fiscal fatigue not being a common feature of the fiscal reaction function exhibited by all nations in the panel.

Finally, financial intermediation has a strong connection to a country's fiscal position since it influences resource allocation and government finance management. Furthermore, banks are playing an important role in channeling funds from depositors to individuals, hence supporting the circulation of capital within an economy. This intermediation role has a direct impact on a government's fiscal condition since it dictates loan interest rates and, implicitly, the availability of cash for public spending. Furthermore, Demirgüç-Kunt and Huizinga (1999) argue that the banking sector's effectiveness in mobilizing savings from households and businesses and then allocating these resources for investments such as infrastructure can influence both government borrowing costs and its ability to finance public projects, ultimately shaping a country's fiscal position. Thus, the relationship between financial intermediation and the fiscal situation is complicated and powerful, with far-reaching consequences for general economic stability and public finance management. Furthermore, this might affect national debt ratings, which are an important indicator of financing costs (Miricescu et al., 2016).

Finally, currently there is a mix of opinions in the literature regarding the fiscal implications of the evolution of the banking system. Some researchers believe that a performing banking sector, as evidenced by high profitability (ROA) and stability (Z-score), can contribute positively to the direction of fiscal policy and fiscal outcomes by increasing government revenues and minimizing the need for future borrowing. Others argue that pronounced fiscal instability combined with a high need for government borrowing to meet current needs may exacerbate risks in the banking sector, creating a vicious cycle of greater risk-taking and fiscal pressures (see Uddin et al. (2020) for additional information). The present study aims to answer some of the questions arising from the analysis of the specialized literature and to effectively study to what extent profitability and risk in the banking industry contribute to shaping the direction of fiscal policy in OECD countries. The results of our study can be of interest both to fiscal policymakers, in their effort to take banking activity into account in their scenario analysis, and to bank managers, who can outline their sales or risk management strategies through reporting the fiscal context.

3. Data Description

We drew on a panel of 34 OECD countries listed in Appendix 1, from 2005 to 2020. The dependent variable is the budget balance. The key independent variables are bank-related factors such as Banking Assets, ROA and Z-score. Following Tujula and Wolswijk (2004), we included among the covariates a series of macroeconomic variables and political factors. We also control for the impact induced by the global financial crisis and the COVID-19 pandemic. Additional details are in Table 1:

Table 1: Data description

Variables	Definition and Source
Budget deficit (BD)	Fiscal (budget) balance is the difference between government revenue and government expenditure. We express the value as a percent of GDP. Source: *The Global Economy*.
Public Debt (PD)	Debt is the entire stock of direct government fixed-term contractual obligations to others outstanding on a particular date. Source: *The Global Economy.*
Output GAP (GAP)	The difference between actual and potential gross domestic product (GDP) as a percentage of potential GDP. Source: *OECD database.*
Short-term interest rate (IR)	The rates at which short-term borrowings are traded between financial institutions or the rate at which short-term government paper is issued or traded in the market. Source: *OECD database.*
Inflation (INF)	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Source: *The Global Economy*.
Foreign Direct Investments (FDI)	Net inflows (new investment inflows less disinvestment) in the reporting economy are from foreign investors, and are divided by GDP. Source: *The Global Economy.*
Remittances (REM)	All current transfers in cash or in kind made or received by resident households to or from nonresident households as percentage of GDP. Source: *The Global Economy.*
Political Stability Index (PSI).	The index of Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. Source: *World Bank*.
Financial Crises dummy (GFC)	A dummy variable that equals one in 2009 and 2010 and zero otherwise.
COVID-19 dummy (COVID)	A dummy variable that equals one in 2020 and zero otherwise.
Bank assets (BA)	Total assets held by deposit money banks as a share of GDP.
Bank return on assets (ROA)	Commercial banks' pre-tax income of commercial banks to yearly averaged total assets, as a percentage.
Bank system z-scores (Z-score)	The index captures the probability of default in a country's banking system. The Z-score compares the buffer of a country's banking system (capitalization returns) with the volatility of those returns.

In what follows, in order to provide a robust analysis we investigate the presence of non-stationary data series issues within the sample. To accomplish this, we conduct the test proposed by Levin et al. (2002), which is recommended considering the structure of our data. The null hypothesis of this test posits that all panels share a common non-stationary autoregressive parameter. In contrast, the alternative hypothesis indicates stationarity, implying that the panels exhibit stationary behavior. The results presented in Table 2 indicate that all the variables are stationary at the 10% level, ensuring the validity and reliability of the econometric analysis and the robustness of the results. In the stationarity analysis, we do not include the dummy control variables.

Variables	Test	Prob.
BD	-4.7913	0.0000
PD	-2.1094	0.0175

Variables	Test	Prob.
GAP	-1.5678	0.0585
IR	-10.308	0.0000
INF	-10.541	0.0000
FDI	-4.6936	0.0000
REM	-1.4315	0.0844
PSI	-2.1158	0.0172
BA	-3.0411	0.0012
ROA	-4.2904	0.0000
Z-score	-1.5877	0.0499

4. Econometric approach

To study the potential non-linearities that characterize the evolution of the budget deficit, we estimate a PSTR model. This model is an extension of the panel transition regression (PTR), developed by Hansen (1999), and is given by:

$$Y_{it} = \begin{cases} \mu_i + \alpha_1' X_{it} + \varepsilon_{it}, S_{it} \leq \tau \\ \mu_i + \alpha_2' X_{it} + \varepsilon_{it}, S_{it} > \tau \end{cases} \quad (1)$$

In Eq. (1), $i = 1, \dots, N$ and $t = 1, \dots, T$ represent the time and country, respectively. The dependent variable Y_{it} is the budget deficit, S_{it} is the lagged public debt[4], X_{it} is the vector of explanatory factors including bank-related variables, μ_i are country fixed effects, and ε_{it} is the error term.

In Hansen (1999), the data below and above the threshold are clearly specified by an abrupt transition from Regime 1 (data below the threshold) to Regime 2 (data above the threshold). To account for any potential smooth and gradual shifts via $j = \overline{1,r}$ transition functions among $r + 1$ distinct regimes, González et al. (2005) proposed the PSTR model:

$$Y_{it} = \mu_i + \beta_0' X_{it} + \sum_{j=1}^{r} \beta_j' X_{it} F\left(S_{it}^{(j)}\,;\, \gamma_j, \tau_j\right) + \varepsilon_{i,t} \quad (2)$$

In Eq. (2), there are r transitions functions $F\left(S_{it}^{(j)}\,;\, \gamma_j, \tau_j\right)$, normalised to lie between zero and one with three key elements: the lagged public debt - S_{it} as threshold, the slope γ_j and the location parameters, τ_j. Teräsvirta (1994) used the logistic transition function to capture the shifts among estimated regimes, which is specified in Eq. (3):

$$F\left(S_{it}^{(j)}\,;\, \gamma_j, c_j\right) = \left[1 + exp\left(-\gamma \prod_{l=1}^{m} (S_{it} - \tau_l)\right)\right]^{-1} \quad (3)$$

with $\gamma > 0$ and $\tau_1 \leq \tau_2 \leq \cdots \leq \tau_m$. González et al. (2005) suggested that $m = 1$ or $m = 2$ is capturing the common types of variation in empirical data. Estimated Eq. (2) requires eliminating the individual effects and then applying the nonlinear least square to the transformed data.

[4] *Using lagged public debt as threshold variables when investigating the influence factors of the budget deficit is in line with Sevda (2019).*

5. Results

Before estimating Eq. (2), it is necessary to investigate the existence of potential nonlinearities within the empirical model. For all specifications, the null hypothesis of a linear relationship between the budget deficit and the selected covariates (H_0: r = 0), in favor of the alternative (H_1: r = 1), is rejected at the 1% level, as shown in Table 3. Furthermore, we can also account for two transition functions in the baseline specifications, as we cannot reject the alternative (H_1: r = 2) in the second trial. All tests have been specified using only the control variables as explanatory variables, but the results remain robust when including bank-related factors. Finally, for simplicity, we chose one transition function to capture the nonlinear impact induced by the lagged public debt on the fiscal deficit relative to other specifications.

Table 3: Linearity and no remaining heterogeneity tests

Test	H_0:r=0 vs. H_1:r=1	H_0:r=1 vs. H_1:r=2
Lagrange Multiplier – Wald (LMW)	71.89 (0.00)	35.46 (0.00)
Lagrange Multiplier – Fischer (LMF)	9.55 (0.00)	4.23 (0.00)
Likelihood Ratio	77.11 (.0.00)	36.66 (0.00)

Table 4a and table 4b present the PSTR estimates for Eq. (2) using four specifications to check the robustness of the nonlinear effect induced by the lagged public debt on the fiscal budget deficit. First of all, the impact coefficients associated with the explanatory variables are sensitive to the level of public debt from the previous year. This suggests that when the lagged public debt is lower (Regime 1), the fiscal deficit responds differently to Output GAP, interest rates, inflation, remittances, pandemics, or financial crises than when the government indebtedness as a ratio to GDP is greater than about 100% (Regime 2).

In the context of fiscal fatigue, these results suggest that as long as public debt levels increases, governments may experience diminishing revenues or or might be confronted with a higher fiscal vulnerability. The differences between Regime 1 and Regime 2 bring to light the varying degrees of fiscal resilience exhibited by governments facing divergent levels of indebtedness. This suggests that fiscal fatigue may manifest more pronouncedly when public debt reaches or exceeds certain critical thresholds, imposing constraints on a government's fiscal policy response to economic shocks and variables.

Table 4a: PSTR estimates

Variables	Regime 1: β_0	Non-linear part: β_1	Regime 2:	Regime 1: β_0	Non-linear part: β_1	Regime 2:
GAP	0.131***	-0.359**	-0.227**	0.109***	-0.320*	-0.211**
IR	-0.120	-1.500***	-1.500***	-0.074	-1.518***	-1.518***
INF	-0.192*	-0.385	-0.192	-0.172	-0.410	0.000
FDI	-0.007	-0.041	0.000	-0.005	-0.046	0.000
REM	0.063**	-0.168***	-0.104**	0.573**	-1.684***	-1.110**
PSI	-0.030	0.332***	0.332***	-0.026	0.224	0.000
GFC	-0.164***	-0.092	-0.164***	-0.158***	-0.096	-0.158***
COVID	-0.237***	-0.419***	-0.656***	-0.237***	-0.416***	-0.654***
BA				-0.014	0.010	0.000
Threshold	101.05%			101.70%		
Slope(γ)	2.6671			2.7850		

Variables	Regime 1: β_0	Non-linear part: β1	Regime 2:	Regime 1: β_0	Non-linear part: β1	Regime 2:
Obs.	544			544		

*Note: *, **, and *** denote statistical significance at the levels of 10%, 5%, and 1%, respectively. In Regime 2 we consider all the coefficients that are statistically significant; otherwise, they are set to zero.*

Table 4b: PSTR estimates

Variables	Regime 1: β_0	Non-linear part: β1	Regime 2:	Regime 1: β_0	Non-linear part: β1	Regime 2:
GAP	0.062	-0.292**	-0.291**	0.117**	-0.368***	-0.252**
IR	-0.071	-1.650***	-1.650***	-0.084	-1.474***	-1.474***
INF	-0.146	-0.244	0.000	-0.176*	-0.436	-0.176*
FDI	-0.010**	-0.019	-0.010	-0.007	-0.043	0.000
REM	0.0618**	-0.297***	-0.235**	0.067***	-0.210***	-0.142***
PSI	-0.0560	0.320***	0.320***	0.018	0.158	0.000
GFC	-0.170***	-0.048	-0.170***	-0.160***	-0.096	-0.160***
COVID	-0.244***	-0.396***	-0.640	-0.242***	-0.498***	-0.740***
ROA	0.402***	-0.522***	-0.119***			
Z-score				0.036**	0.161*	0.197*
Threshold	97.33%			102.28%		
Slope(γ)	0.3142			69.2281		
Obs.	544			544		

, **, and * denote statistical significance at the levels of 10%, 5%, and 1%, respectively. In Regime 2 we consider all the coefficients that are statistically significant; otherwise, they are set to zero.*

We begin the analysis of the results by investigating the bank-related variables. Table 4a reports the impact that the banking size exhibits on the budget deficit. As can be seen, this impact is not significant from a statistical point of view, which suggests that the size of the banking system, regardless of the level of the public debt in the previous year in a country does not influence the fiscal policy in any direction.

However, we notice a positive relationship between ROA and the fiscal deficit when the lagged public debt is less than 97.33%. This indicates that higher banking profitability is likely to be beneficial to public financial sustainability. This result is in line with Sayilgan and Yildirim (2009), who revealed that the ROA of the Turkish banking system and the fiscal deficit have a positive relationship. Indeed, during episodes of increased banking profitability, we can argue that banks become more efficient, and consequently, the government receives more revenues due to higher taxes on commercial profits. However, when we associate the public debt with the second regime, a different narrative emerges. In this scenario, we can see that ROA has a different shifted impact on the budget deficit. We can interpret this result, which is quite interesting, as follows: Commercial banks located in countries with very high levels of public debt typically have a large amount of government securities in their portfolio, ensuring an important part of their commercial profit relative to a low level of risk. Against the backdrop of declining banking profitability, it is projected that the willingness of the commercial banks to acquire more government debt will decline in favor of more profitable but riskier alternatives. This strategy might force governments to implement fiscal adjustments to cover the growing deficits. Although prior research, such as Andries *et al*. (2016), Căpraru and Ihnatov (2014), and Athanasoglou *et al.* (2006), found an impact of the budget deficit on bank profitability, the findings of this study imply that the link may be bidirectional. This indicates that bank profitability can have an impact on the budget deficit, helping to ensure the sustainability of public finances by raising government income from an efficient and lucrative banking industry.

Moving forward, usually, when the Z-score value is increasing, it translates into a more stable banking system with a lower probability of default. Consequently, when the probability of default across a certain banking system within a given country is increasing (Z-score is decreasing), it suggests the fragility of the banking system, and in this circumstance, the government might be forced to bail out the toxic assets, which translates into higher expenditure. The impact is five times greater in Regime 2 compared to Regime 1, which is expected given the limited maneuverability of governments and the high level of public debt. Thus, the amplified impact of increasing banking system default risk on the government's fiscal position in highly indebted countries underlines the need for more focused policies to strengthen the banking system. Also, policymakers should focus on strengthening financial sector regulation, prudential risk management, and fiscal resilience to ensure that they can effectively manage banking crises without excessively burdening public finances. These findings relate to some extent to the previous conclusions drawn by Ashraf (2017) or Uddin et al. (2020), according to which political institutions, have an increased influence on bank risk-taking behavior. The strength and quality of the political institution have a significant impact on the banking sector's stability and risk profile. Similar to the ROA case, this relationship may not be unidirectional but rather bidirectional, meaning that turbulence in the banking system could also lead to more counterintuitive fiscal policies.

In addition, we report a negative relationship between the Output GAP and fiscal balance. Furthermore, the estimates retain their signs and statistical significance in all the specifications but only in Regime 2. This negative sign leads to the conclusion that a larger Output GAP is associated with a deterioration in the fiscal balance. In this context, during economic expansions or when the Output GAP is positive, governments in Regime 2 may experience worsening fiscal conditions, potentially leading to larger deficits. In Regime 1, we report a positive sign, with the coefficients being statistically significant in 3 out of 4 regressions, which indicates that the impact is not robust across all the specifications. The results are, to a certain extend similar to the previous findings reported by Stoian et al. (2023) regarding the Output GAP – fiscal balance nexus across UE states. According to them it can be noticed, based on a quantile regression procedure, a procyclical fiscal behaviour when the balance runs large deficits that turn countercyclical but not significant once the balance improves.

Regarding the impact of interest rates on the budget deficit, we notice that it is negative in Regime 2 and statistically significant at the 99% percent level. In other words, an increase in money market interest rates will result in a decline in the fiscal deficit, which appears contradictory given the research on the subject, such as Stoian et al. (2023). However, this empirical conclusion holds only when the national debt exceeds the Regime 2 threshold amount, which is 97.33%. Indeed, an increase in the level of interest rates may result in austerity measures. Thus, decreasing non-essential expenditure and adopting structural reforms can improve the fiscal balance in the face of an interest rate shock, but only if the lagged public debt is high, implying that the government has less room to maneuver in terms of interest payments.

Finally, when looking at the influence of inflation and political stability on the fiscal balance, the results are ambiguous across both regimes. This shows that changes in inflation rates and political stability have no statistically significant effect on the government's fiscal situation. Although inflation and political stability are essential aspects of financial planning, their immediate impact on the fiscal balance is relatively difficult. Furthermore, the empirical study reveals that the two big sanitary and financial turmoils, the Great Financial Crises and the COVID-19 pandemic, had a long-term detrimental influence on the fiscal balance across the board. The results are not in line with the findings of some recent papers published on fiscal fatigu topics, such as Stoian et al. (2023), leading to the conclusion that the PSTR model may provide some additional evidence that other methods might overlook.

Conclusions

In this paper, we use a comprehensive sample encompassing 34 OECD countries during the period 2005-2020 and employ a Panel Smooth Transition Regression model to investigate how financial development is shaping the fiscal balance considering public debt as a threshold variable. One of the key findings refers to the sensitivity of the fiscal deficit to the profitability of the banking sector and the probability of default within a country's banking system. However, these two bank-related factors induce an asymmetric impact that is sensitive to the level of public debt in a particular country from the previous year.

In line with the previous literature, we find statistically significant evidence relating the interest rate, political stability, remittances, or global financial turmoils with budgetary deficits, but similarly, their impact is sensitive to the level of debt. These intriguing links highlight the need for tailored fiscal strategies that consider the specific economic context and debt conditions of individual countries.

Our results have strong policy implications. First, the results should interest fiscal policy decision-makers since they demonstrate how fiscal policies complement the dynamics of the banking system and how a stronger banking system can facilitate the implementation of fiscal policy. Second, given the complexity of fiscal and monetary interactions and the sensitivity of the financial system to fiscal policies, central bank regulators can adjust their inflation strategies accordingly. Third, the banking managers might be aware that the banking system's development in terms of profitability and risk has a direct impact on the fiscal position, and this is important when shaping the futures purchases of government bonds.

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