

Vladimir Andrić¹
Milojko Arsić²
Aleksandra Nojković³

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Fiscal Reaction to Interest Payments-the Case of Serbia

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Abstract: *We focus on the response of primary fiscal balance to interest payments and borrowing costs on Serbian public debt before, during and in the aftermath of the global financial crisis. Our analysis reveals: i) policy makers financed up to 50% of each percentage point increase in interest payments to GDP ratio with new public debt issuance; ii) the government has responded to rising interest payments and borrowing costs by reducing primary fiscal balance from the onset of the global financial crisis; iii) the response of primary fiscal balance to interest payments mimics the response of primary fiscal balance to the costs of borrowing; iv) fiscal austerity measures adopted after the breach of fiscal rule for public debt have been insufficient to stabilize fiscal policy stance in Serbia.*

Keywords: *Serbia, Fiscal Sustainability, Augmented Fiscal Reaction Function, Global Financial Crisis, Costs, Debt, Payments.*

Fiskalna reakcija u odnosu na troškove kamata-slučaj Srbije

Apstrakt: *U ovom radu fokusiramo se na reakciju primarnog fiskalnog bilansa na troškove kamata i zaduživanja na srpski javni dug pre, tokom i nakon izbijanja globalne finansijske krize. Naša analiza otkriva: i) kreatori ekonomske politike su finansirali i do 50% ukupnog rasta troškova kamata emisijom novog javnog duga; ii) nakon izbijanja globalne finansijske krize vlada smanjuje primarni fiskalni bilans uprkos rastu troškova kamata i zaduživanja; iii) reakcija primarnog fiskalnog bilansa na troškove kamata*

¹ University of Belgrade, Faculty of Economics, contact@vladimirandric.com

² University of Belgrade, Faculty of Economics

³ University of Belgrade, Faculty of Economics

oponaša reakciju primarnog fiskalnog bilansa na troškove zaduživanja; iv) mere štednje usvojene nakon kršenja fiskalnih pravila za gornju granicu javnog duga su se pokazale kao nedovoljne za stabilizaciju javnih finansija u Srbiji.

Ključne reči: *Srbija, Fiskalna Održivost, Proširena Funkcija Fiskalne Reakcije, Globalna Finansijska Kriza, Troškovi, Dug, Isplate.*

1. Introduction

We focus on the response of primary fiscal balance to interest payments and borrowing costs on Serbian public debt before, during and in the aftermath of the global financial crisis. Between 2004Q3 and 2014Q3, policy makers in Serbia increased primary fiscal balance as share of GDP in a range of 0.50-1.07 percentage points for each percentage point increase in interest payments to GDP ratio. The government, hence, financed up to 50% of each percentage point increase in interest payments to GDP ratio with new public debt issuance. We contribute this result to myopic behaviour of the Serbian government from the onset of the global financial crisis. In particular, the government responded to rising interest payments and borrowing costs by reducing primary fiscal balance after the global financial crisis unfolded. In 2012Q1, public debt to GDP ratio breached its fiscal rule limit of 45%, so policy makers pushed for numerous fiscal consolidation measures between 2012Q1 and 2014Q3. The measures were, however, inconsistent and unsystematic, so the government was unsuccessful in consolidating its fiscal policy stance. Although the response of primary fiscal balance to interest payments and borrowing costs had strengthened after 2012Q1, it remained in negative territory throughout our sample span.

Our estimates of fiscal reaction functions (FRFs) provide several novelties to the existing literature on fiscal solvency in the case of emerging European economies from Central and Eastern Europe. First, we investigate the fiscal prudence of the Serbian government not only with respect to public debt, but also with respect to interest payments and borrowing costs. Other contributions from the literature mainly focus on the solvency of government debt, and neglect to analyse the fiscal response to interest payments and borrowing costs. Notable exceptions familiar to us are Staehr (2008), Baldi and Staehr (2013), Debrun and Kinda (2013) and Mauro et al. (2013). Second, we detect a myopic behaviour of the Serbian government from the onset of the global financial crisis. We implement the ordinary least squares (OLS) estimation algorithm with endogenously determined breakpoints proposed in Bai (1997) and Bai and Perron (1998, 2003a, b) to detect potential shifts in the response of primary fiscal balance to interest payments

and borrowing costs. Our OLS estimates of FRFs with breakpoints, similar to the ones in Uctum et al. (2006) and Mauro et al. (2013), detect a regime change in the evolution of response of primary fiscal balance to interest payments and borrowing costs. The estimated FRFs capture the transition of the response from positive before the crisis to negative during and after the global financial crisis. In particular, the Ministry of Finance responded to rising interest payments and borrowing costs by reducing primary fiscal balance as share of GDP after the global financial crisis unfolded. Therefore, policy makers in Serbia financed up to 50% of each percentage point increase in interest payments to GDP ratio with new public debt issuance between 2004Q3 and 2014Q3. The use of public debt for financing maturing interest expenses sheds new light on why public debt to GDP ratio has exhibited upward trend since the outbreak of the global financial meltdown.

The additional original contribution of this paper is our focus on a single transition economy from emerging Europe while other related papers primarily operate with panel data sets. Mauro et al. (2013) is the only study from aforementioned contributions which uses time series data, but their sample does not contain any transition economy from Central and Eastern Europe.

The rest of the paper is organized as follows. Section II presents the theoretical framework which we use to motivate our econometric analysis. Section III comprises of two subsections: the first one documents stylized facts in Serbian public finances, while the second one discusses our empirical estimates. Section IV concludes by suggesting policy implications and avenues for further research.

2. Theoretical Background

We present a simple deterministic two-period model of optimal fiscal policy which serves as a framework for our subsequent empirical estimates. The model follows logic outlined in Barro (1979) and Debrun and Kinda (2013).

The utility function of the government is:

$$U = U(q_1) + \frac{1}{1+\delta} U(q_2). \quad (1)$$

Utility function from above is time separable with standard neoclassical properties $U' > 0$ and $U'' < 0$. In period i the government delivers the quantity of primary public spending denoted by $q_{i(i=1,2)}$, while δ stands for the discount rate of the government.

The government budget constraint is:

$$\begin{cases} q_1 = \tau y + b_1 - (r + \omega)b_0 \\ q_2 = \tau y - (1 + r)[(1 - \omega)b_0 + b_1] \end{cases} \quad (2)$$

in which τ represents a proportional fixed tax rate, as in the tax smoothing model of Barro (1979), while y represents exogenously determined output level. b_0 is exogenously inherited amount of public debt at the beginning of the first period, while b_1 is the amount of public debt at the end of the first period, i.e., at the beginning of the second period. The market interest rate paid on public debt is denoted by r , while ω , $\omega \in [0,1]$, stands for the proportion of an initial debt level b_0 to be amortized during the first period.

The government maximizes its utility from equation (1) given the budget constraint from equation (2). The maximization problem of the government is:

$$\max_{q_{i,i=1,2}} U = \max_{q_{i,i=1,2}} \left\{ U(q_1) + \frac{1}{1+\delta} U(q_2) \right\}. \quad (3)$$

From government budget constraint stated in equation (2), we express q_2 as a function of q_1 :

$$q_2 = \tau y(2 + r) - (1 + r)q_1 - b_0(1 + r)^2. \quad (4)$$

The maximization problem of the government now becomes a function of only one variable q_1 :

$$\max_{q_1} U = \max_{q_1} \left\{ U(q_1) + \frac{1}{1+\delta} U[\tau y(2 + r) - (1 + r)q_1 - b_0(1 + r)^2] \right\}. \quad (5)$$

The optimality condition with respect to q_1 is:

$$U'(q_1^*) = \rho U'(q_2^*) \quad (6)$$

in which $\rho = (1 + r)/(1 + \delta)$ represents a deterministic discount factor of the government.

By differentiating the optimality condition in (6) with respect to b_0 and r , we obtain the following comparative statics derivatives:

$$\frac{dq_1^*}{db_0} = \frac{db_1^*}{db_0} = - \frac{(r+\omega)U''(q_1^*) - \rho(1+r)(1-\omega)U''(q_2^*)}{U''(q_1^*) + \rho(1+r)U''(q_2^*)} \quad (7)$$

$$\frac{dq_1^*}{dr} = \frac{db_1^*}{dr} = - \frac{(1+\delta)^{-1}U'(q_2^*) - \rho((1-\omega)b_0 + b_1^*)U''(q_2^*) + b_0U''(q_1^*)}{U''(q_1^*) + \rho(1+r)U''(q_2^*)}. \quad (8)$$

The signs of comparative statics derivatives in (7) and (8) depend only on the signs of corresponding numerators, since the expressions in both denominators are always negative. The signs are ambiguous, and they depend crucially on the values of debt amortization parameter ω and subjective discount rate δ . The signs are positive for low values of these parameters, while they are negative if these parameters take on higher values. In particular, if the debt amortization parameter ω is close to 0, then the government shifts the amortization of inherited debt b_0 to the second period. On the other hand, if debt amortization parameter ω is close to 1, then the government amortizes almost entire inherited public debt b_0 in the first period. The behaviour of the government in the first case stems from low values of its discount rate δ , while the behaviour of the government in the second case stems from high values of its discount rate δ . Intuitively, low values of discount rate δ imply relatively higher marginal utility of primary public spending q_1^* in comparison to marginal utility of primary public spending q_2^* , while high values of discount rate δ imply relatively higher marginal utility of primary public spending q_2^* in comparison to marginal utility of primary public spending q_1^* . In the case of low δ , the government values primary public spending from the first period relatively more than primary public spending from the second period, so it increases its spending in the first period even when faced with increasing public debt and interest rate. The behaviour of the government is, therefore, myopic from the standpoint of fiscal solvency. In the case of high δ , the government values primary public spending from the second period relatively more than primary public spending from the first period, so it decreases its spending in the first period when faced with increasing public debt and interest rate. The behaviour of the government is, therefore, sustainable from the standpoint of fiscal solvency.

Bohn (1998) was the first to estimate the response of primary fiscal balance to public debt while controlling for transitory government spending and output fluctuations. Strictly positive, and at least linear, response of primary fiscal balance to public debt is *sufficient* for intertemporal budget constraint to hold. Intuitively, increasing primary fiscal balance will reverse any upward movement in public debt, so, consequently, public debt becomes mean-reverting. Ghosh et al. (2011) argue how Bohn's criterion represents *weak* solvency criterion, since it does not rule out an ever-increasing debt-to-GDP ratio. They propose a stricter solvency test which restricts public debt to converge to some finite proportion of GDP. For a given debt target, and a given inherited debt level, interest payments-to-GDP ratio is a proxy for debt stabilising primary fiscal balance. Stated differently, if the primary fiscal balance increases proportionally with interest payments, both in ratio to GDP,

then debt-to-GDP will stabilize at some predetermined debt level. If the primary fiscal balance, on the other hand, increases faster than interest payments, both in ratio to GDP, then debt-to-GDP will converge to some lower debt level. Finally, if the primary fiscal balance does not keep pace with rising interest payments, both in ratio to GDP, then there will be a debt level above which public debt dynamics becomes explosive. Therefore, the response of primary fiscal balance to interest payments in a given FRF points, indirectly, to the use of public debt in covering maturing interest expenses. In particular, the response of primary fiscal balance to interest payments which equals 1 in a given FRF indicates no use of public debt in covering maturing interest expenses. On the other hand, the response of primary fiscal balance to interest payments which is above 1 in a given FRF indicates the use of primary fiscal balance in covering both interest expenses and public debt. Finally, the response of primary fiscal balance to interest payments which is below 1 in a given FRF indicates the use of public debt in covering maturing interest expenses.

3. Empirical Evidence

Before we bring the model from the previous section to the data, we acquaint the reader with major trends in Serbian public finances before, during and in the aftermath of the global financial crisis.

3.1. Data and Trends

Our research uses official quarterly time series data from Ministry of Finance, National Bank of Serbia and the Statistical Office of the Republic of Serbia.⁴ The sample covers the period between 2004Q3 and 2014Q3. Fig. 1 shows two main sub-periods in the dynamics of fiscal balance, primary fiscal balance and public debt in Serbia. The first sub-period refers to the period before the crisis, and spans from 2004Q3 to 2008Q3. The second sub-period refers to the period during and in the aftermath of the global financial crisis, and spans from 2008Q4 to 2014Q3.

Following earlier contributions in the literature on fiscal reaction functions, we use overall, cyclically unadjusted, primary fiscal balance as an indicator of

⁴ We seasonally adjust our time series data with TRAMO/SEATS procedure in accordance with Eurostat (2015) and IMF (2001) guidelines. All data, both seasonally unadjusted and adjusted, are available from the authors upon request. Fiscal data pertain to the general government, except for public debt which is recorded at central government level due to data unavailability. Central government debt, however, constitutes 98% of general government debt between 2004Q3 and 2014Q3, as the Ministry of Finance (2015) reports.

fiscal policy stance.⁵ We build on theoretical models of Barro (1979) and Debrun and Kinda (2013) in our choice of fiscal policy stance indicator. This choice is also consistent with the model-based sustainability analysis developed in Bohn (1998), and later on outlined in Mendoza and Ostry (2008) and Lamé et al. (2014). The use of overall primary fiscal balance enables us to assess the overall response of fiscal policy stance to changes in public debt, interest payments and borrowing costs. Some authors, however, use cyclically adjusted primary fiscal balance as the proper measure of fiscal policy stance, following the seminal work of Gali and Perotti (2003).⁶ We, on the other hand, find this particular measure less satisfying in assessing overall fiscal sustainability, since it only captures the discretionary intentions of policy makers in conducting fiscal policy. The rise of aforementioned fiscal magnitudes can hinder economic growth which, in turn, can lead to lower government revenues and lower overall primary fiscal balance. Although there is a large body of literature which documents negative correlation between public debt and economic growth, this research question is beyond the scope of our paper.⁷ Finally, even if the previously stated assertions do not hold, it is comforting to note that the discrepancy between overall and cyclically adjusted primary fiscal balance in the case of Serbia is not large. In particular, Arsić et al. (2013) document how 80% of variations in overall primary fiscal balance is due to discretionary fiscal policy changes. In other words, the changes in structural, cyclically adjusted, primary fiscal balance govern approximately 80% of variations in overall, cyclically unadjusted, primary fiscal balance.

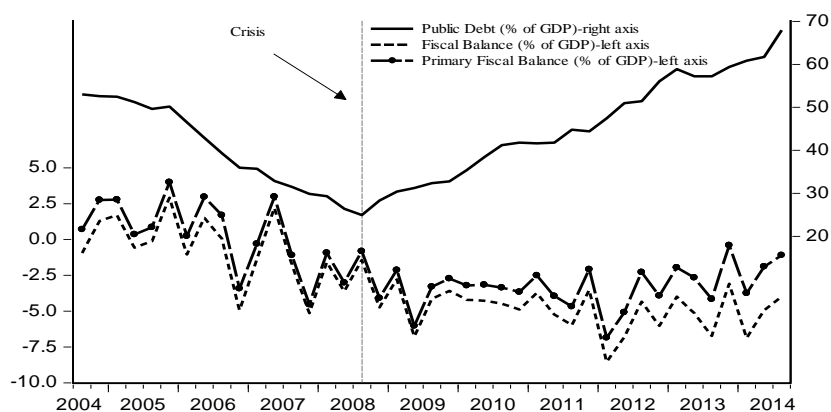
Fiscal balance in Serbia has recorded a deficit before, during and in the aftermath of the global financial crisis, the only exception being the period from the end of 2004 until the end of 2005. In particular, between 2004Q3 and 2005Q4, fiscal balance in Serbia achieved a surplus of around 0.7% of GDP, on average. The transient surplus in Serbian public finances was a result of fiscal consolidation package of over 5% of GDP between 2002 and 2005 (Cocozza et al., 2011). IMF's Extended Arrangement ensured the successful implementation of fiscal stabilization program. In 2006Q1, immediately after the Arrangement had expired, fiscal balance in Serbia entered into the negative territory.

⁵ The paper of Bohn (1998) is the first to measure the overall fiscal sustainability by linking the changes in primary fiscal balance to changes in public debt. Other papers from the literature, most notably Bohn (2005), Uctum et al. (2006), Mendoza and Ostry (2008), Staehr (2008), Ghosh et al. (2011), Mauro et al. (2013), Debrun and Kinda (2013) and Baldi and Staehr (2013), followed the same approach in assessing overall fiscal sustainability.

⁶ Plödt and Reicher (2014) document the great number of studies which follow the approach of Gali and Perotti (2003). See Plödt and Reicher (2014, page 4, footnote number 5).

⁷ The negative effect of high and increasing public debt on growth in transition economies can be even larger than a standard crowding-out effect, if it leads to policy uncertainty, foreign capital outflows, higher interest rates and higher probability of default.

Figure 1. Fiscal Balance, Primary Fiscal Balance and Public Debt in Serbia, 2004Q3-2014Q3



Sources: Ministry of Finance and the Statistical Office of the Republic of Serbia

Between 2006Q1 and 2008Q4, fiscal balance in Serbia fluctuated around its mean value of around -2 % of GDP, which is in line with the average actual fiscal deficit in the EU-10 economies during 2008.⁸ The deteriorating fiscal stance in Serbia after the completion of IMF's surveillance program points to the weakness of fiscal institutions in Serbia. In particular, policy makers in Serbia conducted procyclical expansionary fiscal policy in 2006, 2007 and 2008. Large privatizations of state owned banks and enterprises, along with the absorption boom led surge in indirect revenues, motivated the government to accompany cuts in marginal tax rate on wages with increases in public wages and non-taxable wage threshold. Arsić et al. (2013) argue how these measures increased structural fiscal deficit in Serbia by approximately 1.7% of GDP. In addition, policy makers approved several unprecedented hikes in public wages and pensions of around 2.5% of GDP during 2008 (Arsić et al., 2013).

At the beginning of the second sub-period, the government witnessed sharp decline in public revenues due to the arrival of the global financial crisis to Serbia. Moreover, the government signed a trade agreement with the EU which resulted in the overall loss of custom revenues of around 1.5% of GDP (Arsić et al., 2013). Between 2009Q1 and 2011Q1, the government froze public wages and pensions, and introduced several other austerity measures

⁸ Average actual fiscal deficit in the EU-10 countries in 2008 amounted to 2.8% of GDP (Arsić et al., 2013). EU-10 countries include Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia and Slovak Republic.

on both sides of the budget.⁹ These measures resulted in a relatively lower average fiscal deficit in Serbia in comparison to other transition economies from Central and Eastern Europe. In particular, actual fiscal deficit in Serbia averaged around 4.5% of GDP between 2009 and 2010, while EU-10 economies recorded an average fiscal deficit of around 6% of GDP in the same period. The effects of these measures were, however, largely reversed during 2011 when the government had abandoned fiscal austerity measures and introduced a fiscal decentralization package which widened structural fiscal deficit in Serbia for approximately 1.7% of GDP (Arsić et al., 2013). Therefore, between 2011Q2 and 2014Q4, the fiscal deficit in Serbia averaged around 5.9% of GDP, while EU-10 economies recorded an average fiscal deficit of around 3.4% of GDP, as a direct consequence of introduced fiscal austerity measures.

The dynamics of public debt-to-GDP ratio has also exhibited two distinctive patterns throughout our sample span-one before, and the other during and in the aftermath of the global financial crisis. Although rapid economic growth, absorption boom and politically motivated debt write-offs pushed debt-to-GDP ratio downward for approximately 30 percentage points between 2004Q3 and 2008Q3, debt to GDP ratio in Serbia exhibited one of the fastest increases in the group of emerging European economies from the onset of the global financial crisis. Widening fiscal balance pushed public debt to GDP ratio upwards for approximately 40 percentage points between 2008Q4 and 2014Q3-from around 30% of GDP in 2008Q3 to approximately 68% of GDP in 2014Q3.

As public debt grows, so do interest payments and effective borrowing costs.¹⁰ Fig. 2 depicts interest payments as % of GDP along with the implied effective interest rate on Serbian government debt between 2004Q3 and 2014Q3.¹¹ The two series are highly correlated with the sample correlation coefficient of 0.92. The dynamics of these magnitudes exhibits highly persistent upward trend with several structural shifts. First, between 2004Q3 and 2005Q2, interest payments and borrowing costs primarily decreased due to IMF's fiscal stabilization program which encompassed, among other measures, several debt reduction packages from international creditors. International creditors also provided the refinancing of older debts with much favourable repayment arrangements. In addition, international financial organizations provided concessional loans with longer grace periods and

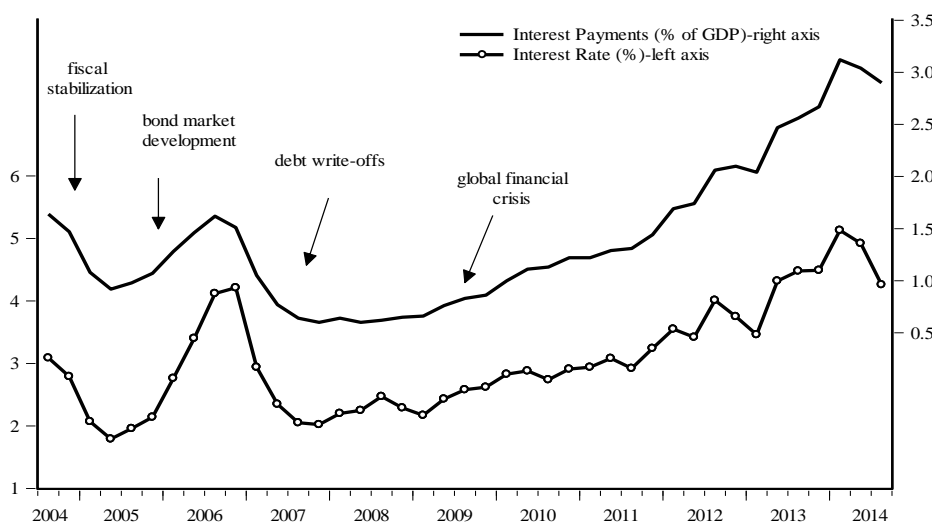
⁹ For a detail account of these measures see Fiscal Council (2012), Arsić et al. (2013) and Ministry of Finance (2015).

¹⁰ The sample correlation coefficient between public debt and interest payments equals 0.87, while the correlation coefficient between public debt and borrowing costs equals 0.64.

¹¹ We compute the implied effective interest rate on Serbian public debt as the ratio of interest payments and public debt. We do not operate with government bond yields due to data unavailability.

interest rates below those available on the market. Second, between 2005Q3 and 2006Q3, interest payments and borrowing costs primarily increased because the government had started issuing bills and notes in the process of domestic bond market development (Ministry of Finance, 2015). Third, between 2006Q4 and 2008Q3, interest payments and borrowing costs primarily decreased due to a breakup between Serbia and Montenegro, and due to partial debt write-offs towards the London and Paris international clubs of creditors. In addition, the government was not issuing bills and notes in this period due to a large inflow of privatization revenues from abroad. Fourth, between 2008Q4 and 2014Q3, primarily as a consequence of the global financial crisis, interest payments increased from 0.65% to 2.90% of GDP in the period under consideration. In the same period, international financial organizations reduced concessional lending to Serbia which, coupled with higher market interest rate due to the delay of comprehensive fiscal consolidation package, pushed borrowing costs upward from 2.29% to 4.26%.

Figure 2. Interest Payments (% of GDP) and Implied Effective Interest Rate (%) on Serbian Public Debt, 2004Q3-2014Q3



Sources: Ministry of Finance and the Statistical Office of the Republic of Serbia

3.2. Results

This section brings outlined theoretical model from section 2 to the data. First, we estimate the linear OLS augmented fiscal reaction function along the lines

of Bohn (1998), Debrun and Kinda (2013) and Mauro et al. (2013). Second, we model the nonlinearities in the response of primary fiscal balance to interest payments before, during and after the global financial crisis by following guidelines outlined in Bai (1997) and Bai and Perron (1998, 2003a, b). Finally, we investigate whether the shifts in primary fiscal balance response to interest payments correspond to the shifts in borrowing costs and/or public debt. We also provide numerous sensitivity checks for all aforementioned baseline estimates.

The linear OLS specification for the augmented fiscal reaction function is as follows:

$$S_t = \mu + \alpha_0 Crisis + \alpha_1 GGAP_t + \alpha_2 YGAP_t + \alpha_3 B_{t-1} + \alpha_4 Interest_{t-1} + \epsilon_t \quad (9)$$

in which S_t represents primary fiscal balance, B_{t-1} is lagged public debt, $Interest_{t-1}$ are lagged interest payments on public debt, $GGAP_t$ is transitory government spending, $YGAP_t$ is output gap and ϵ_t are i.i.d. normal white noise residuals with parameters 0 and σ^2 . *Crisis* is a dummy variable which equals 1 if $t > 2008Q3$, and 0 otherwise, following Berglöf et al. (2009) and Coccozza et al. (2011) who date the outbreak of the global financial crisis in Serbia at the end of 2008. We express all regressors as shares of GDP, except $YGAP_t$ which is in log levels, as in Uctum et al. (2006) and Bohn (2005). In particular, we compute $GGAP_t$ as the detrended values of nominal government expenditures, and then divide the obtained transitory component with nominal GDP, while we calculate $YGAP_t$ by detrending the values of log real GDP.¹²

FRF from equation (9) is closely related to Barro's (1979) tax smoothing model. The tax smoothing model of Barro (1979) implies exogenous permanent government spending which determines the level of collected taxes. Policy makers fix the tax rate to minimize the administrative costs of tax collection and the deadweight cost of taxation. Consequently, transitory government spending, as a consequence of political and business cycles, and output gap, via its impact on the tax base, are the only non-debt determinants of the primary fiscal balance.

We present the coefficient estimates from equation (9) in Table 1. Table 1 shows how the estimated response of primary fiscal balance to 1 percentage point increase in interest payments is **0.50** percentage points. The estimated response is significant at more than 1% significance level. The estimated coefficient shows how policy makers in Serbia funded approximately 50% of each percentage point increase in interest payments with primary fiscal balance, and around 50% with newly issued government debt. We use lagged interest payments and public debt as explanatory variables in equation (9) for

¹² We use Hodrick-Prescott (HP) filter with smoothing parameter set to 1600 in both calculations.

two reasons. First, we circumvent potential endogeneity between contemporaneous interest payments, public debt and the unexplained variations of primary fiscal balance. In addition, by controlling for public debt variations in our FRF, we can isolate the sole response of fiscal policy stance to variations in interest expenses. Second, we allow the additional quarter for the corrective fiscal actions of the government in repaying maturing interest expenses.

Table 1. Augmented FRF with Interest Payments (period: 2004Q3-2014Q3)

Regressor	Coefficients	Standard Errors	t – stat.
μ	-1.23**	0.82 (0.57)	-1.50 [-2.16]
<i>Crisis</i>	-3.82***	0.27 (0.26)	-14.12 [-14.43]
$GGAP_t$	-0.93***	0.07 (0.07)	-12.90 [-13.40]
$YGAP_t$	8.36*	7.02 (4.87)	1.19 [1.72]
B_{t-1}	0.02	0.03 (0.02)	0.75 [1.29]
$Interest_{t-1}$	0.50***	0.39 (0.17)	1.29 [2.89]
R^2	0.93	S.E.	0.72
$F - stat.$	95.95	DW	1.94

Notes: Estimates are from equation (9). S_t -primary fiscal balance as the dependent variable. μ -constant term; *Crisis*-dummy which equals 1 if $t > 2008Q3$, and 0 otherwise; B_{t-1} -quarter lagged public debt; $Interest_{t-1}$ -quarter lagged interest payments; $GGAP_t$ -transitory government spending; $YGAP_t$ -output gap. Variables expressed in % of GDP, except $YGAP_t$ which is in log levels. Newey-West HAC standard errors with Bartlett kernel and lag window of size 4 are given in (). Newey-West HAC t -statistics are given in []. OLS estimation method. *** 1% level significance, ** 5% level significance, * 10% level significance for HAC standard errors.

The estimated response for lagged public debt equals 0.02. The estimated coefficient, however, is not significant at even 10% significance level. The insignificance of the estimated response points to insolvency of public debt management in Serbia between 2004Q3 and 2014Q3.¹³

The global financial crisis has increased the share of primary fiscal deficit in GDP by 3.82 percentage points. The estimated coefficient for the dummy variable *Crisis* in Table 1 is significant at 1% level. The percentage point increase (decrease) of general government expenditures as % of GDP from its overall trend level reduced (increased) the share of primary fiscal balance

¹³ The reader should interpret this result cautiously, since the correlation coefficient between public debt and interest payments of 0.87 points to severe multicollinearity issues.

in GDP by 0.93 percentage points. The estimated coefficient for $GGAP_t$ in Table 1 is also significant at 1% level.

The estimated coefficient for output gap measures the automatic response of primary fiscal balance to business cycle fluctuations. The percentage point increase (decrease) of real GDP from its potential level increased (reduced) the share of primary fiscal balance in GDP by 0.08 percentage points. The estimated cyclical response is significant at 10% level. Although the significant positive response points to pro-cyclical of primary fiscal balance in Serbia, its magnitude is more in line with a-cyclical explanation of fiscal policy behaviour. The size of the estimated cyclical response shows the inability of output fluctuations to increase the share of primary fiscal balance in GDP. In particular, for the primary fiscal balance to increase its share in GDP for 1 percentage point, output should deviate upward from its overall trend level by more than 10 percentage points. This estimate does not change even when we define output gap as % of potential output. To provide additional robustness check, we have also used real GDP growth instead of output gap. The estimated coefficient of -0.003 is not significant at even 10% significance level, once again supporting our baseline claims. Our results reinforce the findings of Arsić et al. (2013) who contribute 80% of overall fiscal deficit to structural discretionary measures, predominantly on the expenditure side of the budget, and only 20% of overall fiscal deficit to business cycle and other macroeconomic considerations. In addition, the results are robust with respect to simultaneity bias, since the correlations with residuals from equation (9) are indistinguishable from zero. Moreover, the size and significance of cyclical response do not change when we instrument $YGAP_t$ with its lagged value.¹⁴ Putted differently, the absence of simultaneity between primary fiscal balance and output gap shows unsynchronized fiscal policy conduct in Serbia between 2004Q3 and 2014Q3 with respect to business cycle fluctuations. In particular, the positive effects of fiscal consolidation between 2002-2005 were largely reversed by the negative effects of procyclical fiscal expansion in 2006, 2007 and 2008. Similarly, the positive effects of fiscal consolidation in 2009 and 2010, were largely reversed by the fiscal developments in 2011, 2012 and 2013.

The estimation of long-run variance in Newey-West HAC correction might be biased in small samples such as ours. Plödt and Reicher (2014) link the autocorrelation in primary fiscal balance with the degree of cyclicity in fiscal policy. If primary fiscal balance is assumed to respond slowly to output gap due to implementation lags in discretionary fiscal policy, then the specification

¹⁴ The estimated coefficient equals 11.46, and it is significant at 12% level. We do not report these, and many others, sensitivity checks throughout our paper in separate equations and tables to preserve journal space. All reported results are, however, available from the authors upon request.

for FRF should model autocorrelation in primary fiscal balance with an appropriate lag of the dependent variable. On the other hand, if primary fiscal balance is assumed to respond quickly to output gap due to automatic adjustments, then the specification for FRF should model autocorrelation in primary fiscal balance with an appropriate AR term for the residuals of primary fiscal balance. Two alternative modelling approaches confirm our baseline estimates in Table 1. In particular, we have alternatively modelled the autocorrelation in primary fiscal balance by: i) experimenting with the first four lags of the dependent variable S_t ; ii) fitting AR terms up to the 4th order to the unexplained component of primary fiscal balance from equation (9). Two findings are particularly worth emphasizing. First, only coefficient for S_{t-3} is significant at 10% level, and equals 0.13. The significance of the third lag points to very slow changes in primary fiscal balance as a consequence of discretionary fiscal policy measures, while the size of the estimated coefficient implies very flexible fiscal reaction function for primary fiscal balance, as in Staehr (2008) and Baldi and Staehr (2013). Although all other estimates remain very close to those from equation (9), fourth lag autocorrelation is still present at 10% significance level. Second, only AR (4) specification for the residuals of primary fiscal balance from equation (9) is significant at 10% level, and the estimated AR (4) term equals -0.34. The size of the estimated AR term shows how 1 percentage point shock in S_t due to automatic adjustments reduces the share of primary fiscal balance in GDP for approximately 0.3 percentage points after one year. Although all other estimates again remain very close to those from equation (9), autocorrelation in the residuals of primary fiscal balance still perseveres.¹⁵

Following Mendoza and Ostry (2008), we have also experimented with trade balance and inflation rate as additional control variables in equation (9). The inclusion of trade balance as control variable is important for encompassing the influence of indirect taxes on fiscal policy stance. In particular, increasing trade deficits imply higher indirect taxes, most notably higher VAT and custom revenues, as a consequence of higher imports. The inclusion of the inflation rate as control variable is important for encompassing potential inflation tax effects. In particular, higher inflation rate implies higher nominal incomes which, in turn, might imply higher nominal income taxes. The response to interest payments, significant at 5% level, jumps to **0.66** in the specification with trade balance, although the coefficient for trade balance fails to attain statistical significance. The response to interest payments, significant at 5% level, jumps to **0.77** in the specification with inflation rate, although the

¹⁵ A meticulous reader might wonder whether our estimates from this paragraph are just a mere consequence of residual seasonality present in our time series data. We have tested for the presence of residual seasonality within X-ARIMA procedure, according to the ESS (Eurostat, 2015) and QNA (IMF, 2001) guidelines. The tests within X-ARIMA procedure reject the presence of residual seasonality.

coefficient for inflation rate fails to attain statistical significance. All other estimates in both specifications have the same size, sign and statistical significance as those in Table 1. The inclusion of additional controls, hence, does not change our baseline estimates in Table 1, which provides further evidence for their robustness.

In the case of Serbia, privatization proceeds, which were particularly high between 2006Q4 and 2008Q3, also represent an important potential control variable. Policy makers had used these proceeds to finance fiscal deficits which altered a standard debt-surplus relationship in the intertemporal government budget constraint. Privatization proceeds influenced, hence, interest payments indirectly via their influence on public debt accumulation. Since our FRF specification controls for public debt and interest payments variations, we have, therefore, indirectly controlled for the great majority of variations in privatization proceeds as well.

Lamé et al. (2014) argue how estimates of FRFs are difficult to interpret when the primary fiscal balance to GDP ratio is stationary, while public debt and interest payments are (near) unit root processes.¹⁶ The error term is most likely correlated with the evolution of public debt and interest payments. The estimators for public debt and interest payments, hence, have nonstandard asymptotic distributions in finite samples. The finite sample bias is present even when the regressors are instrumented with their lagged values. Lamé et al. (2014) propose a parametric correction for the elimination of this potential finite sample bias by adding additional lags of public debt and interest payments in FRF.¹⁷ They estimate the FRF specification of the following general type:

$$S_t = \mu + \alpha + \beta B_{t-1} + \gamma B_{t-2} + \delta Interest_{t-1} + \theta Interest_{t-2} + \epsilon_t$$

$$= \mu + \alpha + (\beta + \gamma) B_{t-1} - \gamma \Delta B_{t-1} + (\delta + \theta) Interest_{t-1} - \theta \Delta Interest_{t-1} + \epsilon_t \quad (10)$$

where μ represents the vector of control variables.

We follow the advice of Lamé et al. (2014) and augment equation (9) with lagged first differences of public debt and interest payments. The primary

¹⁶ First lag autocorrelation coefficient for both public debt and interest payments equals 0.91. The results of unit root tests are inconclusive. Primary fiscal balance, on the other hand, is trend stationary, so we do not test for the cointegration between the two series.

¹⁷ Lamé et al. (2014) also propose a nonparametric correction to the heterogeneous persistence between primary fiscal balance on one hand, and public debt and interest payments on the other. The nonparametric approach is, however, only valid under the assumption of uncorrelated primary fiscal balance, a condition not satisfied throughout our sample span.

fiscal balance response to interest payments equals **0.57**, and it is almost identical to the baseline estimate in Table 1. The estimated coefficient is significant at 5% level. Included first differences of public debt and interest payments are insignificant at 10% level, while all other estimates have the same size, sign and statistical significance as in Table 1. The results are consistent with baseline estimates, most probably because aforementioned small sample bias is negligible in our case. In particular, the correlation coefficient between the error term and public debt is only 0.004, while the correlation coefficient between the error term and interest payments is -0.007.

An alternative way to approach the problem of different persistence between primary fiscal balance, public debt and interest payments is to include time trends as additional explanatory variables in equation (9). The included terms should take into account influences on primary fiscal balance which are not captured with existing control variables. In particular, we have experimented with linear and quadratic time trends. These specifications, however, yield somewhat different results with respect to baseline estimates in Table 1. The primary fiscal balance response in a FRF with linear time trend jumps to **1.07** (1% level significance), while the included linear time trend, significant at 1% level, is economically insignificant and equals only -0.08. When we experiment with a quadratic time trend, the primary fiscal balance response drops to **0.88** (1% level significance), but the included linear and quadratic trend terms are insignificant at 10% level. In both cases, all other coefficient estimates, in general, have the same size, sign and statistical significance as in Table 1.

The reported estimates from the previous passage, at least when we focus on a FRF with linear time trend, show how primary fiscal balance has increased proportionally with interest payments-to-GDP ratio. This result implies an absence of self-generating public debt issued to finance maturing interest expenses between 2004Q3 and 2014Q3. To shed more light on this issue, we dissect the evolution of primary fiscal balance response in aforementioned period to see whether the response changed or remained fairly constant. In addition, theoretical framework from Section 2 is ambiguous with respect to the sign of primary fiscal balance response, i.e., the response can be positive or negative. We explore, hence, the possibility of a non-linear relationship between the interest bill and primary fiscal balance by tracing the evolution of response across different regimes and sub-periods.

We follow OLS estimation algorithm with endogenously determined breakpoints proposed in Bai (1997) and Bai and Perron (1998, 2003a, b) to detect potential shifts in the response of primary fiscal balance to interest payments. In particular, we estimate the following specification for FRF:

$$S_t = \mu + \alpha_0 GGAP_t + \alpha_1 YGAP_t + \alpha_2 B_{t-1} + \alpha_3 Interest_{t-1(2004Q4-2008Q4)} + \alpha_4 Interest_{t-1(2009Q1-2012Q1)} + \alpha_5 Interest_{t-1(2012Q2-2014Q3)} + \epsilon_t. \quad (11)$$

The first break date occurred in 2008Q4, while the second break date occurred in 2012Q1. We follow the guidelines outlined in Bai and Perron (1998, 2003 a, b) in determining the number and location of potential break points.¹⁸ The 95% confidence interval for the first break date is [2008Q2 – 2009Q2], while the 95% confidence interval for the second break date is [2011Q2 – 2012Q4]. We calculate the confidence intervals for the case of trending regressors as in Bai (1997), according to the formula $[\hat{t}_i - [c/\hat{L}_i] - 1, \hat{t}_i + [c/\hat{L}_i] + 1]$, in which \hat{t}_i is the estimated break date, $[c/\hat{L}_i]$ is the integer part of c/\hat{L}_i , c is the 97.5th quintile from the symmetric case CDF for which $c = 11$ and $\hat{L}_i = ((\hat{\alpha}_1 - \hat{\alpha}_2)^2 Interest_{t \hat{t}_i - 1}^2) / \sigma_{\epsilon HAC}^2$ is a scale factor with $\hat{\alpha}_1$, $\hat{\alpha}_2$ and $\sigma_{\epsilon HAC}^2$ defined as the interest payments coefficient before the break point, interest payments coefficient after the break point and the HAC corrected estimated variance of ϵ_t from (11), respectively. The use of symmetric CDF is appropriate, since the model's residuals are stationary on the whole sample. The results of both ADF and KPSS test confirm this finding.¹⁹ Moreover, our results do not change if we allow heterogeneous errors across break dates.

We outline the results of estimation in Table 2. First, the estimate for transitory government spending is identical to the one in Table 1. Second, the coefficient for output gap jumps in terms of magnitude with respect to estimate in Table 1. The estimated coefficient is, however, still small to imply more substantial economic influence on fiscal stance in Serbia. Third, the response for public debt jumps to 0.05, simultaneously gaining statistical significance at 5% level. The obtained estimate is identical to the one in Andrić et al. (2016) who focus solely on the fiscal prudence of public debt between 2004Q3 and 2014Q3.

Fourth, before the global financial crisis, the government responded to each percentage point increase in interest payments with **1.69** percentage point

¹⁸ First, we specify the upper bound for potential number of breaks, i.e., we determine the minimal regime length by setting the value of trimming percentage ϵ . If autocorrelation is present in the data generating process, Bai and Perron (2003a, b) advise the use of ϵ of at least 20%. Given our sample size, we set the value of ϵ to 25% which corresponds to a minimal regime length of 10 quarters. Second, we implement double maximum tests UD_{max} and WD_{max} from Bai and Perron (1998) to see if at least one break is present, given the ϵ -prespecified upper bound for potential number of breaks. Third, given the presence of at least one break, we apply a sequential test of $\ell + 1$ versus ℓ globally determined breaks, as in Bai and Perron (1998, 2003a, b). The described 3-step procedure yields two breakpoints, the one in 2008Q4 and the other in 2012Q1.

¹⁹ ADF test statistic with intercept equals -5.43, while the corresponding KPSS test statistic equals 0.05. The stationarity of the residuals from equation (11) also suggests that the number and location of estimated break points corresponds to those of the "true" model. Moreover, the number and location of estimated break points is robust with respect to different algorithms proposed in Bai and Perron (1998, 2003a, b).

increase in primary fiscal balance. The response is significant at 1% level, and it is, at least partially, influenced by public debt write-offs by the international creditors in 2005, 2006 and 2007.

The solvency of the government with respect to interest payments, however, deteriorated sharply between 2009Q1 and 2012Q1. In particular, the primary fiscal balance response dropped to **-1.77** percentage points for each percentage point increase in interest payments to GDP ratio. Putted differently, for each percentage point increase in interest payments to GDP ratio from the onset of the global financial crisis, the government reduced primary fiscal balance for more than 1 percentage point, thus accelerating the deterioration of its fiscal policy stance. The drop-in response, significant at 1% level, is primarily due to: the rebalancing of the economy towards exports and the associated decline in indirect government revenues; the loss of custom revenues of around 1.5% of GDP due to a signed 2008 EU trade agreement; hikes in public wages and pensions of around 2.5% of GDP during 2008; vertical fiscal imbalances of around 1.7% of GDP created in 2011 as a consequence of populist fiscal decentralization package.²⁰

Although the government introduced numerous fiscal austerity measures between 2012Q1 and 2014Q3, these ad hoc measures were insufficient to stabilize fiscal policy stance in Serbia. Therefore, public debt to GDP ratio breached its fiscal rule upper limit of 45% in 2012Q1, despite the government had kept nominal public wages and pensions frozen during 2009 and 2010. Therefore, the response of primary fiscal balance to interest payments, though higher by approximately 1 percentage point after the fiscal rule breach, still remained in negative territory. In particular, the response, significant at 10% level, averaged **-0.65** between 2012Q1 and 2014Q3. The improvement in the response of primary fiscal balance to interest payments is primarily due to: the increase in standard VAT rate from 18% to 20%; the increase in corporate income tax rate from 10% to 15%; increases in excise taxes on tobacco, oil and oil derivatives; slower than inflation indexation scheme for public wages and pensions; ad hoc public sector hiring freezes and the additional taxation of monthly governmental salaries which exceeded 60.000 RSD during 2014.²¹ The primary fiscal balance response remained negative, however, because the effects of aforementioned measures were largely reversed due to higher local purchases of around 0.7% of GDP in 2012 and bailouts of state owned banks and enterprises of around 1% of GDP in 2013.²²

²⁰ For a more detailed account of these measures see Arsić et al. (2013) and Coccozza et al. (2011).

²¹ For a more detailed account of these measures see Fiscal Council (2012) and Ministry of Finance (2015).

²² For a more detailed account of these measures see Arsić et al. (2013) and Ministry of Finance (2015).

Table 2. Augmented FRF with Interest Payments Shifts (period: 2004Q3-2014Q3)

Regressors	Coefficients	Standard Errors	t – stat.
μ	-4.12***	0.91 (0.77)	-4.50 [-5.34]
$GGAP_t$	-0.93***	0.07 (0.07)	-13.45 [-13.55]
$YGAP_t$	14.73*	7.45 (7.49)	1.98 [1.97]
B_{t-1}	0.05**	0.03 (0.02)	2.12 [2.38]
$Interest_{t-1}(2004Q4-2008Q4)$	1.69***	0.51 (0.44)	3.34 [3.88]
$Interest_{t-1}(2009Q1-2012Q1)$	-1.77***	0.52 (0.42)	-3.43 [-4.19]
$Interest_{t-1}(2012Q2-2014Q3)$	-0.65*	0.35 (0.36)	-1.84 [-1.83]
R^2	0.93	S. E.	0.70
F – stat.	86.35	DW	1.77

Notes: Estimates are from equation (11). S_t -primary fiscal balance as the dependent variable. μ -constant; B_{t-1} -lagged public debt; $Interest_{t-1}$ -lagged interest payments; $GGAP_t$ -transitory government spending; $YGAP_t$ -output gap. Variables are in % of GDP, except $YGAP_t$ which is in log levels. Bai and Perron (1998, 2003a, b) estimation algorithm with 25% sample trimming percentage dates breaks in 2008Q4 and 2012Q1. HAC standard errors with Bartlett kernel and window of 4 are given in (). HAC t -statistics are given in []. *** 1%, ** 5%, and * 10% significance for HAC standard errors.

We subject our results in Table 2 to numerous sensitivity checks. Table 3 summarizes the most important of these sensitivity analyses. First, the use of lagged dependent variable up to the 4th lag instead of HAC standard errors does not change estimates in Table 2. All lags of the dependent variable are insignificant at 10% level. Second, omitted variable F-test statistic rules against the inclusion of linear non-breaking time trend in equation (13).²³ The same conclusion holds for the inclusion of breaking trend across breaks in 2008Q4 and 2012Q1.²⁴ In addition, sample splitting across sub-samples

²³ The p-value of the F-statistic equals 0.73. For the subsample 2004Q4-2008Q4, the response of primary fiscal balance to interest payments equals **1.64** (p-value=0.00). All other coefficient estimates have the same size, sign and statistical significance as those in Table 2. For the subsample 2009Q1-2012Q1, the response drops to **-1.50** (p-value=0.04). For the subsample 2012Q2-2014Q3, the response equals **-0.41** (p-value=0.55).

²⁴ An omitted variable F-test statistic has a p-value of 0.07. The only significant trend term is the one for the period 2012Q2-2014Q3. For the subsample 2004Q4-2008Q4, the response of primary fiscal balance to interest payments equals **0.89** (p-value=0.03). In great contrast with stylized facts about macro-fiscal variables during the global financial crisis, the response of primary fiscal balance to interest payments between 2009Q1-2012Q1 jumps to **2.44** (p-value=0.51), pointing out to severe overfitting and multicollinearity issues. For the subsample 2012Q2-2014Q3, the response equals **0.98** (p-value=0.21).

2004Q4-2008Q4, 2009Q1-2012Q1 and 2012Q2-2014Q3 roughly mimics the estimates presented in Table 2.²⁵ Third, the specification with only one break in 2008Q4 also detects the sharp decline in the response of primary fiscal balance to interest payments in terms of magnitude and statistical significance during and after the global financial crisis. In particular, the response drops from **2.43** (p-value=0.00) before the break to **-0.49** (p-value=0.33) after the break. Other coefficient estimates have the same size, sign and statistical significance as those shown in Table 2. Finally, we have allowed for simultaneous breaks in public debt and interest payments in equation (11). The estimates from the specification with one break in 2008Q4 show identical responses before and after the crisis. The responses are equal to **1.00** (1% level significance), and they reinforce the claims about the absence of self-generating public debt in covering maturing interest expenses. The response of primary fiscal balance to public debt before the crisis equals 0.08 (p-value=0.00), while the response after the crisis equals -0.01 (p-value=0.68), supporting, to a certain extent, the findings of Andrić et al. (2016).²⁶

Table 3. Sensitivity Analyses for the Primary Fiscal Balance Response to Interest Payments

Period/FRF	Linear Trend	Breaking Trend	Sample Split	Crisis Break	Simultaneous Breaks	
					08Q4	08Q4, 12Q1
04Q4 – 08Q4	1.64***	0.89**	0.98**	2.43***	1.0***	1.01***
09Q1 – 14Q3	-	-	-	-0.49	1.0***	-
09Q1 – 12Q1	-1.50**	2.44	-2.44	-	-	-0.26
12Q2 – 14Q3	-0.41	0.98	-0.51	-	-	0.53

Notes: *** 1% level significance, ** 5% level significance, * 10% level significance for HAC standard errors. Column *Linear Trend* corresponds to FRF from equation (11) with linear non-breaking trend. Column *Breaking Trend* corresponds to FRF from equation (11) with breaking trend across breaks in 2008Q4 and 2012Q1. Column *Sample Split* corresponds to FRF from equation (9) without dummy *Crisis* for subperiods 2004Q4-2008Q4, 2009Q1-2012Q1 and 2012Q2-2014Q3. Column *Crisis Break* corresponds to FRF from equation (11) with one break in 2008Q4. Columns *Simultaneous Breaks* correspond to FRF from equation (11) with simultaneous breaks in public debt and interest payments across one break in 2008Q4 and two breaks in 2008Q4 and 2012Q1.

²⁵ For the subsample 2004Q4-2008Q4, the response of primary fiscal balance to interest payments equals **0.98** (p-value=0.03). All other coefficient estimates have the same size, sign and statistical significance as those in Table 2. For the subsample 2009Q1-2012Q1, the response drops to **-2.44** (p-value=0.67). Output gap and public debt also lose their statistical significance. For the subsample 2012Q2-2014Q3, the response equals **-0.51** (p-value=0.38). Output gap and public debt again lose their statistical significance. The statistical insignificance of reported estimates in the last two sub-samples is probably due to their relatively shorter time span and the associated loss of degrees of freedom.

²⁶ Andrić et al. (2016) estimate how the response of primary fiscal balance to public debt in Serbia has dropped from 0.15 between 2004Q3-2008Q3 to 0.05 between 2008Q4-2014Q3.

The estimates from the specification with two breaks, one in 2008Q4 and the other in 2012Q1, roughly trace the results shown in Table 2. The response of primary fiscal balance to interest payments between 2004Q4-2008Q4 equals **1.01** (p-value=0.01), while the response to public debt equals 0.07 (p-value=0.00). The response of primary fiscal balance to interest payments between 2009Q1-2012Q1 equals **-0.26** (p-value=0.88), while the response to public debt equals 0.01 (p-value=0.90). The response of primary fiscal balance to interest payments between 2012Q2-2014Q3 equals **0.53** (p-value=0.3), while the response to public debt equals 0.001 (p-value=0.95). All other coefficient estimates have the same size, sign and statistical significance as those shown in Table 2. The statistical insignificance of aforementioned responses is probably due to overfitting and multicollinearity issues.

The reported robustness results unequivocally point to a drop in the response of primary fiscal balance to public debt during and in the aftermath of the global financial crisis. The results are less clear for the response of primary fiscal balance to interest payments. As a final robustness check, we instrument interest payments with R_t , an implied effective interest rate on Serbian public debt, calculated as a share of interest payments in public debt. The instrument is valid, since the interest payments to GDP ratio is just a multiple of public debt to GDP ratio and implied effective interest rate. In addition, theoretical model from Section 2 operates with interest rates, not interest payments, although our choice for interest payments can be justified from the standpoint of their importance for overall fiscal sustainability. The idea is to examine whether the evolution of the primary fiscal balance response to interest payments mimics the underlying evolution of the response of primary fiscal balance to implied effective interest rate. Finally, the use of implied effective interest rate mitigates potential collinearity issues, since its correlation coefficient with public debt is significantly lower than the one between interest payments and public debt. In particular, we estimate the following FRF with shifts in implied effective interest rate on Serbian public debt:

$$S_t = \mu + \alpha_0 GGAP_t + \alpha_1 YGAP_t + \alpha_2 B_{t-1} + \alpha_3 R_{t-1(2004Q4-2008Q4)} + \alpha_4 R_{t-1(2009Q1-2012Q1)} + \alpha_5 R_{t-1(2012Q2-2014Q3)} + \epsilon_t \quad (12)$$

The 95% confidence interval for the first break date is [2008Q3 – 2009Q1], while the 95% confidence interval for the second break date is [2010Q4 – 2013Q2]. We outline the results of estimation in Table 4.

Table 4 conveys several important messages. First, the estimates for transitory government spending and public debt correspond, as expected, to those in Table 2, both in terms of magnitude and in terms of statistical

significance. Second, the estimate for output gap is quantitatively very similar to the one in Table 2, but the estimated response is insignificant at even 10% significance level. The insignificant influence of output gap on primary fiscal balance reinforces our claims about a-cyclical primary fiscal balance in Serbia. Third, the response of primary fiscal balance to interest payments mimics the response of primary fiscal balance to implied effective interest rate across estimated break points in terms of size, sign and statistical significance. Putted differently, the results in Table 4 with respect to borrowing costs re-establish our main finding about myopic behaviour of the Serbian government with respect to interest payments during and in the aftermath of the global financial crisis.

Table 4. Augmented FRF with Shifts in Implied Effective Interest Rate (period: 2004Q3-2014Q3)

Regressors	Coefficients	Standard Errors	<i>t</i> – stat.
μ	-3.87***	1.02 (0.80)	-3.80 [-4.80]
$GGAP_t$	-0.96***	0.07 (0.07)	-14.24 [-14.19]
$YGAP_t$	9.94	7.31 (7.43)	1.36 [1.34]
B_{t-1}	0.06***	0.02 (0.02)	2.97 [3.32]
$R_{t-1(2004Q4-2008Q4)}$	0.46***	0.21 (0.15)	2.24 [3.05]
$R_{t-1(2009Q1-2012Q1)}$	-0.93***	0.21 (0.15)	-4.30 [-6.05]
$R_{t-1(2012Q2-2014Q3)}$	-0.58***	0.17 (0.15)	-3.46 [-3.85]
R^2	0.94	<i>S. E.</i>	0.67
<i>F</i> – stat.	93.20	<i>DW</i>	2.11

Notes: Estimates are from equation (12). Bai and Perron OLS breakpoints estimation algorithm with fixed breaks in 2008Q4 and 2012Q1. S_t -primary fiscal balance as the dependent variable. μ -constant term; B_{t-1} -quarter lagged public debt; R_{t-1} -quarter lagged implied effective interest rate on public debt; $GGAP_t$ -transitory government spending; $YGAP_t$ -output gap. Variables expressed in % of GDP, except R_{t-1} which is a ratio of interest payments to public debt (%) and $YGAP_t$ which is in log levels. Newey-West HAC standard errors with Bartlett kernel and lag window of size 4 are given in (). Newey-West HAC *t*-statistics are given in []. *** 1% level significance, ** 5% level significance, * 10% level significance for HAC standard errors.

The results from Table 4 are consistent with numerous robustness checks. Table 5 summarizes the most important findings of these sensitivity analyses. First, the use of lagged dependent variable up to the 4th lag instead of HAC standard errors does not change estimates shown in Table 4.

Table 5. Sensitivity Analyses for the Primary Fiscal Balance Response to the Costs of Borrowing

Period/FRF	Linear Trend	Breaking Trend	Sample Split	Crisis Break	Simultaneous Breaks	
					08Q4	08Q4, 12Q1
04Q4 – 08Q4	0.48***	0.36**	0.37**	0.64***	0.47***	0.37**
09Q1 – 14Q3	-	-	-	-0.6***	0.30	-
09Q1 – 12Q1	-0.64**	0.83	-0.96	-	-	-0.39
12Q2 – 14Q3	-0.25	0.46	-0.29	-	-	0.13

Notes: *** 1% level significance, ** 5% level significance, * 10% level significance for HAC standard errors. Column *Linear Trend* corresponds to FRF from equation (12) with linear non-breaking trend. Column *Breaking Trend* corresponds to FRF from equation (12) with breaking trend across breaks in 2008Q4 and 2012Q1. Column *Sample Split* corresponds to FRF from equation (9) with R_{t-1} instead of $Interest_{t-1}$ and without dummy *Crisis* for subperiods 2004Q4-2008Q4, 2009Q1-2012Q1 and 2012Q2-2014Q3. Column *Crisis Break* corresponds to FRF from equation (12) with break in 2008Q4. Columns *Simultaneous Breaks* correspond to FRF from equation (12) with simultaneous breaks in public debt and the costs of borrowing across one break in 2008Q4 and two breaks in 2008Q4 and 2012Q1.

The only significant lags are the second one, $S_{t-2} = -0.13$ (p-value=0.02), and the fourth one, $S_{t-4} = 0.11$ (p-value=0.097). All other estimates have the same size, sign and statistical significance. Second, omitted variable F-test statistic rules against the inclusion of non-breaking time trend in equation (12).²⁷ The same conclusion holds for the inclusion of breaking trend across breaks in 2008Q4 and 2012Q1.²⁸ In addition, sample splitting across subsamples 2004Q4-2008Q4, 2009Q1-2012Q1 and 2012Q2-2014Q3 roughly mimics the estimates presented in Table 4.²⁹ Third, the specification with only one break in 2008Q4 also detects the sharp decline in the response of

²⁷ The p-value of the F-statistic equals 0.27. For the subsample 2004Q4-2008Q4, the response of primary fiscal balance to the costs of borrowing equals **0.48** (p-value=0.01). All other coefficient estimates have the same size, sign and statistical significance as those in Table 4. For the subsample 2009Q1-2012Q1, the response drops to **-0.64** (p-value=0.03). For the subsample 2012Q2-2014Q3, the response equals **-0.25** (p-value=0.37).

²⁸ Omitted variable F-test statistic has a p-value of 0.25. The only significant trend term is the one for the period 2012Q2-2014Q3. For the subsample 2004Q4-2008Q4, the response of primary fiscal balance to the costs of borrowing equals **0.36** (p-value=0.04). In great contrast with stylized facts about macro-fiscal variables during the global financial crisis, the response of primary fiscal balance to the costs of borrowing between 2009Q1-2012Q1 jumps to **0.83** (p-value=0.60), pointing out to severe overfitting and multicollinearity issues. For the subsample 2012Q2-2014Q3, the response equals **0.46** (p-value=0.31).

²⁹ For the subsample 2004Q4-2008Q4, the response of primary fiscal balance to the costs of borrowing equals **0.37** (p-value=0.05). All other estimates have the same size, sign and statistical significance as those in Table 3. For the subsample 2009Q1-2012Q1, the response drops to **-0.96** (p-value=0.65). Output gap and public debt lose their statistical significance. For the subsample 2012Q2-2014Q3, the response equals **-0.29** (p-value=0.37). Only output gap loses its statistical significance in the last subsample.

primary fiscal balance to implied effective interest rate in terms of magnitude and statistical significance during and after the global financial crisis. In particular, the response drops from **0.64** (1% significance) before the break to **-0.61** (1% significance) after the break, providing additional evidence for the drop in response from the beginning of the global financial crisis. Other coefficient estimates have the same size, sign and statistical significance as those shown in Table 4. Finally, we have tested for simultaneous breaks in public debt and implied effective interest rate in equation (12). The estimates from the specification with one break in 2008Q4 detect the drop in the response of primary fiscal balance to implied effective interest rate during and after the global financial crisis. The response before the crisis equals **0.47** (1% level significance), while the response during and after the crisis equals **0.30** ($p=0.51$). The same conclusion holds for the response of primary fiscal balance to public debt. The response of primary fiscal balance to public debt before the crisis equals 0.11 ($p\text{-value}=0.00$), while the response after the crisis equals 0.03 ($p\text{-value}=0.29$). All other estimates have the same size, sign and statistical significance. The estimates from the specification with two breaks, one in 2008Q4 and the other in 2012Q1, roughly trace the results shown in Table 4.³⁰ Overall, the additional results point in a direction of deteriorating fiscal policy stance with respect to borrowing costs and, consequently, interest payments during and in the aftermath of the global financial crisis. Moreover, the response of primary fiscal balance to implied effective interest rate and interest payments failed to recover after the fiscal rule breach in 2012Q1.

4. Conclusion

We estimate the response of primary fiscal balance to interest payments in Serbia between 2004Q3 and 2014Q3. Our baseline FRF estimates reach several conclusions. First, the response of primary fiscal balance to interest payments ranges between 0.50-1.07 percentage points in the entire period under consideration. The government, hence, financed up to 50% of each percentage point increase in interest payments to GDP ratio with new public debt issuance. The result is robust with respect to numerous sensitivity checks standard in this line of literature. Second, the global financial crisis reduced the share of primary fiscal balance in GDP between 3.50-4.00

³⁰ The response of primary fiscal balance to the costs of borrowing between 2004Q4-2008Q4 equals **0.37** ($p\text{-value}=0.03$), while the response to public debt equals 0.08 ($p\text{-value}=0.00$). The response of primary fiscal balance to the costs of borrowing between 2009Q1-2012Q1 equals **-0.39** ($p\text{-value}=0.79$), while the response to public debt equals 0.04 ($p\text{-value}=0.67$). The response of primary fiscal balance to the costs of borrowing between 2012Q2-2014Q3 equals **0.13** ($p\text{-value}=0.73$), while the response to public debt equals 0.02 ($p\text{-value}=0.52$). All other coefficient estimates have the same size, sign and statistical significance as those shown in Table 3.

percentage points. The result is consistent with macro-fiscal stylized facts. Third, we document a-cyclical of primary fiscal balance with respect to business cycle fluctuations. Putted differently, automatic adjustments are incapable of restoring fiscal solvency in Serbia in the period under our consideration.

We also trace the evolution of the primary fiscal balance response with respect to interest payments before, during and in the aftermath of the global financial crisis. The responses differ markedly across sub-periods. Although different FRF specifications yield somewhat different estimates, the estimated FRFs capture the transition of the response from positive before the crisis to negative during and after the global financial crisis. The drop-in response is primarily due to the decline in indirect government revenues caused by the rebalancing of the economy towards exports, the loss of custom revenues associated with the 2008 EU trade agreement, hikes in mandatory public spending during 2008 and fiscal decentralization measures adopted in 2011. The response has remained in negative territory even after the public debt fiscal rule breach in 2012Q1. Putted differently, ad hoc fiscal consolidation measures adopted after the breach have been insufficient to restore fiscal solvency with respect to interest payments.

Finally, we have decomposed the evolution of the primary fiscal balance response to interest payments to the evolutions of the primary fiscal balance response with respect to public debt and implied effective interest rate. Both responses dropped sharply since the arrival of the global financial crisis to Serbia. Moreover, the response of primary fiscal balance with respect to interest payments mimics the response of primary fiscal balance to the costs of borrowing. Putted differently, the response of primary fiscal balance to the costs of borrowing failed to recover after the public debt fiscal rule breach in 2012Q1.

The most important question for future research is how to mitigate further deterioration of primary fiscal balance in Serbia. In 2014Q4, the government, with the support of the IMF, has launched a 3-year fiscal consolidation package. Further analyses must wait additional data to evaluate the successfulness of ongoing 3-year fiscal consolidation package.

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