WP/16/79

IMF Working Paper

Fiscal Multipliers for Brazil

by Troy Matheson and Joana Pereira

INTERNATIONAL MONETARY FUND

© 2016 International Monetary Fund WP/16/79

IMF Working Paper

Western Hemisphere Department

Fiscal Multipliers for Brazil

Prepared by Troy Matheson and Joana Pereira

Authorized for distribution by Alfredo Cuevas

March 2016

IMF Working Papers **describe research in progress by the author(s) and are published to elicit comments and to encourage debate.** The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

Abstract

We find historical fiscal multipliers for Brazil around 0.5, larger than what existing literature typically identifies for the average emerging market. However, spending and public credit multipliers seem to have dropped to near zero since the global financial crisis, as the estimate for the whole sample period (1999−2014) is about ½ of that for pre-crisis years. By contrast, revenue multipliers have remained broadly stable. We conclude that fiscal consolidations based on expenditure and public credit retrenchment are likely to entail a modest drag on growth in the near term.

JEL Classification Numbers: E62, H5, H81

Keywords: Fiscal policy, fiscal multipliers, public credit

Author's E-Mail Address: jpereira@imf.org, tmatheson@imf.org

Contents Page

Abstract 1

I. Fiscal Policy and Growth in Brazil since the Global Financial Crisis 3

II. Fiscal Multipliers in Brazil: What do we know? 4

III. Methodology 5

IV. Estimated Fiscal Multipliers 7

V. Have the Multipliers Changed? 9

VI. Robustness 12

VII. Policy Implications 13

VIII. Appendix 14

IX. References 15

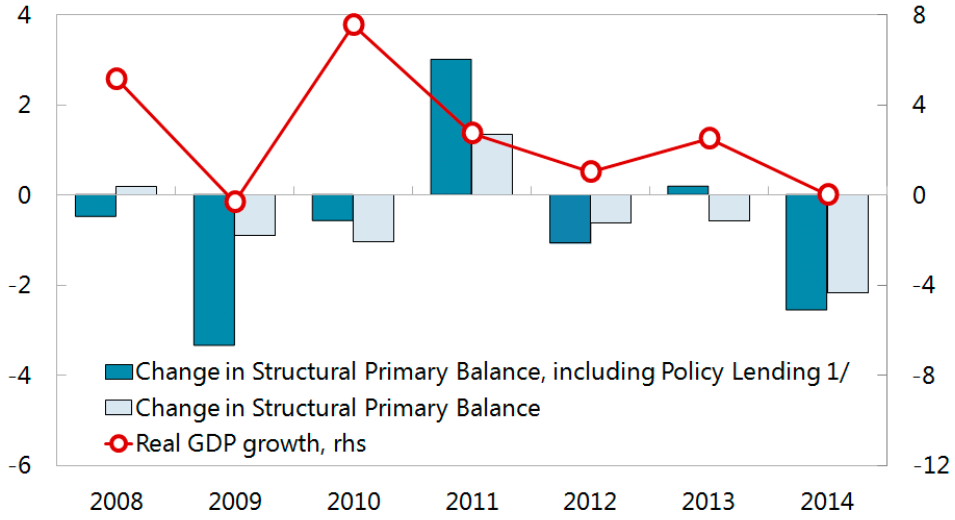
Figures

1. Fiscal Stimulus and Ecnomic Growth 3
2. Brazil: Basic Multipliers 8
3. Multipliers: Basic Shocks 10
4. Multipliers: Credit Shocks 11
5. Brazil: Basic Multipliers 12

I. Fiscal Policy and Growth in Brazil since the Global Financial Crisis

In this paper, the stance of fiscal policy and its impact on activity in Brazil is analyzed using data for the period from 1999 to 2014. Fiscal policy in Brazil was broadly expansionary in recent years. The structural primary balance declined from near 3½ percent in 2008 to -0.6 in 2014, dropping consecutively through the period with the single exception of 2011 (Figure 1). This deterioration exceeded the impact of automatic stabilizers, totaling a negative ¾ percent of GDP, and has been dominated by an expansion in public spending considerably above GDP. Tax stimulus measures have however played a larger role since mid 2012.

Figure 1. Fiscal Stimulus and Economic Growth
(In percent of GDP and annual percentage change, respectively)



Sources: IMF WEO and authors' estimates.
1/ Policy lending is subtracted from structural primary balance.

Beyond the supportive budgetary position, the government also implemented substantial quasi fiscal stimulus during the most recent part of the period of analysis. Credit extended by public banks grew substantially from 2008 onwards, particularly by BNDES and Caixa Econômica Federal (Caixa), as private credit supply retrenched in the aftermath of Lehman's bankruptcy. The expansion was supported by transfers from the Treasury, which in net terms add up to 8 percent of 2014 GDP since 2008. More recently, policies geared at keeping energy and fuel prices artificially low further supported consumers and corporations, with a cost that is only partially absorbed in the budget. Despite this large fiscal and quasifiscal support, however, economic activity has remained subdued.

Going forward, consolidation measures will be needed to rebuild fiscal buffers. A scenario where the fiscal stance remains broadly neutral over the coming years would entail a substantial rise of the public debt ratio, with increased pressure on interest rates. Thus, despite the current downturn, fiscal consolidation is urgent to rebuild buffers and put debt on a firm declining path, thereby reducing yields and opening fiscal space for future productive

spending. Consolidation needs relative to 2014 are large, in the order of 2.5 percent of GDP to stabilize debt and at least 3 to reduce it with high likelihood (see Pereira (2013)).
How much could the necessary consolidation hurt growth in the short to medium term, and what does this imply for the design of fiscal consolidation? This paper contributes to this discussion by estimating the size of fiscal multipliers—the effect of a 1 percent change in the structural fiscal balance on GDP—for spending and tax policy, as well for public credit. It will also assess how much multipliers have changed since the global crisis. To the best of our knowledge, no other paper has previously attempted to quantify the short-term impact of extending public bank lending in Brazil. Furthermore, existing studies on Brazil's fiscal multipliers use data up to 2011 only, therefore missing the period of low growth discussed above. The next Section summarizes related literature, and the methodology is described in Section III. Section IV presents results for the full sample, while in Section V we comment on changes relative to the pre-crisis period. The robustness of baseline estimates to different model specifications are discussed in Section VI. We conclude with remarks on the policy implications of our results in Section VII.

II. Fiscal Multipliers in Brazil: What do we know?

A growing literature highlights that fiscal multipliers in emerging markets (EMEs) tend to be lower than in advanced economies. Multipliers are notoriously difficult to measure. A vast literature has pointed to a wide range of estimates, depending on the country and time sample, as well as econometric (typically SVARs) or modeling (typically DSGEs) specification. Nevertheless, on average, spending and revenue first-year multipliers (in normal times) have been calculated at about 0.75 and 0.25, respectively, for advanced economies (AEs). In its turn, the scarce empirical literature focusing on EMEs suggests lower multipliers, with minor differences between spending and revenue measures. Using a panel of EMEs, Ilzetzki (2011) finds short term spending and revenue multipliers lie in the 0.1−0.3 and 0.2−0.4 range, respectively. Pre-crisis studies highlighted potential non-keynesian effects, concluding that fiscal multipliers can be even negative, particularly in the long run and when debt is high (IMF (2008)). The level of development has also been found to influence the persistence of multipliers; Ilzetzki and others (2013) estimate not only lower but also considerably less persistent output responses to increases in EMEs, relative to AEs.

There are few Brazil specific studies, particularly covering the post crisis period. Using an SVAR approach, Peres (2006) finds small but significant positive fiscal multipliers in 1995−2004. In contrast, Mendonça and others (2009) and Cavalcanti and Silva (2009) provide evidence of non-keynesian effects of fiscal policy in Brazil during 1995−2008. Their findings could be influenced by the debt distress episodes in the late nineties, and/or expectations that fiscal expansions will eventually be compensated by offsetting consolidation measures (a sort of Ricardian equivalence). Controlling for the effect of monetary policy shocks and external economic conditions, Oreng (2012) concludes that fiscal multipliers were positive and larger than previously estimated (close to AEs levels) in 2004−11, a period of stronger macroeconomic stability and relatively contained fiscal sustainability concerns.

Fiscal multipliers depend on specific economic conditions, some of which vary in the short term. Batini et al. (2014) surveys the literature on the various factors by which fiscal

multipliers can change across countries and time. Countries with (i) high import propensity, (ii) high propensity to save, (iii) limited liquidity constraints, (iv) flexible wage setting, (v) floating exchange rate regimes, (vi) large automatic stabilizers, and/or (vii) high debt levels tend to have smaller multipliers. Although Brazil scores low in (i)−(iv), which suggests large multipliers, by all other accounts, multipliers should be on the low end. It is also difficult to judge how the various aspects balanced out over time. The macro stabilization achieved in the early 2000s and subsequent reduction in public debt arguably contributed to an increase in multipliers. On the other hand, financial deepening and a more flexible exchange rate would have had the opposite effect. More recently, as public finances deteriorated and the need for adjustment became clearer, Ricardian effects arguably lowered multipliers. While the state of business cycle could also influence multipliers, Ramey and Zubairy (2014) find no evidence that multipliers vary over the business cycle in the U.S, and show that the most widely-cited literature suggesting higher multipliers during recessions are not robust to plausible generalizations.

III. METHODOLOGY

A structural vector-autoregressive model (SVAR) is used to estimate fiscal multipliers for government spending, government revenue (tax), and public credit. The basic VAR specification is:

$$Y_t = AY_{t-1} + U_t$$

where $Y_t = [W_t, S_t, C_t^*, X_t, C_t, P_t, T_t, R_t]'$ is an eight-dimensional vector of endogenous variables and U_t is the corresponding vector of reduced-form shocks.[1] The endogenous variables set includes the real minimum wage (W_t), real primary government spending (S_t), real public credit to the private sector (C_t^*), real GDP (X_t), real private credit to the private sector (C_t), the consumer price index (P_t), real primary government revenue (T_t), and the short-term interest rate (SELIC) (R_t). The data are measured at the quarterly frequency and the sample period is 1999Q1 to 2014Q1.[2]

How are the fiscal shocks identified? All variables can influence each other with some lags. In order to identify the structural shocks, we employ a Cholesky decomposition. The decomposition imposes a recursive causal structure that restricts the contemporaneous impact of each variable on the other variables. The causal ordering assumed in the baseline specification is:

$$W_t \rightarrow S_t \rightarrow C_t^* \rightarrow X_t \rightarrow C_t \rightarrow P_t \rightarrow T_t \rightarrow R_t$$

[1] The model includes one lag of all variables, as suggested by the Schwarz-Bayesian criterion.

[2] The natural logarithm is taken of each variable prior to estimation, except the interest rate, which is left in levels (see the appendix for a more detailed description of the data). The VAR is estimated in levels and is stationary; it has a well-defined vector-moving-average representation and the impulse response functions are not explosive.

Spending
An unexpected movement in government spending is assumed to have an immediate (within the same quarter) impact on output, while an unexpected movement in output only influences government spending with a lag. Effectively, it is assumed that policymakers take longer than one quarter to adjust spending in response to output surprises due to legislative lags. At the same time, because a significant share of spending is tied to the minimum wage, government spending is impacted immediately by movements in the minimum wage.[3]

Revenue
Unexpected changes in government revenue are assumed to impact the interest rate in the same quarter (since monetary policy can react quickly), and the remaining variables with a lag. Thus, the central bank is assumed to respond to unexpected changes in tax policy by changing its policy rate within the same quarter, while tax revenue in any given quarter is impacted by unexpected movements in wages, spending, credit, output, and prices.

Public Credit
An unexpected movement in public credit is assumed to immediately impact output, private credit, prices, government revenue, and the interest rate, with unexpected movements in these variables only impacting public credit with a lag. Similar to the assumptions related to government spending, policymakers are assumed to take more than one quarter to respond to output, private credit, prices, government revenue, and interest rate surprises. Public credit can be immediately impacted by wages and government spending, considering that unexpected movements in government spending lead to an adjustment in the policy mix between on-budget spending and the amount of credit public banks extend. Private credit is assumed to more endogenous than public credit and is immediately impacted by unexpected movements in output.

The fiscal multiplier measures the output effect in reais of a one real increase in discretionary spending or revenue. Specifically, the multiplier at horizon *t* is:

$$Multiplier = \frac{\frac{\Delta X_t}{\Delta Z_0}}{S_z}$$

where ΔX_t is the change in output in period t, $\Delta Z_0$is the initial change in the fiscal variable (i.e. $Z = S, T,$ or C^*), and, to convert these changes into reais, S_z is the average share of the fiscal variable in output over the sample. The impact multiplier is measured at t=0.

[3] The minimum wage directly influences with social welfare spending, given that the minimum benefit is, by a constitutional requirement, linked to the minimum wage. Higher benefits are indirectly linked to the minimum wage, through its impact on average wages.

IV. ESTIMATED FISCAL MULTIPLIERS

The estimated multipliers are displayed in Figure 2. The model is estimated 1000 times using bootstrapped data.[4] Figure 2 displays the median multipliers for each variable along with the 25th and 75th percentiles.

The government spending multiplier peaks at around 0.5 in the same quarter as the spending increase. The impact multiplier is high for an EME, but still below AEs levels.[5] The output effect is nevertheless short lived, consistent with previous findings for EMEs and Brazil. By the end of the second year after the shock, the accumulated multiplier is virtually zero. Two factors may contribute to this finding. First, in the context of a binding primary surplus target, surprise increases in government spending in a given quarter will likely generate consolidation measures later on. Second, the nature of spending increases matter. Public investment, which typically entails larger and more persistent multipliers, is exceptionally low in Brazil; thus shocks to S_t may be dominated by current spending, particularly transfers which have a short lived impact (working as a demand boost which fuels inflation and expectations of future monetary tightening).[6]

Likewise, the revenue multiplier peaks at around 0.5 one year after a tax cut. Traditionally, the literature relying on SVAR estimates has identified lower revenue than spending multipliers. However, some recent papers (e.g. Mertens and Ravn (2012)) dispute that conclusion, using a 'narrative approach' to the identification of shocks. The marginal effect on output in Brazil seems to also come down to zero after two years, but the medium-run (accumulated) multiplier of tax cuts is positive, at about 2.

Finally, the public credit multiplier peaks at around 0.5 one year after the credit increase and is notoriously persistent. After 2 years, the accumulated multiplier of public credit reaches 3.8 and the policy continues to prop up GDP through the end of the forecast horizon. Public credit has been mostly extended by BNDES to support investment, and public banks played an important countercyclical role at the beginning of the crisis, when private credit supply dried out. Thus, a large and persistent effect seems reasonable. As discussed next, however, public credit has become less effective in boosting GDP in more recent years.

---

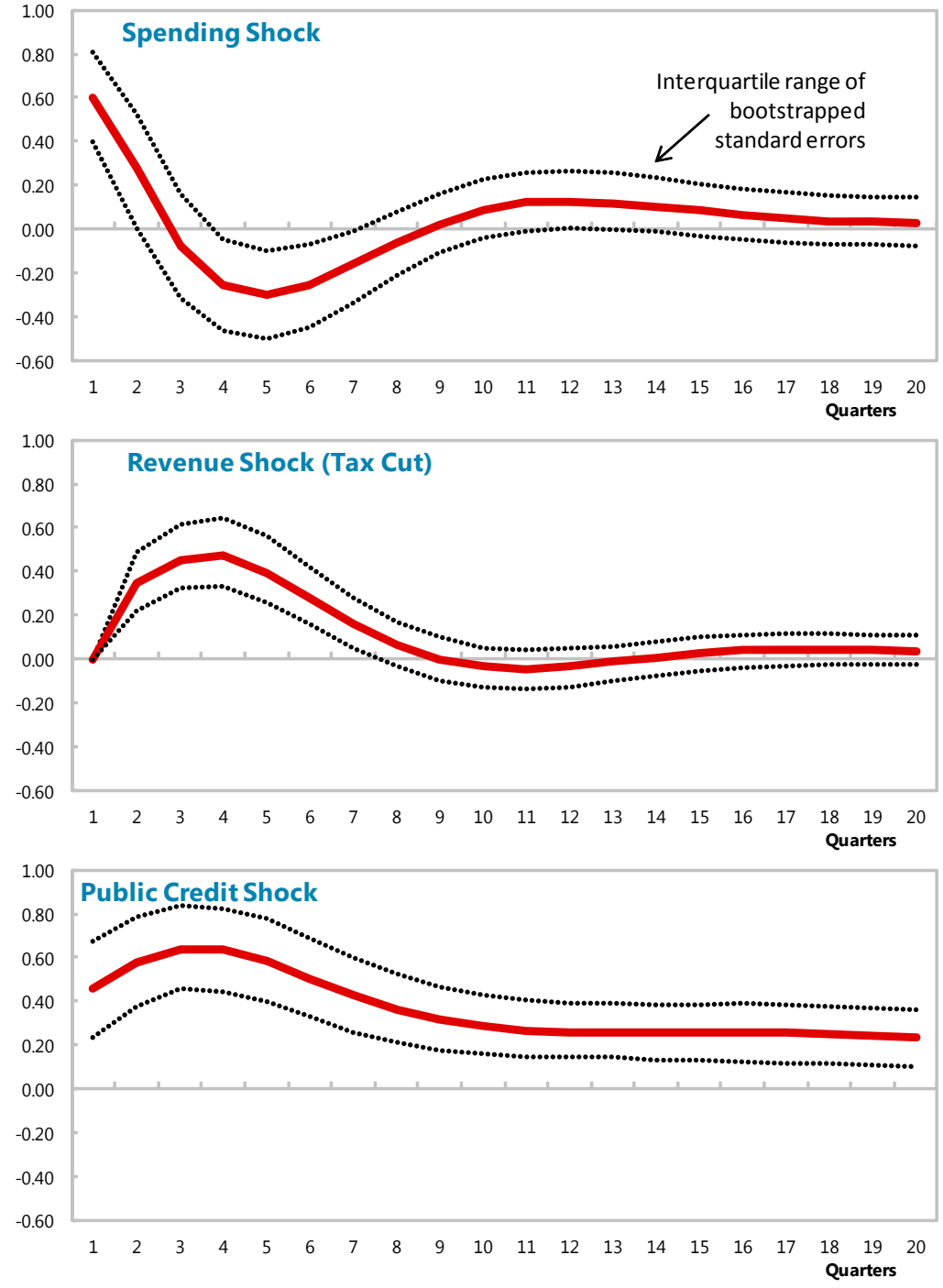
[4] Bootstrapping involves the following steps: 1) estimate the model parameters and obtain the residuals; 2) resample (with replacement) from the estimated residuals and simulate the model using the parameters from 1; 3) re-estimate the model, saving the parameters; 4) repeat steps 2 and 3 a large number of times.

[5] The lower spending multipliers in EMEs has been often attributed to relative expenditure inefficiencies and the difficulty of unwinding expenditure growth, both of which of potential relevance in Brazil.

[6] Model estimates are based on central government quarterly fiscal data (see appendix for details), which is available from 1995 onwards. However, there is no information on public investment at quarterly frequency before 2006.

Figure 2. Brazil: Basic Multipliers

(Responses of GDP to a one Brazilian *real* spending, revenue or public credit shock)



Source: Authors' calculations.

V. HAVE THE MULTIPLIERS CHANGED?

Government spending and public credit multipliers fell after the global financial crisis, while the revenue multiplier has remained broadly stable (Figure 3). The former practically halved from pre-crisis levels[7], indicating that the effectiveness of government spending and expansion of credit by public banks was close to zero in the recent past. Given subdued growth performance—generally associated with larger multipliers[8]—this may be a consequence of inefficiencies in public spending increases (mostly pensions), impact on debt levels (traditional crowding out effect and expectation of a sharp adjustment need in the future), and possibly the crowding out of private bank activity (which market share declined continuously since 2011). The lower estimated multiplier for public bank lending could also reflect easier access to private funding (including external) by many Brazilian corporates over time, particularly the larger ones, rendering public bank support less critical for these firms. Interestingly, we obtain very similar estimates in the pre-crisis period to those obtained by Oreng (2012) for 2004−11.

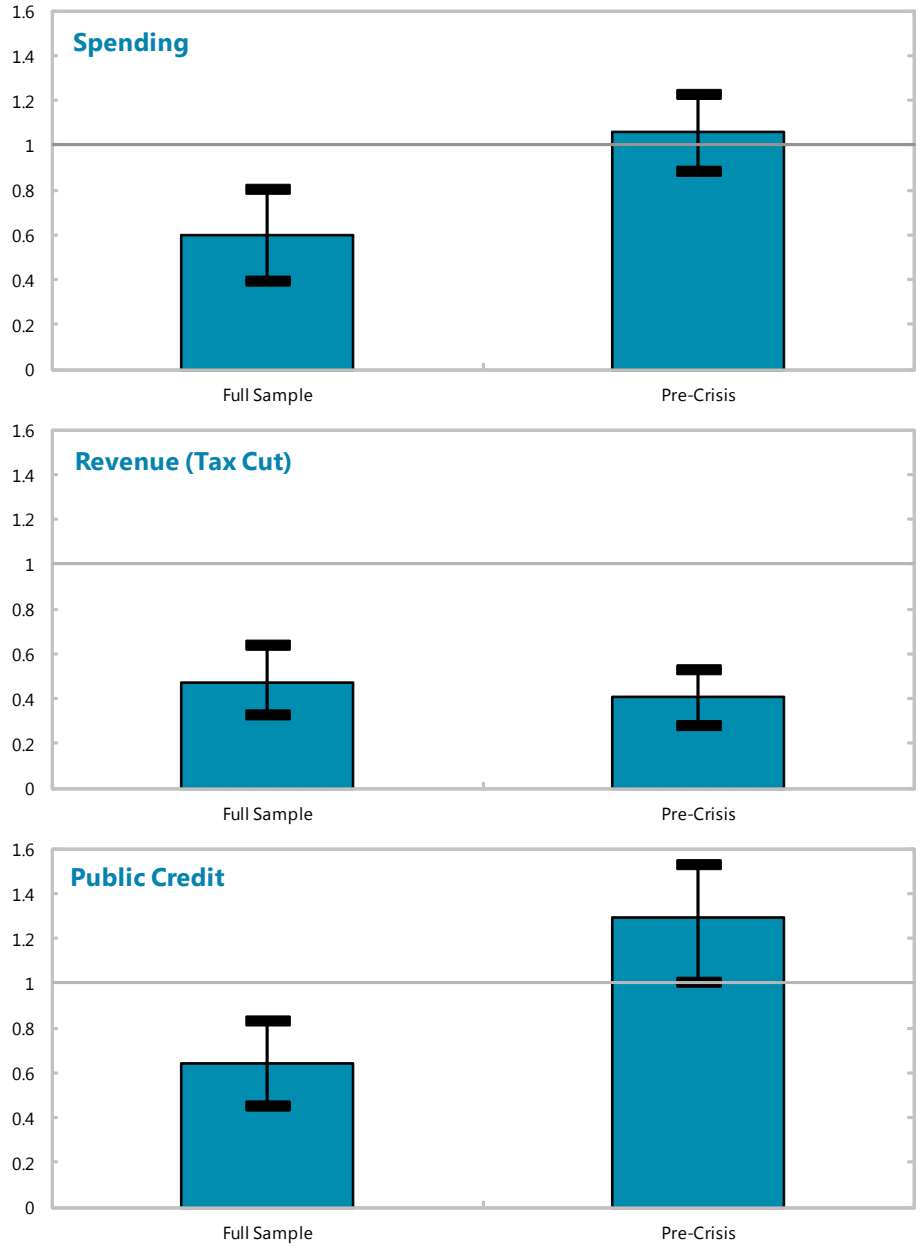
Does the public credit multiplier differ across public banks? To shed further light on the nature of the public credit multiplier, we also investigate potential differences across the three main federal banks, which pursue very different business segments (Figure 4). BNDES finances exports, working capital for large firms, and long-term infrastructure projects. Caixa traditionally provides housing loans, although in recent years it branched into other types of credit, such as non-payroll personal loans, credit card, and SME loans. Banco do Brasil supplies rural credits, but has also recently increased its share of housing loans. We however obtain similar estimated multipliers for all three banks, despite their different business models.

[7] The pre-crisis subsample ends in 2007Q4.

[8] The size of the output gap is not included in the framework; thus Figure 3 plots average multipliers over the cycle. Supply constraints in the post crisis period can, however, have contributed to lower multipliers. We do not expect such impact be significant, though, as revenue multipliers would also be lower, which does not seem to be the case.

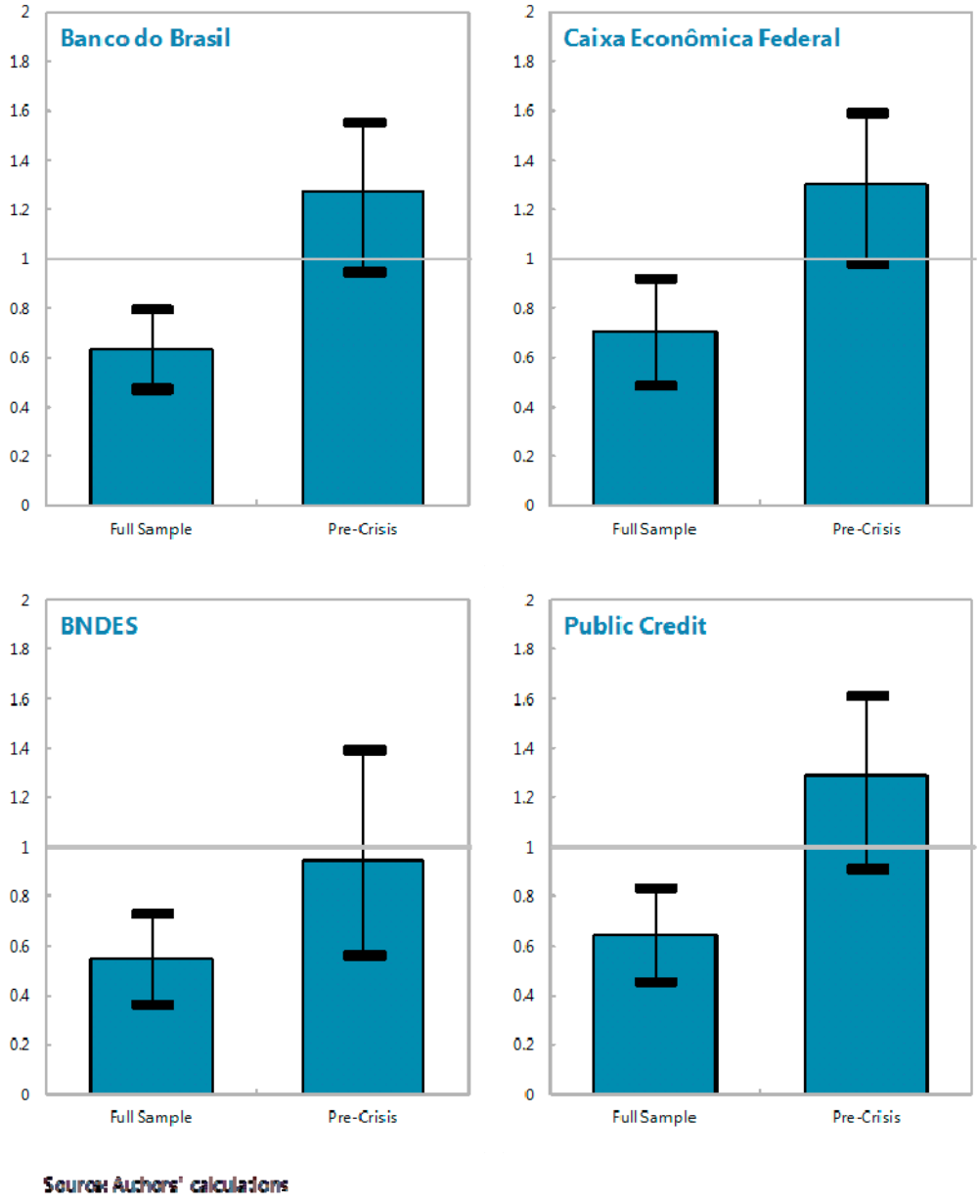
Figure 3. Multipliers, Basic Shocks

(Peak response of GDP to a one Brazilian *real* spending, revenue, or public credit shock)



Source: Authors' calculations.

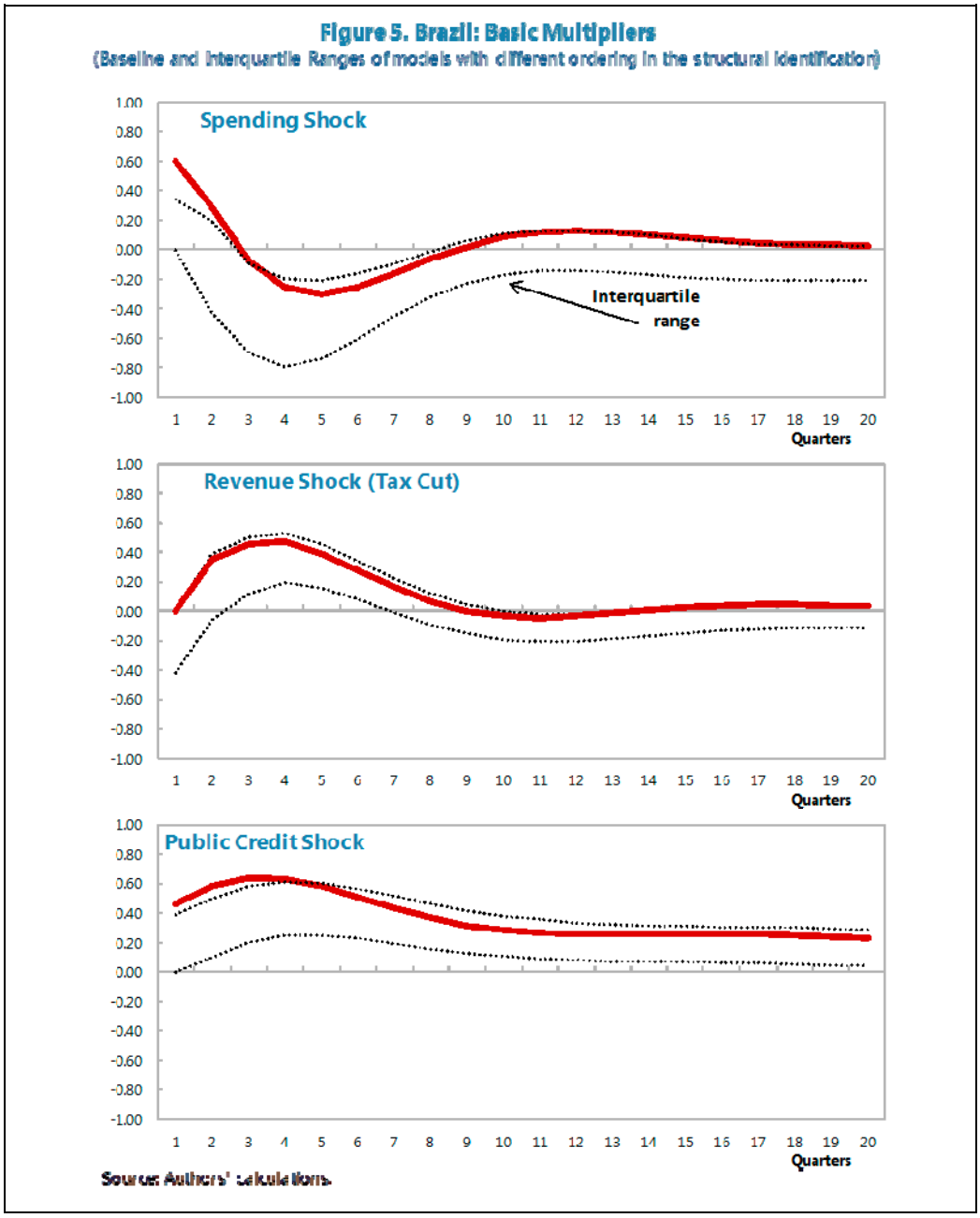
Figure 4. Multipliers: Credit Shocks
(Peak response of GDP to a one Brazilian *real* spending, revenue, or public credit shock)



Source: Authors' calculations

VI. Robustness

Our main results are robust to alternative specifications. Taking an agnostic view, as a robustness check, each fiscal variable was ordered from first to last in the identification scheme, and 1000 multipliers are computed for each of the 8 identification schemes. The results are in Figure 5. Multiplier estimates are broadly similar across specifications, although the baseline specification tends to produce impact multipliers that are on the high side. The results are also robust to the inclusion of US growth (as a proxy for global economic conditions) in the model, as well as to different cut-off dates for the pre/post-crisis sample split (2008Q4 and 2009Q4).



VII. POLICY IMPLICATIONS

The exercise in this paper sheds light onto three important features of fiscal multipliers in Brazil:

(1) The impact of fiscal policy on economic activity should be measured not only by the strict budgetary impulse but also by the effect of public bank lending. Public lending multipliers in the 1999−2014 period are similar to those of budgetary expenditures.

(2) Fiscal multipliers in Brazil are comparable to those of AEs, but have substantially declined since the global financial crisis. At the current juncture, fiscal stimulus, particularly in the form of larger current spending or extended public credit, is expected to be ineffective, and *non-keynesian* effects are more likely to prevail should fiscal consolidation be biased towards expenditure rationalization and phasing out of on-lending through public banks.

(3) Revenue based consolidations will likely entail a larger fiscal drag. On the one hand, Figure 2 shows that although the maximum impact on growth is similar (for the whole sample period), the accumulated effect after two years is larger. Additionally, the revenue multiplier has not declined in the recent past.

VIII. APPENDIX

Data

All data are seasonally adjusted, with the exception of the short-term interest rate.

- Real minimum wage (W_t), deflated with GDP the deflator (Instituto Brasileiro de Geografia e Estatística).
- Real primary government spending (S_t) and revenue (T_t) of the central government, deflated with the GDP deflator (Secretaria do Tesouro Nacional). Note: The revenue and expenditure series are netted out for the impact of (i) the 2010 operations with Petrobras (oil concession and capitalization), and (ii) transfers to and withdrawals from the Sovereign Wealth Fund (in 2008, 2012).
- Real GDP (X_t) (Instituto Brasileiro de Geografia e Estatistica)
- Real private credit to the private sector (C_t), deflated with the GDP deflator (Banco Central do Brasil).
- The consumer price index (P_t) (Instituto Brasileiro de Geografia e Estatistica).
- Short-term interest rate (SELIC) (R_t) (Banco Central do Brasil).

IX. REFERENCES

Batini, N., L. Eyraud, L. Forni, and A. Weber, 2014, "Fiscal Multipliers: Size, Determinants, and Use in Macroeconomic Projects," IMF Technical Notes and Manuals No. 14/4 (Washington: International Monetary Fund).

Ilzetzki, E., 2011, "Fiscal Policy and Debt Dynamics in Developing Countries," Policy Research Working Paper Series No. 5666 (Washington: The World Bank).

Ilzetzki E., E. G. Mendoza, and C. A. Vegh, 2013, "How Big (Small?) Are Fiscal Multipliers?", *Journal of Monetary Economics*, Vol. 60, pp. 239–54.

International Monetary Fund, 2008, *World Economic Outlook, October 2008, Chapter 5, "Fiscal Policy as a Countercyclical Tool*," World Economic and Financial Surveys (Washington: International Monetary Fund).

Mendonça, M. J. C., L. A. Medrano, and A. Sachsida, 2009, "Avaliando os efeitos da política fiscal no Brasil: resultados de um procedimento de identificação agnóstica," Texto para Discussão IPEA, No. 1377.

Mertens, R. and M. O. Ravn, 2012, "A Reconciliation of SVAR and Narrative Estimates of Tax Multipliers," CEPR Discussion Paper No. 8973 (London: Center for Economic Policy Research).

Oreng, M., 2012, "Estimando o impacto da política Fiscal no Brazil: 2004 a 2011," mimeo.

Pereira, J., 2013, "Public Debt Dynamics Under Brazil's Current Fiscal Framework," IMF Country Report No. 13/313, (Washington: International Monetary Fund).

Peres, M. A., 2006, "Os efeitos dinâmicos da política fiscal sobre a atividade econômica: um estudo para o caso brasileiro," Dissertação (Mestrado em Economia), Departamento de Economia, Universidade de Brasília.

Ramey, V.A, and S. Zubairy, 2014, "Government Spending Multipliers in Good Times and in Bad: Evidence from U.S. Historical Data," NBER Working Paper, No. 20719.