Fiscal Multiplier, Output and Inflation

Due to the international financial crisis of 2008/2009, many countries implemented accommodative monetary policies to offset the sharp drop of output that was then observed. The policy mix involved interest rate cuts, in some cases to values close to the zero lower bound, the use of unconventional instruments such as direct liquidity injection in domestic currency (quantitative easing), and, at times, in foreign currency as well; and even the change of the balance sheets of central banks (qualitative easing).

Given the magnitude and intensity of the impact of the financial crisis on the economic activity, as well as the natural limits of the monetary stimuli, several developed and emerging economies also adopted strongly expansionary fiscal policies, by reducing taxes and/or increasing spending. In the specific case of Latin American economies, the countercyclical policies contributed to a relatively quick economic recovery. Still, in some of these economies, the fiscal stimuli have not yet fully reversed.[1]

This box has two goals. First, it puts the issue into perspective by presenting a brief review of the theory and empirical evidence on the fiscal multiplier. Second, it assesses the expected impact of fiscal policy on inflation in Brazil.

Fiscal Multiplier: Theory and Evidence

The effect on aggregate demand of the change in government spending and/or taxes is proportional to the size of the fiscal stimulus and this coefficient of proportionality is known as the "fiscal multiplier". For the fiscal authority, knowing the size of the

1/ See, for example, Cárdenas and Levy-Yeyati (2010).

multiplier is important in order to choose the right policy mix (expenditures, taxes and/or transfers), as well as to gauge the magnitude and duration of the stimulus. For the monetary authority, knowing the multiplier is relevant for assessing the impact of the fiscal stimulus on the output gap and, thus, on inflation.

Macroeconomic models, even the simplest, suggest that the size and signal of the fiscal multiplier result from a non-trivial combination of several factors – for example, openness of economy, exchange rate regime, and monetary policy stance, among others. These models suggest that fiscal policy tends to be more potent in closed economies, in situations similar to that of the liquidity trap in which monetary policy remains accommodative and, therefore, does not counterbalance part of the stimulus; and in open economies with fixed exchange rates. In general, traditional Keynesian models generate a fiscal multiplier greater than 1. In extreme cases of a closed economy with marginal propensity to consume between 0.5 and 0.9 (and Auberbach Gorodnichenko, 2010) and relatively flat LM curve, the multiplier could reach values between 2 and 10.

Dynamic stochastic general equilibrium (DSGE) models, even those with Keynesian features, such as sticky prices and wages, generate multipliers less than 1. Two aspects help explain the differences between DSGE models and purely Keynesian models. First, DSGE models combine some rational (or forward-looking) expectations and some dose of Ricardian equivalence. Under this framework, consumers anticipate that a persistent reduction in public spending from today will require lower tax burden in the future, which may induce them to consume more today and generate inflationary pressures.[2] Second, given that fiscal restraint contributes to reducing inflation, the monetary authority can respond by lowering the nominal interest rates, if this is determined by some rule (e.g., the Taylor rule). With prices relatively rigid in the short-run, inflation responds with some lag to economic activity and the real interest rate falls, thus stimulating consumption and investment.

2/ Including non-Ricardian features into DSGE models – for example, agents that consume all their current income (hand-to-mouth households) – tends to weaken the Ricardian equivalence.

This reaction cancels part of the desired effect by the tax authority and, ultimately, fiscal restraint causes only a redistribution of aggregate demand among its various components, not a reduction of its level. However, there is at least one important exception to the rule: when the nominal interest rate remains close to zero at the relevant horizon, the multipliers of DSGE models reach 2 or more (Christiano *et al.* (2009), Hall (2009), Woodford (2010), among others).

Coenen *et al.* (2010) simulate the impact of fiscal stimuli in the United States of America (USA) and in the Euro Zone using seven structural models, including DSGE models.[3] Table 1 illustrates the estimated effects on U.S. inflation and output, caused by an increase in government consumption equivalent to one percentage point (p.p.) of the Gross Domestic Product (GDP). The second and third columns contain the multipliers for each scenario, while the last two columns show the maximum effect on inflation. Note that the longer the fiscal stimulus and the more accommodative the monetary policy, the greater the effects on output and inflation. As, in general, the models are linear, the effect of a reduction in government spending would be symmetrical.

Table 1 – Effect of a Fiscal Stimulus on Inflation and Output
Increase in the USA Government Consumption-to-GDP Ratio by 1p.p.

Monetary Policy	Effect on GDP PIB (%)		Maximum Effect on Inflation (p.p.)	
Stance	1-year stimulus	2-year stimulus	1-year stimulus	2-year stimulus
No accomodation	0.8 a 1.3	0.6 a 1.4	0.2	0.4
1-year accomodation	0.9 a 1.5	0.6 a 1.9	0.4	1.0
2-year accomodation	1.0 a 1.5	0.9 a 2.6	0.6	2.0

Original source: Coenen *et al*. (2010).

Based on semi-structural and DSGE models, Hemming et al. (2002) gather evidence for the U.S. and other economies of the Organization for Economic Cooperation and Development (OECD). Some of the semi-structural models generate short-term multipliers between 0.6 and 1.4 when the fiscal instrument is government consumption, and between 0.3 and 0.8 in the case of taxes.

3/ European Commission (QUEST), International Monetary Fund (GIMF), Federal Reserve (FRB-US and SIGMA), Bank of Canada (BoC-GEM), European Central Bank (NAWM) and Organization for Economic Cooperation and Development (OECD Fiscal).

And what do purely statistical models have to say about fiscal multipliers? Much of the evidence is based on econometric techniques using vector auto-regression (VARs) and focuses on the U.S. economy during the second half of the twentieth century, following the seminal work of Blanchard and Perotti (2002). The range of available estimates is wide, but they tend to point to multipliers of government spending between 0.5 and 1.0.[4] Given that these econometric exercises identify the average behavior of the economy during the sample period – not in specific events like the Great Depression or the 2007/2010 crisis – Auberback and Gorodnichenko (2010) try to overcome this limitation. They use a structural VAR with a regime change (regime-switching SVAR) that is capable of distinguishing the multipliers during recessions and expansions. The results for the U.S. economy support the conjectures of Christiano *et al.* (2009) and others in the context of DSGE models: the estimated multipliers are higher in periods of recessions than in expansions.

To some researchers, the traditional econometric techniques have identification problems, which would reduce the degree of confidence in the estimates. To deal with this problem, Ramey (2009) uses the so-called narrative approach, which would be less subject to problems of identification. By applying this unconventional methodology to the United States, during the period of 1939-2008, the author finds multipliers between 0.6 and 1.1. Therefore, VAR models – using conventional identification techniques or the narrative approach – point to relatively modest magnitudes for the multipliers, which are closer to those suggested by DSGE models with non-accommodative monetary policy than to those suggested by purely Keynesian models.

Regarding emerging economies, the evidence is scarce, because of data limitations, macroeconomic instability and/or difficulty in identifying fiscal shocks, among other factors. The literature suggests that fiscal multipliers are lower in emerging than in mature economies. For example, Ilzetzki and Vegh (2008) estimate a maximum multiplier of 0.6 for a sample of developing countries, compared

4/ Limitations imposed by the data and identification problems have not ruled out the possibility that the multipliers are greater than 1 (Hall, 2009).

with 0.91 for a sample of developed countries. According to this study, on average, fiscal policy would be pro-cyclical in emerging economies, while it would be counter-cyclical or a-cyclical in industrialized countries. Thus, fiscal policy would tend to amplify rather than mitigate the business cycles in developing countries.[5]

In turn, Ilzetzki *et al.* (2010) use a sample of 44 countries – 20 developed and 24 developing countries, including Brazil – covering the period of 1960-2007 and applying structural VARs (SVARs). Their results suggest that the spending multiplier is greater in closed economies, in open economies with fixed exchange rate regimes, as well as in mature economies. In particular, the authors estimate that in mature economies, the multiplier of government consumption varies from 0.37, on impact, and 0.80 in the long run. On the other hand, in developing economies, the multiplier is negative on impact (-0.21) and 0.18 in the long run.

What does the literature says about Brazil? The estimates of Ilzetzki *et al*. (2010) capture the average multiplier for two groups of countries, but are uninformative on individual economies. Although included in the sample, the study does not provide estimates of the fiscal multiplier for the Brazilian economy. There is also little evidence regarding the impact of fiscal shocks in Brazil using the DSGE methodology.[6] Some features of the Brazilian economy, however, suggest that the fiscal multiplier in Brazil would probably be higher than in other emerging economies with similar level of development. First, the Brazilian economy is relatively closed, which tends to reduce external leaking. Second, the average propensity to save is relatively low. Finally, the relevant part of fiscal stimulus in Brazil refers to current spending, as well as transfers for groups with low savings rate/high propensity to consume.

5/ For Levy-Yeyati (2010) and others, the current round of fiscal expansion in Latin America, which during the international crisis of 2008/2009 played a countercyclical role, would be too prolonged and exacerbate the economic cycle.

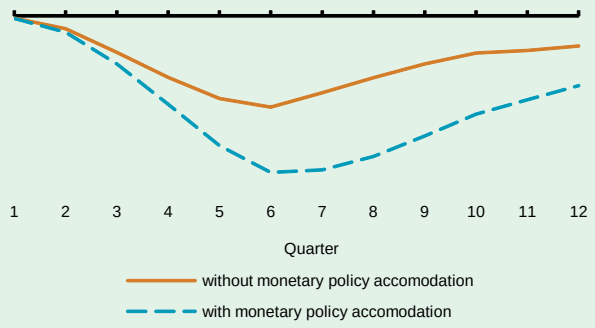
6/ However, there is already some evidence available based on DSGE models. For example, Valli and Carvalho (2010) calibrate a large-scale DSGE model for the Brazilian economy and find that an increase of 1 p.p. in the fiscal surplus-to-GDP ratio would lead to a fall in the output gap by 1 p.p. on impact.

In a study carried out by the Department of Investor Relations and Special Studies (Gerin),[7] market participants responded that a fiscal effort for a year, equivalent to 1% of GDP, combined with accommodative monetary policy in the first year, would lead to an average decline of 0.34 p.p. in inflation (maximum of 0.8 p.p.). The wide range of responses by market participants about the expected effects, captured by the survey, indicates that considerable uncertainty surrounds the estimates for the fiscal multiplier in Brazil, as happens with the international empirical evidence.

Simulations for Brazil

The simulations follow the line adopted by Coenen *et al.* (2010); however, it utilizes a semi-structural medium-sized model[8], which has the advantage of being an intermediary tool between DSGE models and purely econometric models such as the VARs. The fiscal stimulus is modeled exogenously, being described by a cut in government spending equivalent to 1% of GDP for four consecutive quarters. Two scenarios for monetary policy were considered: (1) the policy interest rate reacts to the fiscal effort according to the Taylor rule estimated in the model (non-accommodative monetary policy), and (2) the policy interest rate remains constant in the first year of the simulation, reacting according to the Taylor rule from the second year onwards (accommodative monetary policy).

Figure 1 – Effect on Inflation of a Fiscal Effort of 1% of GDP, for one year



In Figure 1, the solid line shows the effects on inflation of a 1 p.p. reduction in the government spending-to-GDP ratio (for this simulation, the fiscal multiplier is estimated at around 0.9), lasting one year and without monetary accommodation. The exercise suggests that fiscal restraint impacts inflation relatively quickly and the effects are significant and long-lasting. The maximum effect on inflation occurs about six quarters after the beginning of the fiscal effort. The dotted line shows the response of inflation in the case of accommodative monetary policy (constant nominal interest rates), which, coupled

7/ Available at the Central Bank's website on <http://www.bcb.gov.br/Pre/ASIMP/bcimprensa/2774-Pesquisa 20sobre%%% 20Política 20Monetária.pdf>.

8/ See Minella and Souza-Sobrinho (2009). In order to make the simulations more representative, two modifications were made in the original model: (i) inflation expectations are a weighted average of model-consistent expectations and the inflation target and (ii) the Taylor rule also responds to the output gap.

with the fall in expected inflation causes a greater increase in the real interest rate than that suggested by the previous exercise. As a consequence, the effects on inflation are amplified – the maximum effect also occurs around the sixth quarter.

In both exercises, the transmission of fiscal policy to prices materializes primarily via the aggregate demand channel (or, equivalently, by reducing the output gap). In line with the results found by Coenen *et al.* (2010), the second simulation indicates that the effects on the output gap and inflation may be amplified if monetary policy remains temporarily accommodative. This magnifying effect occurs because the fiscal effort, when combined with temporary monetary accommodation, leads to a higher increase in real interest rates, a key variable for consumption and investment decisions.

In summary, despite the uncertainties surrounding the estimates of the fiscal multiplier, the simulations presented in this box indicate that a fiscal contraction may have important effects on inflation dynamics in Brazil, even when the fiscal effort is short-lived. It is reasonable to claim that long-lasting changes in the fiscal regime would have significant implications for the sustainability of the public debt in the medium and long run as well as for aggregate savings. Therefore, persistent changes in the fiscal regime would certainly have even more important effects on the entire price system.

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