Estimating the Fiscal Multiplier in Argentina

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Abstract

Argentina's government has resorted to fiscal policy as a countercyclical tool to mitigate the negative impact of the current economic downturn on aggregate demand. Empirical results based on a vector error correction model suggest, however, that the fiscal multiplier is relatively small and short-lived. This could reflect a number of

factors, including the higher propensity of households to save during the economic downturn, the implementation lag of public expenditures, particularly of capital expenditures, and the narrow tax base that limits the impact of countercyclical revenue measures on domestic demand.

This paper—a product of the Economic Policy Sector, Latin America and the Caribbean—is part of a larger effort in the department to estimate the fiscal multiplier in LAC countries. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at panoscasero@worldbank.org.

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ESTIMATING THE FISCAL MULTIPLIER IN ARGENTINA

Authors: Paloma Anós-Casero, Diego Cerdeiro and Riccardo Trezzi

1. INTRODUCTION

The ongoing global downturn and financial turmoil have led many countries to resort to fiscal stimulus to cushion the impact on domestic economic activity. In turn, this has reignited the long-standing debate among economists about the effectiveness of fiscal policy as a counter-cyclical tool. Supporters of an active role for fiscal policy suggest that economies lack an efficient mechanism to return to full potential. Critics, on the other hand, argue that economic agents will offset the impact of fiscal policy on aggregate demand through changes in their saving behavior. A middle-of-the-road view holds that fiscal policy can be effective provided certain conditions hold, including sound macroeconomic fundamentals, nominal wage and price stickiness, and/or economic agents with finite horizons and liquidity constraints.

Argentina's policy makers have also resorted to fiscal stimulus packages to mitigate the negative impact of the current economic slowdown on aggregate demand (see Table 1 for details).

Table 1 - Response to the Financial Crisis – Countercyclical Measures

Countercyclical fiscal measures	Details	Fiscal costs (US\$) (-)=savings
<i>Credit lines</i>		<i>US\$2.7bn</i>
to the agricultural sector		US\$500mn
to the manufacturing sector		US\$380mn
to the SMEs		US\$880mn
to those buying their first car		US\$910mn
to those buying appliances		US\$1mn
Other subsidized credits for consumption	The newly created SIPA (Social Security fund) conducted an auction to allocate time deposits across different banks. The winning bids will be those that charge less to finance these activities. The cost is paid by future retirees.	No immediate fiscal costs,
<i>Safety Nets</i>		<i>US\$400mn</i>
Lump-sum payment to retirees	ARS200 lump sum payment for retirees (for 2008 only)	US\$ 290mn
Other programs		US\$110mn
<i>PIT/exemptions/deductions</i>		<i>US\$1.2bn</i>
Lower export taxes	From 28 percent to 23 percent for wheat, 25 percent to 20 percent for corn	US\$ 170mn
Income tax reduction	The elimination of the tax brackets put in place in 2001 would benefit those who earn (after some Social Security taxes) more than AR\$7000 (US\$2060) per month	US\$850mn
<i>Infrastructure Investment</i>		<i>US\$3.6bn</i>
Program of public works	4-year infrastructure spending plan of about AR\$71 bn (US\$20bn). Fiscal impact will depend on the sources and details of financing. Most of the capital expenditures to be announced for 2009 are likely to be already included in the budget. It is assumed that 40 percent of the additional revenues from the nationalization of private pension funds will be used to finance additional infrastructure expenditures (about AR\$6bn or about 1.5 bn US\$)	US\$1.5bn
Other programs in Infrastructure		US\$1.9bn
<i>Other Measures</i>		<i>-US\$760mn</i>
Capital repatriation	Fiscal impact unclear	
Tax moratorium	2 percent of annual tax collection (estimated)	-US\$760mn
Employment formalization	No fiscal effect expected	
Total fiscal costs for 2009		US\$ 2bn

But the implementation of countercyclical fiscal policies can be challenging, particularly for emerging economies. For start, economic fluctuations tend to be more intense for these countries. A typical recession in Argentina reduces output by an average of 6.2 percent. In the OECD, output falls by 2 percent, on average. As the tax base is narrower and revenues are largely dependent on commodity exports, external shocks and fluctuations in economic activity often resulted in large changes in government revenues. Recessions can cost the Treasury an average of 9 percent of its revenues, compared with six percent for the OECD as a whole. Additionally, automatic stabilizers are weak when compared to those in developed economies, and discretionary government spending might take several months to be implemented. Another complicating factor common to most LAC economies is the increased cost of borrowing during recessions, as creditors are wary of buying emerging-market bonds during bad times¹. This, in turn, prevents emerging-country governments from smoothing the cycle by borrowing, as their rich counterparts can afford to do.

This paper empirically analyzes the effectiveness of fiscal policy in stimulating economic activity in Argentina, drawing on a vector error correction model to derive the fiscal multiplier.

2. BRIEF LITERATURE REVIEW

Empirical studies based on structural vector autoregression models conclude that fiscal multipliers have declined over time and, in some cases, may even have been negative (on this specific point see Perotti, 2005). According to Eskesen (2009), these results, which differ widely across countries, likely reflect: (i) increasing leakage through the trade channel due to higher openness of economies; (ii) a decline in the share of liquidity constrained households due to better access to credit; and (iii) a sharper focus of monetary policy on price stability.

In his study for OECD countries, Perotti (2005) finds that the effects of fiscal policy on GDP are small. He finds that only for the U.S. prior to 1980 the fiscal multiplier for government expenditures was larger than one. The figures below summarize these findings.

¹ During the 2001-02 crisis interest rate shifted from 15.4 percent in June to 132.6 percent in November 2001.

Studies drawing on aggregate dynamic macro models conclude that fiscal multipliers are in the range of 0.3 to 1.2 percent, and that expenditure measures appear to have a larger effect than tax measures (Hemming et al 2002, Botman 2006). Other studies find that government investment has the largest impact on economic activity and inflation. However, the size of the estimated multipliers depends on assumptions about, among other things, the monetary regime, labor supply elasticities and liquidity constraints (IMF, 2008).

3. METHODOLOGY

This paper focuses on two measures: a general government tax cut and a general government expenditure increase. The expenditure variable is defined as total purchases of goods and services, meaning government consumption plus government investment. The revenue variable is defined as total tax revenues minus transfers.

The traditional approach in the literature consists in estimating impulse reaction functions using a vector autoregressive (VAR) model (see for example Blanchard and Perotti, 1999 or Bernanke and Mihov, 1998 for monetary policy). Fiscal multipliers are then computed summing the first four, eight or 12 periods of the reaction functions. The basic reduced VAR specification is as follows: $Z_t = \Gamma(L)Z_{t-1} + u_t(1)$ where Z_t is a three-dimensional vector ($Z_t = [Y_t, E_t, R_t]'$) in the logarithms of quarterly observations for government consumption, government revenues and private consumption.

$U_t \equiv [u_t^y, u_t^e, u_t^r]$ is the corresponding vector of reduced form residuals, which in general will have no-cross correlations, and can be represented as follows:

$$(2) u_t^y = \alpha_e^y u_t^e + \alpha_r^y u_t^r + v_t^y$$

$$(3) u_t^e = \alpha_y^e u_t^y + \beta_r^e v_t^e + v_t^e$$

$$(4) u_t^r = \alpha_r^y u_t^y + \beta_e^r v_t^e + v_t^r$$

However, as is well known in the literature, the reduced form residuals represented by equations (2), (3) and (4) have little or no economic significance. In fact, they are linear combination of the underlying “structural” tax, spending and private consumption shocks. Equation (2) states that unexpected movements in output can be due to unexpected movement in taxes and/or unexpected movements in government spending. Equation (4) states that unexpected movements in taxes within a quarter can be due to one of the following factors: the response to unexpected movements in private consumption (captured by $\alpha_r^y u_t^y$), the response to structural shocks in spending (captured by $\beta_e^r v_t^e$), and to structural shocks to taxes, captured by v_t^r . Finally, v_t^e and v_t^r are the mutually uncorrelated structural shocks to government expenditure and revenues that we seek to identify. In order to do so, we follow a four-step procedure.

In the **first step**, the reduced form residuals are estimated from the VAR specified in equation (1). Given the fact that the reduced form residuals are correlated with the structural shocks, it is necessary to apply further restrictions in order to identify the coefficients α_y^e and α_y^r . However, since ordinary least squares in equation (2) and (4) would not generate consistent estimates α_y^r and α_y^e , external estimates are used.²

With these estimates, in the **second step**, the cyclically adjusted fiscal shocks, $u_y^{e,adj}$ and $u_y^{r,adj}$ can be calculated. Expressed in more detail:

$$(5) u_t^{e,adj} \equiv u_t^e - \alpha_y^e u_t^y = \beta_r^e v_t^r + v_t^e$$

$$(6) u_t^{r,adj} \equiv u_t^r - \alpha_y^r u_t^y = \beta_e^r v_t^e + v_t^r$$

In the **third step**, assuming that structural revenue shocks have no impact on structural spending shock (meaning that $\beta_r^e = 0$), the structural fiscal shocks are identified. Equation (5) reduces to $u_t^{e,adj} = v_t^e = u_t^e$. This simply implies that structurally adjusted expenditure shocks are effectively assumed equal to the cyclically adjusted expenditure

² The elasticity of expenditure with respect to changes in economic activity is assumed to be close to zero within the quarter, as commonly assumed in many other empirical studies. The elasticity of revenues to economic activity is estimated to be 0.45 for Argentina.

shocks. Finally, equation (6) can be estimated using ordinary least squares to get consistent estimates of β_e^r .³

In the **fourth step**, the coefficients α_e^y and α_r^y in equation (2) can be determined using the structural uncorrelated fiscal shocks v_t^e and v_t^r as instruments for u_t^e and u_t^r , respectively.

Combined, the four steps allow us to estimate the A and B matrices of the standard relation between the reduced-form innovations and the structural shocks $Au_t = Bv_t$, where:

$$A = \begin{bmatrix} 1 & -\alpha_e^y & -\alpha_r^y \\ -\alpha_y^e & 1 & 0 \\ -\alpha_y^r & 0 & 1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & \beta_e^r & 1 \end{bmatrix} \text{ which brings to:}$$

$$u_t = \begin{bmatrix} 1 & -\alpha_e^y & -\alpha_r^y \\ -\alpha_y^e & 1 & 0 \\ -\alpha_y^r & 0 & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & \beta_e^r & 1 \end{bmatrix} \begin{bmatrix} v_t^y \\ v_t^e \\ v_t^r \end{bmatrix}$$

With this, impulse responses are computed using Monte Carlo simulations based on 10,000 replications.

Given the non-stationary properties of the underlying series, we test for co-integrated relationships among variables. If no co-integrated relationships are found, a Vector Auto Regressive (VAR) model, specified in first log differences, is estimated. If there are co-integrated relationships, a vector error correction (VEC) model is estimated, without imposing additional restrictions in order to avoid over-identification. In its basic form, a VEC model can be represented as:

$$\Delta y_t = \Pi y_{t-1} + \Gamma \Delta y_{t-1} + \varepsilon_t$$

Where Π is the long-run matrix which contains the equilibrium correction terms. As usual, the *number* of co-integrating vectors is given by the number of linearly independent rows of Π , namely the rank of Π .

³ β_e^r is estimated to be 0.7541 for Argentina.

4. ESTIMATING THE FISCAL MULTIPLIER

Consistent with the visual inspection of the data, no evidence for co-integration was found among the variables (see annex). Figure 1 shows diverging patterns of government revenues and private consumption⁴. Thus, we specify a VAR model⁵ and estimate the impulse response functions of shocks to both government expenditures and revenues, specifying the variables in log differences to eliminate the non-stationary properties. Finally, in order to estimate the fiscal multiplier, we calculate the cumulative response of private consumption to each of these shocks by adding the first four, eight and twelve lagged quarter responses.

Figure 1. Tax Revenues, Government Expenditure and Private Consumption

Source: National Authorities. Series seasonally adjusted.

In Argentina, the fiscal multiplier is small and short-lived. A (one standard deviation) shock to government expenditures, which represents additional AR\$ 1.17 million in government expenditures, is estimated to increase private consumption by nearly 0.5% within the same year. Put it differently, each AR\$ 1 million of additional expenditures, private consumption increases 0.39%. The multiplier of revenue measures is also small. The cumulative impact on real private demand of a (one standard deviation) shock in tax revenues, which represents AR\$ 1.16 million, is close to zero. The fiscal multiplier evaporates quickly (lasting one year). It should be noted that the coefficients after the fourth quarter should be interpreted with caution since only within the first year coefficients are statistically significant. The limited effectiveness of revenue measures could be related to a narrow tax base since the informal sector is not negligible. The small and short-lived cumulative impact⁶ of increases in expenditures may reflect a number of factors, including a high propensity to save among households (possibly, in part, reflecting the lack of a comprehensive social safety net) and the implementation lag of public investment programs.

⁴ During the period that spans from 1993Q1 through 2003Q1 (end of the most recent financial crisis), the seasonally-adjusted series for private consumption increased by 1.72 percent (from 157,762.6 to 160,482.1), while government tax revenues increased 38.6 percent (from 8,207.2 to 11,380.7). The substantial increase in both government revenues and expenditures in 1997Q1 was not associated with a similar movement in private consumption. Finally, an exceptional increase (80.1 percent) in government tax revenues during 1998 was associated with a negligible 0.007 percent increase in private consumption.

⁵ It includes two dummy variables, corresponding to 1998-crisis and to the crisis in 2001-2002.

⁶ In fact, only the first four quarters are associated to statistically significant coefficients.

That the fiscal multiplier is small is not a surprising result. The small size of the fiscal multiplier in Argentina is comparable to the size of fiscal multipliers in other LAC economies (Perry et al., 2008). In many industrialized countries, the fiscal multipliers can range from less than zero to at most three (Perotti and Blanchard, 2005). In the US, Barro (2009) estimates that the multiplier of the increase in government expenditures at the peak of World War II (1943-44) was 0.8. But when Barro estimates the fiscal multiplier associated with peacetime government purchases in the US, he obtains a number close to

zero. The evidence for Argentina and elsewhere points to one of the key challenges of fiscal policy as a counter-cyclical tool: the relatively small size and short-lived nature of the fiscal multiplier.

Finally, we estimate the fiscal multiplier in Peru, to compare the results obtained for Argentina. The Johansen's procedure suggests one co-integrated relationship, consistent with the visual inspection of the data for Peru (see Figure 2). Thus, we estimate a VECM to estimate fiscal multipliers, that are calculated on a cumulative basis over the first four, eight and twelve quarters (see annex for details).

Figure 2. Peru :Tax Revenues, Government Expenditure and Private Consumption

Source: National Authorities. Series seasonally adjusted.

The fiscal multiplier in Peru is also small, close to zero, and short-lived. The impact of one standard deviation shock in government expenditure on private domestic demand is close to zero.

ANNEX

Johansen's Procedure – ARGENTINA

Date: 05/20/09 Time: 14:56
Sample (adjusted): 1993Q4 2008Q3
Included observations: 60 after adjustments
Trend assumption: Linear deterministic trend
Series: PRIV_CONSSA GOV_EXPSA GOV_REVSA
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.253503	26.17100	29.79707	0.1237
At most 1	0.129025	8.629179	15.49471	0.4008
At most 2	0.005661	0.340648	3.841466	0.5595

Trace test indicates **no cointegration** at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.253503	17.54182	21.13162	0.1479
At most 1	0.129025	8.288531	14.26460	0.3501
At most 2	0.005661	0.340648	3.841466	0.5595

Max-eigenvalue test indicates **no cointegration** at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

VAR results for ARG, variables specified in log differences.

Vector Autoregression Estimates
Date: 05/21/09 Time: 14:36
Sample (adjusted): 1993Q4 2008Q3
Included observations: 60 after adjustments
Standard errors in () & t-statistics in []

D(LOG(PRIV_C D(LOG(GOV_E D(LOG(GOV_R

	ONSSA))	XPSA))	EVSA))
D(LOG(PRIV_CONSSA(-1)))	0.643741 (0.14466) [4.45018]	1.757509 (1.01856) [1.72548]	1.819987 (0.97272) [1.87102]
D(LOG(PRIV_CONSSA(-2)))	-0.152693 (0.15219) [-1.00329]	0.470141 (1.07164) [0.43871]	0.747600 (1.02341) [0.73050]
D(LOG(GOV_EXPSA(-1)))	-0.039537 (0.03644) [-1.08500]	-0.616201 (0.25658) [-2.40157]	-0.152425 (0.24504) [-0.62205]
D(LOG(GOV_EXPSA(-2)))	-0.014673 (0.03580) [-0.40983]	-0.255629 (0.25210) [-1.01401]	-0.250986 (0.24075) [-1.04251]
D(LOG(GOV_REVSA(-1)))	0.052093 (0.03730) [1.39665]	0.095097 (0.26263) [0.36210]	-0.295705 (0.25081) [-1.17900]
D(LOG(GOV_REVSA(-2)))	0.019451 (0.03651) [0.53278]	0.024786 (0.25707) [0.09642]	-0.023454 (0.24550) [-0.09554]
C	0.005087 (0.00301) [1.68930]	-0.000273 (0.02120) [-0.01289]	-0.002308 (0.02025) [-0.11397]
DUMMY98	-0.008476 (0.00956) [-0.88686]	0.098150 (0.06730) [1.45847]	0.092226 (0.06427) [1.43502]
DUMMY01	-0.018267 (0.01343) [-1.35977]	-0.003741 (0.09459) [-0.03955]	0.017975 (0.09033) [0.19898]
R-squared	0.518550	0.250246	0.230159
Adj. R-squared	0.443028	0.132637	0.109400
Sum sq. resids	0.014482	0.718021	0.654846
S.E. equation	0.016851	0.118654	0.113314
F-statistic	6.866250	2.127784	1.905932
Log likelihood	164.7394	47.63172	50.39469
Akaike AIC	-5.191314	-1.287724	-1.379823
Schwarz SC	-4.877163	-0.973572	-1.065671
Mean dependent	0.006997	0.012353	0.013774
S.D. dependent	0.022579	0.127404	0.120072
Determinant resid covariance (dof adj.)		1.57E-08	

Determinant resid covariance	9.66E-09
Log likelihood	298.2462
Akaike information criterion	-9.041539
Schwarz criterion	-8.099084

Johansen's Procedure – PERU

Date: 05/20/09 Time: 14:33
Sample (adjusted): 1981Q2 2008Q3
Included observations: 110 after adjustments
Trend assumption: Linear deterministic trend
Series: PRIV_CONSSA TAX_REVSA GOV_EXPSA
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.194352	35.72291	29.79707	0.0092
At most 1	0.080222	11.95094	15.49471	0.1593
At most 2	0.024711	2.752365	3.841466	0.0971

Trace test indicates **1 cointegrating eqn(s) at the 0.05 level**

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.194352	23.77196	21.13162	0.0207
At most 1	0.080222	9.198577	14.26460	0.2700
At most 2	0.024711	2.752365	3.841466	0.0971

Max-eigenvalue test indicates **1 cointegrating eqn(s) at the 0.05 level**

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

VECM results for PERU, variables specified in log.

Vector Error Correction Estimates
Date: 05/20/09 Time: 14:40
Sample (adjusted): 1981Q1 2008Q3

Included observations: 111 after adjustments
Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1		
LOG(PRIV_CONSSA(-1))	1.000000		
LOG(GOV_EXPSA(-1))	-5.539632 (1.08443) [-5.10835]		
LOG(TAX_REVSA(-1))	4.116692 (1.03463) [3.97889]		
C	2.489465		
Error Correction:	D(LOG(PRIV_C ONSSA))	D(LOG(GOV_E XPSA))	D(LOG(TAX_R EVSA))
CointEq1	0.003664 (0.00584) [0.62711]	0.075820 (0.01777) [4.26768]	-0.017105 (0.01415) [-1.20873]
D(LOG(PRIV_CONSSA(-1)))	-0.003520 (0.10315) [-0.03412]	0.580140 (0.31366) [1.84956]	-0.482135 (0.24984) [-1.92976]
D(LOG(PRIV_CONSSA(-2)))	-0.142206 (0.09339) [-1.52273]	0.012405 (0.28398) [0.04368]	-0.171618 (0.22620) [-0.75871]
D(LOG(PRIV_CONSSA(-3)))	-0.223590 (0.08841) [-2.52911]	-0.085381 (0.26883) [-0.31760]	0.061868 (0.21413) [0.28893]
D(LOG(GOV_EXPSA(-1)))	0.075170 (0.03794) [1.98151]	-0.089658 (0.11536) [-0.77723]	0.024927 (0.09188) [0.27129]
D(LOG(GOV_EXPSA(-2)))	0.066604 (0.03599) [1.85083]	-0.192547 (0.10943) [-1.75960]	-0.048395 (0.08716) [-0.55523]
D(LOG(GOV_EXPSA(-3)))	0.014277 (0.03345) [0.42687]	0.138317 (0.10170) [1.36003]	0.057988 (0.08101) [0.71583]
D(LOG(TAX_REVSA(-1)))	0.013674 (0.04470) [0.30591]	-0.229854 (0.13592) [-1.69107]	-0.155426 (0.10827) [-1.43559]

D(LOG(TAX_REVSA(-2)))	0.136474 (0.04604) [2.96396]	-0.072110 (0.14001) [-0.51502]	0.216053 (0.11152) [1.93729]
D(LOG(TAX_REVSA(-3)))	-0.021874 (0.04481) [-0.48816]	-0.349052 (0.13626) [-2.56166]	0.237864 (0.10853) [2.19160]
C	0.011261 (0.00376) [2.99672]	0.014617 (0.01143) [1.27925]	0.013869 (0.00910) [1.52385]
DUMMY87	-0.028946 (0.01310) [-2.21016]	-0.029857 (0.03982) [-0.74971]	-0.080481 (0.03172) [-2.53711]
DUMMY90	-0.021113 (0.01708) [-1.23639]	-0.094835 (0.05193) [-1.82632]	0.038780 (0.04136) [0.93759]
R-squared	0.320937	0.382791	0.216285
Adj. R-squared	0.237786	0.307214	0.120320
Sum sq. resids	0.102162	0.944644	0.599334
S.E. equation	0.032287	0.098180	0.078203
F-statistic	3.859701	5.064932	2.253783
Log likelihood	230.4833	107.0373	132.2892
Akaike AIC	-3.918618	-1.694366	-2.149355
Schwarz SC	-3.601286	-1.377033	-1.832023
Mean dependent	0.006284	0.007022	0.006045
S.D. dependent	0.036982	0.117956	0.083379

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