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Structural fiscal balances in Latin America and the Caribbean: New dataset and estimations

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Structural Fiscal Balances in Latin America and the Caribbean

New Dataset and Estimations

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Inter-American Development Bank
Institutions for Development Sector

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Abstract*

In recent years, an increasing number of countries have begun anchoring their fiscal policy frameworks in terms of rules that target the cyclically adjusted or structural (as opposed to actual) balance in an effort to overcome problems of procyclicality and fiscal volatility. The logic for doing so is in principle compelling: rule-based fiscal policies allow automatic stabilizers to work freely during the cycle and help accumulate fiscal surpluses in good times. However, the estimation of structural balances is subject to a number of methodological challenges, including the degree of estimation uncertainty. This paper presents a range of estimates of the structural budget balance and uses them to analyze the cyclical behavior of fiscal policy in Latin America and the Caribbean. Based on an original dataset comprising detailed fiscal information from 20 countries across the region between 1990 and 2013**, the paper finds that the range of estimates can be large for some countries, especially those that derive substantial fiscal revenue from commodity-related activities. In addition, the evidence shows that on average, the region has followed a procyclical policy pattern: a 1 percent increase in the output gap is associated with up to a 0.66 percentage point deterioration in the structural primary balance. This pattern hides substantial regional heterogeneity: procyclicality is more marked in countries that face large terms of trade shocks, but it can be counteracted by higher institutional quality.

JEL Classifications: E62, E32, E02

Keywords: structural fiscal balances, cyclicity, business cycle, commodity prices, institutions

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** The original dataset can be found at <http://publications.iadb.org/handle/11319/6979> and a summarized format at <https://mydata.iadb.org/Public-Finance/Structural-Fiscal-Balances-Database-for-LAC-A-Tool/3itg-avtz>.

1. Introduction

Fiscal policy in Latin America and the Caribbean (LAC) has traditionally been procyclical and volatile. That is, governments have tended to increase public spending (or cut taxes) during periods of expansion and to cut expenditures (or raise taxes) during periods of recession. In addition, fiscal policy has also been historically volatile, due to discretionary shocks or sudden changes in fiscal policy undertaken for reasons other than addressing current macroeconomic conditions. Since there is ample empirical evidence suggesting that procyclical and volatile fiscal policy negatively affect economic growth (Woo 2011; 2009), exacerbate macroeconomic volatility (Fatas and Mihov, 2003; 2012), and hamper attempts at protecting the most vulnerable groups during recessions (Hicks and Wodon, 2001; Ravallion, 2002), measures to reduce fiscal volatility and contain procyclical biases in fiscal policy can be beneficial for improving long-term economic performance and social welfare.

There are two complementary policy options to address the problem of procyclical and volatile fiscal policy. One is to strengthen the role of automatic stabilizers in the budget, that is, those revenue and expenditure items that adjust to cyclical changes in the economy and are triggered automatically, which so far have been found to be both relatively small and ineffective in reducing output volatility across LAC (Corbacho et al., 2013). The other option is to anchor fiscal policy frameworks in terms of fiscal rules that target structural, as opposed to actual, fiscal balances (Kumar and Ter-Minassian, 2007). According to a standard definition, the structural or cyclically adjusted balance (SBB) is the government's actual fiscal position after controlling for the budgetary consequences of the business cycle (Hagemann, 1999) and other exogenous factors, such as commodity price movements (Bornhorst et al., 2011).

In the aftermath of the recent global economic crisis, anchoring fiscal policy in terms of SBB has become more common, as part of a new wave (or next generation) of fiscal rules (Schaechter et al., 2012). However, only a minority of countries have experimented with SBB rules in practice. As of 2013, out of 67 countries with a balanced budget rule in place, 15 incorporated a cyclical or structural adjustment feature into them (IMF, 2013).¹ Across LAC, only Chile (since 2001) and, more recently, Colombia (2011) and Peru (2013) set budget balance

¹ See the IMF's (2013) "Fiscal Rule Dataset" spanning 87 countries between 1985 and 2013 (available at <http://www.imf.org/external/datamapper/FiscalRules/map/map.htm>).

or expenditure growth targets in cyclically adjusted terms, while Panama (since 2009) and Mexico (since 2014) account for the cycle in other ways.

The fact that such a relatively low number of countries have adopted SBB-based rules may not be an accident, since there are a number of institutional requirements for their successful implementation, and the readiness of countries to meet them cannot be simply assumed (García, 2012; Ter-Minassian, 2010). Moreover, for countries that derive substantial fiscal revenues from commodity-related activities, additional complications arise from the highly volatile and unpredictable evolution of resource prices (Villafuerte et al., 2010).

However, even if a majority of countries in the LAC region have yet to fully satisfy some or all such preconditions, the use of structural fiscal balances as indicators or monitors of the underlying fiscal position could be an important first step in the direction of institutionalizing fiscal policy along these lines. Having a reliable indicator of the impact of economic conditions on the budget is a natural precondition or first step in incorporating a rules-based approach to fiscal policy. Thus, a dataset and estimations of structural fiscal balances are both timely and urgently needed across the region.

Our paper contributes to this policy agenda by presenting original estimates of structural fiscal balances in a sample of 20 LAC countries. In addition to making this information publicly available, our contribution to the literature is threefold. First, we attempt to measure the degree of estimation uncertainty around estimates of the SBB. By definition, the calculation of SBB (and associated measures of fiscal impulse) is subject to estimation uncertainty, since its formula requires estimation of unobserved variables (e.g., estimates of potential output and corresponding output gaps) and parameters (including estimates of tax and spending elasticities). Interestingly, few studies attempt to publish estimation uncertainty around such estimates. Our second contribution is that, in estimating the SBB, we take into account policymakers' (limited) information set by using economic data in real time. Contrary to most studies, which conduct ex post analyses based on all available information and are thus able, with the benefit of hindsight, to calculate the state of the business cycle more accurately, we make use of information on output that is only available at the time that fiscal policy decisions are made. To the extent that we find large differences between these methods, caution in the use of SBB seems warranted. Our final contribution is to show how several features of the dataset can be exploited, which we

do by revisiting an issue that has long attracted attention in the region: the cyclical behavior of fiscal policy and its economic and political determinants.²

The paper is organized as follows. Section 2 places recent fiscal developments across LAC in comparative perspective. Section 3 presents the dataset and methodology to calculate SBB. Section 4 presents estimates of SBB for 20 LAC countries, along with ranges to assess the degree of estimation uncertainty, and Section 5 provides an assessment of the behavior of fiscal policy over the business cycle. Section 6 concludes.

2. The Challenge: Addressing Procyclical and Volatile Fiscal Policy in LAC Countries

LAC countries have traditionally been characterized by high levels of fiscal procyclicality and fiscal volatility. For example, in a sample of 90 countries between 1960 and early 2000s, Woo (2009) finds that the average level of fiscal procyclicality in LAC, measured through the reaction of government spending to changes in real GDP, was the highest among various regions of the world. Similarly, in a study encompassing 87 countries between 1960 and 1999, Alesina and Tabellini (2005) show that the two regions with the most procyclical fiscal policy are Sub-Saharan Africa and (especially) Latin America. Finally, sorting the country data presented in Fatas and Mihov (2003) by regional origin, we find that LAC's level of fiscal volatility between 1960 and 2000, as measured by the standard deviation of the residuals from country-specific regressions of government consumption on output, is comparatively high too, well above the sample mean and only behind the levels of volatility observed across Sub-Saharan Africa.

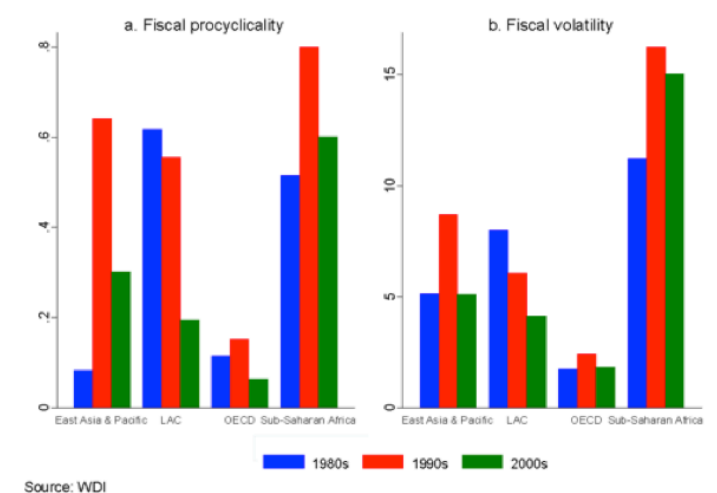
Against this historical background, the last decade witnessed significant changes in the fiscal policies of several countries in the region: average deficits declined steadily, debt ratios improved, and, in contrast to previous crisis episodes, some countries were able to implement effective countercyclical fiscal policy during the global economic downturn of 2008–09 (IMF 2015; 2009; Klemm 2014; Daude et al., 2010).³

² Starting with Gavin and Perotti (1997), an important literature has shown the region's propensity towards procyclical behavior (Kaminsky et al. 2004; Akitoby et al. 2006; Clements et al. 2007; Klemm 2014).

³ To use Frankel et al.'s (2012) terminology, "graduation" from fiscal procyclicality has not been unique to several LAC countries over the last decade, but rather a feature of the developing world in general. See also Céspedes and Velasco (2014) for the case of commodity exporters in particular.

Figure 1 places some of these recent gains in comparative perspective by showing the regional and over-time variations in levels of fiscal cyclicity and volatility. In this figure, fiscal cyclicity is measured in terms of the reaction of government spending to changes in real GDP in country-by-country time-series regressions (larger values imply more procyclical fiscal policy),⁴ and fiscal volatility is simply measured through the standard deviation in government expenditure growth by decade. As shown in Figure 1a, while during the 1980s and 1990s the LAC region had the highest average level of procyclicality, fiscal policy became much less procyclical during the last decade. Similarly, Figure 1b shows that on average, levels of fiscal volatility have been in constant decline for the last three decades, allowing the LAC to reduce the gap with respect to advanced countries. Despite these gains, the median LAC country is still four times more volatile than the median OECD economy.

Figure 1. Fiscal Procyclicality and Volatility across Regions and Over Time (*regional averages*)



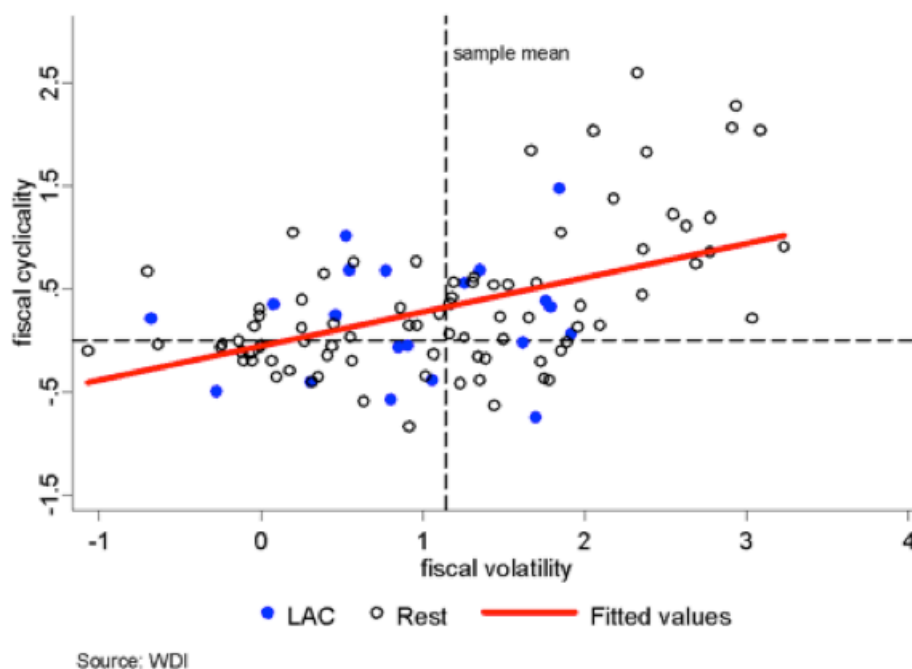
Note: Fiscal procyclicality (volatility) measured using country-by-country time-series regressions (the standard deviation of government expenditure growth).

These average gains, however, mask important variation across countries. For example, Figure 2 plots LAC countries (in blue) along the two dimensions of fiscal cyclicity and volatility in the 2000–10 period in a sample of more than 100 countries for which data were available.⁵

⁴ Specifically, the change in the log of real government consumption expenditure is regressed on the change in the log of real GDP, whose coefficient is taken to proxy for the degree of fiscal procyclicality.

⁵ In this figure, fiscal volatility is measured using the standard deviation of the residuals from country-specific regressions of government consumption on output (see Fatas and Mihov [2003] and Woo [2011] for details).

Figure 2: Fiscal Volatility and Cyclicality (2000–10)



Several interesting facts emerge from this scatter plot. First, it is generally the case that the two phenomena are positively correlated, suggesting that reducing procyclicality and volatility are two sides of the same challenge: constraining excessive fiscal policy discretion. Second, and looking only at the vertical dimension of the figure, LAC countries above and below the zero dashed line (the threshold separating procyclical from countercyclical countries) split almost evenly, suggesting that there is still room for at least half of the countries to further reduce their levels of fiscal procyclicality. Third, looking at the horizontal dimension of the figure, while a plurality of LAC countries now show levels of volatility below the sample or world mean, there is still a non-negligible group of countries with levels above it, also providing margin for improvement on this issue. In sum, putting both dimensions together, we observe that over the last decade, some countries were able to escape the procyclicality and volatility trap, while in others levels of procyclicality and volatility have remained comparatively high.

As noted in the introduction, there are two complementary policy options to overcome procyclical and volatile fiscal policy. One is to strengthen the role of automatic stabilizers, and the other is to anchor fiscal policy frameworks in terms of fiscal rules that target the structural, as opposed to actual, balances. In the rest of the paper, we concentrate on measuring structural

balances and studying their evolution over time as a first step toward considering the adoption of SBB-based fiscal rules.

3. Structural Balance Estimation: Data and Methodology

3.1 Data

While several regional fiscal databases are readily available,⁶ none of them meets the requirements for the appropriate estimation of SBBs. Problems of comparability due to varying institutional coverage, lack of documentation of structural breaks in the time series, as well as availability of revenue data at only very aggregated levels of analysis are among the most important limitations of existing databases. Our original database, constructed on the basis of official data (main sources: Central Banks and Ministries of Finance) attempts to overcome these problems by: (i) consolidating fiscal data in order to arrive at the level of the general government⁷ or its closest approximation; and (ii) disaggregating revenue data by its main components (tax and non-tax revenues).

Following these criteria, the dataset for this study contains information from 20 countries in Latin America and the Caribbean: Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela. The information on each country is presented using the following structure:

- Fiscal revenues
 - Current revenues:
 - Taxes:
 - Corporate income tax (CIT)
 - Personal income tax (PIT)
 - Indirect taxes: valued added tax + excises

⁶ These include: Latin Macro Watch (LMW) prepared by Research Department at Inter-American Development Bank, World Economic Outlook (WEO) and International Finance Statistics (IFS) by International Monetary Fund, World Development Indicators (WDI) by the World Bank, and CEPAL-STAT by ECLAC.

⁷ This includes the central government, subnational (state and local) governments, social security, and other decentralized organizations that are separate from the central government. The operations of public enterprises are available in the dataset and can be added to compute fiscal indicators of the nonfinancial public sector, without any adjustment for economic or commodity cycles.

- Other taxes
 - Social security contributions
 - Nonrenewable resource (NRR) tax revenues (mostly CIT)
- Non-taxes:
 - NRR non-tax revenues (royalties and transfers)
 - Others
- o Capital revenues
- Expenditures: total and primary
- Primary and overall balance
- Structural balance (primary, overall, with and without NRR)

Table 1 provides further details about the institutional units and time span covered in the dataset.

Table 1: Sample and Coverage

Country	Coverage	Years
Argentina	Central Govt + Social Security	1990-2013
Barbados	Central Government	1993-2013
Bolivia	General Government	1990-2013
Brazil	General Government	1998-2013
Chile	General Government	1990-2013
Colombia	General Government	1990-2013
Costa Rica	General Government	1997-2013
Dominican Republic	Central Government	1990-2013
Ecuador	Central Government	1990-2013
El Salvador	General Government	1990-2013
Honduras	Central Government	1990-2013
Guatemala	Central Government	1990-2013
Guyana	Central Government	1992-2013
Mexico	Central Govt + Social Security	1990-2013
Panama	Central Government	1990-2013
Paraguay	Central Gov't + Social Security	1990-2013
Peru	General Government	1990-2013
Trinidad and Tobago	Central Government	1998-2013
Uruguay	Central Gov't + Social Security	1999-2013
Venezuela	Central Government	1992-2013

Source: Authors' elaboration.

3.2 Methodology

The SBB is usually defined as the fiscal balance that would prevail if the economy were at its potential (or trend) level (Blanchard, 1990). In other words, the goal of estimating an SBB is to remove the impact of the business cycle and other exogenous factors (e.g., commodity price movements) from budgetary accounts. Thus, computing the SBB involves basically three steps:

(i) estimation of potential output and the corresponding output gap; (ii) estimation of tax and expenditure elasticities to the output gap; and (iii) adjustments that go beyond the business cycle, such as the effects of commodity prices on fiscal revenues.

Therefore, following Bornhorst et al. (2011), we use the equation:

$$SBB = \sum R_i \left(\frac{Y^P}{Y} \right)^{\varepsilon_{R,i}} + R^{NRR} \left(\frac{P^{LR}}{P} \right)^{\alpha} - G \left(\frac{Y^P}{Y} \right)^{\varepsilon_G}$$

where SBB is the structural budget balance, R_i are the revenue categories, R^{NRR} is the revenue from nonrenewable resources, Y^P is potential GDP, Y is GDP, P is the weighted average of the principal commodity prices, P^{LR} is the long-run weighted average price of the main commodity prices, $\varepsilon_{R,i}$ and ε_G the GDP-elasticity of each revenue category and expenditure, respectively, α is the elasticity of NRR revenues with respect to commodity prices, and G is the total fiscal expenditure.

This equation follows the disaggregated approach based on the cyclical adjustment of individual revenue items where each component of the i -th revenue category is adjusted individually by the cycle. On the expenditure side, we follow the conventional wisdom in assuming $\varepsilon_G = 0$. The zero elasticity assumption seems warranted in the LAC context due to underdeveloped unemployment insurance systems and the general absence of expenditure programs that could act as automatic stabilizers.

3.2.1 Output Gaps

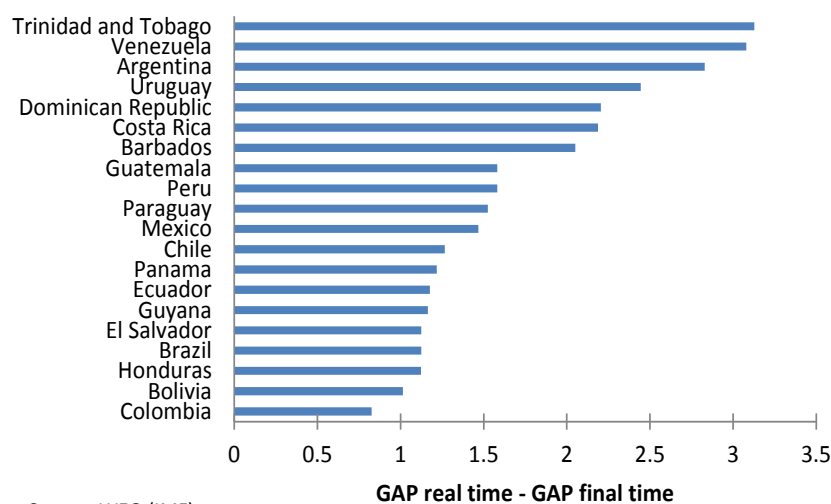
In the absence of data that would allow for the estimation of potential output using a production function approach, we use the Hodrick-Prescott (HP) filtering technique to estimate output gaps. Moreover, to approximate a policymaker's information set, we estimate output gaps in real time. That is, we use the information available on real GDP at time T for estimating output gaps at time $T+1$ using the different vintages of the WEO database.⁸ Specifically, we detrend each WEO vintage of data available to construct an ensemble of output-gap series. That is, in every year we apply the detrending method with data available during that year. Next, we use these different vintages to construct a new series, which consists of the latest available estimate of the output gap for each point in time. The resulting real-time estimate represents the most timely estimate of

⁸ Online vintages are available since 1999. To ease the end-point problem of the HP filtering technique, we use Consensus Forecasts growth projections whenever WEO does not provide them.

the output gap that could be constructed in real time using the method employed (Orphanides and van Norden, 2002).

This setup allows us to compare differences between measures of the output gap in real time and estimates of the output gap that are returned when using the latest available WEO version, which we can refer to as our final time estimates of the output gap.⁹ Discrepancies between real and final time estimates of the output gap reflect both forecasting errors (e.g., the overestimation of growth rates) and ex-post revisions of outturns. As shown by Figure 3a, these absolute differences (averaged over the 2002–12 period) can be large for several countries in the region, but as shown in Figure 3b, are not systematically biased in one direction or another.¹⁰

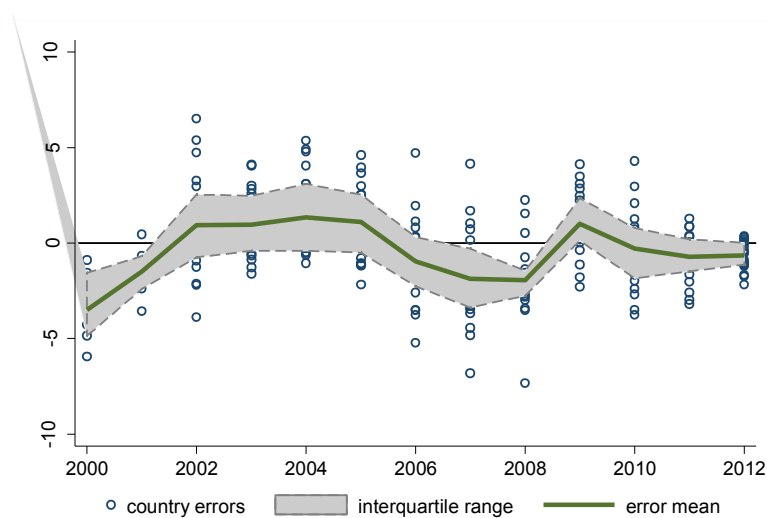
Figure 3a. Absolute Differences between Output Gaps in LAC (*averages 2002–12*)



⁹ At the time of this writing, the latest available version corresponds to October 2014 vintage.

¹⁰ In fact, in only one of the 20 countries reviewed here is the forecast error statistically larger than zero, and in four, it is statistically smaller than zero.

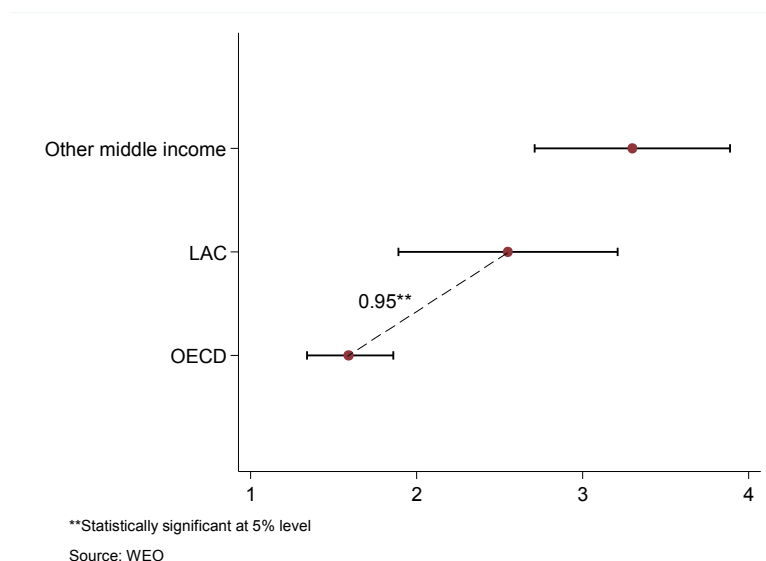
Figure 3b. Forecast Error (Real-Final Time) by Country over Time



Source: WEO October 2014

Additionally, Figure 4 places such discrepancies in comparative perspective by plotting regression coefficients along with corresponding 95 percent confidence intervals for LAC, advanced countries, and a sample of 55 middle-income countries. On average, OECD economies show the least discrepancy between real-time and final-time estimates of the gap. As shown in the figure, while the difference in means between advanced countries and LAC is 1 percentage point and statistically significant at conventional levels, LAC is not an outlier in this respect, since countries at similar levels of economic development show similar patterns.

Figure 4. Difference in Means across Countries



**Statistically significant at 5% level

Source: WEO

3.2.2. Budget Elasticities

We estimate long-run fiscal elasticities relying on Dynamic OLS (DOLS) techniques. We consider the following taxes: Corporate Income Tax (CIT), Personal Income Tax (PIT), indirect taxes (valued added tax and excises), Social Security Contributions (SCC) and the aggregation of other taxes for the period 1990-2010. The equation used is:

$$\ln T_t^i = \beta_0^i + \beta_1^i \ln Y_t + \sum_{n=0}^j \delta_n^i D_t^n + \varepsilon_t^i$$

Where T_t^i is each tax, β and δ are the coefficients estimated, Y_t is the real GDP, D_t^n are the tax rates or dummy variable for institutional (or administrative) changes; finally ε_t^i the error term. The estimations for the 20 countries of this study are presented in the Table 2. These estimations are in line with previous studies.

Table 2: Elasticities Estimated by DOLS

	CIT	PIT	Indirect	SCC	Other taxes
Argentina	2.5	3.4	1.1	2.3	0.01
Barbados	1.8	1.9	1.7	1.6	0.00
Bolivia	3.5	2.4	1.5	1.0	0.03
Brazil	2.1	2.5	1.0	1.6	0.00
Chile	2.0	0.4	1.4	1.5	0.00
Colombia	0.4	2.2	1.8	1.8	0.00
Costa Rica	1.9	2.1	0.8	1.3	0.00
Dominican Republic	1.8	1.8	1.4	1.5	0.01
Ecuador	3.3	1.3	2.0	1.6	0.30
El Salvador	3.1	2.9	2.1	0.6	-0.01
Guatemala	1.9	2.4	2.0	1.4	-0.01
Guyana	1.5	1.7	1.8	1.8	0.02
Honduras	0.7	2.1	3.1	2.3	-0.02
Mexico	0.4	2.2	1.8	1.8	0.00
Panama	1.3	1.2	0.7	1.7	0.01
Paraguay	0.9	0.0	2.1	2.9	0.00
Peru	1.8	2.1	1.8	0.9	-0.02
Trinidad and Tobago	0.7	0.4	0.7	2.2	0.02
Uruguay	2.2	2.7	3.8	2.6	0.01
Venezuela	3.1	3.5	2.6	1.9	0.04
LAC-20 (mean)	1.8	2.0	1.8	1.7	0.02

Source: Authors' calculations.

3.2.3. Other Adjustments: Commodity Fiscal Revenues

Revenues from non-renewable resources play an important role in total fiscal revenues in several countries of the region, a role that has increased considerably in recent years due to the commodity boom (Corbacho et al. 2013). The nature of NRR makes it necessary to disentangle permanent from temporary shocks in fiscal accounts. The literature offers different approaches regarding the management of this type of revenue. Box 1 presents a brief discussion on how Norway and Chile link commodity fiscal revenues with a fiscal rule. Box 2 describes the operation of fiscal stabilization funds in the LAC region.

Box 1: Fiscal Policy Frameworks for Resource-rich Countries: the Cases of Chile and Norway

The adoption of a fiscal rule based on a cyclically adjusted balance, as in Chile, and for intergenerational equity, as in Norway, is the key reform required to avoid procyclical bias and pro-current generation bias in fiscal policy and government spending. While for non-commodity exporters cyclical adjustment may be limited to domestic GDP shocks, for commodity exporters it is key to add cyclical adjustments to price shocks of their commodities.

Chile's fiscal rule for the central government budget was developed in 2000 and implemented in 2001. The rule aims to contribute to two policy objectives: fiscal sustainability and fiscal/macroeconomic stability. Fiscal stability is ensured by committing to a target level for the government's cyclically adjusted balance that is consistent with government saving needs (net of government investment). Fiscal (and possibly macroeconomic) stability is attained by committing to a government spending path that is consistent with cyclically adjusted government revenue. Hence the rule's aim is to save during high-revenue periods in order to withdraw from the latter savings in bad times, over and above the saving or dissaving target reflected by the CAB. Chile's largest sources of government cyclical volatility—i.e., the budget's largest sensitivity to cyclical variables—are non-mining tax revenue and mining tax and transfer revenue.

Norway, one of the world's richest countries, started oil production in 1971 and became an increasingly important oil exporter in the 1980s and 1990s. Prudent and transparent management of government oil rents is a major component of Norway's fiscal policy framework, which targets both cyclical stabilization and inter-generational equity as key policy objectives. Norway's fiscal rule for the non-oil budget is based on the distinction between actual and cyclically adjusted projections for the following key budget items: tax revenue, excise duty revenue, transfers from the central bank (Norges Bank), the central government's net interest payments, and unemployment benefit payments. Over the business cycle, government expenditure (other than on net interest payments and

unemployment benefits) is determined by projected levels of cyclically adjusted government tax and non-tax revenue plus an imputed 4 percent real return on GPFG investments.

The 2001 fiscal policy guidelines do not require that spending be strictly limited to the ceiling imposed by the 4 percent real return on GPFG every year. On the contrary, fiscal policy is expected to contribute to short-term stabilization of the economy by making use of discretionary government spending. Therefore, the Norwegian fiscal rule allows fiscal policy to play a counter-cyclical role that goes well beyond a strict structural or cyclically adjusted income rule (like Chile's acyclical spending rule). In contrast to Chile, Norway's government budget allows for less (more) government expenditure growth during the expansionary (contracting) phase of the business cycle, when projected output gaps are positive (negative).

Source: Schmidt-Hebbel (2012).

Box 2: Fiscal Stabilization Funds in Latin America and the Caribbean

Many LAC countries that generate significant fiscal revenues from the exploitation of raw materials have created stabilization funds. The funds are automatic safety mechanisms designed to attenuate the effects of price fluctuations of these basic products on fiscal accounts, and they seek to stabilize public expenditures whenever revenues display volatile or uncertain behavior (Marcel, 2011). Stabilization funds operate under pre-established rules, accumulating additional revenues during price surges and financing necessary expenditures during declines. Deposits and withdrawals depend on attaining an outcome in relation to a specific trigger. Some funds center on price fluctuations in export products, whereas others mainly concentrate on fluctuations in fiscal revenues. An important challenge is to set the reference value that governs withdrawals and deposits.

With the exception of Bolivia, all of the main exporters of basic commodities in the LAC region have created stabilization funds. Chile established a fund for stabilizing the proportion of copper export revenues that the government is able to spend in one year. The Copper Compensation Fund (Fondo de Compensación del Cobre) operated from 1987 to 2006, primarily to stabilize fluctuations in the real exchange rate and to regulate the availability of foreign currencies in the economy. From the 1990s onward, attention focused on stabilizing fiscal revenues produced by the public sector copper corporation. The fund was eliminated when the Fiscal Responsibility Law (Ley de Responsabilidad Fiscal, or LRF) was enacted in 2000. This law consolidated the structural fiscal balance rule and created a single stabilization fund for all fiscal revenues.

Ecuador's LRF (2002) contained three fiscal rules aimed at balancing the lack of resources, the real expenditure growth rate, and public debt. Subsequently, these were modified and replaced by a non-oil-based Golden Rule (2008). There was also a series of stabilization funds with a set of rigid operational and deposit rules, which were abolished a few years ago.

Mexico has also created a stabilization fund within the framework of its LRF, with rules whose execution depends on current oil prices with regard to budgeted prices. There is also a general balanced-budget fiscal rule (not business cycle-adjusted).

In Peru, the resources of the fiscal stabilization fund (Fondo de Estabilización Fiscal) are accumulated according to the fiscal surplus at the end of each financial year. These resources can be used to service public debt once they surpass 2 percent of GDP. The LRF establishes various fiscal rules not adjusted by the business cycle.

In Trinidad and Tobago, the stabilization fund (Fondo de Estabilización) stipulates rules of execution that depend on real oil revenues in relation to budgeted revenues.

Finally, in 1998, Venezuela established its Economic Stabilization Investment Fund (Fondo de Inversión para la Estabilización Económica, or FIEM) to soften the impact of fluctuating oil revenues on fiscal accounts and on monetary and foreign exchange operations. In 2004, the FIEM was modified and became the Macroeconomic Stabilization Fund (Fondo de Estabilización Macroeconómica, or FEM), aimed at stabilizing public spending at the national, state, and municipal levels. Subsequently, in 2007, the National Development Fund (Fondo de Desarrollo Nacional, or FONDEN) was created so that resources from oil revenues and other sources could be used to finance investment projects. This left the FEM with no practical role as a public expenditure stabilization mechanism. In Venezuela, the rules of execution based on oil prices are frequently modified whenever political circumstances and objectives change, which makes the rule inefficient, useless, and impossible to monitor.

Source: Villafuerte, López-Murphy, and Ossowski (2010).

Following the methodology used in Chile, we introduce an adjustment in the fiscal revenues related to the commodity of interest or basket of commodities.¹¹ This implies defining a structural price (P^{LR}) that is not observable and reflects the long-run price. The adjustment is defined as the ratio between the observed price and the structural price. Methodologies to calculate the structural price for some commodity exporters include the following:

- Chile: An independent board sets the benchmark price for copper in the long run, and more recently also for molybdenum.
- Mongolia: The structural price for copper is determined by the moving average over 16 years: 12 historical, current year, and three-year forecast.

¹¹ For Bolivia, Chile, and Peru, we create an index of structural prices, weighted by export shares in each year.

- Vladkova-Hollar and Zettelmeyer (2008): Structural commodity prices are calculated using forward-looking five-year projections from the IMF.
- Other oil producers: Structural commodity prices are based on the central oil price projection (e.g., from the International Energy Agency [IEA]).

Table 3 shows the variation in the type of commodity exports and fiscal dependence across countries in our sample. While Ecuador, Mexico, Trinidad and Tobago, and Venezuela are oil exporters, Bolivia, Colombia, and Peru export a combination of mining, crude oil, and hydrocarbons. Chile and Guyana are mining exporters. All countries show relatively high levels of fiscal dependence, with the exception of Guyana and Colombia, where participation is relatively low but has increased considerably in recent years.

Table 3: Main Commodities in Mining and Hydrocarbon Exporters

Country	Mining	Hydrocarbon	Fiscal revenue share (%) (2010–12)
Bolivia	Zinc, tin	Natural gas, crude oil	16.7
Chile	Copper, molybdenum		16.4
Colombia	Carbon, ferronickel, gold, emeralds	Natural gas, crude oil	8.2
Ecuador		Crude oil	31.7
Guyana	Gold		4.3
Mexico		Crude oil	32.1
Peru	Copper, gold, silver, zinc	Natural gas	15.2
Trinidad and Tobago		Crude oil	42.0
Venezuela		Crude oil	41.4

Source: Authors' elaboration.

Given the lack of a methodological convention regarding the estimation of structural prices, we define four alternative scenarios based on the extant literature:¹²

- Moving average 15 years of historical data
- Forward-looking five years (Bloomberg forecast)
- 12 years of historical data and four years of forecast
- The average of all above scenarios

4. Estimates of Structural Primary Balances in LAC

This section presents the results of estimating the SBB for 20 countries in LAC during the 2000s. The discussion is divided into two parts. The first defines and discusses the baseline results based on a pre-specified scenario. The second discusses estimation uncertainty around the baseline.

4.1. Baseline Scenario

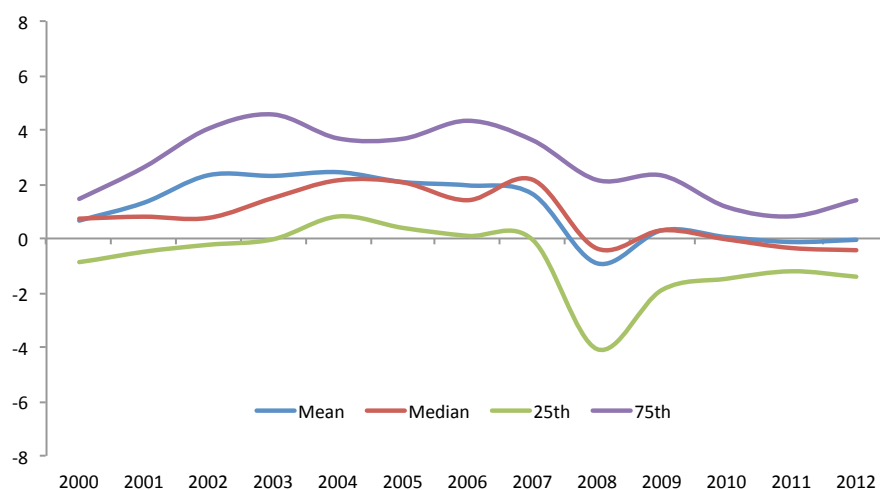
The assumptions for the baseline scenario are as follows. The output gap is estimated using the HP technique with parameter lambda equal to 100 using final-time data. The fiscal revenue elasticities are from Table 2 above. Similarly, commodities revenue elasticities are estimated via Log-OLS regressions, where the structural price is the average of the three scenarios defined above.

Figure 5 presents the evolution in levels of structural budget balances during the last decade along with regional averages, median, and corresponding interquartile ranges. Three main stylized facts can be observed. With some exceptions, structural primary balances improved during the mid-2000s, as the commodity boom took off. In fact, at the onset of the latest financial crisis, structural fiscal balances remained in surplus or equilibrium in 15 out of the 20 cases. Second, there was a sharp deterioration in the underlying fiscal position during the 2008–09 financial crisis, consistent with a countercyclical policy stance. Finally, fiscal positions have only partially recovered since the crisis and, in several cases, have deteriorated. This latter dynamic

¹² In auxiliary calculations, we build a fifth scenario following Villafuerte et al. (2010). They define SBB as nonresource revenues net of government expenditures. Hence, we also estimate the SBB excluding the revenues from NRR.

suggests LAC countries still face important challenges in terms of their ability to withdraw fiscal stimulus as cyclical positions improve (Powell 2015; IMF 2015).¹³

Figure 5. Structural Primary Balances (*in percent of GDP*)



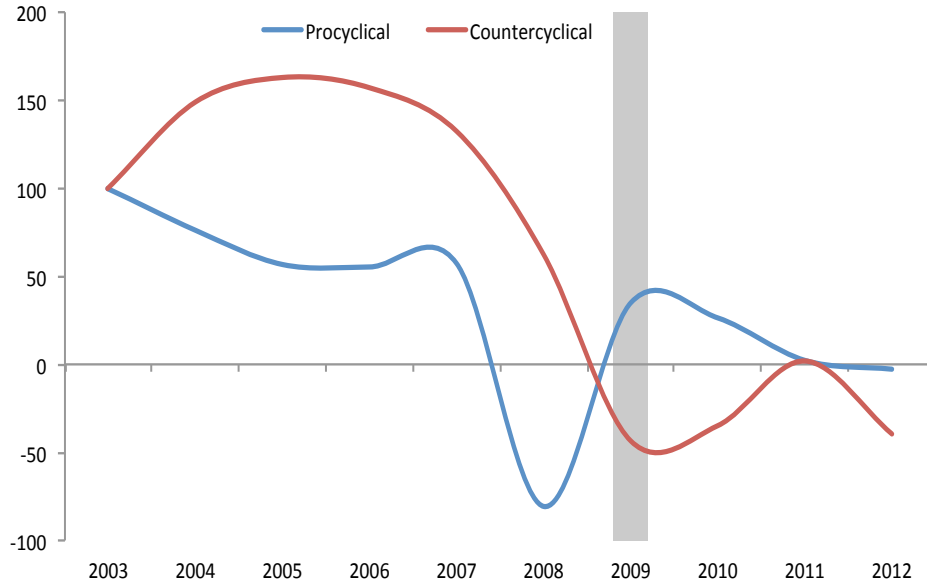
Source: Authors' elaboration.

This stylized overview hides substantial heterogeneity across LAC. Specifically, taking as a classification criterion the response of the structural balance to the output gap during 2009, it is possible to sort countries into two groups: those that were able to respond in a countercyclical manner and those whose response was procyclical (see Figure 6). Notably, the countries that could respond in a countercyclical manner during the global crisis had accumulated larger surpluses during the commodity boom and, until 2011, the structural balance showed signs of improvement. By contrast, in those countries that responded in a procyclical manner in 2009, the structural balance had been on a worsening trend throughout the commodity boom, leaving them with less fiscal space to respond both during and after the downturn.¹⁴

¹³ See Powell (2014) for further evidence on these trends and their relationship with the cyclical stance of fiscal policy.

¹⁴ The countries that responded counter-cyclically include (in order of size of fiscal impulse): Chile, Costa Rica, Guatemala, El Salvador, Peru, Barbados, Honduras, Panama, Brazil, Argentina, and Paraguay.

Figure 6. Structural Primary Balances (*in percent of GDP*) (2003=100)



Source: Authors' elaboration.

4.1.1. Estimation Uncertainty: Alternative Scenarios

This section simulates different values of the SSB according to changes in the assumptions regarding the output gap, revenue elasticities, and commodity prices. The goal of this exercise is to generate a reasonable range of values for each parameter and evaluate the estimation uncertainty around the SBB.

To define plausible ranges, we estimate the output gap using the HP technique, with parameter lambda equal to four different values (6.25, 30, 100, and 400), using the data in both final and real time. The fiscal revenue elasticities are defined with a central value, along with lower and upper bounds (95 percent confidence intervals). We follow a similar strategy to compute commodity revenue elasticities, while the structural price range is defined by the four scenarios proposed in Section 2.

Table 4 shows the results of these simulations, breaking down the data by time period and source of uncertainty: output gap (I), revenue elasticity (II), and structural prices and elasticities of nonrenewable resources (III). The min-max gap represents the (average) difference between the lower and the maximum value of the estimated SBB, taking into account all possible

combinations of the different assumptions. The “total” column considers the full set of assumptions. The remaining columns show the decomposition of the total min-max gap by changing assumptions in one of the corresponding components while leaving the rest constant.

Table 4: Structural Primary Balance: Min-Max Gap of Estimations *(in percent of GDP)*

	2002-2006				2007-2012				2002-2012			
	I	II	III	Total	I	II	III	Total	I	II	III	Total
Argentina	0.5	3.1		3.6	0.2	1.5		1.7	0.4	2.1		2.5
Barbados	0.3	1.5		1.8	0.1	1.7		1.8	0.2	1.6		1.8
Brazil	0.2	0.9		1.1	0.1	0.7		0.8	0.2	0.8		1.0
Costa Rica	0.4	0.8		1.2	0.2	0.6		0.8	0.3	0.7		1.0
Dominican Republic	0.4	0.8		1.2	0.2	0.5		0.7	0.3	0.6		0.9
El Salvador	0.0	0.7		0.7	0.1	1.1		1.2	0.1	0.9		1.0
Guatemala	0.0	0.4		0.4	0.0	0.3		0.3	0.0	0.3		0.3
Honduras	0.2	0.9		1.1	0.2	1.0		1.2	0.2	0.9		1.1
Panama	0.0	0.5		0.5	0.0	0.4		0.4	0.0	0.4		0.4
Paraguay	0.3	0.8		1.1	0.3	0.7		1.0	0.3	0.7		1.0
Uruguay	3.3	7.2		10.5	0.7	3.0		3.7	1.9	4.9		6.8
Average	0.5	1.6		2.1	0.2	1.0		1.2	0.4	1.3		1.6
Resource rich												
Bolivia	0.6	0.1	7.2	7.9	0.6	0.1	6.2	6.8	0.6	0.1	6.6	7.3
Chile	0.7	0.6	1.8	3.1	0.7	0.7	5.7	7.1	0.7	0.7	3.6	5
Colombia	0.9	0.2	1.7	2.8	0.3	0.1	3.6	3.9	0.6	0.1	2.7	3.4
Ecuador	0.5	0.1	4.6	5.3	0.6	0.1	11.8	12.5	0.6	0.1	8.5	9.2
Guyana	1.1	0.3	0.3	1.7	1.1	0.2	1	2.3	1.1	0.2	0.7	2
Mexico	0.3	0.1	5.6	5.9	0.5	0.2	10	10.7	0.4	0.1	8	8.5
Peru	2.8	3.2	0.9	6.9	4.6	4.6	0.6	9.8	3.8	4	0.7	8.5
Trinidad and Tobago	0.4	0.1	14.9	15.5	0.5	0.1	28.4	29	0.4	0.1	22.3	22.8
Venezuela	2.3	1.3	18.6	22	1.2	0.4	24	25.6	1.7	0.9	21.6	24
Average	1.1	0.7	6.2	7.9	1.1	0.7	10.1	12.0	1.1	0.7	8.3	10.1

Source: Authors' elaboration.

The results show a higher dispersion in the SBB in countries with NRR, especially oil-rich countries. In fact, Bolivia, Ecuador, Mexico, Trinidad and Tobago, and Venezuela show the highest dispersion in the estimation of the SBBs. Uncertainty for commodity exporters is even more pronounced during the second part of the decade (during the boom-bust cycle). Among the non-commodity exporters, Uruguay shows a particularly high dispersion, above Chile and Peru (both mineral producers). Guatemala and Panama show the lowest degree of estimation uncertainty.

5. The Cyclical Behavior of Fiscal Policy

Our final empirical section shows one of several ways in which the features of this original dataset can be exploited. Specifically, we focus on the behavior of fiscal policy over the business cycle across the region. To measure the cyclicity of fiscal policy in LAC between 1990 and 2012, we follow a standard specification in the literature (see Klemm (2014) for a recent comprehensive review):

$$\Delta spb_{it} = \beta_i gap_{it} + \gamma X_{it} + \lambda_i spb_{it-1} + f_i + \varepsilon_{it}$$

where spb is the structural primary balance, gap is a measure of the output gap, X is a vector of controls, f_i is a country fixed effect, and ε is an error term.¹⁵ To deal with reverse causality considerations, we also estimate β_i by instrumental variables, instrumenting the output gap of country i with the export weighted output gap of the country's major trading partners. In addition, we present results from system GMM estimators. Table 5 presents the results from OLS, IV, and system-GMM estimations.

Table 5: Cyclicity of Fiscal Policy: Panel Estimates

Dependent variable	OLS				IV				GMM			
					Δ structural primary balance (SPB)							
gap	-0.144*** (0.035)	-0.137*** (0.030)	-0.128*** (0.036)	-0.129*** (0.035)	-0.633** (0.250)	-0.537** (0.233)	-0.627* (0.315)	-0.594** (0.283)	-0.305** (0.123)	-0.312** (0.123)	-0.159** (0.059)	-0.187** (0.072)
L.SPB	-0.415*** (0.046)	-0.447*** (0.048)	-0.436*** (0.049)	-0.437*** (0.048)	-0.491*** (0.062)	-0.503*** (0.070)	-0.504*** (0.086)	-0.500*** (0.083)	-0.593*** (0.161)	-0.581*** (0.138)	-0.484*** (0.145)	-0.487*** (0.147)
DEBT		0.012*** (0.003)	0.012 (0.009)	0.012 (0.009)		0.010* (0.005)	0.001 (0.011)	0.003 (0.009)		-0.007 (0.010)	0.022* (0.012)	0.021* (0.012)
TOT			0.002 (0.025)	0.002 (0.025)			0.039 (0.029)	0.037 (0.028)			0.000 (0.019)	-0.002 (0.021)
FOI				0.058 (0.119)				0.175 (0.156)				0.279* (0.150)
Year effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	395	395	362	362	395	395	362	362	395	395	362	362
Number of ccode	20	20	20	20	20	20	20	20	20	20	20	20

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' elaboration.

The estimates indicate that fiscal policy was procyclical in LAC during the period of analysis. Regardless of the specification or estimation method used, the cyclicity coefficient β is always negative and significant: a 1 percentage point increase in the output gap is associated with

¹⁵ See Appendix for variable definitions and sources.

deterioration in the structural primary balance that ranges between .13-.63 percentages points of GDP.

Table 6 turns to the determinants of the cyclical behavior of fiscal policy, including factors associated with financing constraints, such as the level of debt (DEBT) or the degree of financial integration (FOI), terms of trade shocks (TOT), and political economy considerations, like the degree of corruption (CC), and more generally, overall institutional quality (IQ). (See Appendix for definitions and sources).

Table 6: The Determinants of Procyclicality: Panel Estimates (OLS)

Dependent variable	Δ structural primary balance				
	(1)	(2)	(3)	(4)	(5)
gap	-0.155*** (0.041)	-0.177** (0.063)	-0.183** (0.073)	-0.307** (0.125)	-0.638*** (0.199)
gap*TOT	-0.013*** (0.004)	-0.013*** (0.004)	-0.013*** (0.004)	-0.014*** (0.004)	-0.015*** (0.004)
gap*DEBT		0.001 (0.001)	0.001 (0.001)	0.001 (0.002)	-0.000 (0.001)
gap*FOI			0.010 (0.033)	0.050 (0.043)	-0.025 (0.036)
gap*CC				-0.043 (0.094)	-0.124 (0.101)
gap*IQ					0.781** (0.332)
L.SPB	-0.435*** (0.051)	-0.460*** (0.050)	-0.459*** (0.050)	-0.588*** (0.076)	-0.652*** (0.089)
Year effects?	Y	Y	Y	Y	Y
Observations	362	362	362	249	210
R-squared	0.358	0.371	0.371	0.480	0.549
Number of ccode	20	20	20	20	19

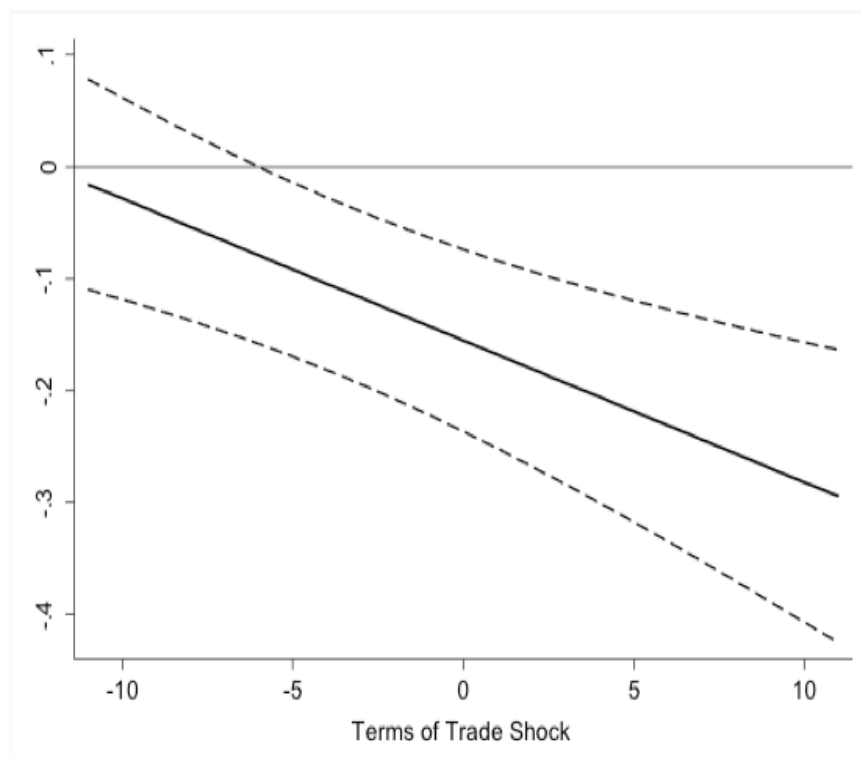
Notes: Constant, TOT, DEBT, FOI CC, IQ terms not reported.

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' elaboration.

Figure 7: Marginal Effects of Output Gap on the Structural Primary Balance



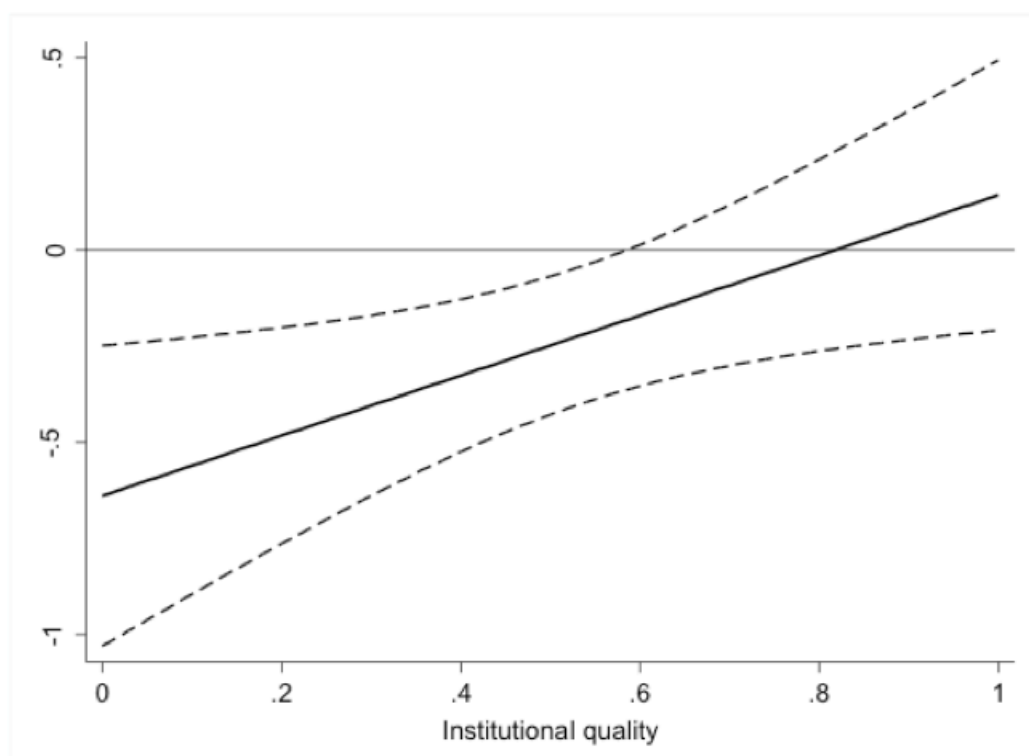
Source: Authors' elaboration.

Across all specifications, the interaction between the output gap and the measure of the terms of trade shock is negative, suggesting that the two variables reinforce each other: that is, larger deviations in the terms of trade from its trend are associated with greater deterioration in the structural primary balance for each percentage point increase in the output gap. Based on the coefficients from Model 1, Figure 7 presents the marginal effects (with associated confidence intervals) of the output gap on the structural primary balance for different deviations of the terms of trade from its long-run trend. To the extent that countries that are more reliant on commodity exports suffer larger (and more volatile) terms of trade shocks, this finding may be consistent with the well-known “voracity effect” of revenue windfalls on fiscal policy (Tornell and Lane, 1999).

Finally, Model 5 accounts for all standard determinants of procyclicality. In line with previous literature based on large cross-country samples (e.g., Frankel et al. [2012]), we find that institutional quality is an important determinant of procyclicality across LAC. As shown in

Figure 8, at low levels of institutional development, the structural balance reacts procyclically to the output gap. This is not the case as countries develop stronger institutions, where fiscal policy becomes at least acyclical (as the confidence bands overlap zero).¹⁶

Figure 8: Marginal Effects of Output Gap on the Structural Primary Balance (*in percent of GDP*)



Source: Authors' elaboration.

6. Conclusions

The extant literature has emphasized the advantages of calculating SBBs to appropriately characterize the fiscal policy stance, but few studies attempt to measure (and publish) estimation uncertainty around such calculations. By definition, the calculation of SBBs is subject to estimation uncertainty, since its formula requires the estimation of unobserved variables (e.g.,

¹⁶ Following Frankel et al. (2012), institutional quality is a composite index of different measures, such as the extent of corruption, the degree of law and order, bureaucratic quality, and the risks of expropriation/repudiation of contracts (see Appendix).

potential output and output gaps) and parameters (including estimates of tax and spending elasticities). Moreover, for countries that derive substantial fiscal revenues from commodity-related activities, additional estimation uncertainty arises from the highly volatile and unpredictable evolution of resource prices.

Using an original fiscal dataset, this paper presented estimates of the SBB for 20 countries in the LAC region over 1990–2012. It first showed that estimates vary according to the methodological assumptions used, and that while the results differ modestly for a number of countries, the range of estimates can be large for others, suggesting that care is needed in computing and interpreting these indicators. Thus, a prudent first step would be for policymakers to start systematically calculating and utilizing structural fiscal balances as indicators of the fiscal stance in order to inform the choice of annual or medium-term budget targets, before moving to enshrine them in a fiscal rule.

The paper then used the estimates to analyze the cyclical properties of fiscal policy, and found that on average, the structural budget balance has moved procyclically with the output gap, a tendency that is reinforced in the context of large terms of trade shocks. Consistent with the cross-country literature, a broad measure of institutional quality is correlated with lower levels of procyclicality within the LAC region. Thus, an avenue for further research is disentangling what specific types of institutions could be beneficial in containing procyclical biases and even more importantly, uncover the conditions under which these institutions are created and persist over time.

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Appendix. Definitions and Sources of Variables

	Description	Obs	Mean	Std. Dev.	Min	Max	Source
SPB	Structural primary balance (% GDP)	415	1.56	3.52	-8.23	17.75	IDB
GAP	Output gap. Deviation of real GDP series from its HP trend (as % of trend)	459	-0.17	3.78	-19.06	11.78	WEO
TOT	Terms of Trade shock. Deviation of terms of trade series from its HP trend (as % of trend)	410	-0.14	7.10	-29.74	26.21	WDI
DEBT	Public Debt as % of GDP	460	58.55	64.52	0.00	637.52	IDB
FOI	Financial Openes Index. Measures a country's degree of capital account openness	440	0.64	1.46	-1.86	2.44	Chinn and Ito (2006)
CC	Control of Corruption. Measures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	280	-0.19	0.74	-1.45	1.76	WGI
IQ	Institutional quality. Normalized index (0-1). Average of four components: investment profile, corruption, law and order, and bureacratc quality	390	0.55	0.16	0.11	0.98	ICRG