



Evaluating Fiscal Performance in Latin America and the Caribbean: Structural Balance Estimates from an Original Dataset*

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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 2014, 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 0.55 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.

Key words: structural fiscal balances, cyclicalities, business cycle, commodity prices, institutions.

JEL Classifications: E62, E32, E02.

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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 2009 and 2011), exacerbate macroeconomic volatility (Fatas and Mihov, 2003 and 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 2014, out of 84 countries with a fiscal rule in place, 24 incorporated a cyclical or structural adjustment feature into them (IMF, 2014)¹. Across LAC, only Chile (since 2001) and, more recently, Colombia (2011) and Peru (2013) set budget balance 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 between 1990 and 2014. In addition to making this information publicly available, our contribution to the literature is three-fold². 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.

The paper is organized as follows. Section 2 provides a motivation to the estimation of structural budget balances based on an overview of the empirical literature on fiscal cyclicity. Section 3 presents the methodology and data 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. Why estimate structural budget balances? A brief review of the empirical literature

Observed fiscal balances move in response to both discretionary policy instruments (such as a change in the tax code) and non-discretionary or "automatic" factors induced by changes in the macroeconomic environment. For example, factors such as strong output growth or commodity price booms are associated with sharp increases in fiscal revenues, leading generally to improved fiscal positions. Inversely, when commodity prices plunge or economic activity slows down, fiscal revenues are negatively affected and certain expendi-

ture categories may increase automatically, resulting in a deterioration of the fiscal balance. However, the fact that the observed fiscal position improves in the former and deteriorates in the latter scenario is not necessarily an indication of sound intertemporal fiscal management, but rather a reflection of the automatic response of fiscal variables to the macroeconomic scenario. Thus, to isolate the discretionary components of fiscal policy, the effects of cyclical (temporary) fluctuations on fiscal accounts must be extracted.

The structural budget balance (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. In spite of the importance of using the SBB to appropriately characterize the underlying fiscal stance, the empirical literature assessing the cyclical policy in developing countries in general, or LAC in particular, has usually relied on observed fiscal balances (as % of GDP) as one of the key dependent variables (Gavin and Perotti, 1997; Catao and Sutton, 2002; Cespedes and Velasco, 2014; Jaimovich and Panizza, 2007; Alesina *et al.*, 2008). In fact, as argued by Kaminsky *et al.* (2004), the primary balance as a proportion of GDP does not provide an unambiguous reading of the cyclical stance of fiscal policy, and call for extreme caution when drawing conclusions on policy cyclical policy based on such indicator, or similar endogenous ones. In contrast, cyclically adjusted or structural balances provide a useful measure to discriminate among different policy stances (Gali and Perotti, 2003).

Unfortunately, previous studies that include cyclically adjusted measures are either focused on OECD countries (Girouard and Andre, 2005; Gali and Perotti, 2003), only cover a limited number of countries across Latin America, like for example, the largest economies (Alberola *et al.*, 2016; Celasun *et al.*, 2015; Daude *et al.*, 2011; IADB, 2008; Alberola and Montero, 2006)³. More recently, Klemm (2014) provides a novel definition of procyclical policy in a sample of 19 Latin American countries that combines information on discretionary and automatic factors. Our paper thus expands the sample size of the extant literature by providing novel estimates of structural primary balances across twenty LAC countries, spanning all income ranges.

3. Structural Balance Estimation in LAC: Data and Methodology

3.1. Data

While several regional fiscal databases are readily available⁴, 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 government⁵ 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
 - Other taxes
 - Social security contributions
 - Nonrenewable resource (NRR) tax revenues (mostly CIT)
 - Non-taxes:
 - NRR non-tax revenues (royalties and transfers)
 - Others
 - 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 Gov't + Social Security	1990-2014
Barbados	Central Government	1993-2014
Bolivia	General Government	1990-2014
Brazil	Central Government	2002-2014
Chile	General Government	1990-2014
Colombia	Central Government	1994-2014
Costa Rica	General Government	1997-2014
Dominican Republic	Central Government	1990-2014
Ecuador	Central Government	1990-2014
El Salvador	General Government	1990-2014
Honduras	Central Government	1990-2014
Guatemala	Central Government	1990-2014
Guyana	Central Government	1992-2014
Mexico	General Government	1990-2014
Panama	Central Government	1990-2014
Paraguay	Central Gov't + Social Security	1990-2014
Peru	General Government	1990-2014
Trinidad and Tobago	Central Government	1998-2014
Uruguay	Central Gov't + Social Security	1999-2014
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). 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

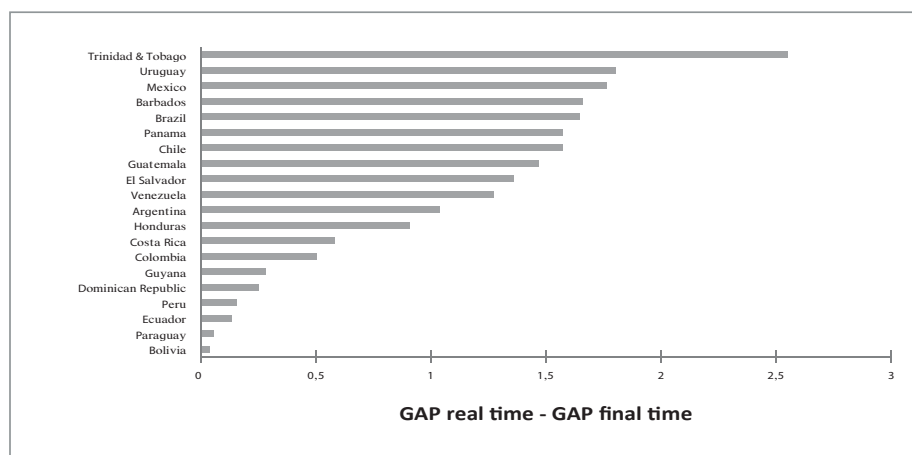
the principal commodity prices, P^{LR} is the long-run weighted average price of the main commodity prices, $\varepsilon_{R,i}$ and ε_G the GDP-elasticity of each revenue category and expenditure, respectively, α is the elasticity of NRR revenues with respect to commodity prices, and G is the total fiscal 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 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.

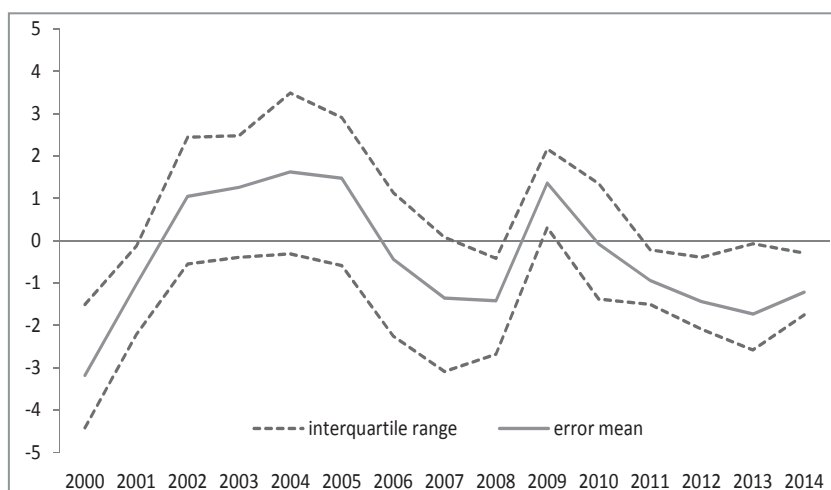
3.2.1. *Output Gaps*

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 database⁶. 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 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 gap⁷. 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 1, these absolute differences (averaged over the 2004–14 period) can be large for several countries in the region, but as shown in Figure 2, are not systematically biased in one direction or another⁸.

Figure 1. Absolute Differences between Output Gaps in LAC (averages 2004–14)

Source: WEO (IMF).

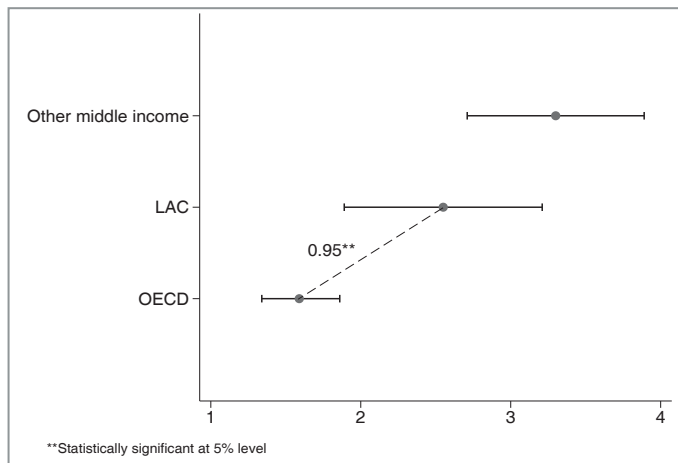
Figure 2. Output Gap Forecast Error (Real-Final Time)

Source: WEO (IMF)

Additionally, Figure 3 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 3. Difference in Means across Countries



Source: WEO (IMF)

3.2.2. Budget Elasticities and the size of automatic stabilizers

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 is T_t^i 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 generally in line with previous studies (Alberola et. al 2016; Daude *et al.*, 2011).

Table 2
ELASTICITIES ESTIMATED BY DOLS

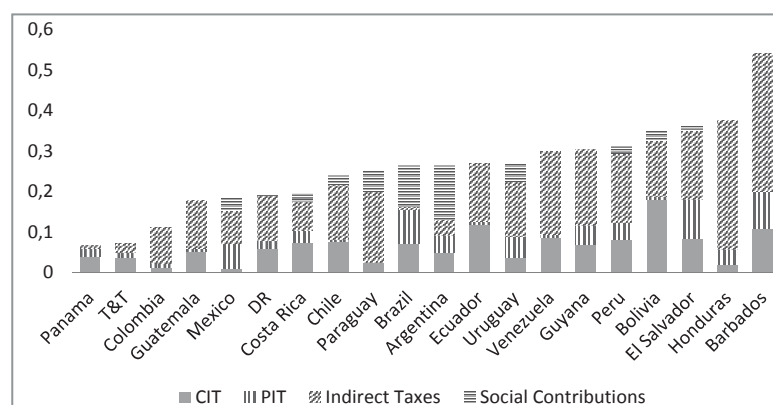
	CIT	PIT	Indirect	SCC	Other taxes
Argentina	2,5	3,4	1,1	2,3	0,01
Barbados	1,8	1,9	1,7	1,6	0,00
Bolivia	3,5	2,4	1,5	1,0	0,03
Brazil	2,1	2,5	1,0	1,6	0,00
Chile	2,0	0,4	1,4	1,5	0,00

	CIT	PIT	Indirect	SCC	Other taxes
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' elaboration

The estimated elasticities allow us to provide a measure of size of tax automatic stabilizers in the region, calculated as the sum of the four different tax revenues elasticities weighted by their respective revenue shares on GDP. According to these calculations, on average for the 20 countries analyzed, a one percent increase in the output gap would result in an improvement of 0.25 pp of GDP in the government balance. This is significantly lower than the almost 0.4 pp improvement for OECD countries (see Daude et. al. 2011), although estimates vary widely as depicted in Figure 4, where values range from a minimum of 0.07 in Panama and Trinidad and Tobago, 0.18 in Guatemala and Mexico, to 0.36 in El Salvador, 0.38 in Honduras, to a maximum of 0.54 in Barbados⁹.

Figure 4. Size of automatic stabilizers (*cyclical budget response from taxes, percent of GDP*)



Source: IDB Structural fiscal balance database

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.

In particular, we introduce an adjustment in the fiscal revenues related to the commodity of interest or basket of commodities¹⁰. 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.
- 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]).

In terms of the composition of commodity related fiscal revenues, we consider direct taxes on income and other non-tax revenue sources including royalties on mining and hydrocarbons, surpluses and contributions paid by private and state companies to the central government. In the case of Chile for example, these include the taxes paid by a group of ten large private copper companies, as well as the taxes and surpluses paid by the state-owned company CODELCO. In Colombia, they include corporate income taxes paid by the mining sector, hydrocarbons contributions, and financial surpluses paid by the state company ECO-PETROL. For Peru, they include corporate income taxes from the mining sector as well, royalties on oil, gas and minerals and a levy on oil. Appendix 1 offers further detail on data sources for each country.

Table 3 shows the variation in the type of commodity exports, fiscal dependence, as well as the revenue components analyzed 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, 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 (2010-2014)	Of which Taxes	Of Which Non Taxes
Bolivia	Zinc, tin	Natural gas, crude oil	16,7	Taxes on Income from mining: “Impuesto sobre las Utilidades Mineras (IUM)”, “Valores Utilidades Mineras”, “Impuesto Especial a los Hidrocarburos y Derivados (IEHD)”.	Mining and hydrocarbon royalties
Chile	Copper, molibdeno		13,4	Taxes paid by a group of the ten large copper companies that had subscribed a Decree Law 600 Foreign Direct Investment Contract in 2001 and were the largest copper producers at that time. These companies accounted for 90 % of private sector mining production and the bulk of mining taxation from this sector.	Surpluses and taxes generated by the state-owned company CODELCO (“Ingresos por cobre bruto”)
Colombia	Carbon, ferronickel, gold, emeralds	Natural gas, crude oil	15,9	Corporate income taxes corresponding to the mining sector.	Financial surpluses from ECOPETROL and Hydrocarbons contributions
Ecuador		Crude oil	27,4		Income from oil exports and sales of oil products
Guyana	Gold		5,4	Income taxes on non-renewable resources	Royalties from gold
Mexico		Crude oil	29,6	Tax on oil yield (“Impuesto a los Rendimientos Petroleros”)	Other revenues from oil: rights on hydrocarbons and yields surpluses (“derechos a los hidrocarburos” and “aprovechamiento sobre rendimientos excedentes”)
Peru	Copper, gold, silver, zinc	Natural gas	9,1	Corporate income taxes corresponding to the mining sector.	Royalties on oil, gas and minerals; levy on oil
Trinidad and Tobago		Crude oil	40,3	Corporate income taxes, withholding taxes and unemployment levy corresponding from the oil sector	Non-tax revenues from THE oil sector
Venezuela		Crude oil	42,1	income taxes on oil sector	non-tax revenues on oil sector

Source: IDB Structural fiscal balance database

Finally, given the lack of a methodological convention regarding the estimation of structural prices, we define four alternative scenarios based on the extant literature¹¹:

- 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.

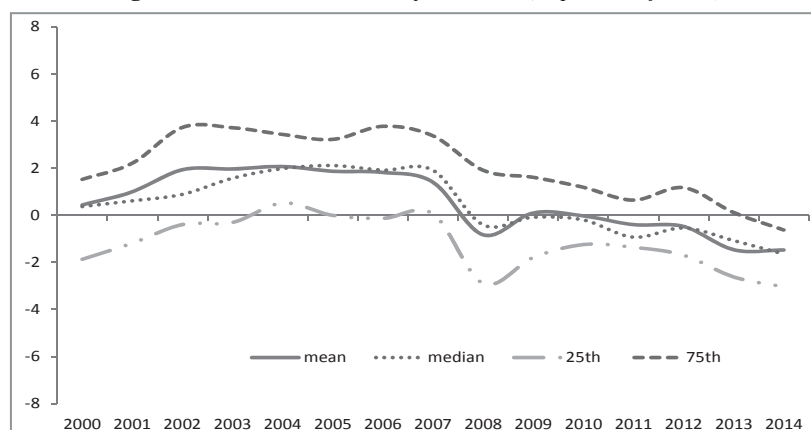
4. Estimates of Structural Primary Balances in LAC

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

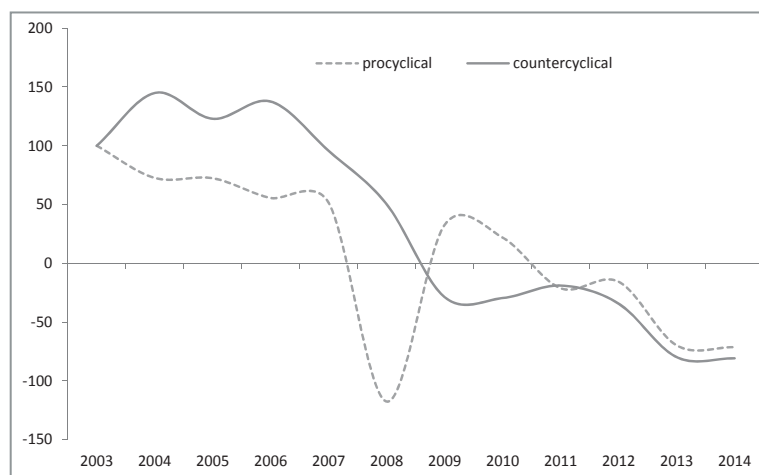
The assumptions for the baseline scenario are as follows. The output gap is estimated using the HP technique with parameter lambda equal to 100 using final-time data. The fiscal revenue elasticities are from Table 2 above. Similarly, commodity revenues' elasticities are estimated via Log-OLS regressions, 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. However, fiscal positions have only partially recovered since the crisis and, in several cases, have deteriorated. This latter dynamic suggests LAC countries still face important challenges in terms of their ability to withdraw fiscal stimulus as cyclical positions improve (Powell, 2015; IMF, 2015)¹².

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

Source: IDB Structural fiscal balance database

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 downturn¹³. Finally, there seems to be some convergence towards structural deterioration in fiscal positions for both groups since 2011.

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

Source: IDB Structural fiscal balance database

4.1.1. Estimation Uncertainty: Alternative Scenarios

This section simulates different values of the SBB 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

Source: IDB Structural fiscal balance database

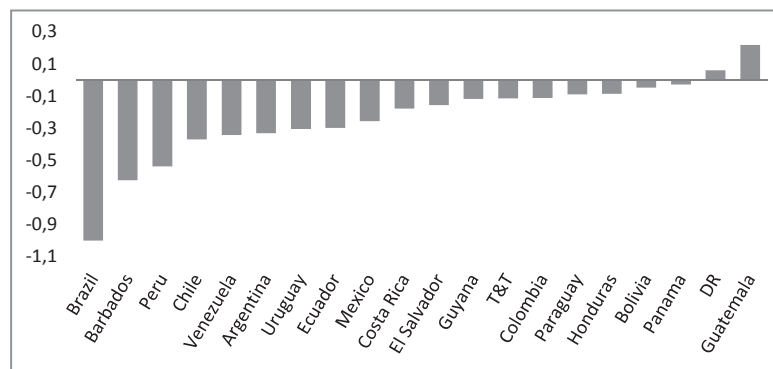
	2002-2006				2007-2012				2002-2012			
	I	II	III	Total	I	II	III	Total	I	II	III	Total
Resource rich												
Bolivia	0,6	0,1	7,2	7,9	0,6	0,1	6,2	6,8	0,6	0,1	6,6	7,3
Chile	0,7	0,6	1,8	3,1	0,7	0,7	5,7	7,1	0,7	0,7	3,6	5
Colombia	0,9	0,2	1,7	2,8	0,3	0,1	3,6	3,9	0,6	0,1	2,7	3,4
Ecuador	0,5	0,1	4,6	5,3	0,6	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.

Finally, by using final vs. real time measures of the output gap as inputs, we can gauge at differences between levels of the structural balance measured at different moments in time. As shown in Figure 7, these differences oscillated between -1 percent of GDP for Brazil and 0.3 percent of GDP for Guatemala for the most recent period. The regional average difference in absolute value was 0.2 percent of GDP.

Figure 7. Difference in estimation of Structural Primary Balances 2010-2014: output gap in final time vs. real time (in percent of GDP)



Source: IDB Structural fiscal balance database

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 2014, 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, is f_i a country fixed effect, and is ε an error term¹⁴. 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 partners¹⁵. In addition, we present results from system GMM estimators, in which the output gap and the lagged dependent variable are treated as endogenous. Table 5 presents the results from OLS, IV, and system-GMM estimations.

Table 5
CYCLICALITY OF FISCAL POLICY: PANEL ESTIMATES

Dependent variable	OLS				IV				GMM			
	Δ structural primary balance (SPB)											
gap	-0.135*** (0.025)	-0.128*** (0.024)	-0.136*** (0.031)	-0.138*** (0.030)	-0.440** (0.174)	-0.391** (0.198)	-0.574* (0.343)	-0.555* (0.330)	-0.192*** (0.063)	-0.217*** (0.055)	-0.193*** (0.064)	-0.192*** (0.063)
L.SPB	-0.414*** (0.049)	-0.444*** (0.050)	-0.430*** (0.048)	-0.430*** (0.047)	-0.465*** (0.052)	-0.482*** (0.053)	-0.500*** (0.074)	-0.497*** (0.072)	-0.435*** (0.066)	-0.441*** (0.068)	-0.405*** (0.069)	-0.398*** (0.073)
DEBT		0.009*** (0.002)	0.006 (0.005)	0.006 (0.005)		0.007* (0.004)	-0.005 (0.011)	-0.004 (0.010)		0.003 (0.003)	0.001 (0.007)	0.001 (0.007)
TOT			0.005 (0.014)	0.005 (0.013)			0.040 (0.031)	0.040 (0.030)			-0.006 (0.017)	-0.006 (0.016)
FOI				0.070 (0.105)				0.169 (0.163)				0.184 (0.148)
Year effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
AR(1)									0.02	0.03	0.04	0.04
AR(2)									0.75	0.67	0.63	0.64
Observations	425	386	371	371	425	386	371	371	425	386	371	371
Countries	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 is always negative and significant: a 1 percentage point increase in the output gap is associated with deterioration in the structural primary balance that ranges between 0.13 and 0.57 percentage points of GDP. The specification tests are consistent with the validity of GMM

instruments: first order serial correlation in the first differenced residuals (AR1) is significant, and there is no second order serial correlation, since AR2 is insignificant.

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 factors, like the degree of corruption (CC), overall institutional quality (IQ), the presence of fiscal rules (FR), and the degree of political polarization (POL) (See Appendix for variable definitions and sources).

Table 6

THE DETERMINANTS OF PROCYCLICALITY: PANEL ESTIMATES (OLS)

Dependent variable	Δ structural primary balance					
	(1)	(2)	(3)	(4)	(5)	(6)
gap	-0.156*** (0.030)	-0.202*** (0.057)	-0.202*** (0.064)	-0.305** (0.108)	-0.679*** (0.208)	-0.653*** (0.226)
gap*TOT	-0.006*** (0.002)	-0.006*** (0.002)	-0.006*** (0.002)	-0.007*** (0.002)	-0.010*** (0.002)	-0.009** (0.004)
gap*DEBT		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.002 (0.001)	0.001 (0.002)
gap*FOI			0.001 (0.021)	0.045 (0.032)	0.042 (0.030)	0.053* (0.031)
gap*CC				-0.012 (0.081)	-0.178 (0.118)	-0.201* (0.112)
gap*IQ					0.630*	0.576* (0.328)
gap*FR						0.162 (0.133)
gap*POL						-0.010 (0.063)
L.SPB	-0.429*** (0.052)	-0.449*** (0.049)	-0.449*** (0.049)	-0.597*** (0.084)	-0.632*** (0.089)	-0.645*** (0.087)
Year effects?	Y	Y	Y	Y	Y	Y
Observations	391	371	371	267	255	236
R-squared	0.337	0.352	0.352	0.460	0.479	0.494
Countries	20	20	20	20	19	19

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

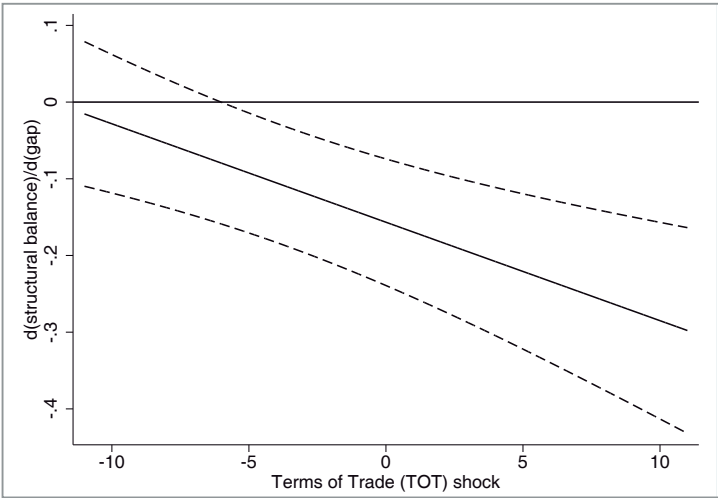
Robust standard errors in parentheses

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

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 8 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).

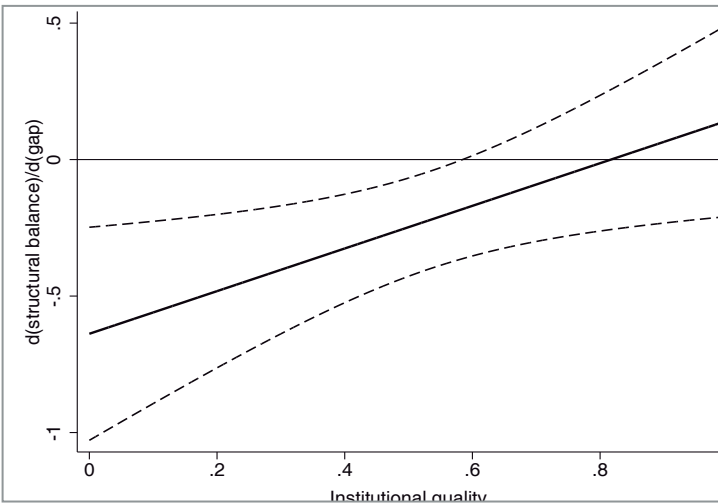
Figure 8. Marginal Effects of Output Gap on the Structural Primary Balance



Source: IDB Structural fiscal balance database

Finally, Model 6 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 LAC¹⁶. As shown in Figure 9, 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). Interestingly, the mere presence of a fiscal rule does not seem enough to contain procyclical biases

Figure 9. Marginal Effects of Output Gap on the Structural Primary Balance



Source: IDB Structural fiscal balance database

6. Conclusions

The extant literature has emphasized the advantages of calculating SBBs to appropriately characterize the fiscal policy stance, but few studies attempt to evaluate fiscal policy on such terms or measure (and publish) estimation uncertainty around these calculations in a broad sample of countries. By definition, the calculation of SBBs is subject to estimation uncertainty, since its formula requires the estimation of unobserved variables (e.g., 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 1990–2014. 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 policy-makers 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.

Notes

1. See the IMF's (2014). "Fiscal Rule Dataset" spanning 87 countries between 1985 and 2014 (available at <http://www.imf.org/external/datamapper/FiscalRules/map/map.htm>).
2. The structural fiscal balances database can be downloaded here: <https://mydata.iadb.org/Public-Finance/Structural-Fiscal-Balances-Database-for-LAC-A-Tool/pavq-j5p2>
3. Alternatively, papers with wider regional coverage do not specifically assess cyclicity (Vladkova Hollar and Zeettelmeyer 2008).
4. 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.
5. 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 enter-

prises 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.

6. 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.
7. At the time of this writing, the latest available version corresponds to October 2015 vintage.
8. 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.
9. Elasticities for Uruguay used in the Figure come from Pizzolon and Rasteletti (2013).
10. For Bolivia, Chile, and Peru, we create an index of structural prices, weighted by export shares in each year.
11. 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.
12. See Powell (2014) for further evidence on these trends and their relationship with the cyclical stance of fiscal policy.
13. 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.
14. See Appendix for variable definitions and sources.
15. We consider a fixed number of trading partners both outside (Canada, China, France, Germany, India, Italy, Japan, the United Kingdom and the United States) and inside the region (those in our sample excluding the country of interest) to instrument the output gap. On average, this set of trading partners represents over 75 % of total exports during the period under analysis.
16. Following Frankel *et al.* (2012), institutional quality is a composite index of four different measures from the International Country Risk Guide (ICRG): the extent of corruption, the degree of law and order, bureaucratic quality, and the risks of expropriation/repudiation of contracts (see Appendix II).

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Resumen

En los últimos años, un creciente número de países ha modificado sus marcos normativos fiscales mediante la introducción de reglas que inciden en el equilibrio fiscal estructural o cíclicamente ajustado, con el objetivo de superar la adopción de políticas fiscales procíclicas, así como de minorar los niveles de volatilidad fiscal. La razón para ello descansa en un principio convincente: las reglas fiscales permiten la acción libre de los estabilizadores automáticos durante el ciclo económico y, además, acumulan superávits en periodos de crecimiento. Sin embargo, la estimación de los equilibrios estructurales tiene retos metodológicos, incluyendo el grado de incertidumbre estimado. Este trabajo presenta una serie de estimadores del equilibrio presupuestario estructural y los utiliza para analizar el comportamiento cíclico de la política fiscal en Latinoamérica y el Caribe. Mediante la explotación de una novedosa base de datos que contiene información fiscal detallada sobre veinte países de la región, y, para el período 1990-2014, el trabajo encuentra que la serie de estimadores puede ser muy amplia para algunos países, especialmente para aquellos que obtienen magros ingresos fiscales provenientes de actividades económicas relacionadas con el comercio de mercancías. Además, la evidencia encontrada muestra que, de media, la política fiscal en la región ha seguido un patrón pro-cíclico: un 1 por ciento de incremento en la brecha de producción se asocia con hasta 0,55 por ciento de deterioro en el equilibrio estructural primario. Esta relación, empero, esconde una gran heterogeneidad entre países: la política fiscal pro-cíclica acontece de forma más acusada en países que se enfrentan a grandes shocks en sus términos de intercambio, pero puede ser contrarrestada con una mejora en los niveles de calidad institucional.

Palabras clave: equilibrios fiscales estructurales, ciclo, ciclo económico, precios de mercancías, instituciones.

Clasificación JEL: E62, E32, E02.

Appendix I. Data Sources on Commodity Related Fiscal Revenues

Data regarding revenues from non-renewable resources for Bolivia comes from the Ministerio de Economía y Finanzas Públicas (Ministry of Economy and Public Finance <http://www.economiayfinanzas.gob.bo/>); for Chile, it comes from the Dirección de Presupuesto (www.dipres.gob.cl) and from COCHILCO (Ministry of Mining www.cochilco.cl); for Colombia, the data is obtained from the Ministerio de Hacienda y Crédito Público (Ministry of the Treasury and Public Credit www.minhacienda.gov.co) and from the Dirección de Impuestos y Aduanas Nacionales (Directorate of National Taxes and Revenues www.dian.gov.co); for Ecuador, the data comes from the Central Bank (www.bce.fin.ec); Guyana's revenues from non-renewable resources are estimated from data on gold exports from the Central Bank (www.bankofguyana.org.gy); for Mexico, data is extracted from the Secretaría de Hacienda y Crédito Público (Secretary of the Treasury and public Credit www.shcp.gob.mx); for Peru, it comes from the Central Bank (www.bcrp.gob.pe) and from the Superintendencia Nacional de Aduanas y de Administración Tributaria SUNAT (National Superintendence of Customs and Tax Administration www.sunat.gob.pe); data for Trinidad and Tobago comes from the Central Bank (www.central-bank.org.tt); finally, data for Venezuela comes from the Ministerio de Economía y Finanzas (www.mefbp.gov.ve) and from the Asamblea Nacional (National Assembly www.asambleanacional.gob.ve).

Appendix II. Definitions and Sources of Variables

	Description	Obs	Mean	Std. Dev.	Min	Max	Source
SPB	Structural primary balance (% GDP)	445	1,171747	3,580569	-7,9	17,8	“Structural Fiscal Balances Database for Latin America and the Caribbean (IDB)”
GAP	Output gap. Deviation of real GDP series from its HP trend (as % of trend)	500	-0,079462	3,786848	-20,3	11,2	World Economic Outlook (IMF)
TOT	Terms of Trade shock. Deviation of terms of trade series from its HP trend (as % of trend)	450	0,2032059	12,08995	-43,8	137,8	World Development Indicators (WB)
DEBT	Public Debt as % of GDP	460	58,55091	64,52001	0,0	637,5	IDB
FOI	Financial Openes Index. Measures a country’s degree of capital account openness	480	0,6687213	1,447843	-1,9	2,4	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	320	-0,2038403	0,7457796	-1,4	1,8	Governance Indicators (WB)
IQ	Institutional quality. Normalized index (0-1). Average of four components: investment profile, corruption, law and order, and bureaucratic quality	475	0,4985154	0,1808509	0	1	International Country Risk Guide (ICRG)
FR	Fiscal rule. Dummy variable indicating whether debt, expenditure, balanced budget, or revenue rule in place	500	0,222	0,4160074	0	1	Fiscal rules dataset (IMF)
POL	Polarization. Ideological distance between executive party and major opposition parties of the legislature	467	0,8158458	0,9079557	0	2	Database of Political Institutions (IDB)

