Sovereign Spreads and Fiscal Consolidations[1]

Lower commodity prices, mediocre growth, and a prolonged period of low global interest rates have contributed to rising public debt in many countries in Latin America and the Caribbean (LAC). Against this backdrop, and amid a more challenging external environment, financial markets' perception of credit risk in LAC has deteriorated somewhat. This has led policymakers in many of these economies to announce fiscal consolidation measures aimed at reducing public debt and improving confidence in the sovereign, as measured by sovereign bond spreads. Nevertheless, empirical evidence quantifying the effects of fiscal policy on sovereign spreads has been elusive. Using a new database on fiscal policy news, this chapter investigates the effects of fiscal consolidation announcements on sovereign spreads in LAC during 2000–18. Our results show that sovereign spreads decline significantly following news that fiscal consolidation measures have been approved by Congress, particularly in periods of high sovereign spreads or in countries under an IMF program. In addition, fiscal adjustment packages are more effective—leading to smaller output losses and larger reductions in the public debt-to-GDP ratio—when sovereign spreads significantly decline following the announcement. These results constitute direct evidence that if confronted with a situation of fiscal stress, credible consolidation efforts get rewarded. These confidence effects are crucial in mitigating the drag on economic activity in the aftermath of fiscal consolidation.

Introduction

A combination of factors has eroded the fiscal space in several economies in Latin America and the Caribbean (LAC). The fall in global commodity prices has negatively affected fiscal revenues of LAC countries that produce oil, gas, agricultural, and metal products. The subsequent slowdown in economic activity and the continued growth of real public expenditure (particularly public consumption) have all reduced the region's fiscal buffers (see Chapter 2 of the April 2018 *Regional Economic Outlook: Western Hemisphere*). Most LAC countries closed fiscal year 2018 with primary deficits that exceed their debt-stabilizing levels, and as a result, public debt continues to rise. At a regional level, debt ratios in LAC now stand well above the average for other emerging economies.

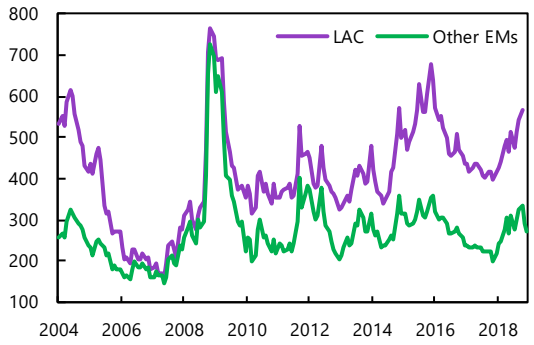
Amid deteriorating fiscal positions, sovereign spreads in the region increased significantly last year, as investors reassessed their risk perception of several economies in LAC. In the last five years, the gap between spreads faced by LAC economies and other emerging economies has widened (Figure 1, panel 1) and several economies in the region pay higher average spreads relative to other economies with comparable credit ratings (Figure 1, panel 2). Therefore, to improve funding conditions and recoup some fiscal space, several economies in the region have announced important fiscal consolidation packages, some of them with IMF support.

The fact that several economies in LAC have high perceived sovereign default risks and weaker policy credibility, implies greater scope for reductions in interest rates on the back of confidence effects following a decisive fiscal consolidation (Blanchard, 1990 and Giavazzi and Pagano, 1990). More confidence in the sovereign and lower borrowing costs will in turn lower the debt burden and, hence, free up more resources for consumption and investment. Nevertheless, empirical evidence on the effectiveness of fiscal consolidation in lowering sovereign spreads has been elusive.

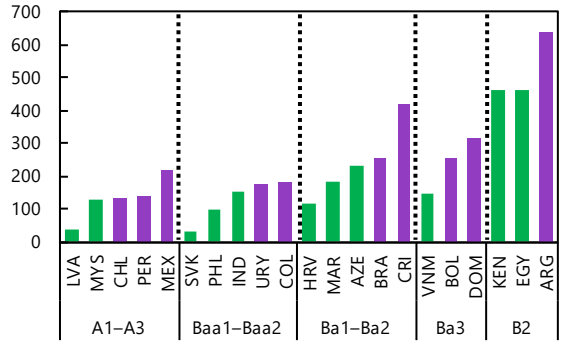
[1]This chapter was prepared by Antonio David, Jaime Guajardo, and Juan Yépez. Excellent research assistance was provided by Genevieve Lindow and Pablo Bejar. See David, Guajardo, and Yépez (2019) for technical details. The database used for the analysis in the chapter contains proprietary information sources and therefore cannot be made available to the public.

Figure 1. Sovereign Spreads in LAC

1. EMBIG Spreads
(Basis points)



2. Sovereign Credit Ratings and EMBIG Spreads[1]



Sources: Bloomberg Finance L.P.; Thomson Reuters Datastream; and IMF staff calculations.
Note: Data labels use International Organization for Standardization (ISO) country codes. EM = emerging markets.
[1]Sovereign credit ratings are based on Moody's rating scale as of July 23, 2019. EMBIG spreads (J.P. Morgan Emerging Market Bond Index Global; US-dollar-denominated sovereign bonds) refer to the 2018–19 average to date.

Against this backdrop, this chapter presents evidence on the effect of fiscal policy actions on perceived sovereign risk. Using a novel dataset on fiscal news, the chapter compares the behavior of sovereign spreads in the days following the parliamentary approval of fiscal consolidation packages across a sample of 14 LAC economies. The chapter highlights that spreads declined significantly following news that fiscal consolidation measures would be implemented, in periods of high sovereign spreads or in countries under an IMF program. It then explores whether the composition or size of the consolidation package matters.

The chapter also looks at the medium-term effects of fiscal consolidation. By expanding the database on fiscal consolidation episodes constructed by David and Leigh (2018) based on a "narrative approach", it analyzes the effects of fiscal actions on growth and debt ratios. In this regard, the chapter finds that the reduction in sovereign spreads is instrumental in the success of fiscal consolidation actions to limit the recessionary effects of fiscal adjustment and stabilize the debt-to-GDP ratios.

Identifying Fiscal Policy Shocks

Disentangling the causal effects of fiscal policy actions is a particularly difficult task. The strategy used to identify exogenous fiscal policy actions has crucial implications for the estimates of the effects of consolidations. Typically, shocks tend to be recovered from structural VAR models (Blanchard and Perotti, 2002) or by using real-time forecast errors in fiscal variables (Auerbach and Gorodnichenko, 2013; Furceri and Li, 2017, Born, Müller, and Pfeifer, 2019). Both methods are prone to measurement error as they may capture changes in non-policy factors.[2] In addition, the timing restrictions that typically underlie the identification of expenditure shocks in VAR models can also be arbitrary and do not adequately address endogeneity problems.

To circumvent these issues, some authors (see Beetsma et al., 2015 and de Jong, 2018) have resorted to the use of high frequency data to identify the precise date of fiscal announcements and their effects on bond yields and sovereign spreads. In this regard, the assumption that fiscal policy is unlikely to be adjusted instantaneously to changes in sovereign spreads on the same or previous day is more plausible, since the design and implementation of fiscal packages typically takes weeks or months. However, due to

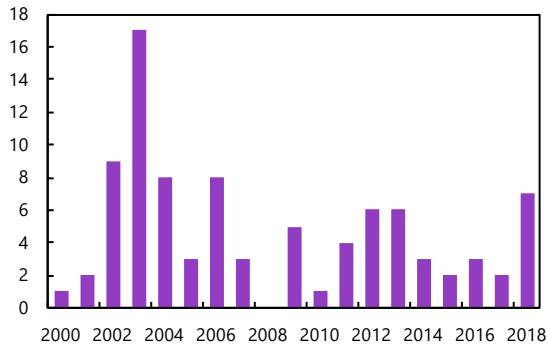
[2]For example, the use of changes in the cyclically adjusted primary balance to identify fiscal policy shocks includes shifts in fiscal variables unrelated to policy decisions.

data restrictions and the data-intensive nature of this empirical approach, these studies are country specific or restricted to a small sample of advanced economies.

This chapter also employs a high frequency identification approach by exploiting a novel database on fiscal consolidation announcements constructed by David, Guajardo, and Yépez (2019). This database is a compilation of fiscal consolidation announcements based on news articles from a variety of domestic sources contained in the Dow Jones' Factiva online database for 21 Emerging Market and Developing Economies (EMDEs) over the period 2000 to 2018.[3] This database provides the precise date in which a specific fiscal consolidation package was approved by the legislature (congress or parliament), therefore allowing to construct a tight window around the episode for event-type of studies.[4] By analyzing the effects of fiscal actions over a narrow window around the announcement, it is possible to mitigate some of the typical endogeneity problems that arise when studying the effects of fiscal consolidations.[5]

In total, David, Guajardo, and Yépez (2019) identify 90 announcements from congress about fiscal consolidation actions in 14 LAC economies between 2000 and 2018.[6] Announcements are evenly spread over the sample period, although there is some clustering around 2002–04 (Figure 2), when several countries in the sample were under (or in negotiations towards) an IMF supported program. There is also some clustering around dates of global or regional financial turmoil (2002–04 in particular).

Figure 2. Number of Fiscal Consolidation Announcements by Congress in LAC



Source: IMF staff calculations.
Note: LAC = Latin America and the Caribbean.

The dates of fiscal announcements are used in the empirical analysis presented in the next section to investigate the association between fiscal consolidation measures and movements in sovereign spreads. The analysis uses the local projection method proposed by Jordà (2005) and estimate the response of J.P. Morgan's Emerging Market Bond Index Global (EMBIG) spreads to these fiscal announcements.[7] This strategy mitigates somewhat possible reverse causality issues. For instance, a sudden increase in sovereign spreads could lead policymakers to put in place fiscal consolidation measures in order to calm financial markets. If these actions are not controlled for in the analysis, one would erroneously conclude that the fiscal consolidation measures were the culprit to the rise in spreads.

Does Fiscal Consolidation Trigger Confidence Effects?

This section studies the impact on sovereign spreads of the announcement of the approval of a fiscal adjustment package, which can be implemented using any combination of expenditure and revenue measures (Figure 3, panel 1).[8] Once congress agrees on a consolidation package, spreads fall significantly,

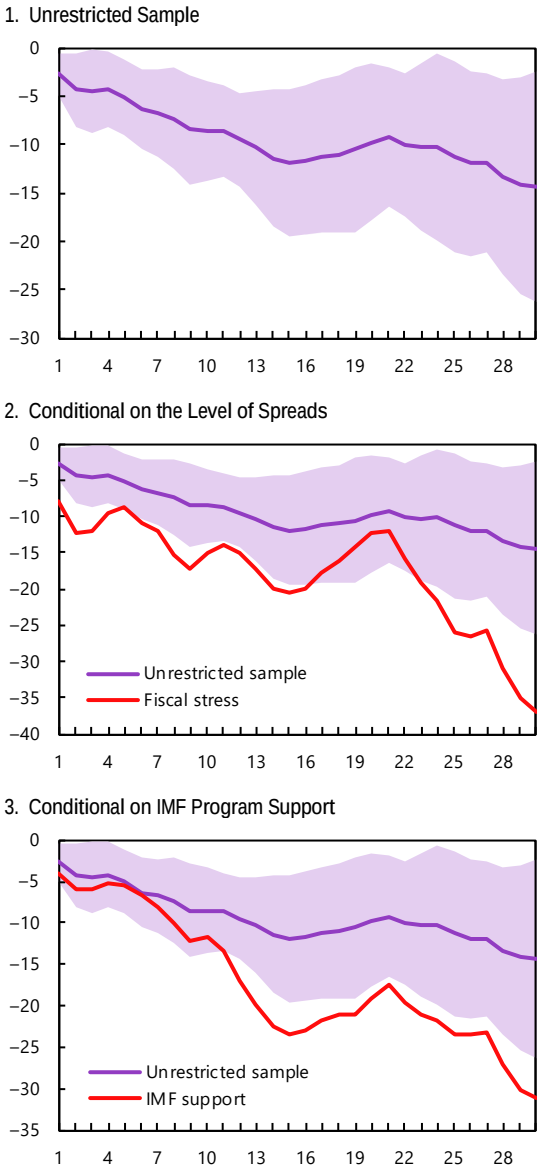
[3]See David, Guajardo, and Yépez (2019) for a detailed description of how this database was constructed.
[4]The database also contains the dates when the austerity package was proposed by the executive.
[5]It is important to note that the identification approach does not rely on an assessment of the motivation for fiscal announcements to determine whether they are "exogenous" to cyclical considerations.
[6]These economies are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Paraguay, Peru, and Uruguay.
[7]See Annex 1 for technical details, the full specification, and data sources.
[8]In the sample, almost all parliamentary approved packages were actually implemented, with the exception of Ecuador (2001) and Costa Rica (2006). In both cases, courts deemed the reform packages as unconstitutional.

by around 15 basis points within a 30-day window after the announcement, with a confidence interval between 3 and 26 basis points at a 90 percent confidence level. Thus, confidence in the sovereign improves significantly if policymakers are able to successfully pass the fiscal consolidation measures through congress. These results stand in contrast with recent studies by Beetsma et al. (2015) and Born, Müller, and Pfeifer (2019), which find that in normal times spreads do not respond to fiscal actions.

Previous empirical work (see, for example, Corsetti et al., 2012; Auerbach and Gorodnichenko, 2013; Ilsetzki et al., 2013) has found some evidence that the macroeconomic impact of fiscal consolidation measures is state dependent. Therefore, the announcement of fiscal consolidation packages could have a differentiated effect on spreads in periods of high fiscal stress. To test this hypothesis, the sovereign spread response is conditioned on whether EMBIG levels are at or above the 75th percentile of the sample distribution (Figure 3, panel 2). As expected, higher perceived sovereign default risk does imply a greater scope for reduction in interest rates. Following a fiscal consolidation announcement spreads decline by more than 35 basis points in the four weeks following the announcement.[9]

The effect of fiscal consolidation announcements on investor confidence could also depend on whether the fiscal measures are supported by an IMF program (Figure 3, panel 3). It is clear from the results that having an IMF program is a key factor for sovereign spreads to decrease following the announcement of fiscal consolidation measures. The reduction in spreads is larger and more persistent, as compared to the estimates using the unrestricted sample, with spreads declining by around 30 basis points 30 days after congressional approval of the fiscal adjustment measures.

Figure 3. Effects of Fiscal Consolidation Announcements on EMBIG Spreads
(Basis points)



Source: IMF staff calculations.
Note: Estimates based on local projection methods. Shaded area indicates 90 percent confidence intervals using HAC standard errors. EMBIG = J.P. Morgan Emerging Market Bond Index Global.

[9]There are no significant effects for countries with low perceived sovereign risk, that is, countries with EMBIG levels in the 25th percentile of the sample distribution.

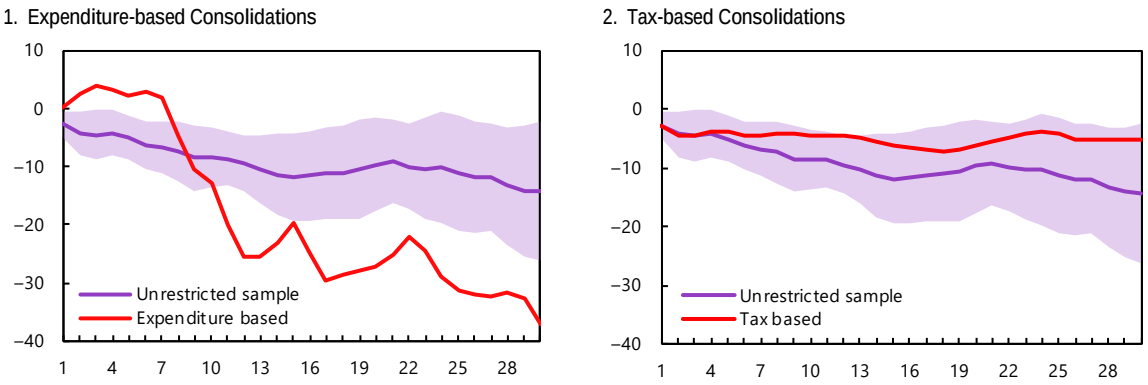
The Devil is in the Details: Does the Composition and Size of Fiscal Adjustment Package Matter?

The results presented so far are clear: previous episodes of fiscal consolidation in LAC have been, on average, successful in restoring investor confidence and conducive to more favorable funding conditions, particularly in periods of high fiscal stress or under an IMF program. But if consolidation is needed to lower sovereign borrowing costs, what can policymakers do to maximize the impact of fiscal adjustment on spreads? To explore this question, news about fiscal actions are distinguished based on their composition (adjustments *mostly* based on tax hikes versus those *mostly* based on expenditure cuts) and the size of the adjustment.

The composition of the fiscal consolidation package may have implications for the effectiveness of the consolidation process, in terms of both its sustainability and its macroeconomic effects (von Hagen and Strauch, 2001). In this context, some of the recent empirical literature finds that expenditure-based adjustments are associated with milder and shorter contractions than revenue-based ones (see for example, Alesina et al., 2019; Guajardo, Leigh, and Pescatori, 2014).

The results shown in Figure 4 are in line with these findings. We follow the literature by classifying consolidation packages as being "expenditure-based" if they involve a mix of tax and expenditure measures where expenditure cuts play a prominent role (50 percent or more of the total size of the adjustment). Conversely, tax-based consolidations are adjustments in which tax measures are predominant.[10] The estimated fall in spreads in the month after the announcement of expenditure-based consolidations is larger and more protracted than those from the announcement of tax-based consolidations (and the average unrestricted sample response).

Figure 4. Effects of Fiscal Consolidation on Spreads and the Composition of Adjustment
(Basis points)



Source: IMF staff calculations.
Note: Estimates based on local projection methods. Shaded area indicates 90 percent confidence intervals using HAC standard errors.

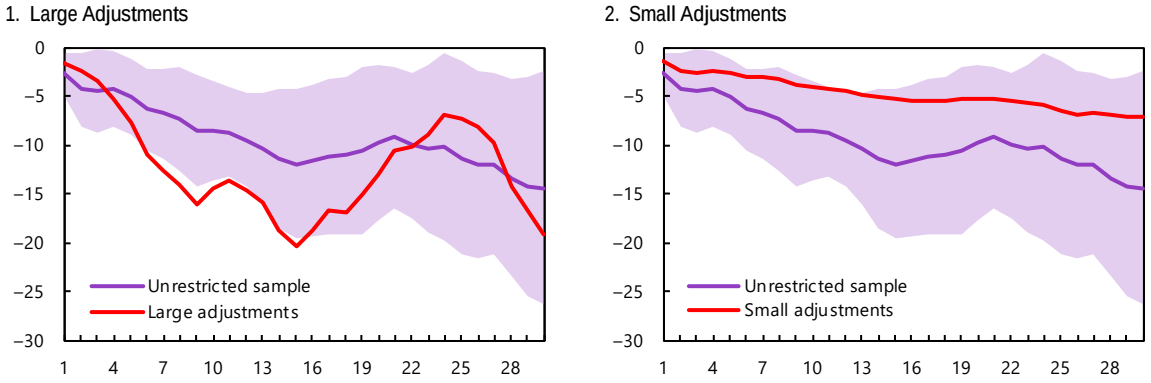
This suggests that fiscal consolidations implemented *mainly* by reducing government expenditure lead to smaller output losses than those based on raising taxes in part because they are more effective in easing financing conditions for the economy, and thus stimulating private demand. This finding will be corroborated with additional evidence in the next section. Nevertheless, it is also important to consider institutional constraints in the design of fiscal consolidation plans. Rigidities in public expenditure (for

[10] Interestingly, Carrière-Swallow, David, and Leigh (2018) show that for LAC countries expenditure-based consolidations are not more persistent than tax-based ones, contrary to the case of advanced economies.

example because of constitutionally mandated expenditure) are pervasive across Latin American countries, thus frequently rendering the implementation of tax measures more feasible from a practical standpoint.

While the composition of fiscal adjustment is important, the size of the adjustment may also matter. In fact, many countries in the region are undertaking large fiscal consolidations (Argentina, Brazil, Ecuador) to reduce high debt-to-GDP levels and lower sovereign risk. Figure 5 shows that these efforts could pay off. Using the size of fiscal consolidation actions provided by David and Leigh (2018), the sample is split in half into small- and large-adjustment bins.

Figure 5. Effects of Fiscal Consolidation on Spreads and the Size of Adjustment
(Basis points)



Source: IMF staff calculations.
Note: Estimates based on local projection methods. Shaded area indicates 90 percent confidence intervals using HAC standard errors. The Latin America and the Caribbean sample is split at the median of the empirical distribution for the size of the adjustment package.

For economies in which large consolidations (about 1 percentage point of GDP in average) were approved, the adjustment significantly reduces sovereign spreads, particularly in the first week after the announcement. This compares to an insignificant reduction in spreads following the approval of smaller adjustment programs. This is important, because it suggests that in those LAC economies where fiscal consolidation is most urgently needed to stabilize public finances, taking decisive action is likely to ease financial conditions and help mitigate the output losses.

Confidence: The Key Ingredient to Fiscal Adjustment Effectiveness

Effective fiscal consolidation episodes are typically defined as large fiscal adjustments associated with limited output losses and substantial debt reduction (Alesina and Perotti, 1995; Alesina and Ardagna, 2012). Could it be the case that a reduction is sovereign spreads is necessary for effectiveness?

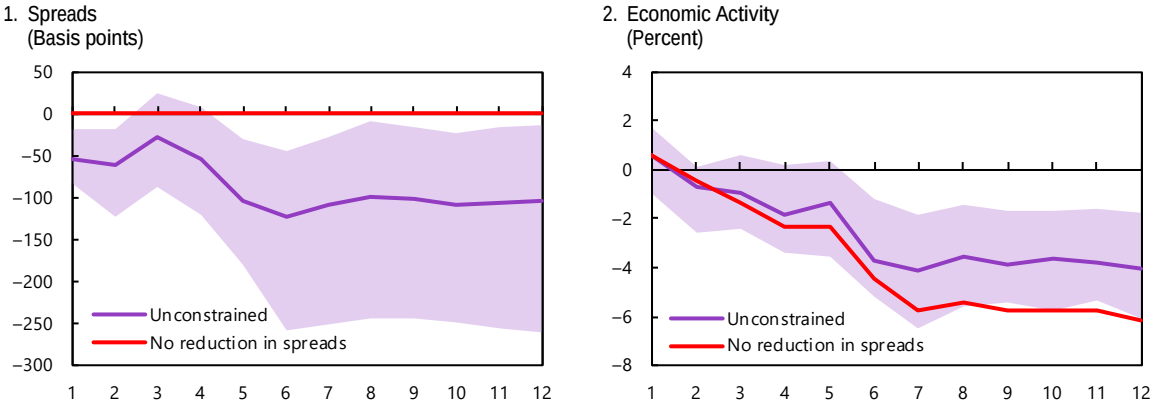
Regarding the effects on output, previous studies find that fiscal consolidations could be less contractionary if they help to reduce borrowing costs by dissipating doubts about the solvency of the government (Guajardo, Leigh, and Pescatori, 2014). Giavazzi and Pagano (1990) were among the first to highlight the importance of increased confidence in the sovereign on the transmission of fiscal policies. The argument was that a decisive fiscal adjustment—capable of sharply reducing borrowing costs—tends to generate an increase in confidence. This could offset the direct contractionary effect of tax hikes and expenditure cuts on aggregate demand, therefore mitigating the decline in economic activity.

Against this backdrop, this section studies whether sovereign spreads play a role in the transmission of fiscal policy shocks to economic activity by embedding the announcement dates in a panel vector autoregression (PVAR) along with changes in EMBIG spreads and industrial production using monthly

data.[11] The effect of lower spreads in attenuating the contractionary effects of consolidations is estimated by constructing a counterfactual scenario using the methodology proposed by Bernanke et al. (1998), Sims and Zha (2006), Killian and Lewis (2011), and Bachmann and Sims (2012). Given that the impact of fiscal announcements on spreads is larger in economies with high-perceived sovereign risk, the impulse responses are conditioned on the level of EMBIG spreads.

Figure 6 shows the results of the conditioned model, where the coefficients of the PVAR can vary depending on the level of EMBIG spreads. In periods of high perceived sovereign risk, defined as those at or above the 75th percentile of the empirical distribution, spreads decline significantly after the announcements by around 100 basis points in a 12-month window. However, the announcement is also typically followed by a large and protracted output loss (of around 4 percent).

Figure 6. Effects of Fiscal Consolidation on Spreads and Economic Activity

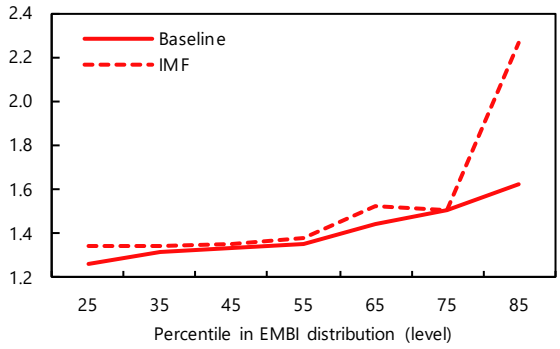


Source: IMF staff calculations.
Note: Estimates based on a PVAR. Shaded area indicates 90 percent bootstrap confidence intervals. The red line is the counterfactual scenario in which spreads do not respond.

However, the output losses would have been even larger if the spreads had not declined following the consolidation announcements (red line in Figure 6). Consistent with previous findings, the difference in output losses following fiscal adjustments between the two scenarios is large and significant, with the 12-month cumulative output loss in the unconstrained specification being almost half of the output loss in the counterfactual scenario. These results constitute direct evidence that confidence effects, in the form of lower sovereign spreads, are an important transmission channel of fiscal shocks and can reduce the drag on economic activity in the aftermath of fiscal consolidations.

With these estimates at hand, the findings above can be illustrated with simulations of the accumulated responses of output under different scenarios. Figure 7 presents the ratio of the counterfactual to the unconstrained output response for different percentiles of the EMBIG distribution under two distinct scenarios: the "baseline" scenario considers the effects of a generic fiscal consolidation package described in

Figure 7. Ratio of the Response of Output in Counterfactual Relative to Unconstrained Specification and EMBIG Levels
(Percent)



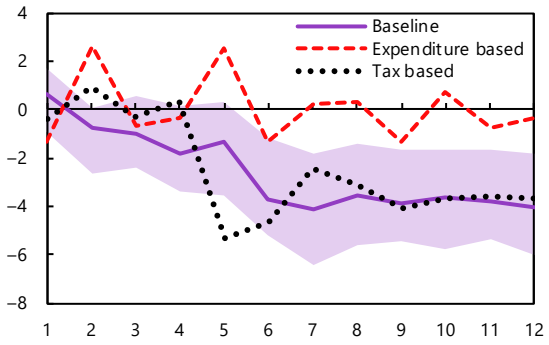
Source: IMF staff calculations.
Note: EMBIG = J.P. Morgan Emerging Market Bond Index Global.

[11]See Annex 2 for a detailed description of the PVAR framework.

Figure 7 (solid line) and a scenario in which the consolidation announcement takes place in the context of an IMF supported program (dashed line). In line with the results presented in earlier sections, the benefits from lower borrowing costs accrue mainly in high risk economies and when the adjustment plans are supported by an IMF program.

The previous section also showed that the decline in spreads can be larger for expenditure-based consolidations. Does this mean that cutting expenditure is less harmful for growth than raising taxes? Figure 8 compares the estimates of the response of output to the announcement of expenditure-based consolidations (dashed line) and to tax-based consolidations (dotted line). The estimated responses suggest that expenditure-based consolidations are less harmful to growth, with a negligible effect on economic activity a year after the shock. However, tax-based consolidations seem to have a negative effect on growth, with output contracting by close to 4 percent in the 12-month window after the announcement.

Figure 8. Effect of Fiscal Consolidation on Economic Activity by Consolidation Type
(Percent)

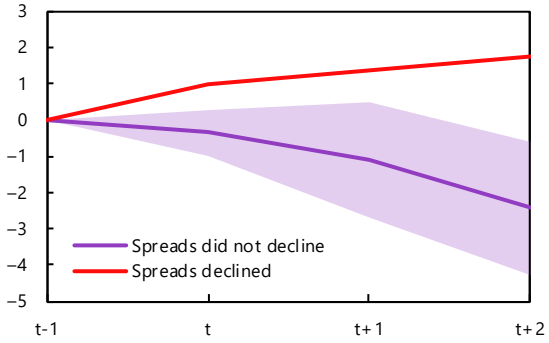


Source: IMF staff calculations.

It is important to note that the identification approach followed in the daily database constructed by David, Guajardo, and Yépez (2019) is different from the "narrative" approach in David and Leigh (2018). Consequently, fiscal consolidations announcements may not be "exogenous" to cyclical considerations. To address possible endogeneity issues, the announcement episodes are restricted to match the events documented in the David and Leigh (2018) database, in which the fiscal consolidation episodes are motivated by considerations such as reducing an inherited budget deficit, reducing public debt levels, or increasing economic efficiency to raise long-term growth. Decisions that are driven by a desire to respond to current or prospective economic conditions are discarded. In principle, this should reduce the endogeneity bias in the empirical estimates. However, the number of episodes is also reduced to 40, which deems the vector autoregression framework inadequate to analyze the effects of these narrative based shocks on output.

Therefore, an alternative exercise is conducted using a two-step approach. In the first step, the "narrative" based events are separated into two categories: episodes in which spreads declined significantly in the 12-months following the consolidation announcement, and those in which they did not. In the second step, impulse responses of output to fiscal consolidation shocks are estimated for the two groups using Jordà (2005) local projection methods with annual real GDP. Figure 9 shows that in the group where spreads did not decline following the consolidation announcement, output fell by about 3 percentage points over a three-year window. On the other hand, output increased by almost two

Figure 9. Response of Output to "Narrative-Based" Fiscal Shocks

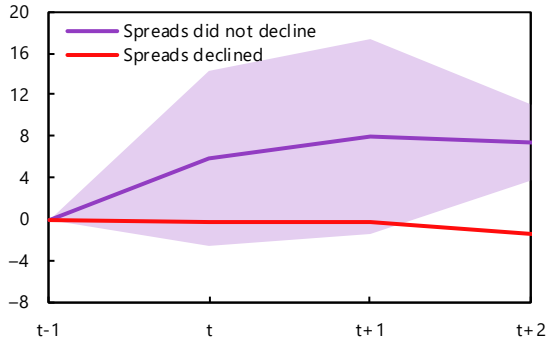


Source: IMF staff calculations.
Note: Estimates based on local projection methods. Shaded area indicates 90 percent confidence intervals using HAC standard errors.

percent when spreads declined, although the estimate is not significantly different than zero. These results are also evidence that a reduction in spreads is in fact instrumental in limiting the contractionary effects of fiscal adjustments.

Another key measure of effectiveness is the debt reduction associated with the fiscal adjustment. Using the same two-step approach discussed before—in which real GDP is substituted by gross debt-to-GDP ratios at the general government level—this section examines debt dynamics for episodes in which spreads declined in the aftermath of a fiscal consolidation shock. Figure 10 shows that public debt declined only in episodes in which there was a significant reduction in sovereign spreads. In the absence of lower spreads, fiscal consolidation fails to stabilize debt dynamics, with the debt-to-GDP ratio continuing to rise even after the fiscal adjustment.

Figure 10. Response of Debt-to-GDP Ratios to "Narrative-Based" Fiscal Shocks



Source: IMF staff calculations.
Note: Estimates based on local projection methods. Shaded area indicates 90 percent confidence intervals using HAC standard errors.

Policy Takeaways

In the face of rising sovereign credit risk, several countries in LAC have laid out fiscal consolidation plans aimed at decisively putting debt in a downward trajectory but without placing a significant drag on economic growth. Results presented in this chapter suggest that the ability of these plans to restore confidence—as measured by declines in sovereign risk premia—will be key in determining their effectiveness, as the absence of demonstrable improvements in the first few years can endanger the plan's sustained implementation if public support frays. In this regard, this chapter has uncovered a roadmap aimed at improving the effectiveness of the consolidation process.

First, periods of high perceived sovereign default risk are a particularly opportune moment to undertake fiscal consolidation, as the contractionary effects tend to be mitigated by easier financial conditions—resulting from lower sovereign spreads—when these policies are deployed. Given that perceived sovereign default risk is higher in LAC than in other regions, there is greater scope for a reduction in funding costs in the region, which in turn provide greater room for policy maneuver. In this regard, as recently evidenced in some economies in the region, IMF program support has been instrumental in allowing countries to restore investor confidence and lower sovereign risk premia.

Second, policymakers can design the composition and size of their plans in order to boost confidence in the sovereign while at the same time mitigating their drag on growth and thus accelerate progress toward stabilizing the public debt-to-GDP ratio. The findings presented in this chapter suggest that, fiscal consolidations implemented mainly by reducing government expenditures tend to lead to smaller output losses than those based on raising taxes in part because they are more effective in easing financing conditions for the economy. Nevertheless, institutional constraints need to be part of the design of fiscal consolidation plans and rigidities in public expenditure, which are common across Latin American countries, frequently render the implementation of tax-based adjustments more feasible from a practical standpoint. While the analysis presented in this chapter does not differentiate confidence effects across expenditure items, recent evidence suggest that governments should favor plans that preserve public investment where possible (see Chapter 4 in April 2018 *Regional Economic Outlook: Western Hemisphere*).

Finally, while the focus of this chapter was on the role of sovereign risk premia in determining the effectiveness of fiscal adjustment, public support for fiscal adjustment is likely to be another key

determinant of a government's ability to meet ambitious fiscal consolidation objectives. Therefore, for many countries in the region building public support can benefit immensely from transparency and clear communication. These would aim at educating the public about the rationale and the scale of the needed fiscal challenges and explaining what can reasonably be achieved through reforms without unduly curtailing necessary public services, overburdening taxpayers, or affecting the most vulnerable.

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Annex 1. Estimation of Impacts Using Local Projections

The Local Projections (LP) framework is flexible enough to accommodate a panel structure and does not constrain the shape of the impulse response functions and is thus less sensitive to misspecification. Auerbach and Gorodnichenko (2013), Jordà and Taylor (2016), Ramey and Zubairy (2018), as well as Born, Müller, and Pfeifer (2019) among others, also rely on local projections while analyzing fiscal policy. Their focus, however, is on the effects of fiscal policy changes on economic activity.

The benchmark specification for different horizons $(h = 0,..,30)$ in days is as follows:

$$r_{i,t+h} - r_{i,t-1} = \alpha_{i,h} + \gamma_{t,h} + \beta_h D_{i,t} + \delta X_{i,t} + \varepsilon_{i,t+h}, \qquad (1)$$

where $r_{i,t+h}$ denotes the EMBIG sovereign spreads in basis points; $D_{i,t}$ is a dummy variable representing the onset of a fiscal consolidation announcement, taking the value of 1 in the day of the announcement and zero otherwise; and *h* denotes the time horizon considered.[1] $X_{i,t}$ denotes a vector which contains seven lags of daily changes in EMBIG spreads. The specification also includes country ($\alpha_{i,h}$) and time ($\gamma_{t,h}$) fixed effects to capture time-invariant country features and shocks that are common across countries (such as changes in U.S. interest rates, for example), respectively. The impulse responses are constructed based on the estimated β_h coefficients at each horizon. The confidence bands are based on the respective estimated standard errors.

Another advantage of the LP method in estimating the effects of fiscal consolidations is its flexibility in dealing with non-linearities and state dependency (Ramey and Zubairy, 2018). Hence, in addition to the benchmark regression presented in Equation (1), the chapter explores specifications that condition the response of spreads on the following scenarios: (i) the consolidation announcements are made in episodes of high fiscal stress (when the EMBIG spread levels are high) and (ii) when a country was under an IMF supported program. The typical state-dependent specification will take the following form:

$$r_{i,t+h} - r_{i,t-1} = S^j_{i,t-1}\left[\alpha^j_{i,h} + \gamma^j_{t,h} + \beta^j_h D_{i,t} + \delta^j X_{i,t}\right] + \left(1 - S^j_{i,t-1}\right)\left[\alpha^j_{i,h} + \gamma^j_{t,h} + \beta^j_h D_{i,t} + \delta^j X_{i,t}\right] + \varepsilon_{i,t+h}. \quad (2)$$

The indicator variable $S^j_{i,t-1}$ takes the value of 0 or 1 depending on the statedependency *j* being considered, with $j = \{scenario\ (i), scenario\ (ii)\}$. For scenario (i), $S^{level}_{i,t-1}$ takes the value of 1 if the EMBIG spread is at or above the 75th percentile of the sample distribution (420 basis points). In scenario (ii), $S^{IMF}_{i,t-1}$ takes the value of 1 if the country is under an IMF supported program. Given that countries could put in place adjustment programs before IMF support, the indicator variable also takes the value of 1 for the year before the board approval date of the IMF program.

As discussed in the text, the fiscal announcement dates come from David, Guajardo, and Yépez (2019). The chapter uses daily data for sovereign bond spreads for 11 Latin American and Caribbean economies between January 3, 2000, and December 31, 2018, using the JP Morgan's Emerging Market Bond Index – Global database.[2] This spread is measured by an index that includes sovereign and quasi-sovereign

[1]For the analysis using annual data, the dummy $D_{i,t}$ takes the value of one in the year of the announcement and the horizon (h) is equal to three years.
[2]See footnote 6 for country coverage.

(guaranteed by the sovereign) instruments that satisfy certain liquidity criteria in their trading. The spread of an instrument (bond) is calculated as the premium paid by an emerging market over a U.S. government bond with comparable maturity features. A country's spread index is then calculated as the average of the spreads of all bonds that satisfy the inclusion criteria, weighted by the market capitalization of the instruments. One of the benefits of such an index is that the time series are continuous, without breaks as bonds mature. Only stripped spreads are used, which excludes collateral and guarantees from the calculation. The data is retrieved from Datastream. The IMF program dates are obtained from the IMF's Monitoring of Fund Arrangements (MONA) database. Real GDP and debt-to-GDP ratios are obtained from the IMF's World Economic Outlook (WEO) database.

Annex 2. Estimation using a Panel VAR

Following Burnside, Eichenbaum, and Fisher (2004); and Cavallo (2005), the fiscal announcement dates are embedded in a VAR model. The model for a panel of 11 EMDEs (PVAR) consists of three variables: the fiscal consolidation announcement dates; EMBIG spreads; and an index of economic activity. All variables are included at a monthly frequency. The fiscal consolidation announcements enter the system as a dummy variable that equals one in the month of the announcement. The EMBIG spreads are the average over the month. For the index of economic activity, monthly industrial production or other economic activity volume indicators are used.[1] All economic activity indicators are seasonally adjusted and obtained from Haver Analytics.

Following Blanchard and Perotti (2002), it is assumed that output or other variables of interest react immediately to fiscal policy shocks, whereas fiscal policy does not react on impact to other shocks in the system. This identifying assumption is the standard Cholesky decomposition with the fiscal policy variable ordered first in the VAR. It is usually justified by delays in the legislative system that would prevent the contemporaneous reaction of fiscal variables. This timing restriction is more plausible at a monthly frequency considered here. It is important to note that endogeneity concerns might still not be fully addressed by this restriction given the well-documented procyclicality of fiscal policy in EMDEs (Frankel, Végh, and Vuletin, 2013) i.e. announcements could be motivated by persistently deteriorated economic conditions. Nevertheless, most of these effects should be captured through the dynamics in the system, even if the reaction within the month of the announcement is restricted.

To fix ideas, the panel VAR system can be written as (abstracting from the country-specific intercepts) as:

$$\begin{pmatrix} 1 & 0 & 0 \\ \alpha_{i,2,1} & 1 & \alpha_{i,2,3} \\ \alpha_{i,3,1} & \alpha_{i,3,2} & 1 \end{pmatrix} \begin{pmatrix} D_{i,t} \\ \Delta r_{i,t} \\ \Delta y_{i,t} \end{pmatrix} = \sum_{j=1}^{p} A_{i,j} \begin{pmatrix} D_{i,t-j} \\ \Delta r_{i,t-j} \\ \Delta y_{i,t-j} \end{pmatrix} + \begin{pmatrix} \varepsilon_{i,t}^{1} \\ \varepsilon_{i,t}^{2} \\ \varepsilon_{i,t}^{3} \end{pmatrix} \qquad (1)$$

where $D_{i,t}$ are the fiscal announcement dates, $\Delta r_{i,t}$ is the monthly change in EMBIG spreads, and $\Delta y_{i,t}$ is the log change in the monthly economic activity indicator. The lag length is denoted by *p*. The structural shocks are denoted by $\varepsilon_{i,t}^{k}$ with $k \in [1, 2, 3]$. The fiscal consolidation announcement shock is denoted by $\varepsilon_{i,t}^{1}$.

Conceptually, fiscal announcements affect output directly in two ways: contemporaneously through $\alpha_{i,3,1}$ and dynamically through the relevant coefficients in the $A_{i,j}$ matrices. But there are also indirect effects of fiscal actions to the extent that fiscal announcements move spreads contemporaneously (through ai,2,1) and in turn spreads impact output (through $\alpha_{i,3,2}$). Moreover, spreads can serve as a propagation mechanism for fiscal shocks if they respond to fiscal announcements at any horizon and the coefficients for lagged values of spreads in the output equation are significant.

The objective of this empirical framework is to statistically isolate the role of changes in sovereign spreads in mitigating the effects of fiscal consolidation announcements on economic activity. To do so, a similar strategy as Bachmann and Sims (2012) is employed to "shut off" the indirect channels described

[1]With the exception of Jamaica, for which a monthly interpolation of the quarterly GDP series is used.

previously. In practical terms, this is done by constructing a hypothetical impulse response of output to a fiscal consolidation announcement by holding the changes in EMBIG spreads fixed at zero at all forecast horizons.[2] Using this "counterfactual" analysis the hypothetical response of output is compared to the baseline response, hence quantifying how important are changes in sovereign borrowing costs as a transmission mechanism of fiscal consolidation announcement shocks.[3]

While the timing assumption that government consolidation announcements do not react within a month to changes in sovereign spreads or output is sufficient to identify $\alpha_{i,2,1}$ and $\alpha_{i,3,1}$, an additional restriction is required to identify $\alpha_{i,3,2}$ and $\alpha_{i,2,3}$. Hence $\alpha_{i,2,3}$ is set to zero, which amounts to using a Cholesky decomposition of the system, with the changes in the EMBIG spreads ordered second and output ordered third. This in turn means that $\varepsilon_{i,t}^{2}$ and $\varepsilon_{i,t}^{3}$denote a sovereign spread shock and a residual output shock, respectively.

The chapter has highlighted the importance of initial conditions, mainly the level of EMBIG spreads or IMF program support, in analyzing the effects of fiscal consolidation announcement. A similar analysis is performed by allowing the coefficients in the $A_{i,j}$ matrix to vary depending on the level of spreads and on whether a consolidation announcement was done under IMF program support.

Impulse responses are estimated for the full empirical distribution of EMBIG spread levels. Each equation of the system is estimated using ordinary least squares (OLS), allowing for country fixed effects with 6 lags, following the Schwartz Criterion. As the impulse responses are non-linear functions of the OLS estimates, the procedure employs Runkle (1987) bootstrapping method to adjust for the fact that the data is in a panel format and to make use of the interaction terms.[4]

[2]This approach is similar to the methodology used, for example, by Bernanke et al. (1998), Sims and Zha (2006), and Kilian and Lewis (2011) to understand the role of the systematic component of monetary policy in the transmission of shocks.
[3]See David, Guajardo, and Yépez (2019) for additional details on the counterfactual construction.
[4]See Towbin and Weber, 2013 for a discussion of the algorithm for statistical inference in PVARs with interaction terms.