

GREDI
Groupe de Recherche en Économie
et Développement International



Cahier de recherche / Working Paper
23-03

**Austerity Reexamined: Uncovering
the Role of the Shadow Economy**

Khalil BECHCHANI

Austerity Reexamined: Uncovering the Role of the Shadow Economy

Khalil Bechchani *

August 2023

Abstract

This paper challenges the conventional belief that austerity measures inherently trigger economic contraction. Leveraging a novel narrative dataset of fiscal consolidations across 14 Latin American and Caribbean countries (1989-2016), constructed by David and Leigh (2018), I uncover that the impact of fiscal policy hinges significantly on the shadow economy's magnitude. Specifically, the output downturn post-fiscal consolidation is notable only in low-informality settings, with real GDP declining at impact by 1.12% (tax-based) and 2.77% (spending-based). This effect is accompanied by crowding-out of domestic demand and higher unemployment. Intriguingly, economies with high informality levels exhibit resilience against austerity-induced recession. Empirical support for the “twin deficits” hypothesis emerges in highly informal economies, aligning with Ricardian theory. Conversely, this phenomenon lacks support in economies with smaller informal sectors.

JEL Codes: E62, E26, E32, H5, O17.

Key words: Fiscal Consolidation; Fiscal Multipliers; Informality; Local Projections.

*Ph.D. Candidate in Development Economics, Department of Economics, School of Business, Université de Sherbrooke, 2500 boulevard de l'Université, Sherbrooke, Québec, J1K 2R1, Canada.
E-mail address: Khalil.Bechchani@USherbrooke.ca

I am deeply grateful to my supervisors, Professors Jean-François Rouillard and Patrick Richard, for their helpful comments, feedback, and unwavering support. Special thanks to Professor Amanda Guimbeau for her insightful comments during the initial phases of this project, and to my colleague, Kevin Ndenwadie, his for thoughtful suggestions.

Preamble

The economies of Latin America and the Caribbean (LAC) have fallen prey to several mismanagement episodes in the past, from the notorious “*Década Perdida*” during the late 20th century (1980s and 1990s), commonly known as “The Lost Decade” to the impact of the skyrocketing oil prices, which led non-producer countries to seek compensation through loans and producer countries to increase debt levels in pursuit of economic development.¹ This outbreak of events hindered the socio-economic development of the region, leading to serious downturns.

Debt crises in LAC arose following an increase in interest rates implemented by the authorities in the United States and Europe in 1979 to counter inflation.² As a consequence of creditors’ monetary policies, LAC countries saw their already enormous debt levels rise further. The incapacity to service their debts led them inevitably to sovereign default, and this has become the most serious crisis Latin America has ever seen.

As a response, several countries in the region implemented countercyclical policies in order to shield their economies from subsequent crises, some of them succeeded in reducing the intensity and duration of these crises; with Chile, Brazil, and Mexico being the best performers, as they graduated more rapidly from procyclical to countercyclical policy responses, compared to others such as Argentina and Venezuela for whom the policy transition was much slower (Vegh and Vuletin 2014).

Fiscal rectitude was the only way out of the storming crisis. Consequently, numerous LAC countries adopted fiscal consolidation measures to address their significant budget deficits. Austerity policies were introduced to maintain public finance sustainability and government solvency. Although spending-based and tax-based consolidations are known for their recessionary effects in advanced economies, this was the unique credible measures for LAC countries to escape for some, and avoid for others, default traps set by vicious cycles of borrowing.

Interestingly, Carrière-Swallow, David, and Leigh (2018) find that tax-based fiscal consolidations in LAC were less contractionary than their counterparts in OECD countries. Several factors may explain this finding, and the existence of large shadow economies, per se, may constitute a reliable explanation. Thus, further investigation is needed to gain insight into the mechanisms influencing the effectiveness of fiscal policy in developing and emerging economies and to which degree they contribute to shaping its outcomes.

LAC’s crisis history -redeemed by a peripeteias of austerity measures- and large shadow economies, provide the perfect domain to investigate the factors influencing the effectiveness of fiscal consolidation policies in developing and emerging countries.

¹Motivated by elevated oil prices, countries reliant on oil production significantly increased their borrowing, driven by the belief that the sustained rise in prices would facilitate loan repayment in the future.

²“Will the Fed Strangle Latin America Again?” by Ernesto Talvi, (2022).

1 Introduction

Fiscal adjustment strategies, aimed at reducing significant public deficits and ensuring government solvency, have thrust the perennial debate about the magnitude of fiscal multipliers into the spotlight. While many countries implementing austerity policies have experienced considerable economic setbacks, suggesting potential recessionary effects of such interventions, the literature still lacks consensus on the macroeconomic effects and the size of fiscal multipliers, particularly in emerging markets and developing economies (EMDEs), and how these differ from those observed in advanced economies (AEs).³

For instance, Alesina et al. (2017) find that both tax hikes and spending cuts, the primary instruments of fiscal adjustment, have contractionary effects on output in AEs, with tax hikes being more recessionary than spending cuts. As for EMDEs, Carrière-Swallow et al. (2021) find that fiscal consolidations lead to contractionary effects in the economies of LAC and acknowledge the existence of smaller fiscal multipliers in EMDEs compared to AEs.

Consequently, a pivotal question arises: What factors shape the output response to reductions in government spending and increases in taxation? The answer to this question may elucidate the observed differences in the effects of fiscal consolidation policies between advanced and developing countries.

Although these factors remain inadequately documented, it is reasonable to suspect that the presence of substantial informal sectors may indeed play a significant role in shaping the magnitude of fiscal multipliers. Thus, the ‘informality canal’ demands further investigation. My hypothesis posits that labor market informality constitutes a crucial transmission channel for fiscal policy, playing an independent role in shaping its effectiveness in developing economies and emerging markets.

In this article, I examine the impact of deficit-driven fiscal consolidations on output in 14 Latin American and Caribbean (LAC) economies. My primary focus is to investigate whether the magnitude of fiscal multipliers is influenced by the level of informality within the economy. I employ a novel narrative dataset on fiscal consolidation episodes in 14 LAC countries during the period 1989-2016, developed by Antonio C. David and Daniel Leigh (2018), in combination with the Socio-Economic Database for Latin America and the Caribbean (SEDLAC), a comprehensive database of informal economic activity co-developed by CEDLAS and the World Bank. The narrative dataset I use meticulously identifies fiscal policy changes and their motivations through thorough examination of pol-

³I will use the terms “consolidations” and “adjustments” interchangeably in the remaining of this paper.

icy documents, including budgets, central bank reports, as well as IMF and OECD reports. Similar to the approaches of Ramey and Shapiro (1998), Romer and Romer (2010), and Ramey (2011), the dataset captures exogenous changes in government spending and the level of taxation primarily motivated by long-term fiscal health and a desire to reduce the budget deficit, thereby being irresponsive to contemporaneous economic conditions.

In my baseline empirical specification, I use a linear model based on the Local Projection method (LP) developed by Jordà (2005) to estimate the cumulative dynamic response of real GDP to tax-based, spending-based, and total fiscal consolidation episodes. To explore potential variation in the fiscal multiplier based on the degree of informality in the economy, I consider an alternative specification using a smooth-transition local projections equation (which I will abbreviate to STLP), similar to the approach of Ramey and Zubairy (2018) and Auerbach and Gorodnichenko (2013). To quantify the conditional size of the fiscal multiplier in the state-dependent STLP model, I use informal employment, a proxy for informality, which represents the share of workers in informal jobs based on the productive definition.⁴

To comprehend the key mechanisms influencing the effects of fiscal consolidation through informal markets and their role in shaping fiscal multipliers, I expand the analysis by examining the response of private domestic demand (private consumption and private investment), the unemployment rate, the current account balance, net exports, and the real effective exchange rate following the austerity measures in LAC.

It is important to note that the relatively small tax base in highly informal economies, compared to countries with relatively low informality levels, may either amplify or dampen the business cycle, as highlighted by Elgin et al. (2021). This introduces two opposing perspectives on the consequences of fiscal consolidations:

1. A large shadow economy may hinder government strategies in implementing stabilization policies. Given the relatively small impact of changes in government spending and taxes on aggregate demand, tighter fiscal and monetary policies are required for successful macroeconomic stabilization. This view suggests that higher informality levels result in more substantial fiscal and monetary policy adjustments and consequently larger effects on the economy.

⁴The productive definition encompasses a larger number of observations and is better suited for economic analysis in comparison to the legal definition.

2. Conversely, in economies with significant informality, only a small portion of economic agents is directly affected by fiscal adjustments. Consequently, the recessionary effects of revenue mobilization and spending reduction might be less severe, demonstrating a negative correlation between the size of the shadow economy and the magnitude of these effects. In other words, in economies with large shadow sectors, the contractionary effects of austerity are diminished as a relatively small fraction of economic agents is subject to fiscal consolidation.

Only an empirical investigation can allow us to elucidate which of these two contending perspectives holds true regarding the influence of informality on the effects of fiscal consolidation—specifically, whether fiscal consolidation is more recessionary in the presence of small or large informal sectors. This paper aims to address this question by presenting new empirical evidence based on fiscal rectitude in LAC between 1989 and 2016.

My findings suggest that the latter theoretical insight has the claim to empirical relevance. The results reveal that informality acts as a “social buffer” in countries that have implemented fiscal consolidation policies, mitigating the recessionary effects of austerity. I find evidence of crowding-out effects in countries with relatively low informality levels, where both private investment and consumption decline significantly, and unemployment rises following fiscal consolidation. In contrast, economies with large informal sectors demonstrate resilience in domestic demand and unemployment levels. Large informal sectors appear to “shield” their economies from the contractionary effects of fiscal consolidation. Regardless of the level of economic development, this finding sheds light on the strong negative relationship between informality and the size of the fiscal multiplier. My results also suggest that the output contraction is stronger following spending-based consolidations but lasts longer following tax-based adjustments. A similar result is found by Arizala et al. (2017) for Sub-Saharan countries, documenting larger effects on output associated with fiscal consolidations based on a reduction of public investment, compared to those associated with a revenue mobilization.

Additionally, I find empirical support for the “twin-deficits” hypothesis in highly informal economies, where the current account balance significantly improves, and the real exchange rate depreciates following fiscal shocks. This positive correlation between the government budget balance and the current account balance seems to offset the contractionary effects of austerity. Conversely, no empirical evidence for the “twin-deficits” phenomenon is documented in countries with relatively low informality rates, indicating that the crowding-out effects of domestic demand are fully mirrored by a substantial fall in output.

The remainder of the paper is structured as follows. Section 2 reviews relevant literature. In section 3, I describe the data employed in this paper, providing stylized facts on fiscal policy and informality in LAC economies. Section 4 presents the empirical strategy and discusses potential threats to the identification process. Results are presented and discussed in section 5, while section 6 examines the transmission mechanisms of fiscal policy. Further investigations are performed in section 7, and finally, section 8 concludes the paper and offers recommendations for future research.

2 Related Literature

Most empirical research on the economic consequences of fiscal adjustment focus on advanced economies. While this body of literature finds evidence in accordance with the Keynesian perspective, as austerity leads to recessionary effects on the economy, a growing literature on developing and emerging economies points out smaller output effects of fiscal adjustments in less developed countries. This divergence in findings has generated debate, with some studies, such as Arizala et al. (2017), highlighting smaller fiscal multipliers in sub-Saharan Africa compared advanced and emerging economies. The authors also acknowledge the dependence of these effects on the design of fiscal adjustments and the accompanying policy environment; cuts in public investment are found to be more recessionary compared to decreases in public consumption or revenue mobilization. In accordance with this result, Ilzetzki et al. (2013) document larger output effects following an increase in government consumption in industrial economies compared to developing countries. However, Carrière-Swallow et al. (2021), using the narrative dataset constructed by David and Leigh (2018) for 14 LAC economies, report a remarkable similarity between fiscal multipliers in the emerging markets of Latin America and advanced economies. Given the absence of a consensus view backed by solid empirical evidence, the consequences of government intervention in the developing world require further investigations.

In this context, the role of state-dependency in shaping the consequences of government intervention has gained attention, with labor market informality emerging as a key characteristic of developing and emerging economies. Colombo et al. (2022) focus on expansionary fiscal policies and investigate how informality affects the magnitude of the government spending multiplier in a panel of 141 countries. Their findings indicate a negative correlation between the degree of informality in the economy and the magnitude of the government spending multiplier. Lemaire (2020) find recessionary effects of fiscal consolidation in LAC and smaller tax-based fiscal multipliers in countries with relatively large

informal markets.

However, despite these valuable contributions, there's still much to explore in understanding the mechanisms influencing the effectiveness of fiscal policy in developing and emerging economies. The informality channel appears to be a reliable and pertinent explanation for the differing magnitudes of fiscal multipliers documented in advanced and developing countries. This suggests to me that a focus on LAC economies as a case study, which are highly heterogenous in terms of their structural economic characteristics, including the size of the shadow economy, may constitute a fruitful path of investigation.

In this paper, I test this hypothesis by examining episodes of fiscal rectitude in LAC between 1989 and 2016, leveraging the meticulous dataset provided by David and Leigh (2018).

While Colombo et al. (2022) study how informality affects the magnitude of the government expenditure multiplier in 141 countries around the world, my study focuses on the episodes of fiscal austerity in LAC between 1989 and 2016 by investigating the role of informality in shaping the effectiveness of fiscal adjustment in a sample of 14 LAC economies. While Lemaire (2020) has explored a similar issue in LAC, he employs a simple ranking strategy to classify the countries according to their average rate of informal labor and separate them thereafter into two groups (a group of highly informal economies with an informality rate exceeding 60%, and a group of lowly informal economies with an informality rate below 54%). To overcome this limitation and account for nonlinearities implied by the dependence of estimated multipliers on the state of the economy, I exploit instead the flexibility of Local Projections and estimate a state-dependent smooth-transition LP (STLP) equation to compute output impulse responses to the fiscal consolidation shocks. This approach allows for nonlinearities implied by a dependence of the estimated multipliers on the state of the economy, and avoids the need to divide the sample into different groups, thereby increasing the risk of a type II error, as smaller sample sizes lead to a loss in statistical power.⁵

Additionally, while most studies have primarily focused on the output effects of fiscal shocks, my paper offers a unique contribution by examining the under-examined responses of the external current account balance, net exports, and the real effective exchange rate. These additional analyses aim to elucidate the economic policy transmission channels influenced by the shadow economy.

⁵As highlighted by Auerbach and Gorodnichenko (2012a), calculating fiscal multipliers individually for each regime can pose challenges due to the limited number of observations for specific regimes, resulting in estimates that lack precision. In contrast, the application of smooth-transition LPs enables econometricians to derive robust and accurate estimates of fiscal multipliers by leveraging a broader range of data..

Lastly, to the best of my knowledge, this study represents the first to employ a smooth-transition model to investigate how informality shapes the macroeconomic consequences of austerity, and one of the few to exploit the newly constructed narrative dataset by David and Leigh (2018) for the study of macroeconomic effects of fiscal policy in LAC economies.

3 Data and Stylized Facts

The dataset used in this paper covers a period from 1989 to 2016 and includes 14 Latin American and Caribbean economies. The main left-hand side variable is real GDP, from the World Development Indicators (WDI) dataset of the World Bank. Alternative dependent variables are used in sections 6 and 7 to explore the transmission mechanisms of fiscal policy and include the domestic demand (private consumption and investment), the unemployment rate, the current account balance-to-GDP ratio, and net exports, all from the WDI dataset of the World Bank, as well as the real effective exchange rate (REER) from the Bruegel dataset (Darvas 2012). The debt to GDP ratio is from the IMF FAD Historical Debt Database, and the commodity export value is from Gruss and Kebhaj (2019). For a comprehensive overview of all the variables employed in this paper, including their definitions and sources, please refer to Table A.1 in the Appendix.

Table 1 provides descriptive statistics on fiscal consolidation policies, the informality rate, key economic characteristics related to unemployment, trade openness, government debt, as well as some measures of institutional quality within the LAC region. The fiscal policy action as a share of GDP, as depicted in panel A is classified as either a "tax-based" or "spending-based" adjustment depending on whether revenue mobilization or spending reduction predominantly drives the budgetary impact of the narrative fiscal shock. The fiscal consolidations analyzed in this study span across the years 1989 to 2016 and encompass the 14 LAC economies identified within the dataset of David and Leigh (2018): Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Paraguay, Peru, and Uruguay. Panel B reports three common measures of the informality rate used in empirical research. In this paper, the one I use is the informal employment, which represents the share of workers in informal jobs, according to the productive definition. More comprehensive details regarding the narrative fiscal shocks and the informality rate are provided in sections 3.1 and 3.2. Lastly, the estimates for institutional quality, as presented in panel D, are countries' scores on the aggregate indicator, measured in units of a standard normal distribution, i.e., ranging approximately from -2.5 to 2.5.

Table 1: Descriptive Statistics

Variable	Obs.	Mean	Median	Min.	Max.	Standard Deviation	Skewness	Kurtosis
Panel A : Fiscal Consolidations (% of GDP)								
Tax-Based	65	0.72	0.50	-0.9	4.10	0.87	1.10	5.74
Spending-Based	30	0.74	0.65	-0.5	2.00	0.53	0.46	3.47
Total	76	0.90	0.72	-0.9	4.10	1.01	0.95	4.12
Panel B : Informality								
Share of workers in informal jobs	219	52.89	52.32	30.74	77.12	11.83	0.14	1.80
Informal output (% of official GDP) - DGE	378	36.45	33.8	16.38	67.66	12.14	0.72	2.79
Informal output (% of official GDP) - MIMIC	336	38.6	35.9	18.16	68.56	12.9	0.62	2.55
Panel C : Economic characteristics								
Unemployment rate	364	6.64	6.33	2.02	20.52	3.43	1.25	4.92
Imports (% of GDP)	392	28.72	27.69	4.63	71.63	11.99	0.47	2.99
Debt (% of GDP)	371	47.89	39.76	3.89	152.11	28.24	1.42	5.05
Panel D : Political characteristics								
Rule of Law	252	-0.32	-0.52	-1.22	1.34	0.65	1.01	3.07
Control of Corruption	252	-0.18	-0.39	-1.43	1.54	0.72	1.02	3.10
Government Effectiveness	252	-0.12	-0.16	-1.11	1.33	0.54	0.50	2.84

3.1 *Narrative fiscal shocks*

The narrative dataset of fiscal consolidation measures used in this paper is meticulously constructed by David and Leigh (2018) and encompasses 14 Latin American and Caribbean economies, covering the period from 1989 to 2016. The dataset lists a series of exogenous tax-based and spending-based fiscal consolidations, i.e., primarily motivated by the objective of reducing budget deficits and ensuring long-term fiscal sustainability, rather than being driven by a direct response to contemporaneous or prospective economic conditions. The authors undertake a precise and thorough examination of policymakers' intentions and actions, as outlined in policy documents, including budgets, central bank reports, and reports from international organizations such as the IMF and OECD. This meticulous methodology allows for the identification of key details such as the size, timing, principal motivation, and budgetary impact of each fiscal measure. This narrative approach to identifying fiscal actions shares similarities with pioneering works such as Romer and Romer (2010) and Cloyne (2013), among others. As elucidated by Romer and Romer (2010), the identified fiscal actions are not merely responses to the contemporaneous state of the economy but are more closely linked to past and long-term economic conditions. They aim at addressing factors such as inherited budget deficits or ensuring the long-term fiscal health of the country, thus rendering them exogenous to short-term output determinants. Consequently, these measures provide a valid foundation for estimating the macroeconomic

effects of fiscal consolidation.

The sample encompasses a total of 76 fiscal adjustments, comprising both tax- and spending-based consolidations, enacted by the governments of 14 LAC economies during the period from 1989 to 2016, presented at an annual frequency. Among these 76 consolidation episodes, 55 are mostly tax-based, 18 are mostly spending-based, and 3 exhibit a balanced combination of tax hikes and spending cuts (Costa Rica 2016; Jamaica 2003; and Jamaica 2004). Following the classification methodology of Guajardo, Leigh, and Pescatori (2014), the term “mostly” signifies a policy impact that exceeds 50% of the total. Additionally, The dataset offers information on 66 tax-based and 30 spending-based fiscal measures. The 14 LAC countries included in this analysis are as follows: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Paraguay, Peru, and Uruguay. These economies constitute a diverse and representative group for examining the impact of fiscal consolidation measures in the LAC region. ⁶

3.2 Informality

Data on informality comes from the Socio-Economic Database for Latin America and the Caribbean (SEDLAC), constructed by the CEDLAS and The World Bank. This database offers two distinct measures of informality based on different definitions: a productive and a legal definition. For the analysis presented in this paper, I rely on the productive definition as it provides more observations and is better suited for empirical economic analysis. ⁷

Another frequently used measure of informality in empirical research is informal output as a share of official GDP. Elgin et al. (2021) have constructed a database of informal economic activity, spanning from 1990 to 2018, with annual frequency. This database offers estimates of informal output (% of official GDP) computed using two widely recognized approaches in the literature; the Multiple Indicators Multiple Causes model (MIMIC) and a deterministic Dynamic General Equilibrium (DGE) model introduced by Elgin and Oztunali (2012). The first approach involves a structural model based on Medina and Schneider (2018), where the informal economy is estimated using a system of equations involving institutional and economic variables. The second approach employs a two-sector (formal

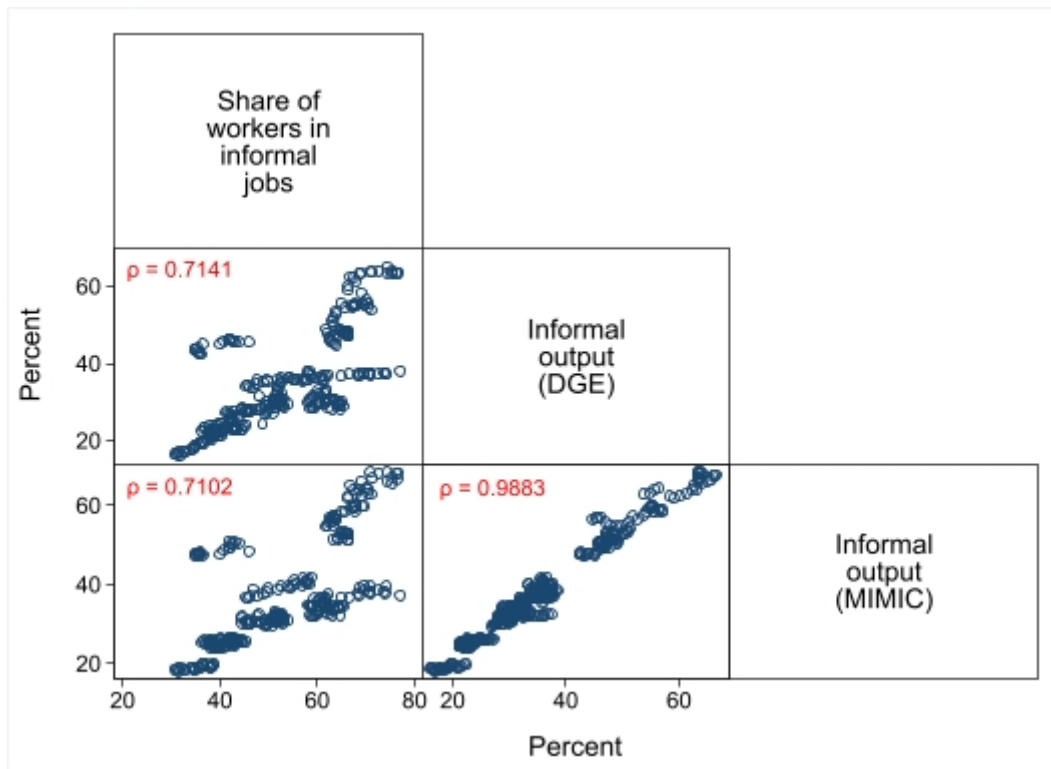
⁶A dataset formulated with a comparable rationale is Ramey’s (2011) defense news series, which centers on fluctuations in government spending tied to political and military occurrences, offering an exogenous element in relation to the economic context.

⁷As per the productive definition, an informal worker is defined as an individual who is employed in a small firm (with fewer than 5 employees) on a salaried basis, holds a non-professional self-employed position, or falls under the category of a zero-income worker. On the other hand, the legal definition designates a worker as informal if they lack entitlement to a pension upon retirement. (Source: CEDLAS and the World Bank: <https://datacatalog.worldbank.org/search/dataset/0040207>).

and informal economies) dynamic general equilibrium model.⁸

However, to facilitate the computation of a smooth-transition regime-switching model, the state variable (in this case, informality) must exhibit fluctuations over time for each of the sample observations (i.e., for each country), enabling the calculation of nonlinear multipliers for each regime while ensuring smooth transition between them. While informal employment in each economy displays significant variation over time, as shown in Figure 1, the evolution of informal output, presented in Figure A.1 in the Appendix, demonstrates a more stable trend, and its cyclical component is very marginal. Nonetheless, Figure 1 underscores a strong correlation exceeding 70% between these two measures of informality.

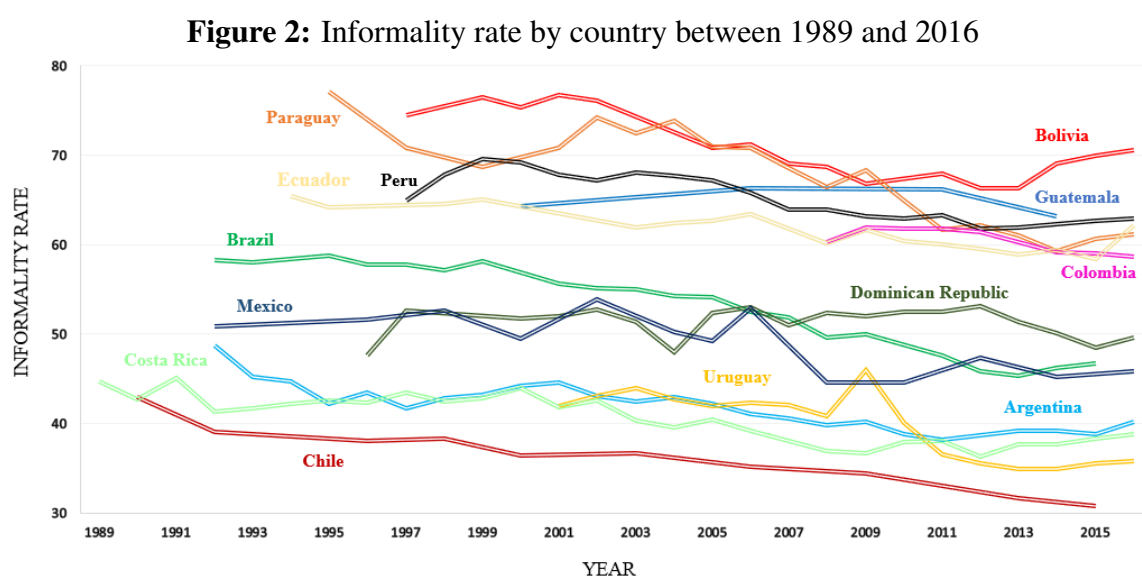
Figure 1: Correlation between different measures of informality



Source: This figure was constructed with data from CEDLAS and The World Bank and Elgin et al. (2021).

⁸Elgin and Oztunali (2012) posit that the model approach's strength lies in its incorporation of micro-foundations and its avoidance of necessitating ad hoc econometric specifications. However, it's important to note that the outcomes derived from this approach could be sensitive to the configuration of the DGE model (Duarte 2014). On the other hand, the MIMIC approach is characterized by a significant limitation emanating from its reliance on a factor-analysis framework, necessitating calibration through data estimated using alternative methodologies. This approach's efficacy, while relatively lesser than that of the DGE and MIMIC approaches, transfers inherent biases to the MIMIC estimates (Breusch 2005).

Figure 2 illustrates the evolution of the informality rate in LAC from 1989 to 2016. The 14 economies of the sample exhibit substantial heterogeneity in terms of their informality levels. For instance, Bolivia has the largest informal economy, with a mean informality rate of 71%, while Chile boasts the smallest informal sector, with a mean informality rate of 36%.⁹

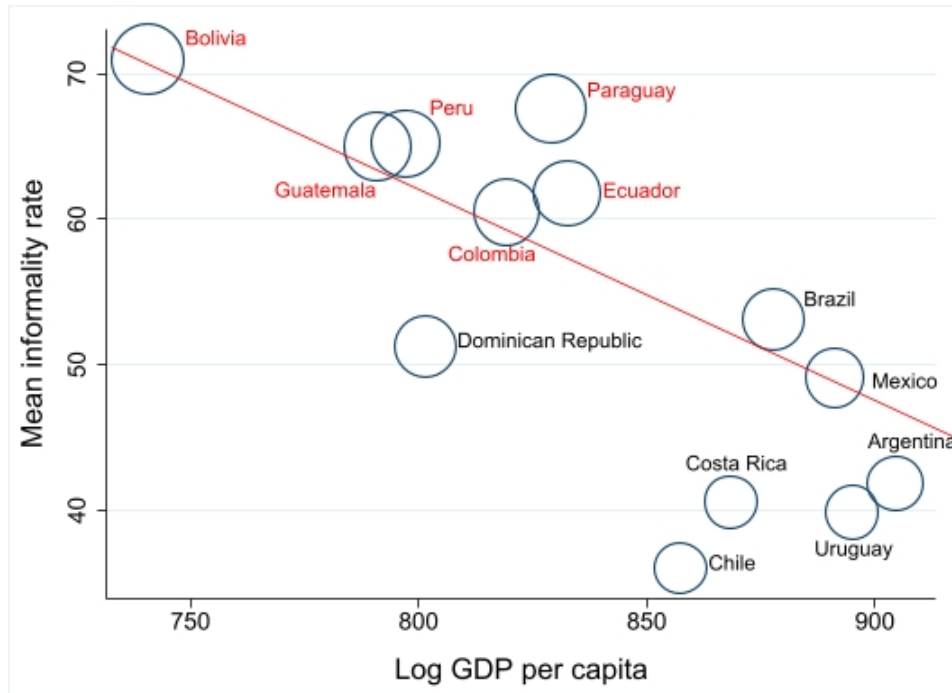


Source: This figure was constructed with data from CEDLAS and The World Bank. The informality rate corresponds to labor market informality according to the productive definition. The figure is better seen if printed in colour.

Figure 3 further highlights the correlation between informality and real GDP per capita over the period 1989-2016. This figure reveals that countries with relatively high GDP per capita in LAC—such as, Argentina, Brazil, Chile, Costa Rica, Mexico, and Uruguay—tend to have smaller informal sectors. In contrast, countries like Bolivia, Colombia, Ecuador, Guatemala, Paraguay, and Peru, feature larger shadow economies and relatively smaller GDP per capita.

⁹Out of the 14 LAC economies encompassed by the dataset of David and Leigh (2018), Jamaica is not present in Figure 1. This arises due to the unavailability of the informality measure, as pertinent to this article, during the period of this study. Consequently, Jamaica is omitted from the analysis, which focuses on a cohort of 13 LAC economies.

Figure 3: Correlation between informality and log GDP per capita



Source: This figure was constructed with data from CEDLAS and The World Bank. The informality rate corresponds to labor market informality according to the productive definition.

4 Empirical Strategy

In this section, I start by describing two specifications of the empirical model, outlining the foundation upon which my analysis is built. Following this, I address the potential threats to the identification of a causal relationship between fiscal policy and economic activity, focusing particularly on their conditional relationship with informality levels. To counter these threats, I propose alternative methods that mitigate the potential biases. Finally, I investigate whether the narrative fiscal shocks under study are susceptible to anticipation effects from both households and the private sector, providing a comprehensive understanding of the dynamics at play.

4.1 The Local Projection Method

In this section, I estimate the macroeconomic effects of fiscal consolidation on output using the Local Projection method (LP) introduced by Jordà (2005), which I accommodate to a state-dependent equation that allows me to estimate nonlinear effects of fiscal policy on economic activity, making it particularly suitable for capturing the complex dynamics of

the relationship.¹⁰ Unlike traditional linear models, this method involves direct nonlinear regressions of future outcomes on current variables, estimated with the Ordinary Least Squares (OLS) estimator.

A noteworthy alternative method to LP inference is the VAR(p) inference, commonly used in such analyses. However, the LP approach offers several advantages, including robustness to misspecifications compared to VAR models, which heavily rely on data persistence and forecasting horizons (Olea and Plagborg-Møller 2021).¹¹

Additionally, as noted by Blanchard and Perotti (2002), the first to use the SVAR approach in the study of fiscal policy, a key assumption behind the identification of fiscal shocks with SVAR is that discretionary policy is enacted by fiscal authorities not instantaneously but after a minimum of one period in response to the state of the economy, making the validity of the identifying assumption conditioned by the use of high-frequency economic data, e.g. a quarterly frequency, since it is unlikely that fiscal authorities take an entire year to respond to a particular economic issue. The frequency of data collection becomes critical, and using the SVAR approach with the dataset in hand will undoubtedly violate the identifying assumption since the narrative fiscal shocks are collected at an annual frequency.

Furthermore, a common problem of nonlinear VARs and the standard linear SVAR highlighted by Ramey and Zubairy (2018) is the conversion of elasticities to multipliers. The fiscal multipliers cannot be directly inferred from the computed impulse response functions because the IRFs replicate the dynamics of elasticities while multipliers are by definition expressed in dollars, so one has to make an ex-post conversion of the estimated elasticities to dollar equivalents. The most common conversion methodology in the VAR literature is based on the sample average of the ratio of output to government spending; Y/G . Because the effects of fiscal policy can either amplify or dissipate over time, it is important to consider the integral of output responses to the integral of fiscal shocks when calculating fiscal multipliers and avoid alternative approaches such as the ratio of output's peak response (Blanchard and Perotti 2002) or average response (Auerbach and Gorodnichenko 2012b) to an initial fiscal shock.

I start by investigating the effects of fiscal consolidation on output within a linear model with no regime switches. In this first specification, I use a standard LP linear equation to es-

¹⁰The pioneering recognition of the potency of this method in estimating state-dependent fiscal models was attributed to Auerbach and Gorodnichenko (2013).

¹¹For short time horizons ($h \leq p$), the estimations provided by the LP estimator and the VAR(p) estimator demonstrate considerable similarity, while discrepancies may emerge at intermediate and extended horizons. Nevertheless, the LP least-squares estimator's advantage in terms of reduced bias compared to the least-squares VAR estimator is offset by an elevated sampling variance observed at intermediate and extended horizons (Li, Plagborg-Møller, and Wolf 2022).

estimate the cumulative dynamic response of real GDP to fiscal consolidation episodes. The benchmark equation for horizons $h = 0, 1, 2, 3, 4$ (four years into the future) is presented as follows:

$$Y_{i,t+h} - Y_{i,t-1} = \alpha_h + \beta_{h,f} \sum_{k=0}^h FC_{i,f} + \Omega_{h,f}(L) X_{i,t,f} + \alpha_i^k + \theta_t^k + \varepsilon_{i,t+k} \quad (1)$$

where the left-hand side bloc represents the macroeconomic variable of interest with Y_i denoting the log of real GDP of country i ; $FC_{i,f}$ denotes the narrative fiscal policy shock of country i of type f (tax-based, spending-based, or total fiscal consolidations) as a share of GDP. $\Omega_{h,f}(L)$ is a polynomial in the lag operator of order 2 and $X_{i,t,f}$ a vector of control variables that includes lags of real GDP growth, total fiscal consolidation, and the contemporaneous growth rate of the commodity export value and its lags, which significantly influence the business cycle and fiscal policy in emerging markets and developing economies (Céspedes and Velasco 2014; Fernández, González, and Rodríguez 2018).¹² I consider as a covariate the difference between announced and implemented fiscal policies, to control for the anticipation effects of economic agents, discussed in sub-section 4.3. I include country and time fixed effects to capture country-specific characteristics of fiscal policy and growth as well as common shocks affecting the region.¹³

The coefficient of interest is $\beta_{h,f}$, and it corresponds to the estimated fiscal consolidation multiplier, representing the cumulative dynamic response of real GDP growth to the cumulative fiscal shock over a given horizon (response of Y at time $t + h$ to the shock at time t). Thus, for each horizon, a single regression is estimated, and the sequence of estimated $\beta_{h,f}$ coefficients shapes the impulse response functions.

To explore the relationship between the magnitude of the fiscal multiplier and the level of informality in the economy, I introduce an alternative specification based on a smooth-transition local projections equation. I augment the standard LP model with a measure of informality to allow the estimated fiscal multiplier to vary according to the size of the shadow economy, providing a nuanced understanding of the impact of fiscal policy. To proceed, I follow the empirical methodology of Auerbach and Gorodnichenko (2012a; 2013) and Ramey and Zubairy (2018) and estimate the following equation:

¹²While information criteria such as AIC and BIC, as well as residual analysis, commonly guide lag selection in time-series data, the determination of suitable lag lengths in panel data predominantly stems from economic theory.

¹³To delve into the potential mechanisms underpinning how informality influences the economic response to austerity shocks, I explore different dependent variables, discussed upon in section 6.

$$Y_{i,t+h} - Y_{i,t-1} = \alpha_h + F(z_i) [\beta_{h,f,L} \sum_{h=0}^k FC_{i,f}] + (1 - F(z_i)) [\beta_{h,f,H} \sum_{h=0}^k FC_{i,f}] + \Omega_{h,f}(L) X_{i,t,f} + \alpha_i^k + \theta_t^k + \varepsilon_{i,t+k} \quad (2)$$

with:
$$F(z_i) = \frac{\exp(-\gamma z_i)}{1 + \exp(-\gamma z_i)}, \quad \gamma > 0$$

where:
$$z_i = \frac{s_i - \bar{s}_l}{\sigma(s_i)}$$

The variable z_i is an indicator for shadow economy s_i (normalized to have zero mean and unit variance), $F(z_i)$ is the weighting function that governs the state-dependent equation and can be interpreted as the probability of a country i to have a given level of labor market informality. Thus, each regime (high-informality state vs low-informality state) is assigned a weight that varies from 0 to 1.

Figure 4 presents the Epanechnikov kernel density estimate of the indicator of the shadow economy (z_i) used to compute the weighting function $F(z_i)$. As the figure shows, the high informality regime ($z \rightarrow \infty$) is characterized by a high probability density, exceeding 0.8, while the low informality regime ($z \rightarrow -\infty$) is characterized by a relatively low probability density, approximating 0.6, given the fact that high average informality rates (s_i) have a relatively high probability density, as shown in figure 5, with the highest density associated with a mean informality rate of around 65%.

$\beta_{h,f,H}$ describes the behaviour of the system in a relatively high informal economy (i.e. $z \rightarrow \infty$ & $1 - F(z_i) \approx 1$) and $\beta_{h,f,L}$ describes the behaviour of the system in a relatively low informal economy (i.e. $z \rightarrow 0$ & $F(z_i) \approx 1$). These two coefficients give the impulse responses for the fiscal multiplier in the two states of the economy.

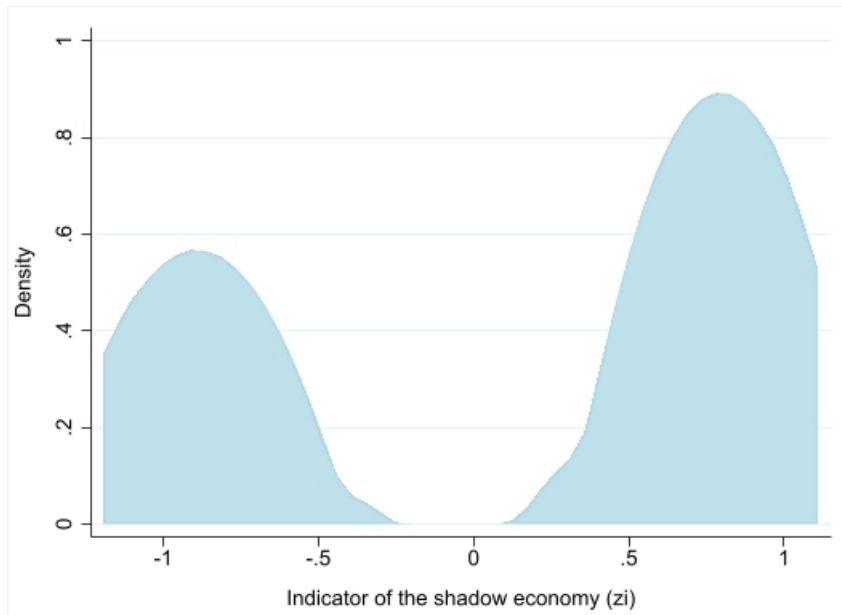
The parameter γ governs the smoothness of the transition from one state of the economy to another, with larger values implying instantaneous switches, while smaller values are associated with a smoother transition. As noted by Auerbach and Gorodnichenko (2012a), Granger and Teravistra (1993) propose to impose fixed values of γ and then assess the robustness of the chosen values by using a grid search over the smoothness parameter to check if the estimated state-dependent coefficients are sensitive to changes in γ 's value. Thus, I follow Auerbach and Gorodnichenko (2012a; 2012b; 2013) and calibrate (rather than estimate) the smoothness parameter γ and fix its value for the baseline analysis to $\gamma = 5$ as in Colombo et al. (2022) who investigate the relationship between informality and the

size of the fiscal multiplier following expansionary episodes, of which choice is motivated by giving an intermediate level of intensity to the regime-switching model.

It is important to note that to the extent one estimates multipliers for a given regime while considering (unintentionally) the behavior of the system in the opposite regime may bias the estimates by failing to point out any significant differences of the fiscal multipliers across states (Auerbach and Gorodnichenko 2012a). For this reason, the choice of γ is crucial, therefore I show that the results are not sensitive to γ 's value and remain robust to alternative specifications (Cf. section B of the Appendix).

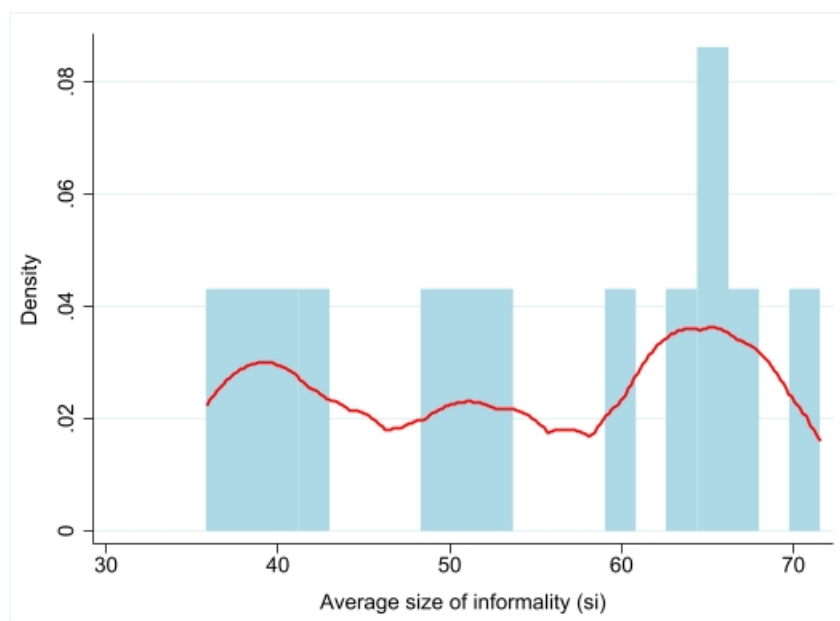
The narrative fiscal consolidation shocks are directly included in equations (1) and (2), and both specifications are estimated using the OLS estimator.

Figure 4: Probability density distribution of the indicator of the shadow economy (z_i)



The magnitude of the fiscal multipliers conditional on informality levels in the economy could be altered by country-specific characteristics and idiosyncratic government policies, such as monetary policy. As it has been demonstrated in the literature, the exchange rate regime can influence the outcomes of fiscal policy, as government spending multipliers are found to be larger under fixed exchange rate regimes (Ilzetzki, Mendoza, and Végh 2013; Born, Juessen, and Müller 2013; Sheremirov and Spirovska 2019). The exchange-rate policy can also influence the magnitude of the fiscal multipliers. For instance, a devaluation may ameliorate the trade balance and therefore the current account balance, inducing positive effects on output, of which magnitude depends on the elasticity of the tradable sector of the economy. If such a policy is implemented alongside a fiscal consolidation policy, the

Figure 5: Probability density distribution of the average size of informality (s_i)



positive output response to the exchange rate devaluation may be attributed to the austerity measure, thus reviving the claims of the expansionary austerity hypothesis.

Consequently, I control in a third specification of the STLP model in equation (2) for the real effective exchange rate (REER), as well as the level of the sovereign debt, by including the contemporary REER growth rate and its two lags as well as the first and second lags of the debt to GDP ratio.

A crucial aspect, however, remains unanswered. The empirical model I've presented may be subject to two important problems that can influence the causal interpretation of the estimated fiscal multiplier. Although the fiscal narratives are exogenous to the contemporaneous state of the economy, the level of informality is not. Therefore, the first challenge is reverse causality (simultaneity bias) between labor market informality from one side and economic activity and fiscal policy from the other. Furthermore, when estimating the effects of fiscal policy on the economy, a second challenge is posed by the problem of “*fiscal foresight*” which arises when fiscal policies are anticipated by economic agents and associated with rational expectations, therefore altering their consumption and investment behaviour. This phenomenon generates a non-fundamental equilibrium and thus constitutes an empirical problem for the econometrician aiming for the identification of the structural shocks of interest to which economic agents react (Leeper, Walker, and Yang 2013). In the upcoming sub-sections (4.2 and 4.3), I delve into these issues and present solutions to address these challenges, ultimately contributing to a robust interpretation of the estimated

fiscal multiplier and its relationship with informality levels.

4.2 Endogeneity Threats

Reverse causality poses a significant challenge in establishing a causal relationship between labor market informality and the fiscal multiplier's magnitude. There are two possible scenarios: (i) the shadow economy might respond to fiscal policy changes, or conversely, (ii) informality levels could influence fiscal policy through mechanisms like automatic stabilizers, which can impact real GDP or aggregate demand. Finding an exogenous instrumental variable for informality is a complex endeavor, and when dealing with a potentially endogenous state indicator within a smooth-transition regime-switching model, this challenge becomes even more intricate.

The shadow economy is influenced by both structural factors as well as cyclical fluctuation. Therefore, the exogenous fiscal shocks are supposed to affect only the cyclical component of labor market informality, leaving the trend component of informality unaffected. Consequently, in order to attenuate (or at best, correct) the endogeneity bias of z_i , I adopt a multi-step approach. First, I employ linear interpolation on the informality rate time series. Next, I decompose this interpolated time series into trend and cyclical components using the Hodrick-Prescott filter (with a smoothing parameter of 100). For my analysis, I consider only the "exogenous" long-run trend component as a proxy for labor market informality. Consequently, the secular component of the filtered informality time series becomes the basis for computing the state-dependent fiscal multipliers.¹⁴

To further counteract potential long-term endogeneity bias resulting from the unlikely scenario of the long-term trend component of the shadow economy responding to fiscal shocks, I adopt an additional manipulation. Building on the approach used by Colombo et al. (2022), I consider, for each country, the average size of labor market informality over time ($s_i = \bar{s}_{it}$).

¹⁴It is noteworthy that while the conventional practice often involves adopting a value of $\lambda = 1600$ for filtering quarterly data, as recommended by Hodrick and Prescott (1997), consensus on the smoothing parameter's value for other data frequencies remains elusive. Notably, various trend-cycle decompositions on annual data employ $\lambda = 6.25$. However, there are deviations from this standard; for instance, Backus and Kehoe (1992) advocate for $\lambda = 100$, while Flaig (2015) argues that the customary $\lambda = 1600$ for quarterly data might be insufficient for many macroeconomic time series, suggesting the use of higher values for accurate trend-cycle decompositions. In this analysis, I calibrate λ to 100 in the primary investigation and to 6.25 in a robustness check, yielding indistinguishable outcomes, detailed in section C of the Appendix.

4.3 Anticipation and Exogeneity of Fiscal Policy

A common criticism directed at the estimation of fiscal shocks from data is the potential anticipation of these shocks by economic agents (households and the private sector), which can lead to inaccurate estimates (Perotti 2011; Ramey 2011). Leeper et al. (2013) highlight the importance of accounting for fiscal foresight and the flow of information about fiscal policy in econometric analyses to avoid biases in estimated output multipliers for taxes. Moreover, Hernandez de Cos and Moral-Benito (2013), as well as Jordà and Taylor (2016), among others, argue that fiscal adjustments identified through the narrative approach might be predictable based on their own historical trends or past values of economic variables.

To assess whether the “*exogenous*” fiscal consolidation narratives can be anticipated by economic agents, I conduct a straightforward OLS regression where I regress the narrative fiscal shocks on lagged values of GDP growth and the level of debt. Given that the narrative approach identifies fiscal consolidation episodes based on timing and size, this procedure enables an investigation into whether either of these sources can be predicted by past values of macroeconomic variables.

The regression takes the form of the following equation:

$$\Delta FC_{i,t} = \alpha + \beta_1 GDP\ growth_{t-1} + \beta_2 GDP\ growth_{t-2} + \gamma Debt\ level_{t-1} + \varepsilon_{i,t} \quad (3)$$

where the left-hand side dependent variable represents the same fiscal consolidation measures used in equations (1) and (2). The right-hand side variables include the first and second lag of the real GDP growth rate as well as the first lag of the sovereign debt as a share of GDP.

The results of equation (3) are presented in Table 4. The OLS regression does not reveal a significant relationship between past values of macroeconomic variables and future policy actions. While, the lagged GDP growth rate appears to predict future total adjustments, the coefficient is only significant at the 10% level. Overall, the empirical analysis suggests that past values of macroeconomic variables do not significantly contribute to explaining the future outcomes of fiscal policy. This finding reinforces the notion that the discretionary changes in taxes and government spending, by definition, reflect a desire to reduce the budget deficit and maintain long-term fiscal health and are not a response to prospective economic conditions.

In the spirit of Jordà and Taylor (2016), I perform an additional exercise to conduct an overlap check of the propensity score distributions for treated units, labelled as “fiscal

treatment”, taking a value of 1 when a fiscal adjustment occurs, and of control units, taking a value of 0 when there is no fiscal consolidation (Cf. section 7.2).

Table 2: Testing the predictability of fiscal policy episodes using a simple OLS regression

Fiscal consolidation	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\gamma}$	R^2	N
Tax-based	-0.0122 (0.009)	0.0009 (0.008)	0.001 (0.001)	0.13	358
Spending-based	-0.008 (0.005)	-0.0044 (0.005)	-0.0008 (0.0008)	0.18	358
Total	-0.02 * (0.012)	-0.003 (0.011)	0.0006 (0.002)	0.15	358

Note: * Significant at the 10% level , ** significant at the 5% level, *** significant at the 1% level.

While this simple empirical analysis demonstrates that “*exogenous*” future policy actions cannot be predicted based on past values of macroeconomic variables, it does not provide sufficient proof to confidently assert the absence of anticipation effects from households. As exogeneity and non-anticipation should both characterize the identified fiscal shocks, I include a covariate in all regressions, representing the difference between announced and implemented fiscal policies. The rationale for this inclusion is to help align the information available for the empirical analysis with the information available to economic agents. ¹⁵

Therefore, I construct the impulse responses on the basis of the following assumptions:

- (1) *Each economy remains in a given regime for at least 4 years.*
- (2) *The country average of the secular trend component of labor market informality does not respond to fiscal policy.*

The first assumption implies that the fiscal multiplier is computed for the four years of the current state of the economy, effectively converting the nonlinear model across the two states into a linear model for each of the two states. The second assumption is supported

¹⁵The narrative dataset crafted by David and Leigh (2018) is structured to encompass fiscal measures following their official announcement and excludes all announced measures that did not translate into implementation. Moreover, the dataset comprehensively encompasses narrative descriptions of governmental announcements, encompassing measures that were partially executed or remained entirely unrealized.

by taking the more secular component of the state variable and dropping out the cyclical component, which is more likely to respond to changes in fiscal policy.

5 Results and Discussions

I will now present and discuss the key results of my analysis. I begin by examining the outcomes from the linear model, where the assumption is that fiscal multipliers remain unaffected by the state of the economy. Subsequently, I delve into the results derived from the nonlinear model, which implies that fiscal multipliers are influenced by the degree of informality in the economy. This latter section addresses the central question of this paper, which revolves around the state-dependent nature of fiscal multipliers.

I compute these multipliers over four horizons, capturing the cumulative response of GDP to fiscal shocks over four years.¹⁶ The presented results include 90 percent confidence bands, derived using Driscoll and Kraay's (1998) standard errors, which are spatial correlation consistent (SCC) standard errors, and accommodate various forms of spatial and temporal dependence, effectively addressing serial correlation in regressions, particularly as the time dimension becomes extensive.

5.1 The Response of Output to Fiscal Consolidation Shocks

Figure 6 reports the cumulative dynamic impulse responses of the (log) level of real GDP, derived from the estimation of equation (1), following a 1% of GDP tax-based (left-hand side), spending-based (right-hand side), and total (below) fiscal consolidation shock. These impulse response functions portray the estimated output multipliers at different horizons.

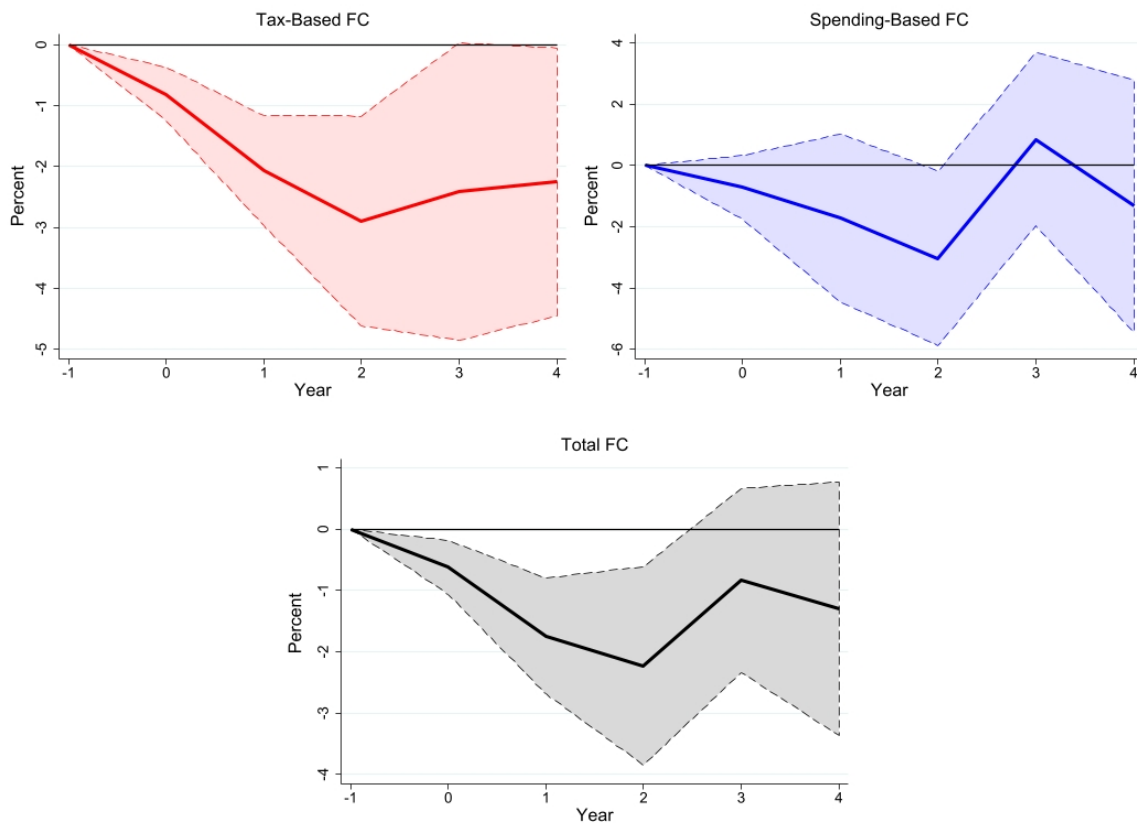
The results indicate that a 1% of GDP (total) fiscal consolidation triggers a notable output contraction. Specifically, a significant 0.624% contraction on impact, followed by further declines of 1.742% after one year, and 2.230% after two years. The magnitude of the impact contraction closely aligns with the findings of Carrière-Swallow et al. (2021) for LAC economies (0.5%), which similarly show scaling-up recessionary effects of fiscal adjustments on real GDP.

¹⁶A confined time frame can lack the informational breadth needed to infer the medium- and long-term dimensions of fiscal multipliers, which can markedly diverge from their short-term levels. As underscored by Drautzburg and Uhlig (2015), extended-term multipliers are notably sensitive to factors such as distortionary taxation. The authors' investigation reveals a positive short-term fiscal multiplier of 0.53 and long-term negative fiscal multipliers, approximately -0.36, in response to the American Recovery and Reinvestment Act (ARRA) of 2009.

While the contraction of output following a 1% of GDP spending-based fiscal consolidation appears substantial, it does not exhibit statistical significance. In contrast, tax-based consolidations do induce significant decreases in real GDP. Tax-based adjustments results in a contraction of 0.811% at impact, followed by further declines of 2.069% after one year, and 2.894% after two years.

These findings suggest that tax hikes have a recessionary impact on the economy, while the effects of spending cuts do not significantly deviate from zero. However, it's important to interpret the latter cautiously, considering the broad confidence interval for spending-based consolidation. This interval's breadth may stem from relatively few non-zero observations, potentially impacting statistical power.

Figure 6: Impact of Fiscal Consolidation on GDP



Note: The solid lines represent the cumulative response of real GDP to a fiscal consolidation shock; Year = 0 is the year of shock. The shaded areas denote the 90 percent confidence intervals based on Driscoll-Kraay standard errors that are robust to autocorrelation and cross-sectional dependence.

5.2 Output, Fiscal Consolidation, and Informality

Figure 7 reports and contrasts the cumulative dynamic impulse response of the (log) level of real GDP to a 1% of GDP tax-based (left-hand side), spending-based (right-hand side), and total (below) fiscal consolidation shock according to the level of informality in the economy, derived from the estimation of equation (2). These impulse responses can be interpreted as the impact of 1 percentage point increase in informality on the estimated output multiplier at various horizons.

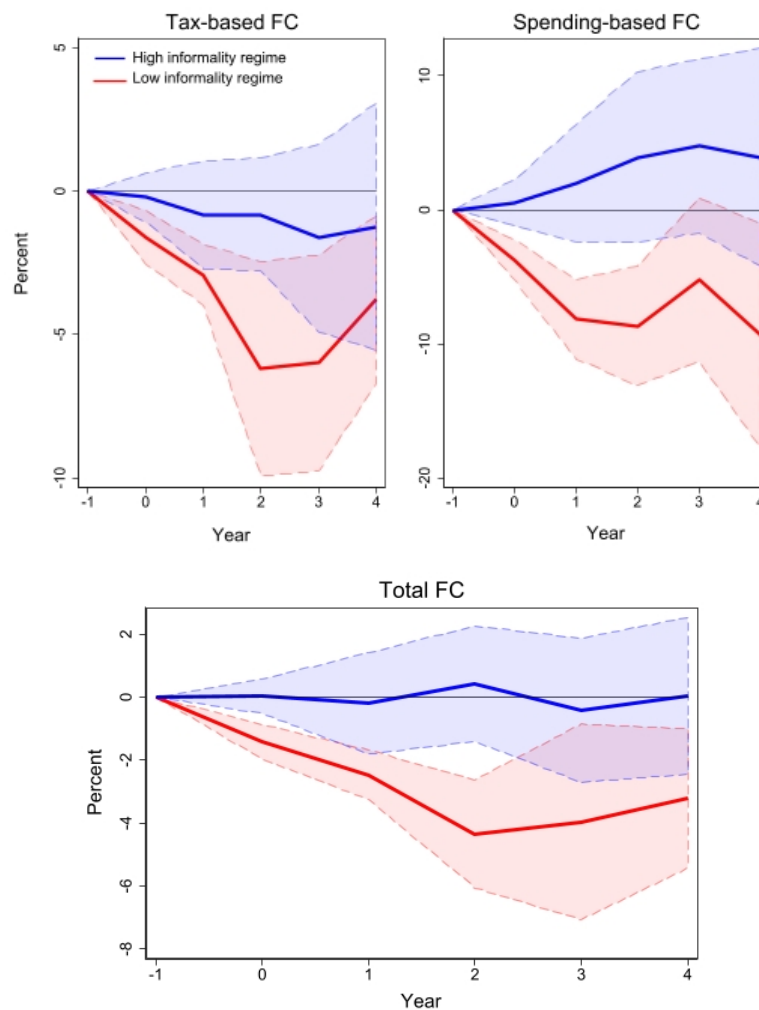
The findings reveal a striking pattern: the impact of fiscal consolidations is affected by the size of the informal economy. In countries with significant informal markets, the effects of fiscal consolidation are dampened, while in nations with smaller informal sectors, the effects are amplified. Specifically, the impulse responses demonstrate that fiscal consolidation policies in countries with relatively small shadow economies tend to induce recessionary effects on output. Consistent with the findings of Carrière-Swallow et al. (2018) for their comprehensive sample of LAC economies, spending-based consolidations prove to be more contractionary than tax-based consolidations. Consequently, spending-based adjustments exhibit larger multipliers.¹⁷

Notably, the response of output to a 1% of GDP spending-based fiscal consolidation in highly informal economies seems suggestive of the expansionary austerity phenomenon. However, the lack of statistical significance prevents robust interpretations of this observation.¹⁸

¹⁷This outcome is evident in their initial working paper (2018), though it does not appear in the subsequent published version of their paper (2021).

¹⁸Expansionary effects of credible fiscal consolidation can be driven by the anticipation of a lower future tax burden by both households and the private sector.

Figure 7: Impact of Fiscal Consolidation on GDP conditional on Informality Levels



Note: The solid lines represent the cumulative response of real GDP to a fiscal consolidation shock; Year = 0 is the year of shock. The blue lines represent high-informal economies and the red lines low-informal economies. The shaded areas denote the 90 percent confidence intervals based on Driscoll-Kraay standard errors that are robust to autocorrelation and cross-sectional dependence.

Table 3 presents the outcomes of various model specifications. Panel A showcases the results of the baseline LP model represented by equation (1). Panel B presents the results of the STLP model outlined in equation (2), while panel C reports the results of the STLP model, including the additional controls discussed in section 4.

According to the linear model, as indicated in panel A, a 1% of GDP total fiscal consolidation would prompt an approximately 0.624% contraction in output during the implementation year. This contraction scale-up then dies out after two years, driven primarily by the recessionary effect of tax-based consolidations, culminating in a 2.894% contraction within a two-year horizon. However, panel A offers insights into a hypothetical economy devoid

of informal markets, rendering it inadequate for assessing the influence of informality on fiscal policy outcomes.

The findings from the state-dependent model in panel B are intriguing. The contractionary effects of fiscal adjustments are significant solely in countries with relatively small informal sectors. Moreover, spending-based consolidations prove more recessionary than tax-based ones in these economies. This result aligns with the findings of Carrière-Swallow et al. (2018), which reveal larger recessionary effects of spending-based adjustments compared to tax-based adjustments in LAC countries.¹⁹

Panel C presents the results obtained from the STLP model, incorporating additional covariates discussed in section 4.1. These covariates encompass the contemporaneous growth rate of the real effective exchange rate (REER) and the contemporaneous debt-to-GDP ratio, as well as their two lags. The augmented model's results closely resemble those of panel B. Notably, incorporating these controls diminishes the estimated output cumulative response to a 1% of GDP fiscal consolidation shock, leading to lower estimated multipliers. However, the results in panel C consistently underscore stronger recessionary effects of fiscal adjustments in economies with low informality levels compared to those with high informality.

While the sign and economic interpretation of the estimated fiscal multipliers remain robust with the inclusion of the additional covariates, it's important to note that countries with substantial informal markets exhibit a significant but relatively small negative short-lived response to tax-based consolidations at one-year and two-year horizons, as well as to total fiscal consolidations at a one-year horizon. Consequently, for further analysis, the augmented STLP model specification in panel C emerges as the preferred choice over the former specification in panel B.

¹⁹In contrast, the authors' findings for a collection of advanced economies reveal a contrasting pattern: spending-based consolidations exhibit a lesser degree of contraction on average compared to tax-based consolidations.

Table 3: Estimation results: Cumulative Fiscal Consolidation Multipliers (Panel A), Effect of Labor Market Informality on the Cumulative Fiscal Consolidation Multipliers (Panel B), Augmented Model (Panel C)

Time horizon :	Impact	Year 1	Year 2	Year 3	Year 4
Panel A : Baseline model					
Tax-Based FC	-0.811 *** (0.269)	-2.069 *** (0.549)	-2.894 *** (1.047)	-2.410 (1.484)	-2.252 * (1.336)
Spending-Based FC	-0.717 (0.633)	-1.715 (1.665)	-3.029 * (1.733)	0.849 (1.715)	-1.317 (2.509)
Total FC	-0.624 ** (0.267)	-1.742 *** (0.575)	-2.230 ** (0.984)	-0.839 (0.913)	-1.297 (1.255)
Panel B : STLP model					
Tax-Based FC x Informality					
<i>Low-Informality Regime</i>	-1.605 *** (0.571)	-2.912 *** (0.639)	-6.203 *** (2.273)	-5.989 *** (2.288)	-3.790 ** (1.784)
<i>High-Informality Regime</i>	-0.231 (0.525)	-0.828 (1.140)	-0.810 (1.200)	-1.635 (1.989)	-1.235 (2.617)
Spending-Based FC x Informality					
<i>Low-Informality Regime</i>	-3.709 *** (0.896)	-8.175 *** (1.793)	-8.668 *** (2.712)	-5.211 (3.723)	-9.394 * (5.079)
<i>High-Informality Regime</i>	0.510 (1.049)	1.974 (2.647)	3.924 (3.885)	4.759 (3.931)	3.914 (4.970)
Total FC x Informality					
<i>Low-Informality Regime</i>	-1.419 *** (0.333)	-2.471 *** (0.480)	-4.347 *** (1.043)	-3.965 ** (1.890)	-3.219 ** (1.347)
<i>High-Informality Regime</i>	0.026 (0.333)	-0.202 (0.980)	0.425 (1.118)	-0.421 (1.392)	0.042 (1.515)
Panel C : STLP model with additional controls					
Tax-Based FC x Informality					
<i>Low-Informality Regime</i>	-1.123 *** (0.416)	-2.758 *** (0.693)	-5.231 ** (2.319)	-5.236 ** (2.240)	-3.551 *** (1.144)
<i>High-Informality Regime</i>	-0.606 (0.373)	-1.497 ** (0.725)	-1.875 * (1.044)	-2.046 (1.477)	-2.976 (2.032)
Spending-Based FC x Informality					
<i>Low-Informality Regime</i>	-2.774 *** (1.012)	-6.690 *** (2.261)	-6.946 ** (2.976)	-4.925 (5.436)	-8.959 * (4.926)
<i>High-Informality Regime</i>	-0.406 (1.225)	0.201 (3.718)	1.359 (2.177)	3.406 (3.639)	2.850 (6.261)
Total FC x Informality					
<i>Low-Informality Regime</i>	-1.093 *** (0.327)	-2.430 *** (0.581)	-3.655 *** (1.243)	-3.449 * (2.098)	-3.031 *** (1.048)
<i>High-Informality Regime</i>	-0.397 (0.292)	-0.987 * (0.535)	-0.686 (0.735)	-1.054 (1.156)	-1.661 (1.284)
Country fixed effects	Yes				
Year fixed effects	Yes				

Note: All regressions include country and time fixed effects. Driscoll-Kraay standard errors in parentheses. Year = 0 is the year of shock. * Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

6 Transmission Mechanisms

In this section, I will address a pivotal question that remains unanswered: Why do the effects of fiscal policy vary in the presence of substantial informal markets? To uncover an explanation, we must delve into the economic policy transmission channels influenced by the shadow economy.

To assess the validity of these potential transmission channels, I use a variant of equation (2) featuring alternative dependent variables, each representing one of the suspected mechanisms through which informality shapes the consequences of fiscal policy. These channels include domestic demand (private consumption and private investment) as well as the level of unemployment. In each regression, I incorporate the first and second lags of the endogenous dependent variable as an explanatory variable.

Figure 9 depicts the responses of private consumption, private investment, and unemployment to a 1% of GDP fiscal consolidation shock, according to the relative level of labor market informality in the economy.

Interestingly, in countries with larger informal sectors, fiscal consolidation appears to have a limited impact on private consumption. However, in economies with smaller informal markets, austerity measures exert a pronounced recessionary effect. Notably, the immediate negative response of private consumption isn't statistically significant for spending-based adjustments, but takes one year to fully materialize. One plausible explanation is that economic agents may anticipate higher provision of public goods and services, leading to high consumer confidence the moment the fiscal consolidation is executed, in line with the "*expansionary fiscal contraction*" phenomenon. However, this positive impact seems to be offset a year after implementation due to the adverse effects of higher taxes and reduced spending on household income, leading to decreased consumption levels. The findings also highlight that spending cuts exhibit stronger short-term contractionary effects, whereas tax hikes manifest as more potent recessionary measures in the long run.

Private investment is strongly crowded-out at impact by both tax hikes and spending cuts in economies with relatively low informality levels. The decline is particularly pronounced after spending-based fiscal adjustments. Conversely, there's no discernible evidence of crowding-out effects on private investment following fiscal consolidation policies in highly informal economies.

For countries with smaller shadow economies, the unemployment rate's peak response is more pronounced following tax-based fiscal consolidations. This response reaches up to 2.546 percentage points within a two-year horizon, subsiding after the third year post-fiscal shock. The impact of spending-based fiscal adjustments on the unemployment rate isn't significant initially. However, it does show a substantial rise of 2.074 and 2.387 percentage points within one-year and two-year horizons, respectively. Total fiscal consolidation shocks lead to an initial increase of 0.412 percentage points in the unemployment rate, scaling up to 0.8 percentage points after one year, then reaching 1.247 percentage points after two years, before tapering off around the third year after the fiscal shock. These unemployment responses align closely at impact and slightly surpasses at a one and two-years horizon those found by Carrière-Swallow et al. (2021) for a panel of 14 LAC economies.

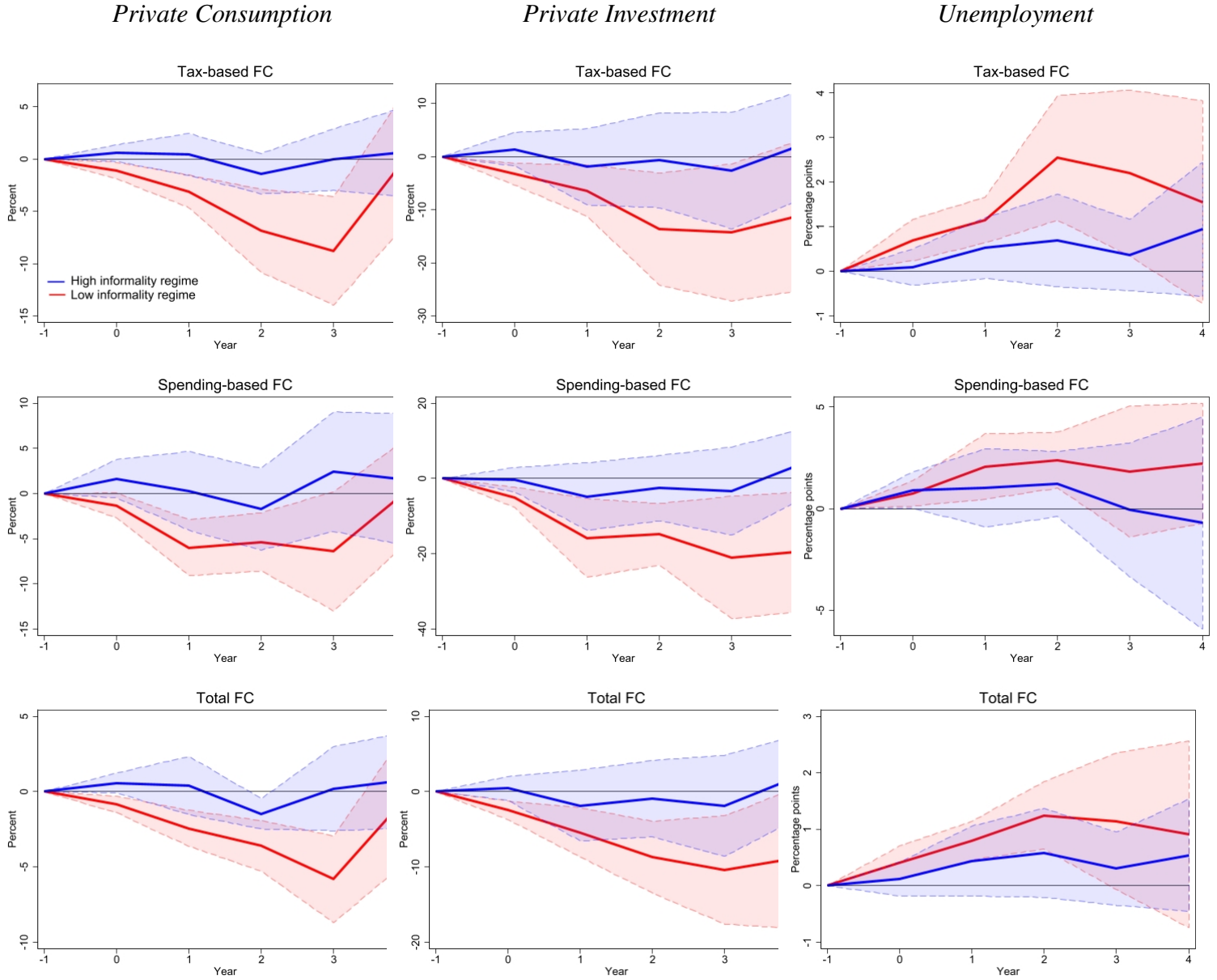
Their study shows an increase in the unemployment rate of 0.3 percentage points over two years, compared to an unemployment rate multiplier of 0.5 percentage points observed for advanced economies over the same period.

The results reveal crowding-out effects in economies with relatively low informality levels, as private consumption and private investment decline and unemployment rises after a fiscal consolidation measure is undertaken. The magnitude of the multiplier appears substantial and significant in the presence of small informal markets. This result is very interesting, as it shows how sensible the private demand is to fiscal policy in countries with relatively low informality levels.

Despite the apparent positive response of household consumption in high informal economies following austerity measures, the wide confidence intervals preclude robust deductions.

These findings show that countries with larger informal sectors possess a degree of “shielding” against the recessionary effects of fiscal consolidation on domestic demand and unemployment. However, what drives this remarkable resilience? One potential explanation lies in the relatively limited tax base of developing and emerging economies due to elevated informality levels. This could lead to a contraction in the portion of economic agents affected by fiscal adjustment measures, consequently mitigating the overall impact of austerity on the economy as a whole.

Figure 8: Impact of Tax-Based, Spending-Based, and Total Fiscal Consolidations on Private Consumption, Private Investment, and Unemployment, conditional on Informality Levels



Note: The solid lines represent the cumulative response of the dependent variable to a fiscal consolidation shock; Year = 0 is the year of shock. The blue lines represent high-informal economies and the red lines low-informal economies. The shaded areas denote the 90 percent confidence intervals based on Driscoll-Kraay standard errors that are robust to autocorrelation and cross-sectional dependence.

7 Further Investigations

7.1 The “Twin Deficits” Hypothesis

Is there empirical evidence of the so-called “twin deficits” hypothesis in LAC economies? If so, how does labor market informality influence such a relationship? As this phenomenon stems from the positive correlation between the primary balance and the current account balance, we must analyze the response of the latter following the fiscal shocks.

Conventional wisdom, supported by the traditional Mundell-Fleming model, suggests that government deficits (fiscal stimuli) lead to an appreciation of the real exchange rate, thus impairing competitiveness and causing a deterioration of the current account balance. Conversely, government consolidations result in a depreciation of the real exchange rate, enhancing competitiveness and potentially improving the current account balance. I examine in this section whether these theoretical presumptions hold in LAC economies and explore the role of labor market informality in shaping this relationship.

Figure 10 depicts the response of the external current account balance-to-GDP ratio, net exports as share of trend GDP, and the real effective exchange rate to a 1% of GDP fiscal consolidation shock, according to the level of labor market informality in the economy.²⁰

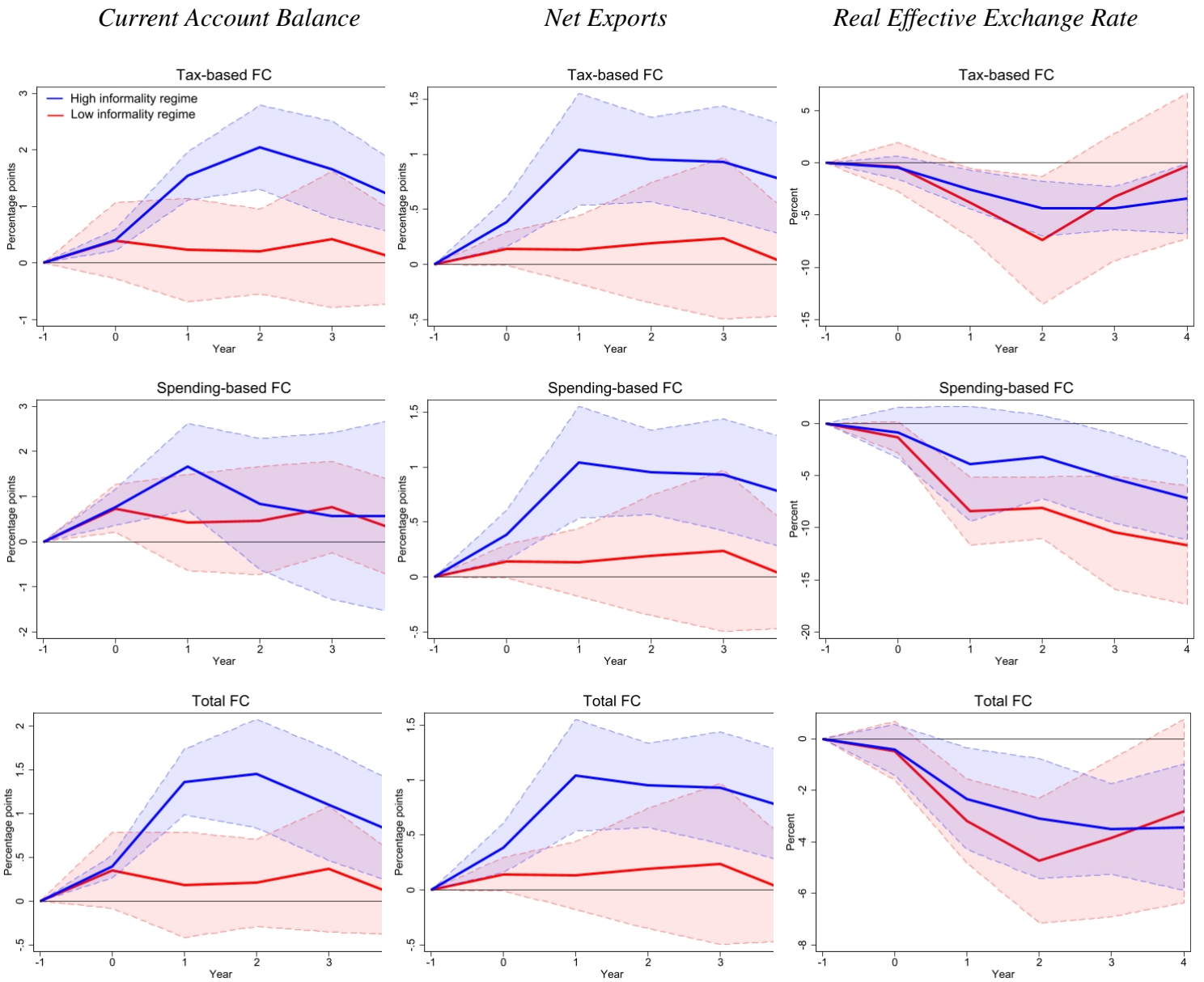
The results reveal a substantial improvement of the current account balance following tax-based consolidations in highly informal countries, peaking at 2 percentage points after two years and lasting more than four years after the fiscal shock. In contrast, countries with relatively low informality levels do not experience a significant improvement of the current account balance. In response to spending-based consolidations, highly informal economies witness a significant improvement in the current account balance, but this effect is relatively short and dissipates between one and two years following the fiscal shock after increasing by 1.6 percentage points over a one-year horizon. Conversely, countries with relatively small informal sectors display an improvement in the current account balance that is only significant at impact.

These findings show that fiscal consolidation fails to significantly enhance the current account balance in LAC economies characterized by relatively small informal sectors. Conversely, economies with higher informality rates exhibit a pronounced and significant enhancement of the current account balance. This improvement, over extended horizons, seems to be primarily driven by tax-based austerity measures.

These results imply that the “twin deficits” hypothesis holds primarily in countries with substantial shadow economies, aligning with the conclusions of Carrière-Swallow et al. (2021), which highlight a more pronounced enhancement of the current account balance in LAC economies compared to OECD countries, where a 1% of GDP fiscal consolidation raises the current account balance by 0.8% in LAC and 0.5% in OECD economies after two years.

²⁰The external current account balance-to-GDP ratio is from the WDI collection of the World Bank. Net exports as share of trend GDP are constructed using the Hodrick-Prescott filter with a smoothing parameter of 6.25.

Figure 9: Impact of Tax-Based, Spending-Based, and Total Fiscal Consolidations on the External Current Account Balance, Net Exports, and the Real Effective Exchange Rate, conditional on Informality Levels



Note: The solid lines represent the cumulative response of the dependent variable to a fiscal consolidation shock; Year = 0 is the year of shock. The blue lines represent high-informal economies and the red lines low-informal economies. The shaded areas denote the 90 percent confidence intervals based on Driscoll-Kraay standard errors that are robust to autocorrelation and cross-sectional dependence.

For countries characterized by relatively large shadow economies, the results indicate a significant depreciation of the real effective exchange rate following fiscal consolidations. This depreciation becomes noticeable around one year following tax-based and total fiscal adjustments, and around the third year following spending-based consolidations. These responses of the real effective exchange rate align with the behavior of the current accounts in highly informal economies after fiscal shocks.

In contrast, while the current account balance does not experience significant improvement following fiscal consolidations in economies with relatively low informality levels, Figure 9 reveals a substantial and significant depreciation of the real effective exchange rate. This depreciation exceeds 10% over a four-year horizon following spending-based consolidations, reaches a peak of 4.7% in the second year following total fiscal consolidations, and significant at one- and two year horizons following tax-based consolidations, reaching a peak of 7.4% in the second year after the tax shock.

However, unlike the situation in highly informal economies, we cannot conclude that the real exchange rate depreciation in countries with relatively small informal markets is associated with an improvement in the current account balance, as the upward impulse responses of the latter are not significant. In the case of countries with substantial shadow economies, these findings align with standard macroeconomic models featuring non-Ricardian elements. According to these models, the real exchange rate acts as a passthrough from fiscal policy to current accounts. The real exchange rate depreciation stimulates exports and raises the cost of imports. This trade balance improvement contributes to an overall current account surplus, effectively offsetting the negative impacts of reduced government spending. The lack of empirical evidence for the “twin-deficits” hypothesis in economies with lower informality levels can be explained by the Ricardian theory, which suggests that the effects of fiscal policy can be counteracted by the saving behavior of households, potentially stemming from a precautionary motive.

As illustrated in Figure 9, there is a noteworthy alignment between the response of the current account balance and the response of net exports following austerity shocks in economies characterized by high levels of informality. However, this relationship appears to be notably weaker in countries with relatively low levels of informality. The contrasting behavior of net exports in these two distinct groups of countries provides a compelling and relevant explanation for the central findings of this paper, as illuminated by the following fundamental macroeconomic accounting identities:

$$Y = C + I + G + NX \quad (4)$$

where :

$$NX = X - M$$

$$CA = S - I \quad (5)$$

In countries with relatively small shadow economies, the response of net exports to fiscal adjustment is muted, and the same holds true for the current account balance. According

to equation (5), the current account is equal to the difference between national saving and investment, with savings comprising private and government components. For the current account to remain minimally affected by austerity shocks, the significant decline in investment must be counterbalanced by a reduction in savings. Given that fiscal consolidation seeks to diminish the primary budget deficit through spending cuts and revenue mobilization, it is improbable that these measures would result in reduced government savings. Instead, given the pronounced crowding-out of domestic demand, private agents tend to smooth their consumption patterns over time, often resorting to dis-saving behaviors to preserve purchasing power. The absence of significant reaction of the current account to fiscal consolidation in countries with relatively low informality levels implies, as indicated by equation (4), that the significant declines in consumption, investment, and government spending are directly mirrored by a substantial decrease in output, ultimately resulting in recessionary effects.

Conversely, in countries with relatively large shadow economies, the impact of austerity shocks on consumption and investment is less pronounced. Fiscal consolidations in these economies lead to a depreciation of the real exchange rate, which, in turn, stimulates exports of goods and services while rendering imports more expensive. This dynamic boosts net exports, a critical component of the current account. The increase in net exports contributes to an overall surplus in the current account, effectively offsetting the adverse effects of reduced government spending.

Table 4 succinctly summarizes the core findings, displaying the direction of the response for each macroeconomic variable of interest following the fiscal shocks.

Table 4: Summary of Results: The Impact of Austerity Shocks on Macroeconomic Variables Based on Labor Market Informality Levels

Variables	Y	C	I	NX	CA	REER	U
Low informality levels	–	–	–	0	0	–	+
High informality levels	0	0	0	+	+	–	0

Note: The signs correspond to those of the impulse response functions. A ‘0’ is assigned to non-significant responses. From left to right, the variables represent the following macroeconomic indicators: real GDP, private consumption, private investment, net exports (computed as the difference between goods and services exports and imports), the current account balance, the real effective exchange rate, and the unemployment rate.

7.2 An Overlap Check: The Empirical Distributions of the Treatment Propensity Score

It is well known in medical and other research fields that whenever observable idiosyncratic characteristics dictate the likelihood of treatment, such as a vaccination campaign, which in turn shapes the outcomes, the measured treatment effect is potentially biased. Propensity score techniques, common in various fields of research, including biology, epidemiology, and applied microeconomics, could be relied on as an alternative method when the conditions for a randomised trial are not fully satisfied.

In order to address the issue of the predictability of fiscal policy, including measures identified through the narrative approach, Jordà and Taylor (2016) propose a novel procedure consisting of an adjustment method based on an augmented inverse propensity-score weighted (AIPW) regression, which builds upon the work of Angrist et al. (2013), and introduces inverse probability weighted estimators of average treatment effects (ATEs) for time series data.

In this section, I assess the predictability of the narrative fiscal consolidations used in the main analysis of this paper, in the spirit of Jordà and Taylor (2016). The intuition behind this method is simple: fiscal measures that are more likely to be predictable are assigned less weight, while fiscal measures that are less likely to be predictable are given a higher weight. The weights are computed based on the predicted component of the narrative fiscal shocks, which is estimated with a probit model to predict the probability of occurrence of a fiscal adjustment. The predictability is assessed on the basis of a vector of appropriate explanatory variables. While I do not apply the AIPW estimator to measure the ATE of fiscal policy (unlike Jordà and Taylor (2016)), I compute the likelihood of each type of fiscal consolidation for treated and control units, then compare the smooth kernel density estimates of the propensity score distribution to ascertain if a significant overlap exists.

In order to estimate the propensity scores, I consider the narrative fiscal shocks as a “fiscal treatment” and create a binary indicator that takes the value of 1 when a fiscal adjustment is undertaken and 0 otherwise. Subsequently, I compute the probability of treatment (i.e., the probability of occurrence of a fiscal adjustment) for tax-based, spending-based, and total fiscal consolidations.²¹ To proceed, I estimate the following probit model:

$$P(\text{fiscal treatment}_{i,t,f} = 1 \mid X_{i,t,f}) = \phi(X_{i,t,f}^T \beta) + \eta_{i,t} \quad (6)$$

$$\text{where : } \quad \text{fiscal treatment}_{i,t,f} = \begin{cases} 1 & \text{if a fiscal consolidation of type } f \text{ occurs} \\ 0 & \text{otherwise} \end{cases}$$

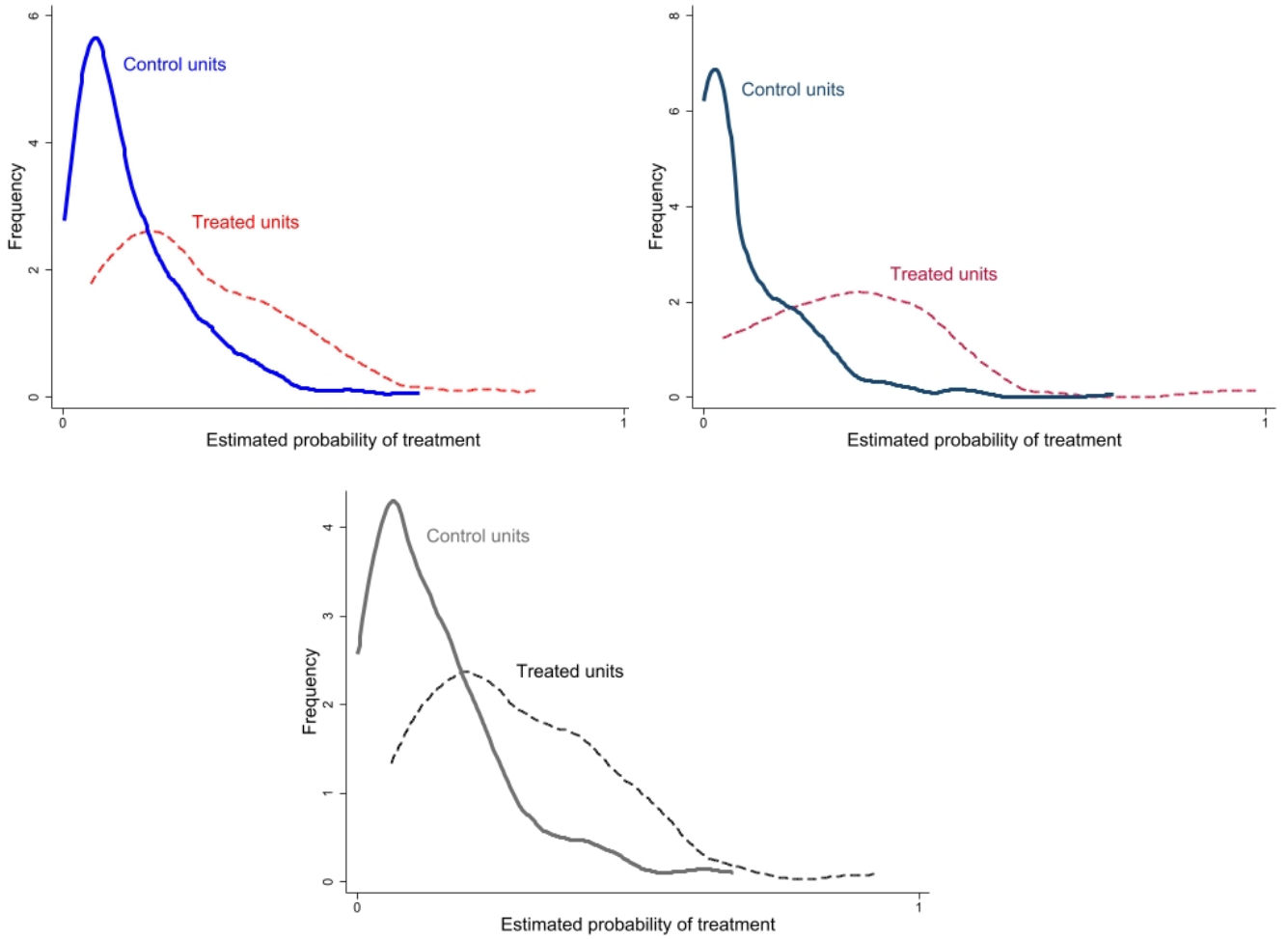
²¹As noted by Carrière-Swallow et al. (2021), a limitation of this approach is that it overlooks the extent of the fiscal measure and solely considers its temporal placement. However, it is important to emphasize that the objective of this endeavor is not to estimate the ATE of fiscal policy, for which the magnitude of fiscal shocks would hold significance. Instead, the focus rests on establishing a propensity score rooted in a binary variable solely connected to the temporal aspect of fiscal shocks.

where P is the probability of occurrence of a fiscal consolidation of type f , in country i , at year t , labelled as “fiscal treatment”, which is a binary response variable. Φ is the cumulative distribution function of the standard normal distribution, $X_{i,t,f}$ is a vector of predictors, including several covariates: two lags of the fiscal adjustment in question (lagged treatment), two lags of real GDP growth, growth rates of the commodity export value and its two lags, lagged government debt-to-GDP ratio, lagged current account balance-to-GDP ratio, and country fixed effects. The parameters, estimated by maximum likelihood, are denoted by β , and $\eta_{i,t}$ is the error term.

Figure 10 presents the smooth kernel density estimates of the propensity score distribution for treated and control units, of each type of the fiscal adjustments of interest.

In the ideal scenario of a randomized control trial (RCT), treated and control groups would exhibit identical and uniform empirical distributions of the propensity score. At the other extreme, if a fiscal consolidation is undertaken in response to the contemporaneous state of the economy, then the distribution of control units (when there is no fiscal consolidation) would peak at 0 and be 0 elsewhere, and the distribution of treated units (when a fiscal consolidation occurs) would peak at 1 and be 0 elsewhere. Nonetheless, the figures show a large overlap between the propensity score distributions of the treatment and control groups for each type of fiscal adjustment. Indeed, this result strongly suggests that attempting to predict the occurrence of a fiscal consolidation based on the state of the economy is a formidable challenge. Furthermore, as the estimated probability of treatment approaches unity, the frequency of observations approaches zero. Consequently, it becomes evident that anticipating the onset of a fiscal adjustment is not easily achievable by relying solely on the prevailing economic conditions.

Figure 10: Overlap Check: Empirical Distributions of the Treatment Propensity Score for Tax-Based (left), Spending-Based (right), and Total (below) Fiscal Consolidations



8 Conclusion

This paper combines the robustness of local projections with the appeal and strength of smooth-transition regime-switching models to add to a recent literature that uses the narrative approach to identify the effects of fiscal policy. The central finding underscores the pivotal role of labor market informality in shaping the effects of austerity in developing and emerging economies.

Fiscal consolidation is found recessionary in countries with relatively low informality rates, whereas its impact is notably dampened in highly informal countries. Whilst the literature points out larger recessionary effects of tax-based consolidation compared to spending-based consolidation in advanced economies, this paper concludes that in the developing and emerging markets of LAC, spending cuts are more harmful to the economy than tax hikes. The economic contraction is not only strong and significant but also long lasting; even four years after the austerity shock, the multipliers in low informality regimes reach as high as 3.5 for tax-based adjustments, 8.9 for spending-based adjustments, and 3 for total adjustments. These findings indicate that the size of the shadow economy is a key element elucidating the varying magnitudes of fiscal multipliers observed across industrialized and developing economies, suggesting that the recessionary effects of austerity are less severe in less developed countries.

In line with the Ricardian equivalence theory, I find empirical evidence supporting the “twin deficits” phenomenon in highly informal economies, where a 1% of GDP fiscal consolidation triggers a significant improvement in the external current account balance, with a notable increase of 2% following tax-based consolidations and a rise of 1.6% following spending-based adjustments. Furthermore, a pronounced and significant depreciation of the real effective exchange rate is observed. In contrast, no support is found for the existence of the “twin deficits” phenomenon in countries with relatively small informal markets, where the response of net exports to fiscal consolidations is subdued. In such cases, the crowding-out effect on domestic demand is mirrored by a significant decrease in output. Conversely, net exports experience a notable increase in highly informal economies, propelled by the real exchange rate depreciation, that effectively offsets the adverse consequences of reduced government spending.

The empirical findings debunk the hypothesis that larger shadow economies might cause stricter fiscal rectitude, as they may hinder governments strategy in implementing stabilization policies and thus leading to more pronounced recessionary outcomes, particularly as the labor market informality intensifies. Instead, my results suggest that the size of the underground economy is negatively correlated with the size of the tax base, implying that a larger proportion of economic agents are ‘shielded’ from revenue mobilization and spending reduction as informality rates rise. Simulating a “social buffer”, large informal sectors play a critical role in mitigating the contractionary impact of austerity. This may occur by providing employment opportunities to dismissed workers as a second-best alternative to unemployment and by fostering an environment conducive to tax evasion, which boosts the appeal of the less productive informal sector and potentially leads to the emergence of new investment opportunities.

Deeper theoretical insights are needed in order to comprehensively understand the various channels through which labor market informality shapes the effects of macroeconomic policy. Additionally, a more precise measurement of the underground economy is crucial for better grasping the effectiveness of fiscal policy in developing countries and emerging markets.

While existing studies tend to focus on the short-term impact of fiscal consolidation, this paper takes a step further by assessing the medium-term consequences of different types of fiscal adjustments, contingent on the level of labor market informality in the economy. Nonetheless, further investigation is warranted to gain a comprehensive understanding of the long-term effects of fiscal policy, particularly on government budget balances and sovereign debt levels. I leave this exercise, as well as the exploration of the influence of informality on the consequences of different types of tax and spending policies, as a task for future research.

References

- Alesina, Alberto et al. (2017). “THE EFFECTS OF FISCAL CONSOLIDATIONS: THEORY AND EVIDENCE”. In: *NBER Working Paper Series*. URL: <http://www.nber.org/papers/w23385>.
- Angrist, Joshua D, Òscar Jordà, and Guido Kuersteiner (2013). “Semiparametric Estimates of Monetary Policy Effects: String Theory Revisited”. In: *NBER WORKING PAPER SERIES*. URL: <http://www.nber.org/papers/w19355>.
- Arizala, Francisco et al. (2017). “The Impact of Fiscal Consolidations on Growth in Sub-Saharan Africa”. In: *IMF Working Paper*.
- Auerbach and Gorodnichenko (May 2012a). “Measuring the output responses to fiscal policy”. In: *American Economic Journal: Economic Policy* 4.2, pp. 1–27. ISSN: 19457731. DOI: [10.1257/pol.4.2.1](https://doi.org/10.1257/pol.4.2.1).
- (Nov. 2012b). “Output Spillovers from Fiscal Policy”. In: *NBER Working Paper Series*. URL: <http://www.nber.org/papers/w18578>.
- Auerbach Alan J. and Gorodnichenko Yuriy (June 2013). *Fiscal Multipliers in Recession and Expansion*. Ed. by Alberto Alesina and Francesco Giavazzi. National Bureau of Economic Research, pp. 63–98. ISBN: 9780226018447. URL: <http://www.nber.org/chapters/c12634>.
- Backus, David K and Patrick J Kehoe (1992). *International Evidence on the Historical Properties of Business Cycles*. Tech. rep. 4, pp. 864–888.
- Blanchard, Olivier and Roberto Perotti (2002). “An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output”. In: *Source: The Quarterly Journal of Economics* 117.4, pp. 1329–1368. URL: <https://www.jstor.org/stable/4132480>.
- Born, Benjamin, Falko Juessen, and Gernot J. Müller (Feb. 2013). “Exchange rate regimes and fiscal multipliers”. In: *Journal of Economic Dynamics and Control* 37.2, pp. 446–465. ISSN: 01651889. DOI: [10.1016/j.jedc.2012.09.014](https://doi.org/10.1016/j.jedc.2012.09.014).
- Breusch, Trevor (2005). *Estimating the Underground Economy using MIMIC Models*. Tech. rep.
- Carrière-Swallow, Yan, Antonio C David, and Danie Leigh (2018). *The Macroeconomic Effects of Fiscal Consolidation in Emerging Economies: Evidence from Latin America*. Tech. rep.
- Carrière-Swallow, Yan, Antonio C. David, and Daniel Leigh (Sept. 2021). “Macroeconomic Effects of Fiscal Consolidation in Emerging Economies: New Narrative Evi-

- dence from Latin America and the Caribbean”. In: *Journal of Money, Credit and Banking* 53.6, pp. 1313–1335. ISSN: 15384616. DOI: [10.1111/jmcb.12784](https://doi.org/10.1111/jmcb.12784).
- Céspedes, Luis Felipe and Andrés Velasco (Jan. 2014). “Was this time different?: Fiscal policy in commodity republics”. In: *Journal of Development Economics* 106, pp. 92–106. ISSN: 03043878. DOI: [10.1016/j.jdeveco.2013.07.012](https://doi.org/10.1016/j.jdeveco.2013.07.012).
- Cloyne, James (June 2013). *Discretionary tax changes and the macroeconomy: New narrative evidence from the United Kingdom*. DOI: [10.1257/aer.103.4.1507](https://doi.org/10.1257/aer.103.4.1507).
- Colombo Emilio, Furceri Davide, Pietro Pizzuto, and Patrizio Tirelli (May 2022). “Fiscal Multipliers and Informality”. In: *IMF Working Papers (Asia and Pacific Department)*. URL: <https://ssrn.com/abstract=4117832>.
- Darvas, Zsolt (2012). “REAL EFFECTIVE EXCHANGE RATES FOR 178 COUNTRIES: A NEW DATABASE”. In: *Bruegel Working Paper*.
- David, Antonio C. and Daniel Leigh (Apr. 2018). “A New Action-based Dataset of Fiscal Consolidation in Latin America and the Caribbean”. In: *IMF Working Paper* 2018.094. URL: <https://doi.org/10.5089/9781484353059.001>.
- Drautzburg, Thorsten and Harald Uhlig (Oct. 2015). “Fiscal stimulus and distortionary taxation”. In: *Review of Economic Dynamics* 18.4, pp. 894–920. ISSN: 10942025. DOI: [10.1016/j.red.2015.09.003](https://doi.org/10.1016/j.red.2015.09.003).
- Driscoll, John C. and Aart C. Kraay (1998). “Consistent covariance matrix estimation with spatially dependent panel data”. In: *Review of Economics and Statistics* 80.4, pp. 549–559. ISSN: 00346535. DOI: [10.1162/003465398557825](https://doi.org/10.1162/003465398557825).
- Duarte, Pablo (2014). *The relationship between GDP and the size of the informal economy: Empirical evidence for Spain*. Tech. rep. URL: <http://hdl.handle.net/10419/93062>.
- Elgin, Ceyhun, M. Ayhan Kose, et al. (2021). “Growing apart or moving together? Synchronization of informal and formal economy cycles”. In: *Working Paper, No. 2115, Koç University-TÜSIAD Economic Research Forum (ERF), Istanbul*. URL: <http://hdl.handle.net/10419/243018>.
- Elgin, Ceyhun and OGuz Oztunali (2012). “Shadow Economies around the World: Model Based Estimates”. In: *Bogazici University Department of Economics Working Papers*, pp. 1–48.
- Fernández, Andrés, Andrés González, and Diego Rodríguez (Mar. 2018). “Sharing a ride on the commodities roller coaster: Common factors in business cycles of emerging economies”. In: *Journal of International Economics* 111, pp. 99–121. ISSN: 18730353. DOI: [10.1016/j.jinteco.2017.11.008](https://doi.org/10.1016/j.jinteco.2017.11.008).

- Flaig, Gebhard (2015). *Why We Should Use High Values for the Smoothing Parameter of the Hodrick-Prescott Filter*. Tech. rep. 6.
- Gruss, Bertrand and Suhaib Kebhaj (2019). “Commodity Terms of Trade: A New Database”. In: *IMF Working Paper*. URL: <https://www.imf.org/external/np/res/commod/index.aspx>.
- Guajardo, Jaime, Daniel Leigh, and Andrea Pescatori (2014). “EXPANSIONARY AUSTERITY? INTERNATIONAL EVIDENCE”. In: *Source: Journal of the European Economic Association* 12.4, pp. 949–968. DOI: [10.2307/90023402](https://doi.org/10.2307/90023402).
- Hernández de Cos, Pablo and Enrique Moral-Benito (Dec. 2013). “Fiscal Consolidations and Economic Growth”. In: *Fiscal Studies* 34.4, pp. 491–515. ISSN: 01435671. DOI: [10.1111/j.1475-5890.2013.12017.x](https://doi.org/10.1111/j.1475-5890.2013.12017.x).
- Hodrick, Robert J and Edward C Prescott (1997). *Postwar U.S. Business Cycles: An Empirical Investigation*. Tech. rep. 1, pp. 1–16.
- Ilzetzki, Ethan, Enrique G. Mendoza, and Carlos A. Végh (Mar. 2013). “How big (small?) are fiscal multipliers?” In: *Journal of Monetary Economics* 60.2, pp. 239–254. ISSN: 03043932. DOI: [10.1016/j.jmoneco.2012.10.011](https://doi.org/10.1016/j.jmoneco.2012.10.011).
- Jordà, Òscar and Alan M. Taylor (Feb. 2016). “The Time for Austerity: Estimating the Average Treatment Effect of Fiscal Policy”. In: *Economic Journal* 126.590, pp. 219–255. ISSN: 14680297. DOI: [10.1111/eoj.12332](https://doi.org/10.1111/eoj.12332).
- Jordà Òscar (Mar. 2005). “Estimation and Inference of Impulse Responses by Local Projections”. In: *The American Economic Review* 95.1, pp. 161–182. URL: <https://www.jstor.org/stable/4132675>.
- Leeper, Eric M., Todd B. Walker, and Shu-Chun Susan Yang (2013). “Fiscal Foresight and Information Flows”. In: *Econometrica* 81.3, pp. 1115–1145. ISSN: 0012-9682. DOI: [10.3982/ecta8337](https://doi.org/10.3982/ecta8337).
- Lemaire, Thibault (2020). “Fiscal Consolidations and Informality in Latin America and the Caribbean”. In: *Banque de France Working Paper*. URL: <https://ssrn.com/abstract=3581672>.
- Li, Dake, Mikkel Plagborg-Møller, and Christian K. Wolf (June 2022). “Local Projections vs. VARs: Lessons From Thousands of DGPs”. In: *NBER Working Paper Series*. URL: <http://arxiv.org/abs/2104.00655>.
- Medina, Leandro and Friedrich Schneider (2018). *Shadow Economies Around the World: What Did We Learn Over the Last 20 Years?* Tech. rep. URL: <http://www.econ.jku.at/schneider/>.

- Olea, José Luis Montiel and Mikkel Plagborg-Møller (July 2021). “Local Projection Inference Is Simpler and More Robust Than You Think”. In: *Econometrica* 89.4, pp. 1789–1823. ISSN: 0012-9682. DOI: [10.3982/ecta18756](https://doi.org/10.3982/ecta18756).
- Perotti, Roberto (June 2011). “Expectations and Fiscal Policy: An Empirical Investigation”. In: *Working Paper 429, IGIER (Innocenzo Gasparini Institute for Economic Research), Bocconi University*. URL: <https://EconPapers.repec.org/RePEc:igi:igiierp:429>.
- Ramey, Valerie (Feb. 2011). “Identifying government spending shocks: It’s all in the timing”. In: *Quarterly Journal of Economics* 126.1, pp. 1–50. ISSN: 00335533. DOI: [10.1093/qje/qjq008](https://doi.org/10.1093/qje/qjq008).
- Ramey, Valerie and Matthew D Shapiro (1998). *Costly capital reallocation and the effects of government spending*. Tech. rep., pp. 145–194.
- Ramey Valerie and Zubairy Sarah (Apr. 2018). “Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data”. In: *Journal of Political Economy* 126.02, pp. 451–902. DOI: <https://doi.org/10.1086/696277>.
- Romer, Christina D. and David H. Romer (June 2010). “The macroeconomic effects of tax changes: Estimates based on a new measure of fiscal shocks”. In: *American Economic Review* 100.3, pp. 763–801. ISSN: 00028282. DOI: [10.1257/aer.100.3.763](https://doi.org/10.1257/aer.100.3.763).
- Sheremirov, Viacheslav and Sandra Spirovska (2019). “Fiscal Multipliers in Advanced and Developing Countries: Evidence from Military Spending”. In: *Working Paper, Federal Reserve Bank of Boston*. DOI: [10.29412/res.wp.2019.03](https://doi.org/10.29412/res.wp.2019.03). URL: <https://doi.org/10.29412/res.wp.2019.03>.
- Vegh, Carlos A and Guillermo Vuletin (2014). “The Road to Redemption: Policy Response to Crises in Latin America”. In: *Source: IMF Economic Review* 62.4, pp. 526–568. URL: <https://about.jstor.org/terms>.

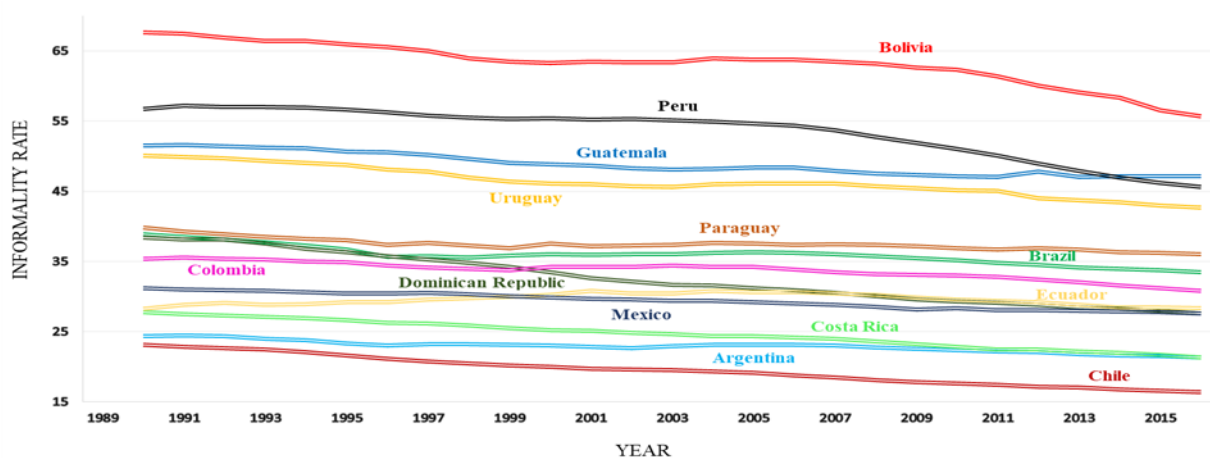
Appendix

A. Additional Tables and Figures

Table A.1 - Data definitions and sources

Variable	Description	Source
Real GDP	Log of real GDP (2015 US \$)	WDI
Real Private Consumption and Investment	% of GDP	WB and OECD National Accounts data
Unemployment	% of total labor force	ILO
Informal employment	Productive definition: share of workers in informal jobs	SEDLAC (CEDLAS and The World Bank)
Informal output (DGE)	Dynamic general equilibrium model-based (DGE) estimates (% of official GDP)	Elgin et al. (2021)
Informal output (MIMIC)	Multiple indicators multiple causes model-based (MIMIC) estimates (% of official GDP)	Elgin et al. (2021)
Narrative Fiscal Consolidation	Budgetary Impact of Narrative Fiscal Shocks (% of GDP)	David and Leigh (2018)
Commodity Export Value	Computed using commodity-level trade data of up to 45 commodities	Gruss and Kebabj (2019)
Real Effective Exchange Rate	CPI forecast method, 51 trading partners	Darvas (2012)
Current Account Balance	% of GDP	IMF, and WB and OECD GDP estimates
Net Exports	% of GDP	IMF
Sovereign debt	% of GDP	IMF FAD Historical Debt Database
Institutional quality	Estimates of country's score, ranging from approximately -2.5 to 2.5	WGI

Figure A.1 - Informality rate by country between 1989 and 2016 – Alternative informality measure: informal output (% of official GDP)



Note: The informal output (% of official GDP) shown in this figure is computed with the Dynamic General Equilibrium (DGE) approach.

B. Alternative calibration of the smoothing parameter gamma of the STLP model

As highlighted by Auerbach and Gorodnichenko (2012a), Granger and Teravistra (1993) recommend setting fixed values for the smoothing parameter gamma of the smooth-transition model and subsequently conducting a grid search over this parameter, in order to ensure that the estimates are robust to variations in its calibrated value. Given that the optimal value of γ can vary based on the specific research question and is often left to the discretion of the researcher, I calibrate (rather than estimate) $\gamma = 5$ in the baseline analysis of this paper. This choice aligns with Colombo et al. (2022) and aims to strike an intermediate degree of intensity for the regime switching model. In this section, I assess the robustness of my results by examining alternative specifications: a smaller value ($\gamma = 3.5$) and a larger value ($\gamma = 6.5$) than the initial choice.

Figure B.1 presents the probability density distribution of the weighting function $F(z_i)$ calculated using three different γ calibrations. Notably, smaller gamma values correspond to smoother transitions, while larger values indicate more abrupt switches.

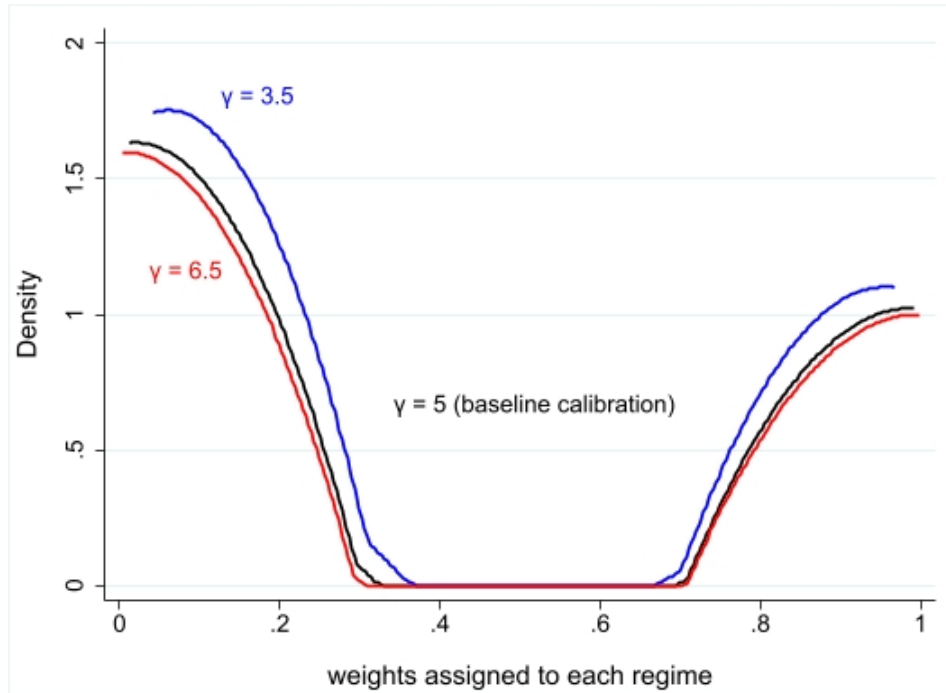
I estimate the same augmented STLP model outlined in equation (2), which results are presented in Panel C of Table 3, with alternative calibrations of γ . The results of this estimation are detailed in Table B.1. As the results demonstrate, there is no statistically significant difference between the baseline estimates and those derived from alternative calibrations of γ . Although the fiscal multipliers derived with $\gamma = 3.5$ are slightly larger than those obtained with the higher value of $\gamma = 6.5$, the economic interpretation of the results remains consistent. Specifically, the analyses continues to affirm that fiscal consolidation is recessionary countries with low levels of informality, whereas its impact is dampened in economies characterized by high informality levels.

Table B.1 - Cumulative Fiscal Consolidation Multipliers according to different calibrations of γ

		<i>gamma</i> = 3.5		<i>gamma</i> = 6.5	
Fiscal consolidation policy	Horizon	Low informality	High informality	Low informality	High informality
Tax-based fiscal consolidations	0	-1.181 *** (0.445)	-0.672 * (0.366)	-1.106 *** (0.407)	-0.585 (0.377)
	1	-2.953 *** (0.781)	-1.656 ** (0.715)	-2.698 *** (0.667)	-1.447 ** (0.732)
	2	-5.492 ** (2.454)	-2.088 * (1.106)	-5.155 ** (2.273)	-1.810 * (1.030)
	3	-5.505 ** (2.346)	-2.246 (1.540)	-5.153 ** (2.203)	-1.981 (1.463)
	4	-3.767 *** (1.125)	-3.230 (2.174)	-3.485 *** (1.157)	-2.898 (1.992)
Spending-based fiscal consolidations	0	-2.797 *** (1.044)	-0.587 (1.340)	-2.771 *** (1.000)	-0.341 (1.182)
	1	-6.716 *** (2.286)	-0.210 (3.952)	-6.688 *** (2.252)	0.340 (3.625)
	2	-7.141 ** (3.169)	0.930 (2.130)	-6.876 ** (2.906)	1.492 (2.195)
	3	-4.754 (5.501)	3.205 (3.860)	-4.997 (5.416)	3.470 (3.562)
	4	-9.101 * (5.152)	2.600 (6.783)	-8.907 * (4.848)	2.900 (6.064)
Total fiscal consolidations	0	-1.137 *** (0.341)	-0.459 (0.280)	-1.081 *** (0.322)	-0.376 (0.297)
	1	-2.570 *** (0.620)	-1.140 ** (0.517)	-2.387 *** (0.569)	-0.938 * (0.545)
	2	-3.824 *** (1.311)	-0.869 (0.766)	-3.602 *** (1.220)	-0.628 (0.732)
	3	-3.586 * (2.166)	-1.199 (1.157)	-3.405 * (2.072)	-1.004 (1.161)
	4	-3.171 *** (1.061)	-1.841 (1.344)	-2.989 *** (1.046)	-1.605 (1.267)

Note: Estimates are based on equation (2) and simply differ from the baseline estimation in terms of the calibrated value of γ . All regressions include country and time fixed effects. Driscoll-Kraay standard errors in parentheses. Year = 0 is the year of shock. * Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level.

Figure B.1 - Empirical probability density distribution of the weighting function $F(z_i)$ according to different values of γ



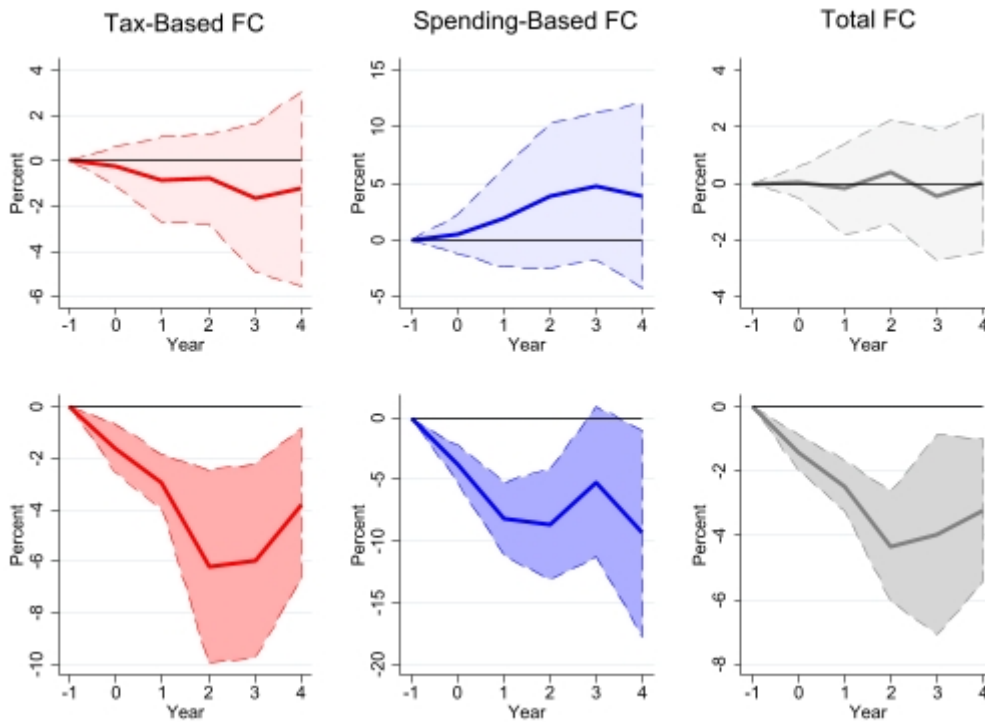
C. Alternative calibration of the HP filter smoothing parameter lambda

Due to the absence of a widely accepted consensus regarding the appropriate value for the smoothing parameter lambda (λ) used in extracting the trend component from annual frequency time series data, I opted to calibrate, I calibrate $\lambda = 100$ in the baseline analysis of this paper and examine in this section an alternative common specification where λ is set to 6.25, to ensure the robustness of my findings.

Figure C.1 illustrates and compares the cumulative dynamic impulse response of the (log) level of real GDP to a 1% of GDP tax-based, spending-based, and total fiscal consolidation shock according to the level of labor market informality in the economy, obtained from the estimation of equation (2), where the smoothing parameter λ of the Hodrick-Prescott filter is calibrated to 6.25 instead of the baseline calibration value of 100.

As depicted in the figure, the results are indistinguishable from those presented in figure 7 using the baseline calibration. The economic interpretation of the results remains robust to this alternative specification, with highly informal economies displaying limited adverse reactions following austerity policies. Conversely, economies with relatively low informality levels experience significant contractions regardless of the type of fiscal adjustment, albeit the short-term consequences of spending cuts are found more recessionary than those of tax hikes when the level of labor market informality is relatively low.

Figure C.1 - Impact of Fiscal Consolidation on GDP conditional on Informality Levels; high informality (light) vs low informality (dark) – alternative calibration of the HP filter smoothing parameter



Note: The solid lines represent the cumulative response of real GDP to a fiscal consolidation shock; Year = 0 is the year of shock. The shaded areas denote the 90 percent confidence intervals based on Driscoll-Kraay standard errors that are robust to autocorrelation and cross-sectional dependence. The light confidence intervals represent highly informal economies and the dark confidence intervals lowly informal economies.

D. Budgetary Impact of the Narrative Fiscal Shocks (% of GDP)

Table D.1 - Narrative Fiscal Shocks (% of GDP)

Country	Year	Total	Tax hikes	Spending cuts
Argentina	1996	0.25	0.25	0.00
Argentina	1997	0.75	0.75	0.00
Bolivia	1995	0.90	0.90	0.00
Bolivia	2004	2.00	2.00	0.00
Bolivia	2005	4.10	4.10	0.00
Brazil	2015	0.80	0.30	0.50
Chile	1990	0.5	0.5	0.00
Chile	1991	0.17	0.17	0.00
Chile	2003	0.60	0.20	0.40
Chile	2004	0.40	0.40	0.00
Chile	2008	-0.50	0.00	-0.50
Chile	2014	0.10	0.10	0.00
Chile	2015	0.18	0.18	0.00
Chile	2016	0.31	0.31	0.00
Colombia	2000	0.90	0.00	0.90
Colombia	2003	1.10	0.00	1.10
Colombia	2011	0.40	0.40	0.00
Colombia	2012	0.80	0.80	0.00
Colombia	2015	0.50	0.00	0.50
Colombia	2016	0.70	0.00	0.70

Continued on next page

Continued from previous page

Country	Year	Total	Tax hikes	Spending cuts
Costa Rica	1990	1.50	1.50	0.00
Costa Rica	1991	3.10	3.10	0.00
Costa Rica	1992	0.50	0.50	0.00
Costa Rica	1993	-0.30	-0.30	0.00
Costa Rica	1994	-0.50	-0.50	0.00
Costa Rica	1995	1.80	1.00	0.80
Costa Rica	1996	0.30	0.30	0.00
Costa Rica	1997	0.40	0.00	0.40
Costa Rica	2016	0.40	0.20	0.20
Dominican Republic	2004	1.70	0.50	1.20
Dominican Republic	2006	-0.80	-0.80	0.00
Dominican Republic	2007	0.90	0.90	0.00
Dominican Republic	2011	0.64	0.44	0.20
Dominican Republic	2013	3.80	1.80	2.00
Ecuador	1990	0.32	0.32	0.00
Ecuador	1993	2.20	1.70	0.50
Ecuador	2000	0.50	0.50	0.00

Continued on next page

Continued from previous page

Guatemala	1995	0.80	0.80	0.00
Guatemala	1996	0.70	0.70	0.00
Guatemala	2000	1.30	0.30	1.00
Guatemala	2002	1.90	1.00	0.90
Guatemala	2012	0.40	0.00	0.40
Guatemala	2013	1.00	1.00	0.00
Jamaica	1992	2.10	2.10	0.00
Jamaica	1999	0.70	0.00	0.70
Jamaica	2000	1.80	0.00	1.80
Jamaica	2003	3.00	1.50	1.50
Jamaica	2004	1.00	0.50	0.50
Jamaica	2012	0.80	0.80	0.00
Jamaica	2013	2.60	2.00	0.60
Jamaica	2014	0.60	0.40	0.20
Mexico	1989	0.90	0.90	0.00
Mexico	2010	0.60	0.60	0.00
Mexico	2014	0.60	0.60	0.00
Paraguay	1989	2.60	2.00	0.60
Paraguay	2001	1.80	0.50	1.30
Paraguay	2003	1.25	1.25	0.00
Paraguay	2004	0.80	0.80	0.00

Continued on next page

Continued from previous page

Paraguay	2005	-0.60	-0.60	0.00
Paraguay	2006	-0.70	-0.70	0.00
Paraguay	2014	0.24	0.24	0.00
Paraguay	2016	0.80	0.00	0.80
Peru	1992	1.00	1.00	0.00
Peru	2002	0.20	0.20	0.00
Peru	2003	0.80	0.80	0.00
Peru	2011	-0.38	-0.38	0.00
Peru	2012	0.38	0.38	0.00
Uruguay	1990	1.70	1.70	0.00
Uruguay	1995	1.65	0.75	0.90
Uruguay	1996	0.25	0.25	0.00
Uruguay	2000	0.80	0.00	0.80
Uruguay	2002	3.28	1.58	1.70
Uruguay	2003	1.62	1.42	0.20
Uruguay	2004	-0.50	-0.50	0.00
Uruguay	2005	-0.90	-0.90	0.00
Uruguay	2015	0.60	0.00	0.60

Note: The table is elaborated by the author, according to the budgetary impact of the narrative fiscal consolidation measures in David and Leigh (2018).