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DEBT SUSTAINABILITY IN GUATEMALA: INSTITUTIONAL ARRANGEMENT AND QUANTITATIVE ANALYSIS

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Debt Sustainability in Guatemala: Institutional Arrangement and Quantitative Analysis*

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Abstract

This paper assesses debt sustainability for Guatemala. Debt stability has been achieved at very low expenditure levels, at the expense of adequate provisioning of public goods and services and a widening gap in social development and infrastructure. Since fiscal outcomes are not independent from fiscal policy arrangements and procedures, the paper also sets forth a hypothesis of possible institutional arrangements that have allowed for the containment of fiscal deficits for over 20 years. This paper argues that embedded in the legal framework and institutional arrangement, there is an "implicit" fiscal rule that favors stability. The paper explores characteristics of how fiscal policy is conducted, showing that government expenditures are pro-cyclical, providing room for improvement in its business cycle management. Fiscal policy has been mainly concerned with stability rather than other possible goals like improving long-run growth, attenuating business cycles, improving human development indicators, and dealing with redistribution issues, among other goals that fiscal policy could pursue.

JEL Codes: H62, H63, E62, E02.

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*The views expressed in this document are those of the authors and do not necessarily represent those of Banco de Guatemala or its authorities.

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1 Introduction

Although fiscal adjustment seems increasingly necessary in several countries in Latin-America, in order to prevent a situation in which debt sustainability is compromised, there are also countries like Guatemala where strict expenditure controls have led to moderate budget deficits and low debt ratios, reflecting a long-standing commitment to prudent fiscal and monetary management. Clearly, fiscal sustainability is desirable, and by any means this should be jeopardized, but in Guatemala debt sustainability has been achieved at very low expenditure levels, at the expense of adequate provisioning of public goods and services and a widening gap in social development and infrastructure. In a country with these social development lags, it is necessary to understand and evaluate how fiscal policy is operating and how these fiscal results are attained.

In order to document debt dynamics and sustainability, I implement four different methodologies: *i)* The standard or long-run approach, *ii)* the short-run approach, *iii)* the Fan-Chart approach and *iv)* the probabilistic model developed by Mendoza & Oviedo (2004). The general conclusion across methodologies is that public debt lies within reasonably stable levels. Fiscal deficits have been contained for over 20 years, which translates into the observed low level of debt. Behind this result, there are culturally-shaped institutions that go against the problem of excessive public indebtedness; in Guatemala there is a strong bias towards cutting spending as opposed to debt increases, whenever there is a decline in government revenues. This is an idiosyncratic characteristic of the country. Furthermore, I argue that legal and institutional arrangements constitute an 'implicit' fiscal rule favoring stability of public finances. Fiscal policy in Guatemala has been mainly concerned with macroeconomic stability, rather than other possible goals like boosting long-run growth, attenuating business cycles, improving human development indicators, dealing with redistribution issues and other goals that fiscal policy could pursue.

Despite Guatemala's success in terms of fiscal sustainability, government expenditure has been pro-cyclical. This tendency might be exacerbated by pre-commitments of revenue to specific spending lines, since they tie down expenditures to revenues, making expenditures almost as pro-cyclical as revenues. On the one hand, these arrangements help to stabilize debt, but on the other, they are detrimental in terms of adequate cycle management. I use dynamic correlations to show the positive association between output and leads and lags of tax income and expenditures. I argue that adequate cycle management requires expenditures to be counter-cyclical. Thus there is still room for improvement in terms of cycle management, particularly when it is apparent that capital spending is highly pro-cyclical; this is precisely the type of expenditure that could be used to implement sound countercyclical policy.

The rest of the paper is organized as follows: Some stylized facts and descriptive statistics are given in Section (2), along with a discussion of how fiscal results are influenced

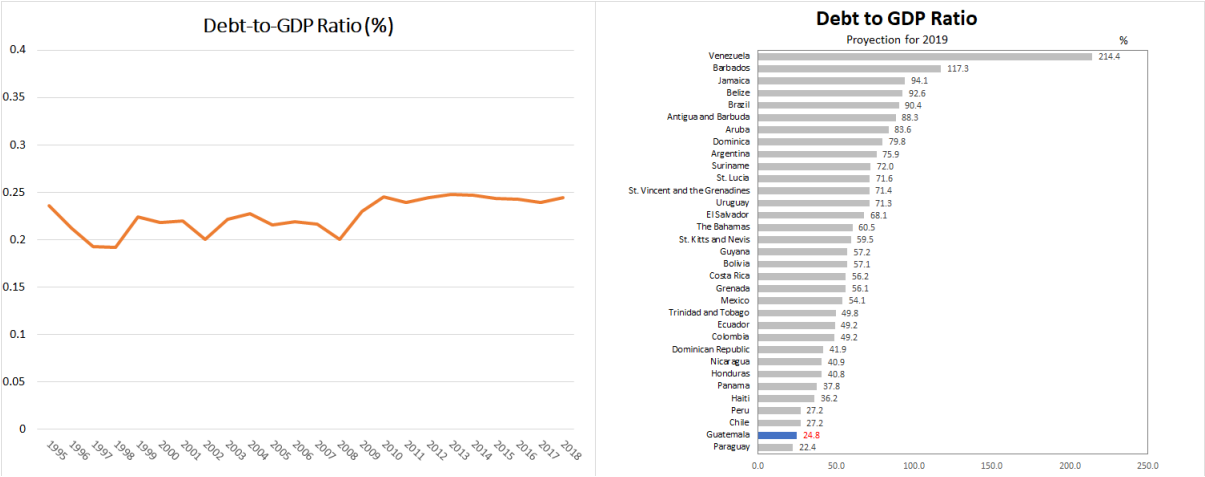
by the institutional arrangement and culture. This section additionally documents pro-cyclicality of expenditures. Section (3) presents the standard debt sustainability analysis and Section (4) concludes with some final remarks.

2 Stylized Facts

2.1 Overview

For more than 20 years, debt has remained low and stable, fluctuating between 20 and 25 percent of GDP. In 2018, for instance, central government debt amounted to 24.5 percent of GDP, one of the lowest in Latin-America (see Figure 1). The largest source of financing for the government is the domestic market, which accounts for about 57 percent of the total debt stock. External financing comes mostly from multilateral loans (28 percent) and external bonds (16 percent). Due to weak revenue collection, the stock of debt as a share of total government revenue, has been rising in recent years, reaching 231 percent in 2018 (see Figure 2).

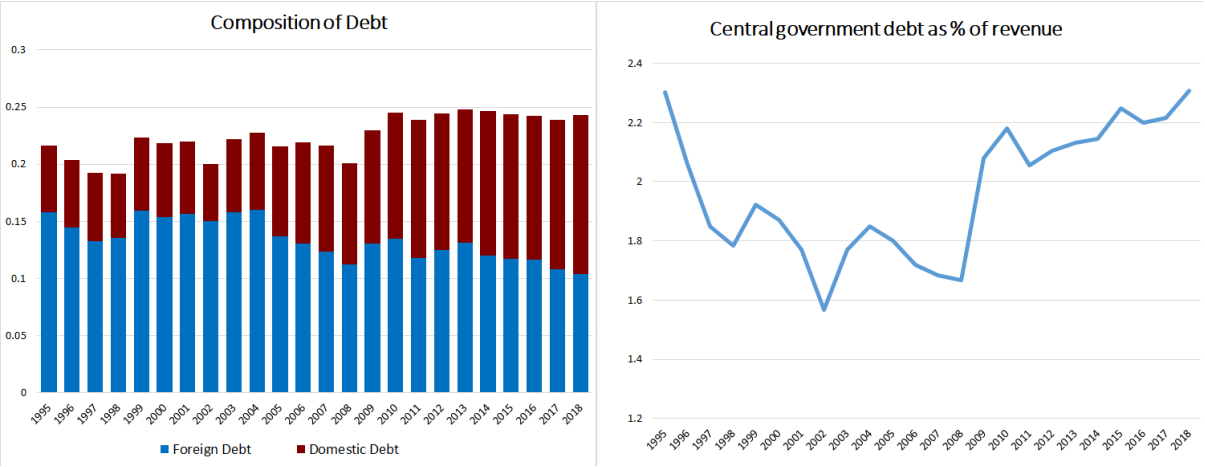
Figure 1: Government Debt Ratios



Notes: Own elaboration with data from Banco de Guatemala (left panel) and International Monetary Fund and World Economic Outlook Database, April 2019 (right panel).

Since government debt is a stock variable reflecting accumulated deficits, this observed stability reflects a track record of low and stable fiscal deficits observed over nearly two decades (see Figure 3). Despite adverse shocks, government finances have remained stable. The deficit widened markedly in 2009-2010 in the midst of the global financial crisis, but narrowed over the following years as economic conditions improved, reaching a low of 1.1 percent in 2016 before rising again to 1.7 percent in 2018, as the result of a more expansionary fiscal policy in the context of a weaker economy.

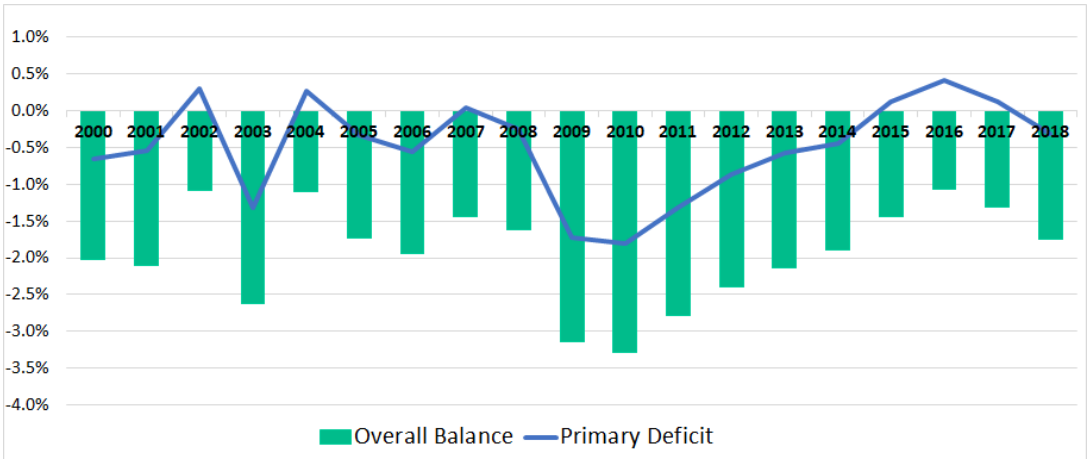
Figure 2: Composition and Debt Burden



Notes: Own elaboration with data from Banco de Guatemala.

In spite of being able to maintain low fiscal deficits, government revenue intake remains a key challenge. Guatemala has consistently ranked in the lowest positions in terms of government revenue as percentage of GDP, 11.4 percent on average from 1999 to 2018 (10.6 percent in 2018). Tax revenue is fairly stable, as 94 percent of total revenue comes from tax collection, but it has been insufficient to satisfy social development needs. Low government revenue has constrained expenditures, also ranking among the lowest in Latin-America at just 12.1 percent of GDP in 2016 (12.3 percent in 2018) and limited the resources available for social development, as expenditures on health and education also rank at the bottom of Latin-American countries (see Figure 4). Although Guatemala was recently upgraded and classified as an upper middle-income country (World Development Indicators Data Bank), rates of inequality and poverty are higher than Latin American averages. The poverty headcount ratio at national poverty lines was 0.6 percent of population, which was higher than the average for Latin America (0.3 percent). Moreover, the Human Development Index was 0.65 in 2017 (Human Development Data 2017, UNDP), lower than Latin-American average (0.73).

Figure 3: Overall and Primary Balances, % of GDP



Notes: Own elaboration with data from the Ministry of Finance.

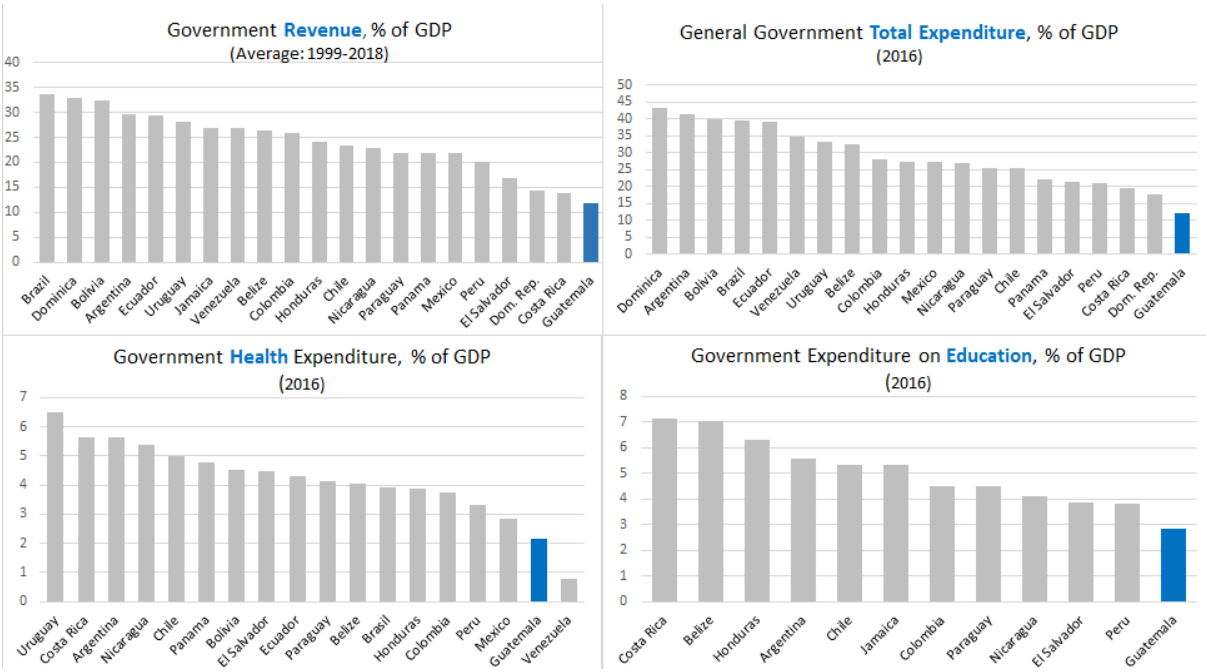
While the fact of having one of the lowest revenue-to-GDP ratios has limited the resources available to satisfy social development needs, it has not jeopardized the stability of public finances (as shown in Section 3), because it seems that in Guatemala it is easier to cut expenditures than to increase debt. This is unusual, since most democracies have a tendency to pursue sub-optimal fiscal policies which lead to the accumulation of excessive debt. I argue that, in the particular case of Guatemala both institutional arrangement and culture (adverse to public indebtedness) help to prevent an excessive accumulation of debt. This does not imply that the current arrangement is close to an optimal fiscal policy, since social needs are left unattended and, as shown later, cycle management does not satisfy basic principles of optimality, but at least it has prevented over-indebtedness.

2.2 Institutions and Culture

Different approaches have been proposed to explain why governments seem to deviate from optimality regarding debt management. A growing literature has recently explored how various cultural traits affect economic decisions in several dimensions, cultural traits like trust, respect of the rule of law, propensity to save, among others. Many of these attitudes are relevant for society's acceptance of government deficits. for example, cultural values certainly affect decisions about tax evasion (see Richardson 2008), which may partially explain low tax collection in Guatemala, reflecting mistrust in public management of resources.[1] Partially due to these cultural traits, increasing tax rates has met considerable opposition. The government submitted to congress a tax reform in 2016, which sought to increase tax revenue by 1.1 percent of GDP, but strong opposition from the private sector and public opinion to the tax reform prompted the government to

[1]Of course there are other determinants for the low capacity of the government to collect taxes, for example, a large informal sector or weaknesses in the Tax Administration Unit (SAT).

Figure 4: Low Revenue-to-GDP Ratio & Low Expenditure Levels



Notes: Own elaboration with data from the World Bank and World Economic Outlook.

postpone the reform indefinitely. Furthermore, because of the same mistrust, in budgets approved by congress, a considerable fraction of fiscal revenues are pre-committed to specific spending lines such as the public sector wage bill, debt service, municipalities, the justice system, tertiary education and support to sports. According to the Ministry of Finance, in 2019, about 89.9 percent of fiscal revenues were pre-committed.

The connection between institutions and culture is important (see Alesina & Giuliano 2015, Bisin & Verdier 2017). The adoption of certain budget rules and institutions may be endogenous to certain cultural traits. Usually, democratic institutions lead to excessive public indebtedness essentially because, in the process of budget approval, main players fail to internalize the tax burden of spending decisions, as in the *Common Pool Problem* and bargaining processes in legislatures.[2] In Guatemala, culturally-shaped institutions go against this commonly observed problem; there is a strong bias towards cutting spending as opposed to debt increases, whenever there is a fall in government revenues. This is an idiosyncratic characteristic of the country. When there is an unexpected budget gap, the minister of finance must seek congress' approval to issue new debt to cover the larger-than expected deficit. There is usually strong public opinion against contracting new debt and congress, time and again, cannot reach agreements and approval is usually delayed or denied.[3]

[2]See for example: Weingast et al. (1981), Krogstrup & Wyplosz (2010), Velasco (2000), Battaglini & Coate (2008).

[3]Also, Guatemalan political system is highly fragmented, and the party in power rarely has the

According to Bisin & Verdier (2017) institutions are mechanisms through which social choices are delineated and implemented.[4] The pre-commitments of revenue and difficulties in approving new debt reflect social choices against public indebtedness. Furthermore, the Organic Law of the Budget states, in Article 66, Section *a)*, that in order to ensure strict compliance with public debt service, an amortization fund must be created and administrated by the Central Bank, proportional in size to the amount of public debt the government must service each year. So the budget law instructs the Central Bank to separate (from the "common pool") and manage the resources needed to service debt. And that is the case even before the central government pays its wage bill or anything else, since in the same article and section, the first item states that, the Bank of Guatemala, without prior or subsequent processing, will separate from the account of the Government, and will credit the amortization fund, with the resources necessary for payment of principal, interest, commissions and other payments derived from the service of public debt.[5] This means that 100 percent of the principal and interest payments due in public debt are paid using resources from this amortization fund and the government cannot use those resources as a temporary source of liquidity to close an eventual budget gap.

In my view, both the pre-commitment of revenues and mechanisms like the amortization fund just described, constitute an implicit fiscal rule favoring stability of fiscal deficits and public indebtedness. Fiscal policy in Guatemala has been mainly concerned with macroeconomic stability, rather than other possible goals that could be pursued by fiscal policy such as boosting long-run growth, attenuating business cycles, improving human development indicators and dealing with redistribution issues.

2.3 Pro-cyclical Expenditure

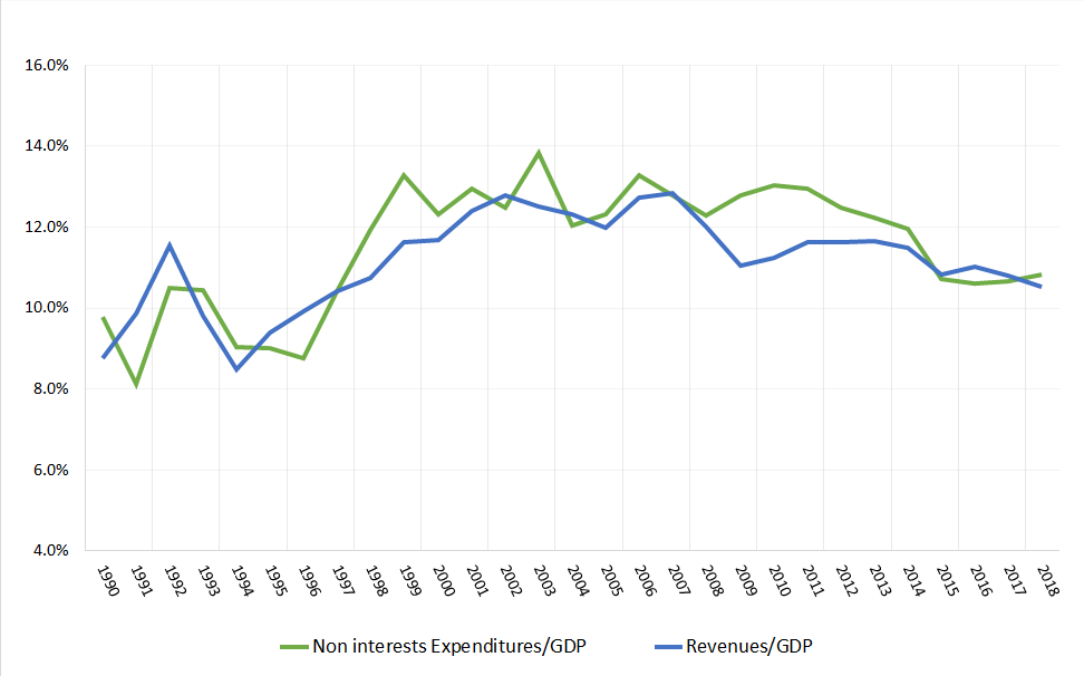
Without discussing in detail the optimal debt literature, we can argue that the very basic principles of optimal debt policies imply that debt-to-GDP ratio is expected to be constant on average, but fiscal surplus should increase in times of prosperity and should decrease in bad times. That is, when the economy is growing, it is optimal to reduce spending (or increase taxes) to generate a provision or fiscal space, which makes it possible for the government to implement an expansionary policy when the economy experiences a recession, and the inverse operation during booms. However, implementing counter-cyclical fiscal policies of this type has been a difficult challenge to overcome for developing economies, given a limited access to international financing and low government revenues that make it difficult to adopt counter-cyclical policies (see Izquierdo et al. 2018, Gavin

majority required to approve debt by itself.

[4]Same authors also conceptualize culture as *"preference traits, norms, and attitudes which can be transmitted across generations by means of various socialization practices or can be acquired through socioeconomic interactions between peers."*, Bisin & Verdier (2017).

[5]Article 66 of the Organic Law of the Budget was reformed by Decree No. 13-2013 on 20/11/2013.

Figure 5: Government Expenditures and Revenues (% of GDP)



Notes: Own elaboration with data from Guatemala's Ministry of Finance.

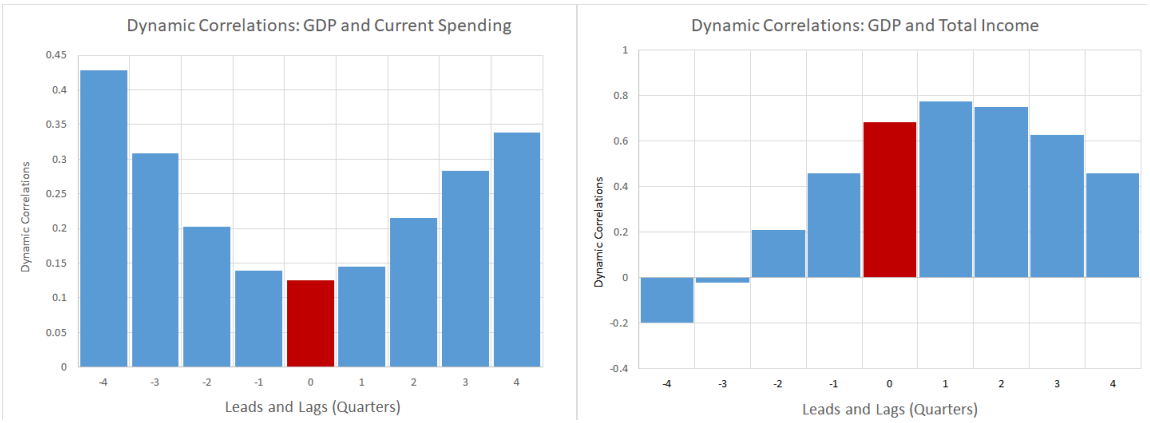
& Perotti 1997). A pro-cyclical surplus can be attained by implementing pro-cyclical tax revenues or counter-cyclical expenditures. Nevertheless, taxes tend to be naturally pro-cyclical since during the expansionary phase of the cycle, the tax base increases. Moreover, distortionary taxes are defined as a percentage of pro-cyclical variables, such as imports, consumption and earnings; therefore, during economic expansions tax revenues increase automatically. Modifying taxes is always a politically arduous endeavor, which takes time to get approval and generally cannot be implemented in a timely manner. Therefore, usually we focus on counter-cyclical expenditures to implement the optimal pro-cyclical surplus.

Government expenditure in Guatemala has been pro-cyclical; this might be exacerbated by pre-commitments of revenue to specific spending lines, since it ties down expenditures to revenues, making expenditures almost as pro-cyclical as revenues. This helps to stabilize debt (as revenues and expenditures end up cointegrating) but it is harmful in terms of optimal or appropriate cycle management. It seems, from inspecting Figure (5), that expenditures tend to follow government revenues in Guatemala. Dynamic correlations also show a positive association among all mayor components of the budget. Figure (6) shows the correlation between output and leads and lags of tax income and expenditures.[6] In both cases there is a positive correlation with output, contemporaneously and with both leads and lags. As aforementioned, having pro-cyclical tax revenue

[6]We use annualized-quarterly data from 2001Q1 to 2018Q4 to estimate dynamic correlations. All series were converted into inter-annual growth rates.

is normal and automatically helps to attenuate the cycle, but in the case of expenditures, one would expect them to be counter-cyclical as an appropriate management of the cycle requires.

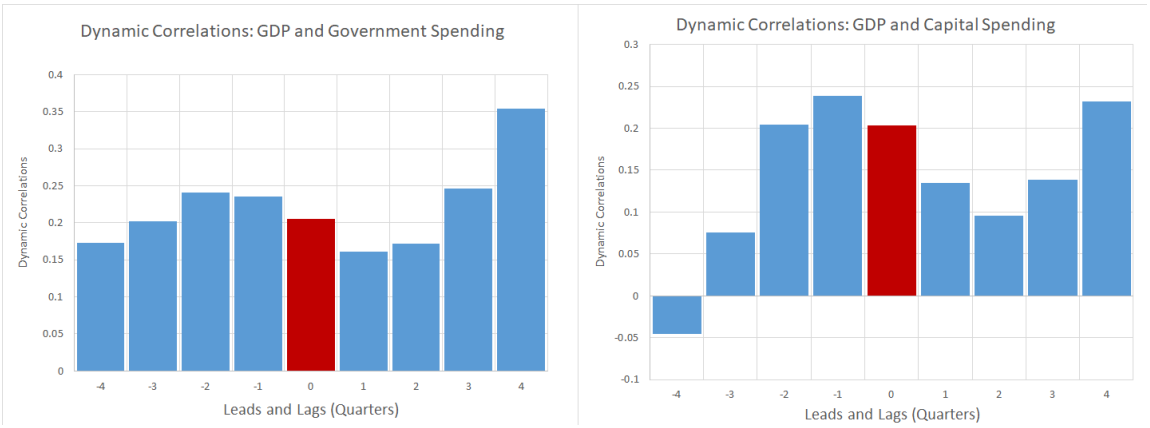
Figure 6: Dynamic correlations, Expenditures and Revenues



Notes: Own elaboration with data from Banco de Guatemala.

Since expenditures are pro-cyclical, I explore whether if at least one of its two major components (current and capital spending) showed a counter-cyclical pattern. As depicted in Figure (7) both components appear to be pro-cyclical, but it is important to note that, at least contemporaneously, correlation is weaker for current spending (0.12) than it is for capital spending (0.20). This is noteworthy because it may suggest, on the one hand, that current spending is more rigid than previously thought (or expected to be), and on the other hand, that capital spending, which could be used to attenuate the cycle, appears to have an even stronger linear association with output cycles. This means that, when growth slows down, tax intake goes down as well as government spending, but the adjustment is made mainly by sacrificing public investment. This is inappropriate since public investment typically has complementarities with private investment, and therefore it is likely that an increase in capital expenditure would have an effect on private investment, positively affecting the growth rate of the economy. Current policy, however, points in the opposite direction: government spending is pro-cyclical and capital spending even more so.

Figure 7: Dynamic correlations, type of expenditure



Notes: Own elaboration with data from Banco de Guatemala.

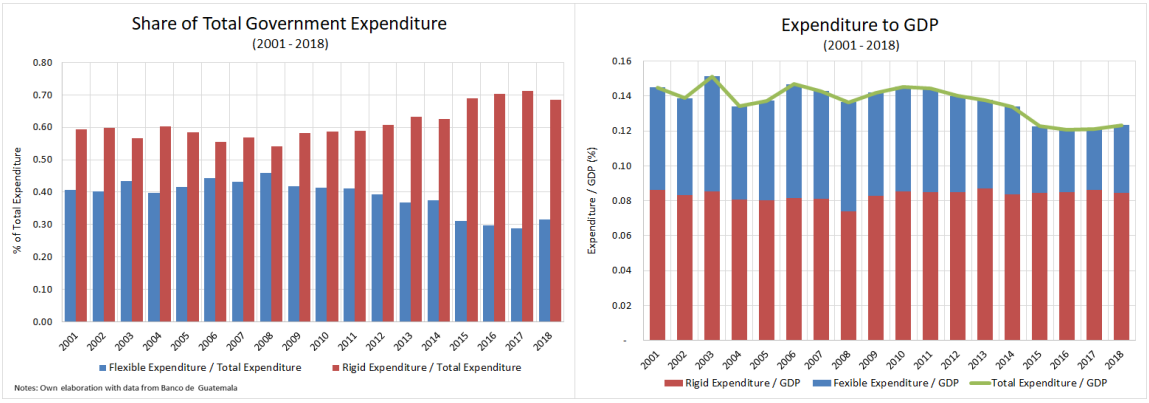
In general, expenditures tend to be slightly more volatile than revenues (see coefficient of variation in Table 1). Within expenditures, capital expenditure (or public investment) is more volatile than current spending, also suggesting that most adjustments are made by reducing or increasing capital expenditure. In order to explore further how government spending is being implemented, we group Capital Spending plus purchases of Goods and Services and label them as "Flexible Expenditure," as both have a high coefficient of variation and we could expect, *a priori*, that these two items are easier to adjust. We add the remaining items in Current Spending and label them as "Rigid Expenditure." It is clear from both panels of Figure (8) that deficit containment has been achieved using Flexible Expenditure, mainly capital spending. On the left panel, we observe the evolution of both types of expenditure, flexible and rigid, as shares of total expenditure, and it is evident how rigid expenditures hardly go down, while towards the end of the sample participation of rigid expenditure increases as flexible expenditures decrease markedly. On the right panel, both components are depicted as a share of GDP consisting of total expenditure (also as share of GDP). In this panel, it is interesting to note that the share of "rigid" expenditures is almost constant and that most of the adjustment is made through "flexible" expenditure.

Table 1: Tax Income and Expenditure Composition, 2018

	Percentage		
Descriptions	***of Total***	***of GDP***	***Coeff. of Variation***
Tax Income	**100.0%**	**10.0%**	**42.9**
Direct	35.6%	3.6%	77.0
Indirect	64.4%	6.4%	32.2
Government Expenditure	**100.0%**	**12.3%**	**43.1**
Current Spending	**80.3%**	**9.9%**	**46.6**
Wage Bill	31.8%	3.9%	53.6
Good and Services	11.7%	1.4%	64.1
Discounts and Bonuses	0.1%	0.0%	181.8
Social Security Benefits	6.5%	0.8%	48.1
Interest, Commissions, and Discounts	11.7%	1.4%	58.5
Transfers	18.4%	2.3%	47.2
Capital Spending	**19.7%**	**2.4%**	**54.3**
Real Direct Investment	5.3%	0.7%	98.2
Financial Investment	0.1%	0.0%	419.8
Transfers	14.4%	1.8%	48.5

Notes: Own elaboration with data from Banco de Guatemala.

Figure 8: Flexible vs. Rigid Expenditure

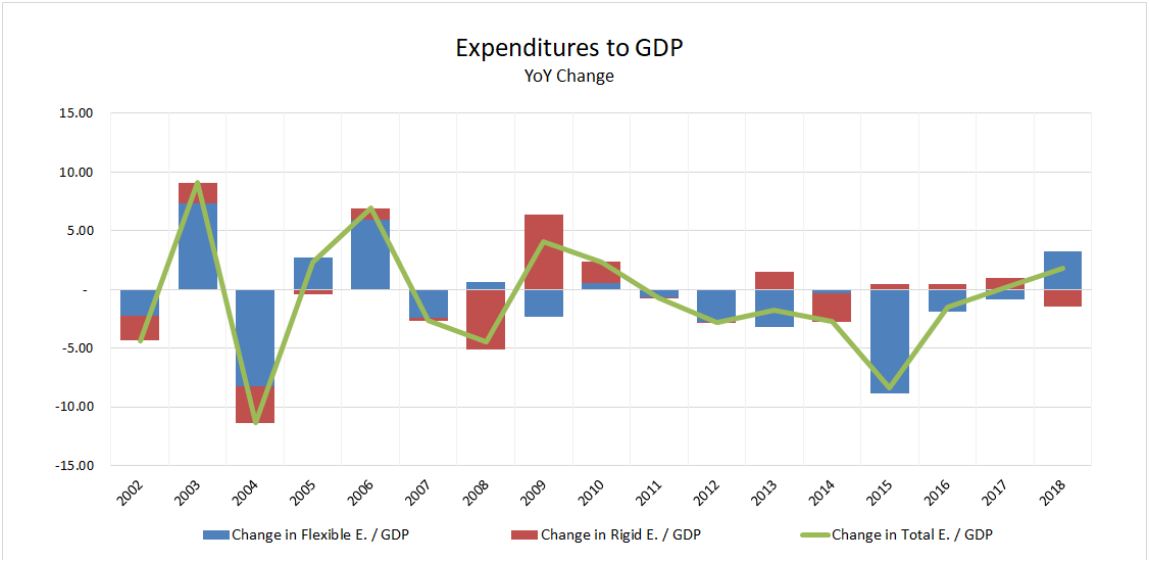


Notes: Own elaboration with data from Banco de Guatemala.

These changes in the composition of expenditures and their share of GDP are more interesting if they are analyzed with Figure (5) in mind. In that Figure, one can see how expenditures track revenues most of the time, but in the midst of the global crisis,

specifically in 2009 when the negative effects of the crisis materialized in the Guatemalan economy (mainly through a decline in exports and workers' remittances), it seems that the government employed a counter-cyclical measure, increasing expenditures (as a share of GDP) as output and tax revenue decreased. After 2010, expenditures began to adjust converging to the level of revenues. To return to Figure (8), in both panels it is evident that the adjustment of expenditures after the crisis came almost entirely through a reduction of "flexible" expenditure, despite the fact that the stimulus of 2009 was engineered mainly through "rigid" expenditure. If we observe the year-over-year change in expenditure-to-GDP ratios (see Figure 9), then it is obvious that the stimulus of 2009 was mainly provided by an increase in "rigid" expenditure. It is also evident that the subsequent adjustment included a large component of capital expenditure reduction.

Figure 9: Expenditure-to-GDP, YoY change (%)



Notes: Own elaboration with data from Banco de Guatemala.

Displaying series of expenditures and revenues that cointegrate in the long run is certainly a basic characteristic of optimal (or at least appropriate) debt management. In Guatemala this seems to be the case. Nevertheless, in terms of cycle management, there is still considerable room for improvement. While expenditures are pro-cyclical, adequate cycle management requires them to be counter-cyclical. In order to implement a successful counter-cyclical expenditure policy, while preserving the good results observed so far in terms of debt sustainability and containment of deficits, Capital Expenditure should be used as the main fiscal policy tool. There are two main reasons for this policy recommendation. First, since Capital Expenditure is flexible, the stimulus can be withdrawn without major political opposition, and therefore this can be undertaken in a timely manner without affecting fiscal finances in the medium term. Secondly, as mentioned above, public investment may have complementarities with private investment, positively affect-

ing the growth rate of the economy, and in turn, improving fiscal sustainability.

3 Debt Sustainability Analysis

There is a large literature on indicators of public debt sustainability and empirical tests of fiscal solvency. Most of the empirical literature attempts to construct simple indicators that can be used to assess debt sustainability (e.g., Blanchard 1990, Blanchard et al. 1991, Buiter 1985) and to develop formal econometric tests that can determine whether the hypothesis that the intertemporal government budget constraint (IGBC) holds can be rejected (or not) by the data; see for example: Bohn (2007), Mendoza & Ostry (2008), Ghosh et al. (2013). Since the debt-to-GDP ratio in Guatemala has been markedly stable during the last 20 years, as noted above, there is no obvious reason to over complicate debt sustainability analysis by applying state-of-the art techniques. I therefore confine the exercise to a classic debt sustainability analysis, using four different methodologies: *i)* The standard or long-run approach, *ii)* the short-run approach, *iii)* the Fan-Chart approach and *iv)* the probabilistic model developed by Mendoza & Oviedo (2004) of what they call the "Natural Debt Limit". All four methodologies are implemented using the Template for Debt Sustainability analysis developed by the Inter-American Development Bank (see Borensztein et al. 2010).

3.1 The Long-Run Approach

The Long-run or Standard Approach follows the contributions of Blanchard (1990) and Buiter (1985). It is based on the analysis of the primary surplus (PS) required to maintain the ratio of debt-to-GDP constant in the long-run. The analysis tries to find the required PS to stabilize debt-to-GDP at a given level—usually (and in this case) the current debt level, given the conditions consistent with the long-run or the steady state.

The analysis starts from the current period budget constraint of the non-financial central government, which equates the flows of government revenues and expenditures with changes in the stock of public debt:

$$G_t + (1 + R_t)D_{t-1} = T_t + D_t \tag{1}$$

where G_t are expenditures, R_t is the interest rate paid over debt, D_t is the stock of (one period, non-contingent) public debt and T_t is government revenues.

After considering that a fraction (α) of debt is issued in US dollars and for which an interest rate (r_t^f) is paid, we can rewrite equation (1) in real terms and as a share of output, to find a difference equation describing the way debt evolves over time:

$$d_t = \left[\alpha \frac{1 + r_t}{(1 + \gamma_t)} + (1 - \alpha) \frac{\left(1 + r_t^f\right)(1 + \Delta rer_t)}{(1 + \gamma_t)} \right] d_{t-1} - ps_t \tag{2}$$

where lower case letters represent same variables as in equation (1) but in real terms and expressed as shares of GDP. Let γ_t be real output's growth rate, rer_t the US-bilateral real exchange rate and $ps_t = (\tau_t - g_t)$ the primary surplus. Imposing the steady state condition over the previous equation and solving for ps, we obtain:

$$ps = \left[\frac{\alpha(1 + r) + (1 - \alpha)\left(1 + r^f\right)(1 + \Delta rer) - \gamma}{(1 + \gamma)} \right] d \tag{3}$$

This condition states that the primary surplus is enough to cover the net, real interest cost of servicing debt (net from the real growth rate of GDP). In other words, the stream of long-run primary surpluses—appropriately discounted—has to fully cover d, the specified level of debt, in this case, the current debt level Borensztein et al. (2010).

Using this equation, we find the level of primary surplus required to stabilize the debt-to-GDP ratio around its current value for a given interest rate and growth rate of the economy (see Table 2).

Table 2: Long-Run Approach

Long-run Approach			**Simulations**	
Steady-State Level of Debt			**GDP growth (-1 s.d.)**	2.3%
Debt-to-GDP Ratio	**24.46%**		**Required Primary Surplus (%GDP)**	0.34%
Average Real Interest Rate	3.71%		Required Adjustment (%GDP)	0.65%
Real Depreciation	-1.92%			
Inflation rate (GDP deflactor)	4.00%		**Average Real Interest Rate (+2 s.d.)**	8.03%
Long-run growth rate	3.50%		**Required Primary Surplus (%GDP)**	1.07%
Alpha	57.14%		Required Adjustment (%GDP)	1.39%
Estimated primary surplus for NFPS	**-0.32%**			
Required Primary Surplus (% GDP)		0.05%	**Debt/Y**	40%
			Required Primary Surplus (%GDP)	0.08%
Required Adjustment (%GDP)		0.37%	Required Adjustment (%GDP)	0.40%
Average Primary Surplus (1990-2018)		**-0.35%**	**All Simulations**	
			Required Primary Surplus (%GDP)	2.24%
			Required Adjustment (%GDP)	2.56%

Notes: Own elaboration with data from Banco de Guatemala.

A primary surplus of 0.05 percent of GDP is required to maintain the debt-to-GDP ratio at its current level (24.5 percent). Table (2) contains all the assumptions made to calculate the required ps. The last observed (or current) level of primary surplus (-0.32 percent, negative meaning a primary deficit) implies a required adjustment from current ps of 0.37 percent of GDP to reach the 0.05 percent of GDP needed to stabilize debt at its current level. Since this calculation is based on the assumptions, described in the left panel of Table (2), about the interest rate, the long-run real growth rate and other variables, it is obvious that the required primary surplus will vary with changes in

these assumptions. Therefore, on the right panel of the same table, some simulations are performed. The first one calculates what would be the required primary surplus if GDP grows one standard deviation below the assumed potential growth, *ceteris paribus*. In this case, in order to stabilize debt-to-GDP ratio in its current level, a primary surplus of 0.34 percent would be required. The second simulation assumes an average real interest rate 2 standard deviations higher of what was previously assumed, increasing the required primary surplus from 0.05 percent to 1.07 percent of GDP. Additionally, if we assume an initial debt level of 40 percent of GDP (instead of the current 24.5 percent) the required *ps* in this case would be of 0.08 percent. Finally, in a worst case scenario, in which all negative shocks were to happen simultaneously, the primary surplus required to stabilize debt is 2.24 percent of GDP.[7]

The assumptions made in this approach are those that one would expect to be fulfilled in a steady state condition. Therefore, they constitute a useful benchmark, but they are rather strong assumptions. Nevertheless, a primary surplus of 0.05 percent of GDP required to maintain the current level of debt-to-GDP ratio, it is reasonably attainable, if we observe that the economy has run surpluses up to 1.7 percent of GDP in the past; achieving a surplus of 0.05 percent would not require major adjustments or fiscal reforms. Additionally, this required primary surplus is close to a balanced budget, which implies that, given our assumptions, the current level of debt is not far from the value consistent with the notion of equilibrium implied by the steady state.

3.2 Short-Run Approach

This approach is also based on equation (2), but in contrast to the long-run approach, the focus here is on the short-run debt dynamics with a central (baseline) scenario and discrete stress tests; over to the most likely path of debt determinants. To elaborate the baseline, we use several sources to determine the most likely path for the determinants of the debt-to-GDP ratio in the short or medium terms. For the Real GDP growth rate, we use projections of Banco de Guatemala for the first two years and for the subsequent years we used IMF's projections reported in the World Economic Outlook (WEO), released in April 2019. Projections for the primary surplus also come from the WEO, April release. Both interest rates, domestic and foreign, are set to the last observed value for the first five years of the projection. The nominal exchange rate depreciation and the inflation rate are taken from forecasts of a macro-model developed within the central bank.

[7] In order provide and idea of how sensitive are these results to changes of the underlying assumptions, Table (7) of Appendix (A) contains a sensitivity analysis in which a grid of possible primary surpluses is presented, responding to changes in the assumed real output growth rate, the average real interest rates and the real depreciation.

Table 3: Short-Term or endogenous approach: Baseline

Baseline: no shocks	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Real GDP Growth	3.7%	3.8%	3.7%	3.6%	3.6%	3.5%	3.5%
Domestic Nominal Interest Rate	7.0%	7.0%	7.0%	7.0%	7.0%	10.0%	10.0%
Nominal Exchange Rate Depreciation	-0.4%	-2.1%	-1.5%	-0.3%	0.7%	0.0%	0.0%
Primary Surplus	-0.6%	-1.0%	-0.6%	-0.5%	-0.3%	-0.3%	-0.3%
Inflation	4.0%	3.6%	3.6%	3.7%	3.7%	3.8%	3.9%
Foreign Nominal Interest Rate	4.4%	4.4%	4.4%	4.4%	4.4%	5.0%	5.0%
Debt/GDP ratio	**24.5%**	**24.9%**	**25.1%**	**25.2%**	**25.2%**	**25.6%**	**26.0%**

Notes: Own elaboration with data from Banco de Guatemala and World Economic Outlook.

The short-run dynamics of the debt-to-GDP ratio are reported in Table (3). Under these assumptions, debt dynamics appear to be stable. We expect the debt-to-GDP ratio to increase 1.5 percentage points of GDP in the next seven years, assuming that the government will run a small primary deficit throughout the projected horizon, in this case, debt (as a share of GDP) shows a modest increase going from 24.5 percent in 2019 to 26 percent in 2025.[8] This baseline scenario considers, with the path for the primary surplus, the expected or most likely behavior of the fiscal authority. Nevertheless, it could be the case that the fiscal authority decides to implement an active policy with a particular objective in mind. For example, in Table (4) we calculate the primary surplus needed to stabilize the debt-to-GDP ratio at its current level of 24.5 percent. This goal could be attained even if the government runs a small primary deficit (a negative ps) during the entire projection horizon, a primary surplus of -0.41 percent of GDP on average. This seems highly feasible after noting that the country has run a primary surplus of -0.35 percent of GDP on average for the last 19 years.

Table 4: Short-Term Approach: Stabilizing Debt-to-GDP Ratio at Its Current Level

Active policy: PS needed to stabilize debt	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Real GDP Growth	3.7%	3.8%	3.7%	3.6%	3.6%	3.5%	3.5%
Domestic Nominal Interest Rate	7.0%	7.0%	7.0%	7.0%	7.0%	10.0%	10.0%
Nominal Exchange Rate Depreciation	-0.4%	-2.1%	-1.5%	-0.3%	0.7%	0.0%	0.0%
Primary Surplus	**-0.6%**	**-0.5%**	**-0.5%**	**-0.4%**	**-0.3%**	**-0.3%**	**-0.3%**
Inflation	4.0%	3.6%	3.6%	3.7%	3.7%	3.8%	3.9%
Foreing Nominal Interest Rate	4.4%	4.4%	4.4%	4.4%	4.4%	5.0%	5.0%
Debt/GDP ratio	**24.5%**	**24.5%**	**24.5%**	**24.5%**	**24.5%**	**24.5%**	**24.5%**

Notes: Own elaboration with data from Banco de Guatemala and World Economic Outlook.

We also simulate an scenario in which the government deliberately increases the primary surplus in one percentage point of GDP in order to increase investment. To account for general equilibrium effects and the fact that public investment may have complementarities with private investment, affecting positively the growth rate of the economy, we

[8] A Sensitivity analysis of this results can be found in Appendix (B).

adjust the expected future path of the real GDP growth rate (using estimates of the elasticity between public investment and output growth) to account for increases in the growth rate arising from higher levels of public spending. Table (5) contains the result of this exercise, where we can observed that debt-to-GDP ratio increases, but not dramatically (5.7 percentage points of GDP), even when the primary deficit increases by one percentage point of GDP every single year along the seven-year horizon.[9]

Table 5: Short-Term Approach: Increasing Primary Deficit by 1 Percent

Active policy: Increase p. deficit by 1%	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Real GDP Growth	3.7%	3.9%	4.0%	4.1%	4.0%	4.1%	4.2%
Domestic Nominal Interest Rate	7.0%	7.0%	7.0%	7.0%	7.0%	10.0%	10.0%
Nominal Exchange Rate Depreciation	-0.4%	-2.1%	-1.5%	-0.3%	0.7%	0.0%	0.0%
Primary Surplus	**-1.6%**	**-2.0%**	**-1.6%**	**-1.5%**	**-1.3%**	**-1.3%**	**-1.3%**
Inflation	4.0%	3.6%	3.6%	3.7%	3.7%	3.8%	3.9%
Foreing Nominal Interest Rate	4.4%	4.4%	4.4%	4.4%	4.4%	5.0%	5.0%
Debt/GDP ratio	**25.5%**	**26.9%**	**27.9%**	**28.8%**	**29.7%**	**30.5%**	**31.2%**

Notes: Own elaboration with data from Banco de Guatemala and World Economic Outlook.

3.3 Fan Charts

Until now, debt sustainability has been analyzed relying on medium and long term simulations of the debt-to-GDP ratio given specific macroeconomic forecasts and fiscal policy assumptions without any consideration of the uncertainty surrounding these assumptions (besides the basic sensitivity analysis presented). This Fan Chart approach is part of what is known as a probabilistic approach to uncertainty analysis. In this context, uncertainties are characterized by the probabilities associated with events or outcomes of a set of variables that affect the dynamics of public debt. This approach renders a probability distribution of the debt-to-GDP ratio. Rather than simply projecting one central scenario, this approach incorporates the structure of random shocks hitting the domestic economy to obtain a complete distribution of possible paths for debt-to-GDP ratio, based on the dynamics provided by a Vector Auto-Regression (VAR) econometric model or external forecast with or without correlated errors. The use of fan charts is a common practice in the study of risk management in monetary policy, as it is useful for graphically illustrating the uncertainty surrounding inflation forecasts; from there, it has been gradually extended to the analysis of debt sustainability, Arizala et al. (2008).

There are several methodologies to generate the Fan Charts; here we present results using the external forecasts methodology following Arizala et al. (2008), where projections of each of the variables included into the debt equation (equation 2) are made according to:

[9] A graphic depiction of debt dynamics can be found in Figure (14) in Appendix (B).

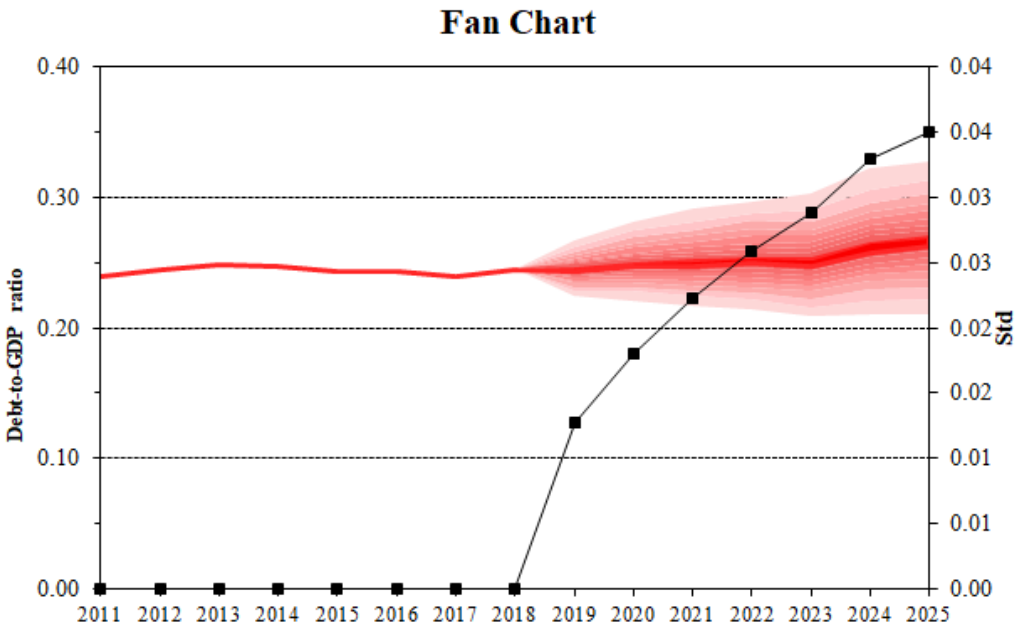
$$x_\tau = x_\tau^{Ef} + \eta_\tau;\ for\ \tau \in [t+1, T]$$

where:

$$\eta_\tau \sim N\left(0, \hat{\Omega}\right)$$

and where x_τ^{Ef} is a vector of external projections included in the debt equation and coming from the same sources as in the baseline scenario used in Section 3.2, η_τ is a vector of simulated errors, with variance $\hat{\Omega}$, that is estimated with the variance-covariance matrix of the residuals from an estimated VAR-model. Figure (10) illustrates the results of computing the Fan Chart using this methodology. It is clear from the chart, that most likely path for the debt-to-ratio is to continue on a stable path along the projection horizon. The probability of exceeding the 30 percent of GDP mark is slim. Actually, one advantage of this methodology is that it allows us to calculate the frequency with which the debt-to-GDP ratio surpasses different threshold values in any of the projected years; in other words, we can calculate the probability that the debt surpasses or achieves certain thresholds. For example, according to this estimation, surpassing the 30 percent of GDP threshold aforementioned has a probability of 3 percent.

Figure 10: External Projections: Correlated Errors



Notes: Own elaboration with data from Banco de Guatemala.

Another variant of this external forecast methodology, is one that uses uncorrelated errors. It simulates errors that have a variance equal to the sample variance of each of the series. Fan Charts can additionally be constructed using the point estimates coming from

the VAR-model, which constitute the central tendency of the forecasts for each of the variables included in the simulation. The simulated paths are the result of the sum of the point estimate from the VAR and one of the generated errors using the VAR-generated variance-covariance matrix. Both additional methodologies were applied and results can be found on Appendix (C).

3.4 Mendoza-Oviedo Approach

Under this approach, Mendoza & Oviedo (2004) assume that there is a government which is highly averse to the risk of default on its sovereign debt. This leads the government to respect a "Natural Debt Limit" (NDL), which represents a credible commitment to be able to repay even in a fiscal crisis. In turn, a "Fiscal Crisis" is defined as a long sequence of adverse shocks to fiscal revenues where public outlays adjust to a tolerable minimum. In this context, if the actual level of debt remains higher than the NDL threshold, the government faces a positive probability of default.

The credible-repayment-commitment value of the debt (the NDL) satisfies the following condition:

$$d \leq d^* = \frac{(t^{min} - e^{min})}{r - g}(1 + g) \tag{4}$$

where d^* the threshold value of GDP ratio; t^{min} is the lowest possible realization of the tax revenue to GDP; e^{min} represents the minimum level of government expenditure to GDP ratio that can be sustained if the country were to enter a fiscal crisis (in which $t = t^{min}$).

The Mendoza & Oviedo (2004) Approach (MO) might be the most suitable methodology for analyzing debt dynamics in Guatemala for two reasons. First, this methodology focuses on revenue uncertainty; as mentioned above, one of the main fiscal issues in this country is the inability to collect taxes. Second, the problem presented by the authors, that of a government which is highly averse to the risk of a collapse in its fiscal outlays (which leads the government to respect the NDL), is akin to the apparent public-debt aversion perceived in Guatemala.

This model requires information about the volatility and persistence of government revenues, the average levels of revenue and expenditure, the size of the potential adjustment in expenditure in the event of reaching a crisis state, the world real interest rate and the economy steady state growth rate. The values used for all these variables are detailed in Table (6). The average level of revenues and expenditures as shares of GDP are calculated from historical data. Persistence of government revenues are approximated by the auto-regressive coefficient of the revenue-to-GDP cyclical component (from an HP filter). One important aspect of the model is the potential adjustment the economy can endure in case of a fiscal crisis. In case of the minimum revenue, we assume that it will be two

standard deviations below its mean (8.8 perccent of GDP). For the maximum expenditure adjustment, we take two different assumptions, the first one is that expenditures can fall two standard deviations bellow its mean in case of crisis, which is fairly standard. But also, since this approach is quite sensitive to the adjustment of government expenditure, we assume alternatively that the minimum level of expenditures that can be attained is equal to the minimum level of expenditures observed in recent history (*i.e.,* 8.1 percent of GDP).

Table 6: Assumptions for the MO Model

Assumptions	Values	Alternative
Real interest rate	1.05	
Steady-State GDP Growth	1.035	
Average levels of non-interest expenditures	11.5%	
Maximum Expenditure Adjustment (2.1 s.d.)	3.2%	
Adjusted Government Expenditure	8.3%	8.1%
Average levels of revenues	11.2%	
Volatility of the government revenues	1.2%	
Persistence of Tax revenue	48.3%	
Minimum Levels of revenues (-2 s.d.)	8.8%	
Initial Level of Debt	24.5%	
Natural Debt Limit	**37.7%**	**46.6%**
Number of repetitions for the simulations	500	

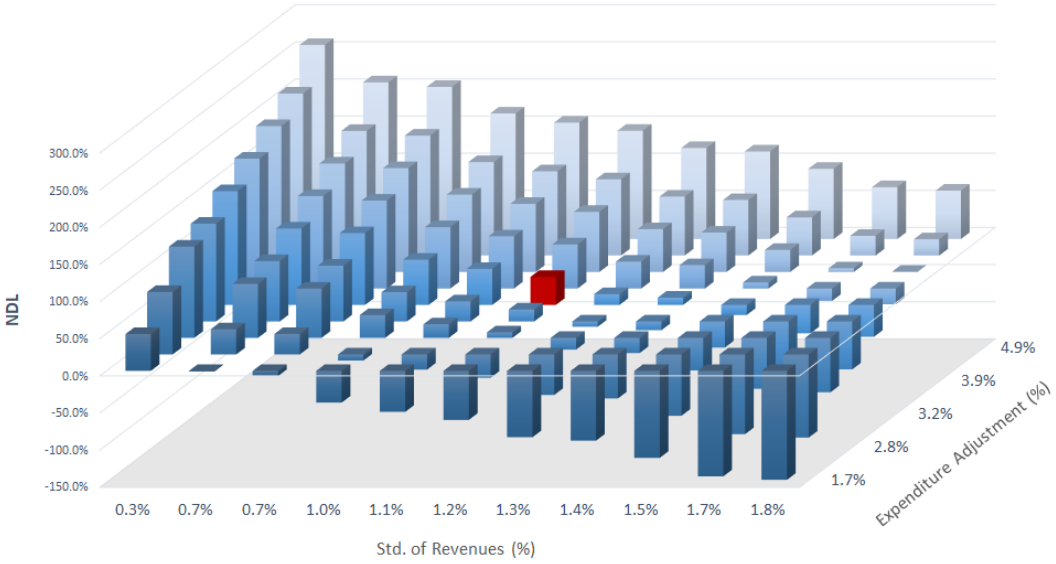
Notes: Own elaboration with data from Banco de Guatemala and World Economic Outlook.

According to this approach, there is still room for Guatemala to increase it debt, as the estimated NDL (in both cases) is reasonably higher than the current levels. Given the sensitivity to different assumptions on revenue volatility and expenditure adjustment, Figure (11) depicts how the NDL will increase as expenditure becomes more flexible and the same happens as revenue volatility decreases. On the contrary, as expenditure becomes less flexible and volatility of revenues increases, the NDL will be lower.[10]

The model allows for simulations, by assuming that public revenues follow a stochastic process characterized by a time-invariant Markov chain, which is approximated with an univariate autoregressive process following Tauchen (1986). Based on the assumptions presented in Table (6) and a dynamic equation for debt, 500 revenue paths were simulated over the mean revenue of 11.2 percent of GDP, with the volatility and the persistence also reported in the same Table. Assuming government keeps expenditure constant at

[10]See Table (9) in Appendix (C) for data on the sensitivity to different assumptions on revenue volatility and expenditure adjustment.

Figure 11: Mendoza-Oviedo Approach, Sensitivity of NDL



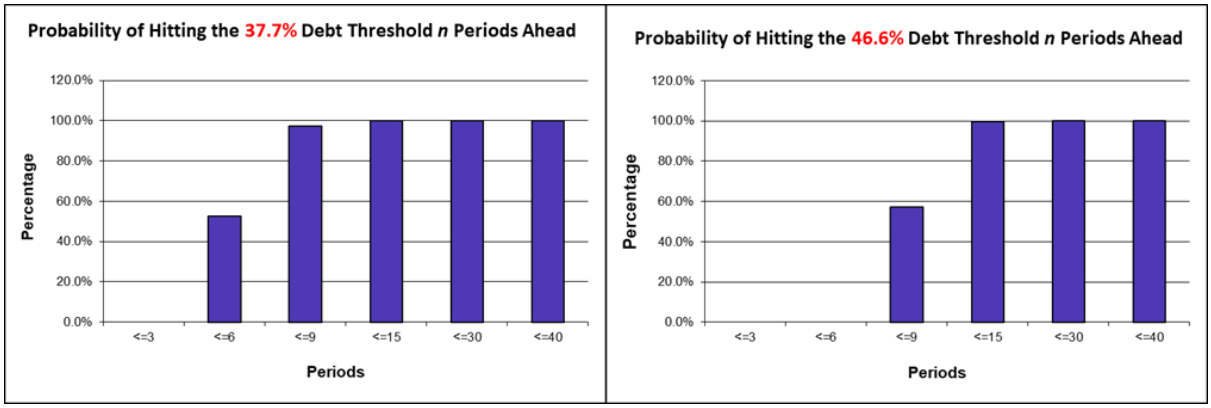
Notes: Own elaboration with data from Banco de Guatemala.

its mean level and taking debt at its current level 24.5 percent of GDP, we compute the relative frequency distribution of government debt n periods ahead, from which the probability of entering a crisis (hitting the threshold) is estimated (see Figure 12). It can be observed that the probability of hitting the first threshold (37.7 percent) in 6 or fewer periods is 49.2 percent and the probability of hitting the second threshold (46.6 percent) in 9 or fewer periods is 57 percent. Given the estimated distribution of hitting a crisis, we can conclude that the current fiscal stance, in terms of debt sustainability, does not present significant vulnerabilities.

4 Concluding Remarks

Discussion and the study of fiscal issues is usually complicated, as fiscal policy deals with redistribution across time and people and ends up at the center of political conflict. Furthermore, fiscal outcomes are not independent from fiscal policy arrangements and procedures; outcomes are always the result of negotiations and a complex game of political economy. With this in mind, in this paper we assess the stability of public debt in Guatemala, conducting a standard debt sustainability analysis, but we went further by laying out a hypothesis of the possible institutional arrangements that have allowed for the containment of fiscal deficits for over 20 years. I found that there are institutional arrangements that promote debt stability and fiscal prudence. Regarding debt sustainability, I conclude that debt is following a stable path without major risks of deviating from stability in the short run. However, tax collection and low government revenues re-

Figure 12: Probability of Hitting the Debt Threshold



Notes: Simulations are run assuming that public revenues follow a stochastic process characterized by a time invariant Markov chain, approximated with an univariate autoregressive process following Tauchen (1986). Values of all variables are depicted in Table 6. I assume government keeps expenditure constant at its mean level and takes debt at its current level (24.5 percent of GDP) to compute the relative frequency distribution of government debt n periods ahead.

main important challenges for the fiscal authority, especially since there is clear evidence of serious lags in human development.

I believe that, embedded in the legal framework and the institutional arrangement, there is an "implicit" fiscal rule that favors stability of deficits and public indebtedness. Beyond of the scope of this document, but of paramount importance, is to performing a formal and mathematical (if possible) characterization of such a fiscal rule in order to evaluate its possible operation mechanisms and the consequences of the rule for the economy in general and for monetary policy in particular. This should be part of a future research agenda.

I also explore characteristics of how fiscal policy is conducted, showing that government expenditures are pro-cyclical, deviating from what could be regarded as optimal or adequate cycle management. The good results in terms of debt stability must be preserved, but there is room for improvement in the way fiscal policy manages the cycle. It would be very useful for future research to evaluate strategies and policies in which cycle management improves, and other fiscal goals are attained, without jeopardizing the financial stability of the government.

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Appendix

Sensitivity Analysis

A Long-Run Approach

Table 7: Long-Run Approach

Av. Real r	Long-Term GDP growth rate				
	1.90%	**2.90%**	**3.50%**	**3.90%**	**4.90%**
0.7%	-0.29%	-0.52%	-0.66%	-0.75%	-0.98%
1.7%	-0.05%	-0.28%	-0.42%	-0.52%	-0.74%
2.7%	0.19%	-0.05%	-0.19%	-0.28%	-0.51%
3.7%	0.43%	0.19%	**0.05%**	-0.05%	-0.28%
4.7%	0.67%	0.43%	0.29%	0.19%	-0.04%
5.7%	0.91%	0.67%	0.52%	0.43%	0.19%
6.7%	1.15%	0.91%	0.76%	0.66%	0.42%

Av. Real Dep.	Av. Real r	Long-Term GDP growth rate			
		1.90%	**2.90%**	**3.50%**	**3.90%**
-16.9%	**-2.9%**	-1.15%	-1.38%	-1.51%	-1.60%
-11.9%	**-0.7%**	-0.62%	-0.86%	-0.99%	-1.08%
-6.9%	**1.5%**	-0.10%	-0.33%	-0.47%	-0.56%
-1.9%	**3.7%**	0.43%	0.19%	**0.05%**	-0.05%
3.1%	**5.9%**	0.96%	0.72%	0.57%	0.47%
8.1%	**8.1%**	1.49%	1.24%	1.09%	0.99%
13%	**10.3%**	2.02%	1.77%	1.61%	1.51%

Notes: Own elaboration with data from Banco de Guatemala and World Economic Outlook.

B Short-Run Approach

As suggested in Borensztein et al. (2010), we simulate a series of adverse shocks to evaluate how the the short-run path for the debt-to-GDP ratio will change if the economy faces a series of adverse exogenous shocks, doing so as a stress test exercise. The scenarios of adverse shocks are as follows: 1) a 30 percent depreciation in t + 1; 2) a 5 percent drop in GDP for two consecutive years; 3) a deterioration equivalent to one standard deviation (down) in the primary surplus ; 4) a 2 s.d. shock in the internal interest rate and the external interest rate; 5) a shock where all the previous scenarios occur together, as an upper bound; and 6) a scenario with historical values is presented, where the

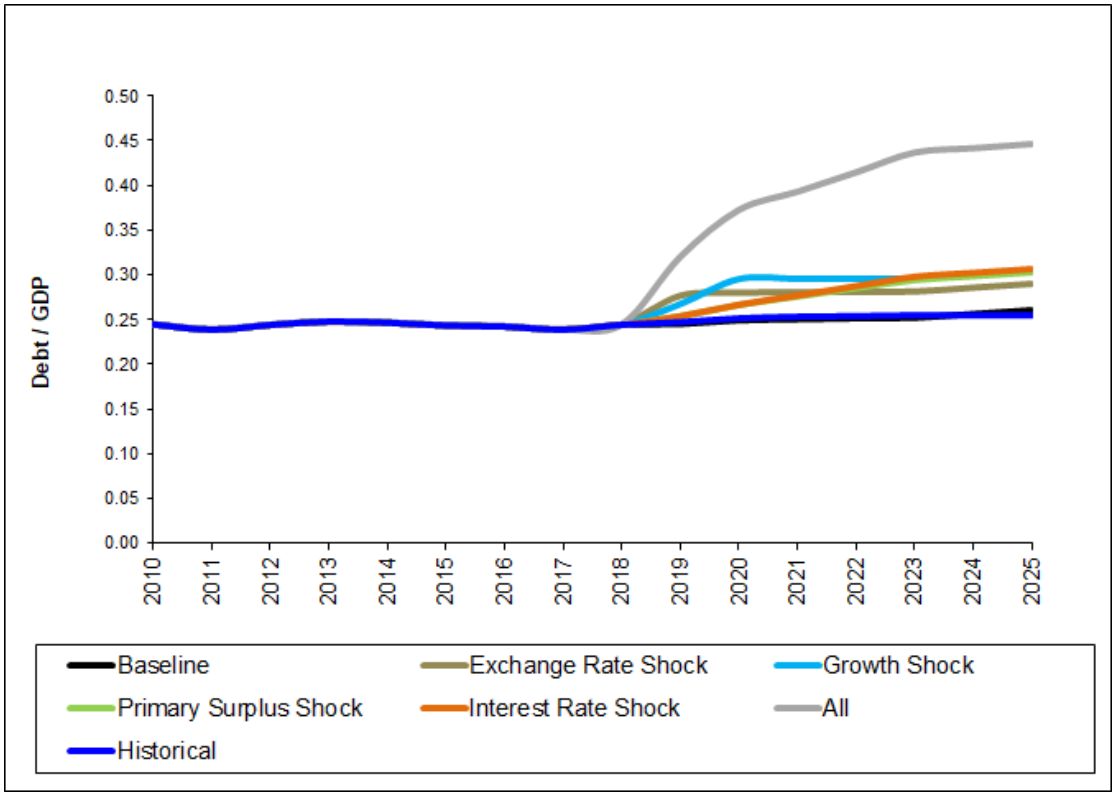
future trajectory of the variables that affect the debt are simulated as a simple average of historical data.

Table 8: Short-Term Approach: Exogenous Shocks

Debt/GDP ratio with shocks	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Shock 1: 30% depreciation (one time)	27.6%	28.0%	28.0%	28.1%	28.1%	28.5%	28.9%
Shock 2: two years stagnation	26.8%	29.5%	29.5%	29.6%	29.6%	30.0%	30.4%
Shock 3: primary surplus down (one s.d.)	25.4%	26.6%	27.6%	28.5%	29.4%	29.8%	30.2%
Shock 4: interest rates increase (2 s.d.)	25.4%	26.7%	27.7%	28.8%	29.8%	30.3%	30.7%
Shock 5: combined shock	32.0%	37.2%	39.3%	41.4%	43.6%	44.1%	44.6%
Shock 6: historical Scenario	24.7%	25.2%	25.3%	25.4%	25.5%	25.5%	25.5%

Notes: Own elaboration with data from Banco de Guatemala and World Economic Outlook.

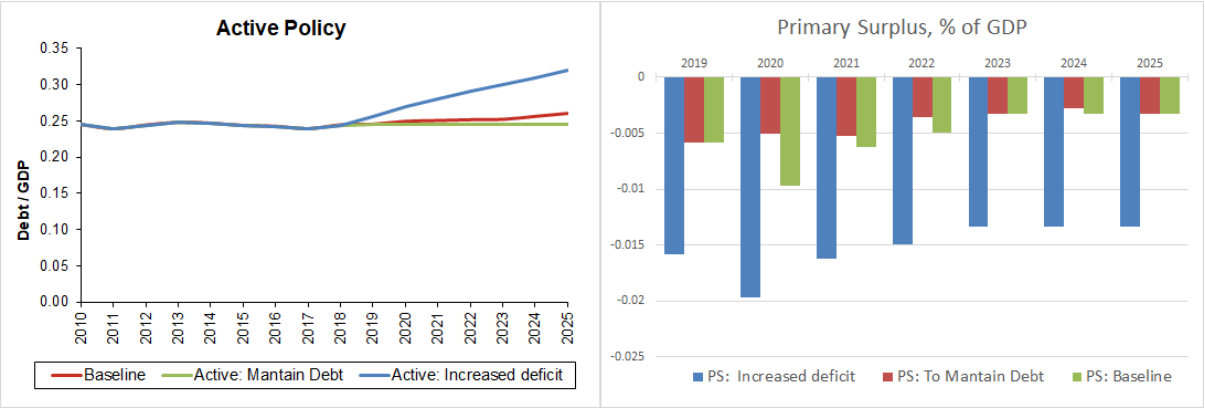
Figure 13: Exogenous Shocks



Notes: Own simulations.

Debt dynamics and primary deficits for both active policy scenarios are presented below.

Figure 14: Active Policy Scenarios



Notes: Own simulations.

C Mendoza and Oviedo

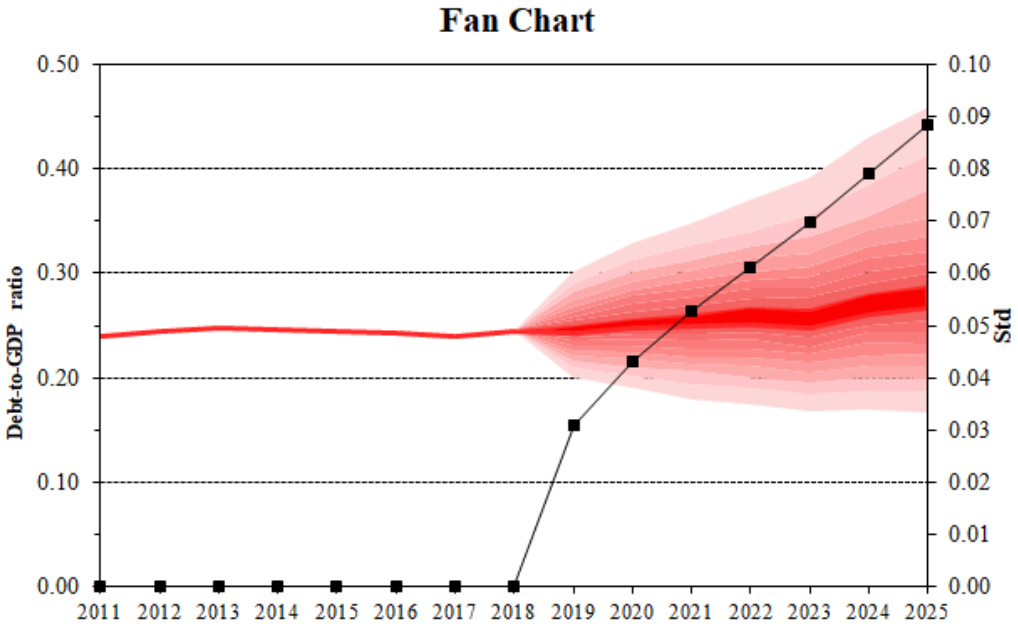
Table 9: Mendoza-Oviedo Approach, Sensitivity

	Adjustment of Expenditures								
Std. Revenue	**1.7%**	**2.2%**	**2.8%**	**2.9%**	**3.2%**	**3.6%**	**3.9%**	**4.2%**	**4.9%**
0.30%	49.6%	84.1%	123.0%	131.7%	153.3%	174.9%	196.5%	218.1%	261.3%
0.67%	-0.8%	33.8%	72.6%	81.3%	102.9%	124.5%	146.1%	167.7%	210.9%
0.72%	-7.0%	27.6%	66.4%	75.1%	96.7%	118.3%	139.9%	161.5%	204.7%
0.99%	-42.7%	-8.1%	30.8%	39.4%	61.0%	82.6%	104.2%	125.8%	169.0%
1.08%	-55.1%	-20.5%	18.3%	27.0%	48.6%	70.2%	91.8%	113.4%	156.6%
1.16%	-66.0%	-31.4%	7.5%	16.1%	**37.7%**	59.3%	80.9%	102.5%	145.7%
1.34%	-89.2%	-54.7%	-15.8%	-7.1%	14.5%	36.1%	57.7%	79.3%	122.5%
1.37%	-93.9%	-59.3%	-20.4%	-11.8%	9.8%	31.4%	53.0%	74.6%	117.8%
1.55%	-117.1%	-82.6%	-43.7%	-35.1%	-13.5%	8.1%	29.7%	51.3%	94.6%
1.73%	-142.0%	-107.4%	-68.5%	-59.9%	-38.3%	-16.7%	4.9%	26.5%	69.7%
1.77%	-146.6%	-112.1%	-73.2%	-64.5%	-42.9%	-21.3%	0.3%	21.9%	65.1%

Notes: Own elaboration with data from Banco de Guatemala and World Economic Outlook.

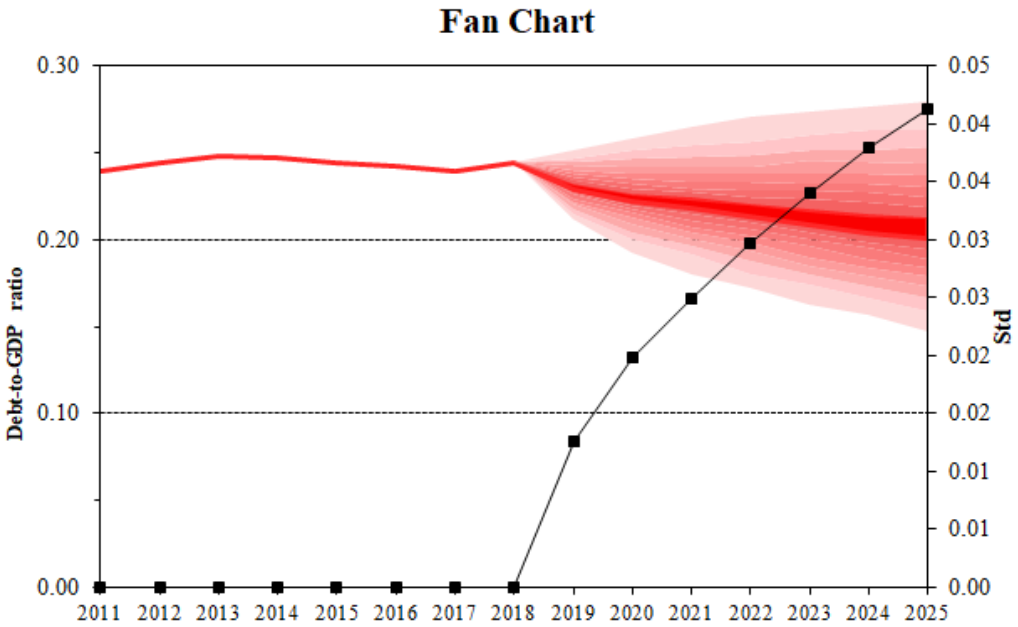
Additional Fan Charts

Figure 15: External Projections: Uncorrelated Errors



Notes: Own simulations.

Figure 16: VAR-Model Projections



Notes: Own simulations.