

# GUATEMALA: SELECTED ISSUES AND ANALYTICAL NOTES



# GUATEMALA

## SELECTED ISSUES AND ANALYTICAL NOTES

August 2016

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# GUATEMALA

## SELECTED ISSUES AND ANALYTICAL NOTES

August 2, 2016

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## SELECTED REAL SECTOR ISSUES

### A. Potential Growth and the Output Gap<sup>1</sup>

*This section estimates potential output growth and the output gap for Guatemala. Potential output growth averaged at 4.4 percent just before the global financial crisis but has declined since to 3¾ percent due to the lower capital accumulation and TFP growth. It is estimated at 3.8 percent in 2016, and the output gap is virtually closed. Looking forward, potential growth is expected to reach 4 percent in the medium-term due to the expected improvements in TFP growth.*

1. **A number of methodologies were employed to estimate potential output for Guatemala.** They included univariate and multivariate filters, as well as the production function approach (see Analytical Note (AN) on Assessing Potential Output, 2014 and Appendix for details). Averaging the results from different methodologies we estimate potential output growth in 2016 at 3.8 percent. At 0.2 percent of potential output the output gap is essentially closed. In the following paragraphs, we elaborate on some specific findings from the multivariate filter analysis, which adds economic structure to the estimates by conditioning them on some basic theoretical relationships, such as the Phillip's curve relating inflation to the output gap, and the Okun's law relating cyclical unemployment to the output gap,<sup>2</sup> as well as the production function approach.

	Potential GDP growth rate				Output Gap		
	2000-08	2009-14	2015	2016	2014	2015	2016
<i>Production Function</i>	3.45	3.38	3.81	3.76	0.11	0.10	0.04
<b>Cycle Extraction Filters</b>							
<i>Hodrick-Prescott</i>	3.49	3.36	3.77	3.73	0.14	0.17	0.15
<i>Butterworth</i>	3.48	3.31	3.84	3.76	0.18	0.15	0.09
<i>Christiano-Fitzgerald</i>	3.36	3.27	3.82	4.02	0.12	0.11	-0.20
<i>Baxter-King</i>	3.74	3.35	3.77	3.73	-0.04	0.00	-0.03
<b>Univariate Kalman Filters</b>							
<i>Deterministic Drift</i>	3.36	3.36	3.36	3.59	0.63	1.25	1.46
<i>Mean Reversion</i>	3.70	3.68	3.68	3.68	-0.55	-0.26	-0.13
<b>Multivariate Kalman Filter</b>							
<i>With inflation and unemployment</i>	3.55	3.20	3.72	3.70	0.03	0.11	0.12
<b>Average of All Models</b>	<b>3.51</b>	<b>3.36</b>	<b>3.72</b>	<b>3.75</b>	<b>0.08</b>	<b>0.20</b>	<b>0.19</b>

Source: Fund staff estimates.

<sup>1</sup> Prepared by Iulia Ruxandra Teodoru.

<sup>2</sup> Univariate filters, on the other hand, do not incorporate any economic structure (e.g. the assumption is that an economy is, on average, in a state of full capacity, without incorporating information from variables such as inflation or unemployment), and thus are not consistent with an economic concept of potential (e.g. Okun's definition: the level of output that can be achieved without giving rise to inflation). Relative to previous literature, and particularly to Blagrove and others (2015), the contribution of this section is twofold: first, it uses WEO forecasts to account for inflation and growth expectations, to guide potential output estimates, which could be particularly important for countries where data on inflation and growth expectations do not exist; and, second, it applies this framework to Central American countries, where multivariate filters were not used before.

2. **Potential growth increased from 3.3 percent to 4.4 percent from early to the mid-2000s.** The increase was driven by higher employment growth and less negative TFP growth. Compared to other Central American economies such as Costa Rica, the Dominican Republic, and Panama where an acceleration in TFP growth lifted potential growth by at least 2 percentage points and as high as 5 percentage points in the case of Panama, the increase in Guatemala was small.

3. **Potential growth declined from 4.4 percent in 2006–07 to 3.7 percent after the crisis in 2013–14.** Lower capital accumulation and productivity growth explain the decline in Guatemala’s potential growth during this period. Most other Central American economies also experienced declines in their potential growth during that period on the account of lower capital accumulation, employment, and TFP growth: by about 2 percentage points in Costa Rica, the Dominican Republic, and Honduras and by about 1 percentage point in El Salvador and Panama. Potential growth increased slightly only in Nicaragua.

4. **TFP growth has not been contributing materially to Guatemala’s potential growth.** In fact, in the early 2000s, TFP growth was negative. This was also the case in Honduras, El Salvador, Nicaragua, and Costa Rica. TFP growth in Guatemala turned positive in late 2006–07, but remained low compared to other Central American countries (with the exception of Honduras and El Salvador). Weak productivity growth in Guatemala may reflect, among other factors, low investment in education and R&D, as well as more generally the lack of opportunities in terms of access to basic services that are found necessary to succeed in life (running water and electricity). Migration of high-skilled workers to the United States as well as a large size of the informal economy, which diverts resources to less productive activities, might have also contributed to lower TFP growth. In addition, productivity gains may be hindered by the lack of competition, weak business environment, high red tape and corruption, lack of legal/judicial stability, weak protection of investors and enforcement of contracts, poor security, high costs and poor quality of infrastructure. After the crisis, TFP growth, while recovering to small positive rates, remained very low in Guatemala (at 0.2 percent in 2013–14); it declined in most other Central American economies. However, TFP growth has recovered to the pre-crisis rates in the Dominican Republic and Nicaragua (where it reached 1 percent in 2013–14), and its contribution to the potential growth remained over 2.5 percent in the Dominican Republic and Panama, which have the highest TFP growth rates in the region. On the other hand, TFP growth continues to be low in Costa Rica (0.2 percent), and negative in Honduras (negative 0.1 percent) as well as El Salvador (negative 0.7 percent).



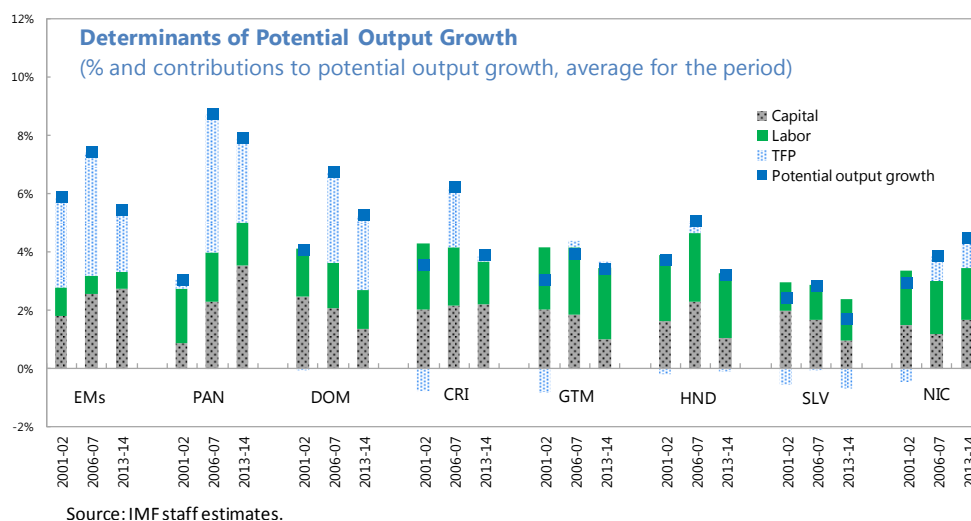
Source: World Bank.  
 Note: The HOI calculates how personal circumstances (like birthplace, wealth, race or gender) impact a child’s probability of accessing the services that are necessary to succeed in life, like timely education, running water or connection to electricity.

5. **Capital accumulation was an important contributor to Guatemala’s potential growth before the crisis, but its contribution after the crisis declined sharply.** Capital growth increased

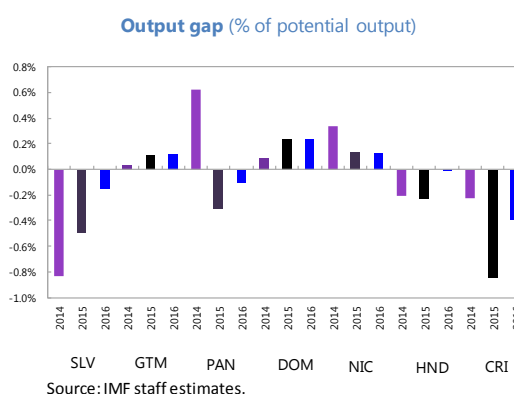


from 4.5 percent in the mid-2000s to 5.5 percent in 2007. A large decline in capital growth accounted for most of the decline in potential growth in Guatemala after the crisis. Capital growth dropped over 2.5 percentage points from 2006–07 to 2013–14, one of the largest declines in Central America.

**6. Employment growth, higher than elsewhere in the region, has been the main driver of potential growth in Guatemala over the past decade.** It increased from 3.3 percent to 3.5 percent during the 2001–07, mainly attributable to higher working-age population growth. Fertility rates and population growth in Guatemala are one of the highest in Central America and life expectancy has been steadily increasing, which can explain in part the high growth in working-age population. Potential employment growth continued increasing in Guatemala after the crisis. It increased by about 0.3 percentage points (from 3.5 percent in 2007 to 3.8 percent in 2014), while other Central American economies went through important declines in potential employment growth.



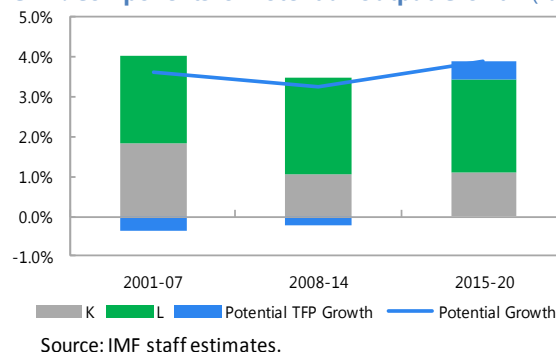
**7. From a cyclical perspective, the Guatemalan economy is assessed to be operating at potential in 2015/16.** The negative output gap in Guatemala in 2009 (negative 1.2 percent of potential output) has significantly shrunk and the slack in the economy has been reduced since then. Both the output gap and the unemployment gap (see Appendix for details of the calculation) are now closed. The closed unemployment gap reflects improved labor conditions, where the unemployment rate is at its equilibrium value having steadily fallen since 2009.



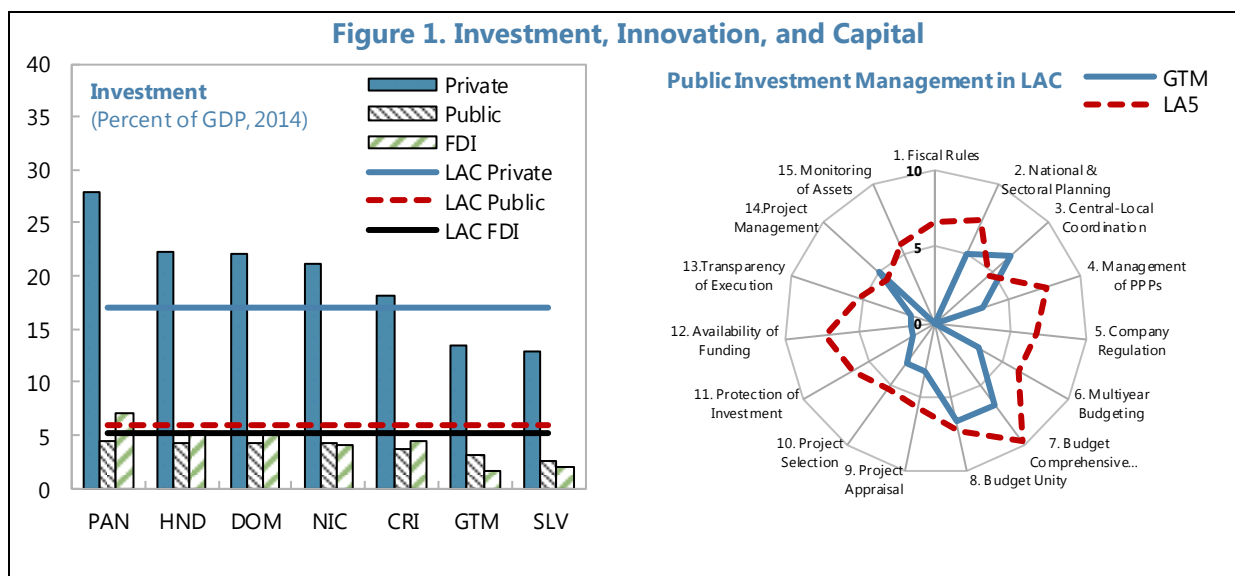
**8. Potential growth in Guatemala is likely to increase to 4 percent in the medium term.** The scenario analysis builds on the analysis of potential growth until 2014 and extends it 2015–2020,

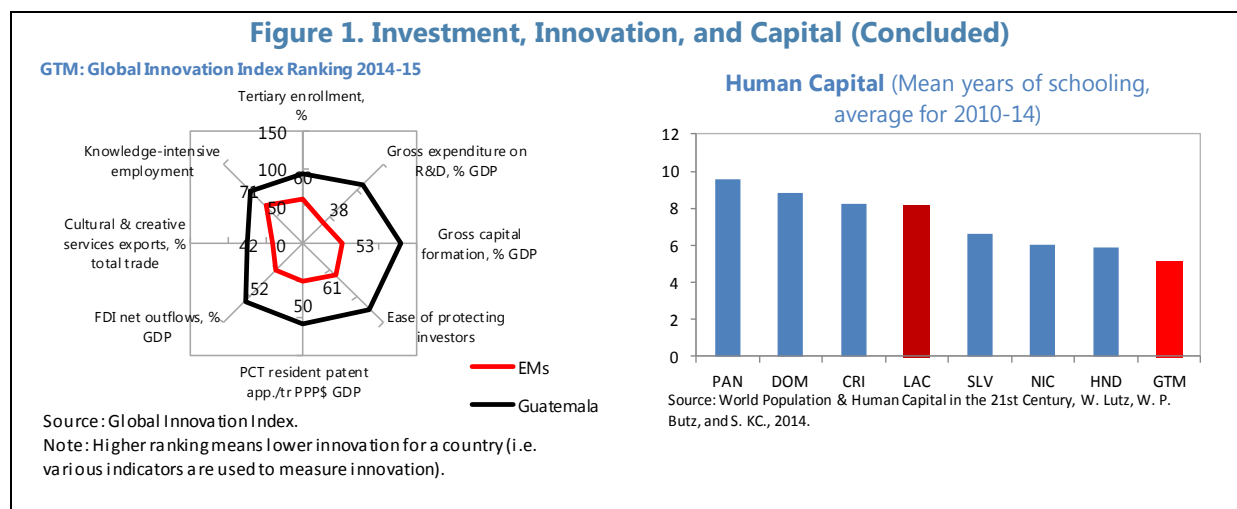
based on the projected demographic patterns, prospects for capital growth and improvements in TFP growth. These scenarios are subject to significant uncertainty, as a number of country-specific factors could influence potential growth, and the evolution of TFP growth in the medium term. The working-age population growth and labor force participation growth are likely to continue at similar rates. Investment-to-capital ratios have not changed much since 2011 and are likely to remain below pre-crisis rates, while improving only slightly over the medium term given improvements in the efficiency of public investment. This is because of less favorable external financing conditions, and weaknesses in the institutional, regulatory, and legal environment. TFP growth is expected to slightly increase towards the end of the horizon driven by improvements in institutions providing legal and judicial certainty, and a reduction in corruption.

GTM: Components of Potential Output Growth (%)



9. **The main challenge in the longer term in Guatemala is to foster TFP growth.** Relative to the region and emerging markets, Guatemala performs poorly in various facets of innovation such as spending on R&D, tertiary enrollment rates, number of patent applications, FDI inflows, ease of protecting investors, knowledge-intensive employment, and creative services exports. Enhancing R&D/technological diffusion will require strengthening institutions, human capital and research, and achieving higher business and market sophistication, and competition in product and labor markets. Adopting the Competition Law currently under consideration and sanctioning anti-competitive behavior would support entry of new innovative firms and punish practices protecting incumbents. Important improvements in the quality of schooling will also be needed to enhance human capital.





10. **Policies should also prioritize mobilizing domestic savings to invest and build a higher capital stock.** Savings are much lower than in other LAC countries and emerging markets. Investment-to-capital ratios are among the lowest in Central America, and much lower than those in other LAC countries. Raising savings would require a deeper, more diversified and more inclusive financial system (see AN on Financial Development and Inclusion). Attracting private domestic and foreign investment will require strengthening institutions to secure property rights and reducing red tape and corruption, ensuring legal and judicial stability, and improving security. Higher and more efficient public investment is critical to address infrastructure deficiencies. The latter will require an increase in government revenue and improvements in public investment management framework.

### B. Food Inflation in Guatemala<sup>3</sup>

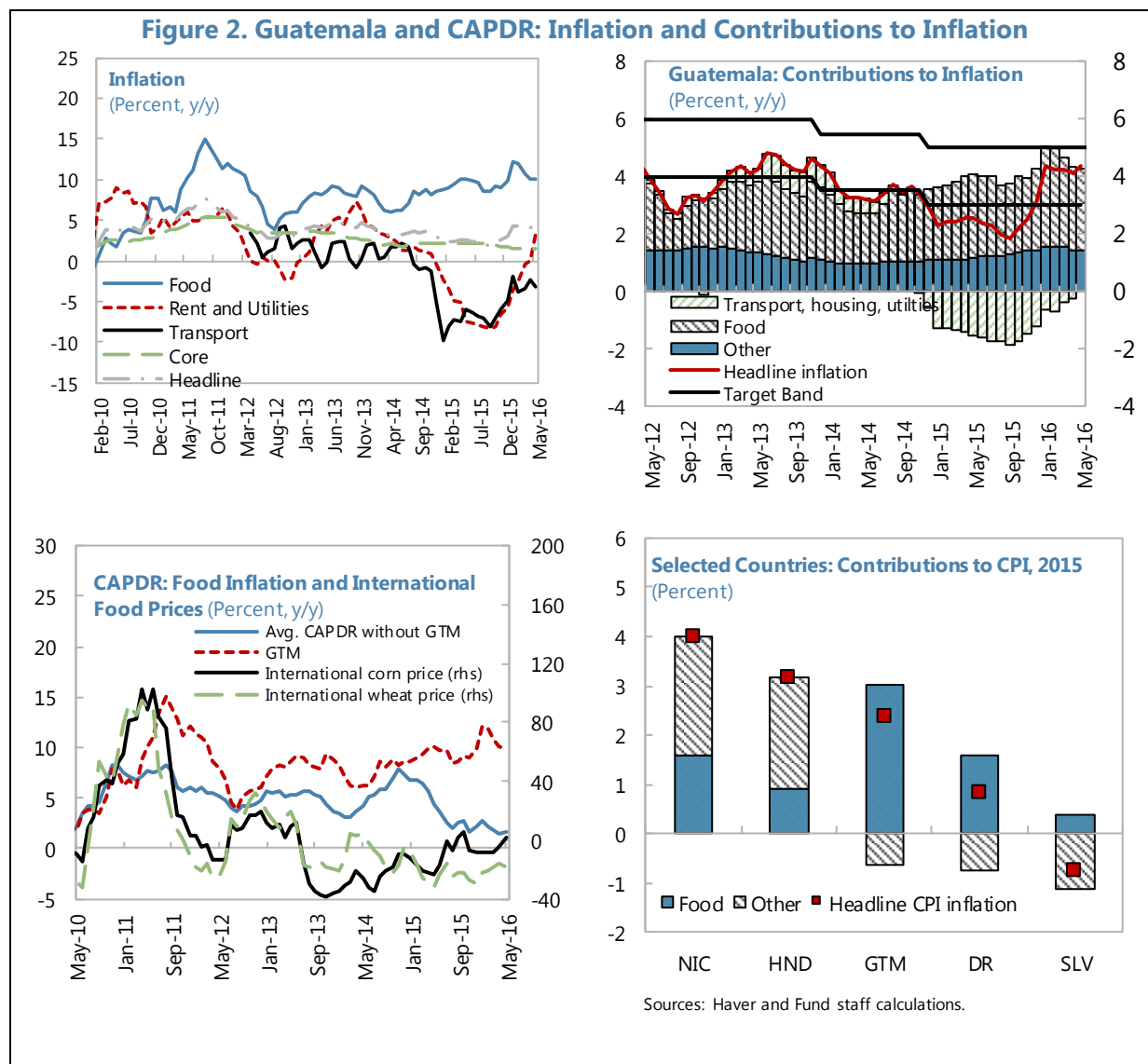
*Food prices have been the main driver of headline inflation during the last few years. While there have been some weather-related supply shocks, demand pressures, especially from strong remittances inflows, have played an important role in driving food inflation, in particular, in 2015. Transport infrastructure deficiencies and other structural factors have likely contributed to a sustained high food inflation in Guatemala, compared to the regional peers, particularly in rural areas. Hence, structural policies to increase elasticity of food supply would be beneficial.*

#### Recent Developments

11. **Food prices have been rising strongly during the last few years.** Food price increases have been the main driver of headline inflation, more than offsetting the negative contributions from other components of the consumer price index (CPI) directly related to oil prices—transport and utilities. On average, food price inflation has been double that of the general price index, resulting in an average contribution of about two thirds to total inflation since 2012, despite having a weight of less than one third in the CPI. While rapidly rising international prices of the main imported food products—corn and wheat—contributed to high food inflation in 2010–11, this has

<sup>3</sup> Prepared by Jaume Puig-Forné and José Pablo Valdés.

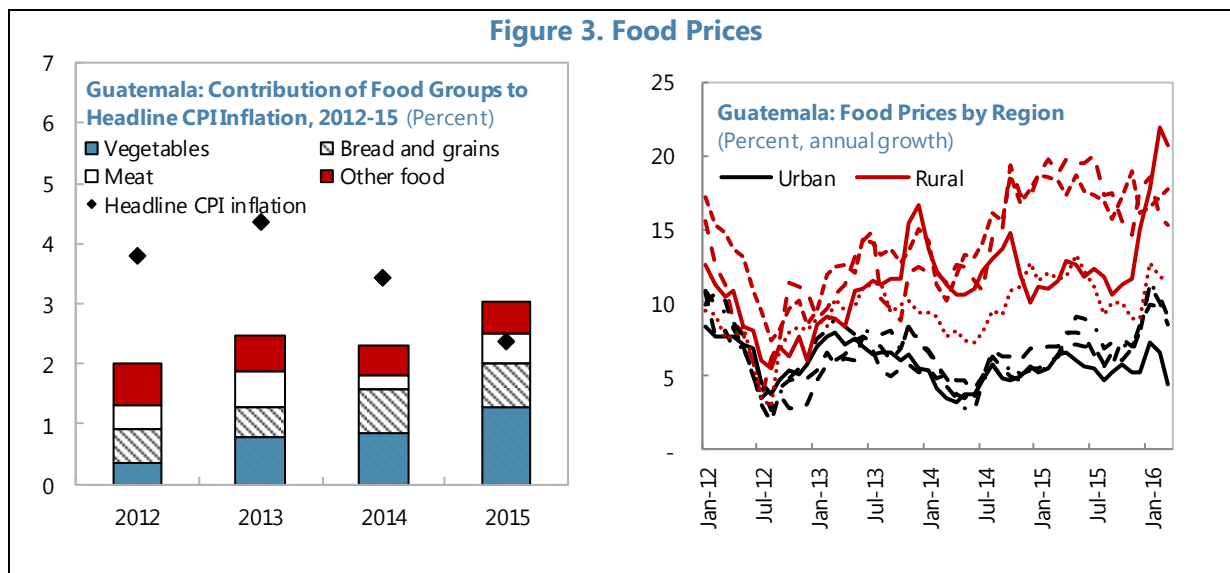
not been the case since 2012 when international food prices have been mostly falling. Moreover, lower food inflation across countries in Central America suggests that country-specific factors have been driving the high food inflation in Guatemala.



12. **Food inflation has been concentrated in a few product groups and rural regions of the country.** The acceleration in food inflation has been largely driven by a few product categories, in particular, vegetables, breads/grains, and meat despite having a combined weight in the CPI of less than 20 percent. There has also been a clear differentiation of food inflation by region, with consistently higher food inflation in rural areas, compared to urban areas.<sup>4</sup> Rural areas have

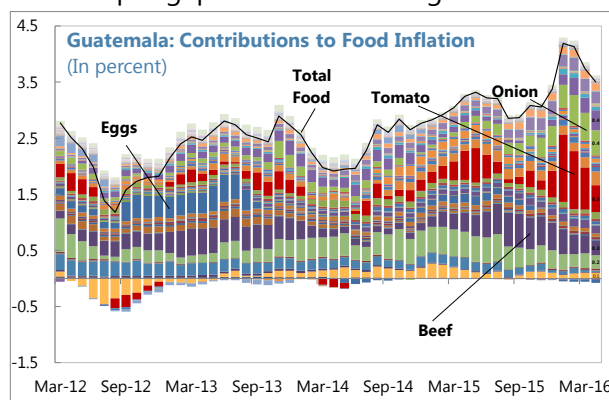
<sup>4</sup> The National Statistics Institute (INE) produces price indices for the eight administrative regions in the country. The regions can be classified into predominantly urban or rural depending on the distribution of large urban centers across regions.

contributed almost half of overall food inflation at the national level during the last few years, despite representing about one fourth of the national CPI.

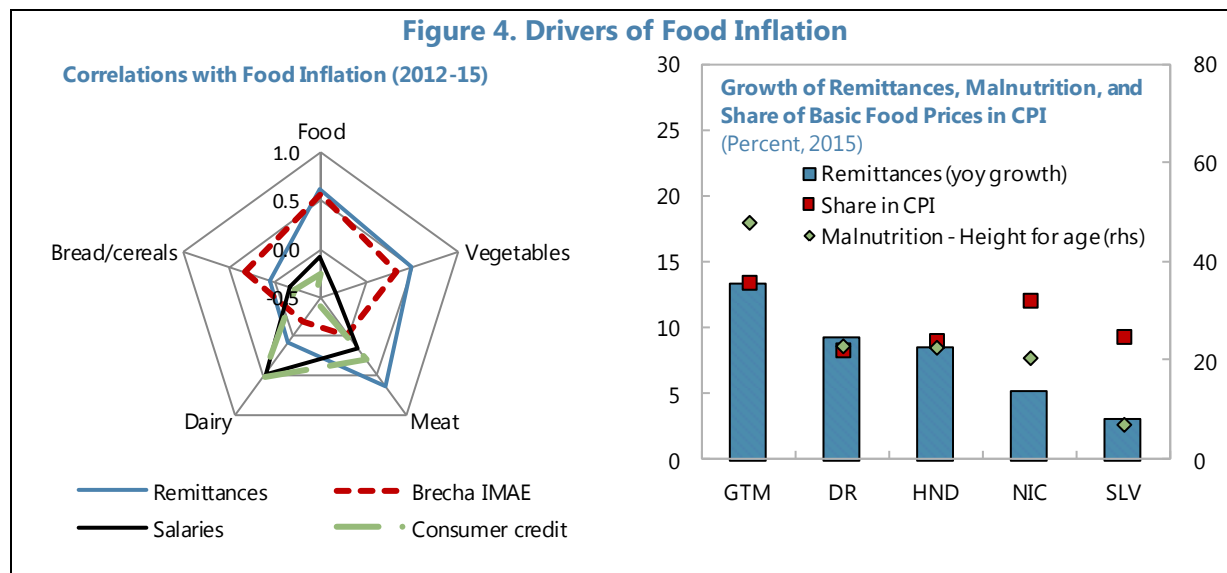


### Drivers of Food Inflation

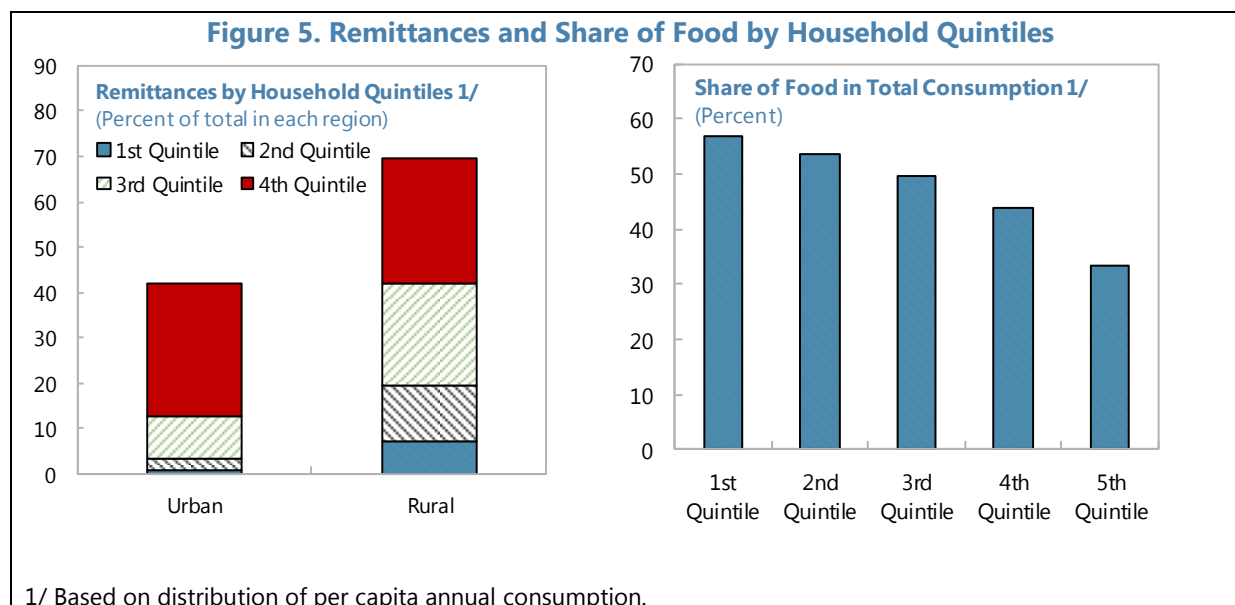
13. **Demand pressures, especially from remittances flows, have played an important role in driving food inflation.** While there have been some weather related shocks temporarily pushing up prices of some vegetable products—especially in late 2015<sup>5</sup>—demand factors, including strong remittances growth, appear to have been the main driver of high food inflation in the last few years, judging from high correlations of food inflation with the output gap and remittances growth. Prices of food products that have been experiencing important increases—especially vegetables and meat that tend to be added to the basic diet as incomes of poor households increase—are particularly highly correlated with remittances inflows. The strong growth in remittances, significantly above other countries in the region in 2015, likely contributed to ease budget constraints of poorer families with high levels of malnutrition.



<sup>5</sup> Weather related shocks explain the sharp increase in prices of tomatoes and onions in late 2015. The shocks also affected neighboring countries, resulting also in increased external demand for these products.

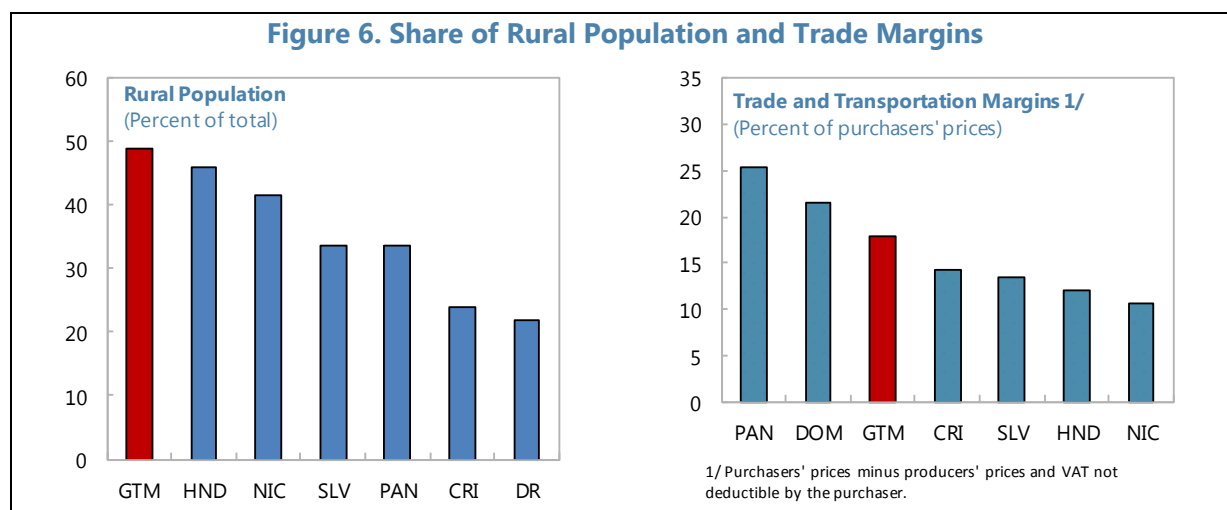


14. **The greater incidence of food inflation in rural areas also points to the importance of remittances.** While a similar share of remittances goes to rural and urban areas (with about half of households living in each of those areas), remittances represent a greater share of total income in rural areas that tend to be significantly poorer. Also, compared to urban areas, a much larger share of remittances goes to the mid- and lower-end of the income distribution. Lower income households spend a larger share of their income on food—almost 60 percent of total household consumption in the lowest quintile, compared to about 35 percent in the highest quintile.



15. **Other structural factors may also be contributing to high food inflation, especially in rural areas.** Guatemala has the lowest level of urbanization in Central America. Low public investment (Section a) resulting in transport infrastructure deficiencies that are particularly acute in

rural areas could be an important driver of the higher trade and transportation margins. However, other factors may also be contributing to the differences with other Central America countries given that countries like Honduras or Nicaragua, that also have low urbanization levels, have much lower trade margins. Literature finds that the degree of competition affects both the price level and inflation. For example, Przybyla and Roma (2005) demonstrate that the extent of product market competition, in particular, measured by the level of mark-up, is an important driver of inflation and that higher product market competition reduces average inflation rates for a prolonged period of time. While there is no sufficient information on the severity of competition problems in the transport and food distribution sectors in Guatemala given the absence of a competition law and a competition authority<sup>6</sup>, the experience in the neighbouring countries that have adopted competition laws suggests that anti-competitive business practices cannot be completely ruled out.<sup>6</sup> Moreover, non-tariff barriers could also be limiting regional trade of food products despite the progress already made to harmonize trade policies and develop a common market in Central America.<sup>7</sup>



## Policy Recommendations

16. **Monetary policy should react if there are second round effects from high food inflation.** If remittances remain strong while downward pressures from oil price declines continue to

<sup>6</sup> In a report on food security in the Northern Triangle, USAID notes that much progress has been recorded in reducing barriers to competition in food-related markets in El Salvador and Honduras over the past decade as a result of the work of competition agencies. USAID considers that these conducts are likely to still be prevalent in Guatemala, which lacks a competition law or enforcement agency (USAID, 2015)—a competition law has already been submitted to Congress as required under the trade pillar of the Association Agreement between Central America and the EU.

<sup>7</sup> USAID finds that delays related to border-crossing procedures in the region—with numerous government agencies present at border crossings, often with separate staff and procedures—increase the price of traded goods, including food products, while also limiting access to perishable products which often spoil at the border (USAID, 2015). Border-crossing procedures also include the application of sanitary and phyto-sanitary (SPS) measures, which differ across countries limiting the ability of imported products to compete; the World Bank finds that in Guatemala, technical measures, including SPS barriers, can increase the average import prices of beef, bread and pastry, chicken meat, and dairy products by an amount equivalent to ad-valorem tariffs of 68, 51, 22, and 5 percent, respectively (World Bank, 2014).

dissipate, sustained high food price inflation—particularly in rural areas where remittances play a disproportionately greater role in final demand and where food supply is more inelastic—could drive overall inflation above target. If this is seen as a temporary development, there is no need for monetary policy to react, but if it has second round effects on inflation expectations or core inflation, monetary tightening would be warranted (see AN on Monetary Policy Management).

**17. Structural policies to increase supply of food, particularly in rural areas, could also help.**

- Investments in transport infrastructure should be prioritized. This will facilitate access to national food and other markets for those living in rural areas.
- The new competition law should be adopted and a competition authority should be established promptly. The new competition authority should prioritize analysis of food and transport industries to determine whether issues within its mandate are contributing to the relatively higher trade and transport margins in food prices compared to other countries in the region.
- Improvements in customs procedures would not only be beneficial for competitiveness of exporters, but could also remove one of the constraints on greater imports of perishable products.
- Additional advances in regional integration—beyond tariff reductions already implemented—to reduce other non-tariff barriers, including SPS regulations would be helpful.<sup>8</sup>
- Programs for rural development and poverty reduction should be comprehensive, supporting both capacity to increase food consumption—through transfers or other means—and to ensure adequate supply of food, including through programs to improve access to irrigation, financing, and technical assistance in the agricultural sector.
- Finally, measures to improve the business climate would also help provide a more enabling environment for remittances to be directed to investment, rather than consumption as is currently the case, especially in rural areas.

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<sup>8</sup> For example, mutual recognition of food product registration approval by national food and health authorities would help reduce time and investment for introduction of national food products in new regional export markets.



## C. Female Labor Force Participation in Guatemala<sup>9</sup>

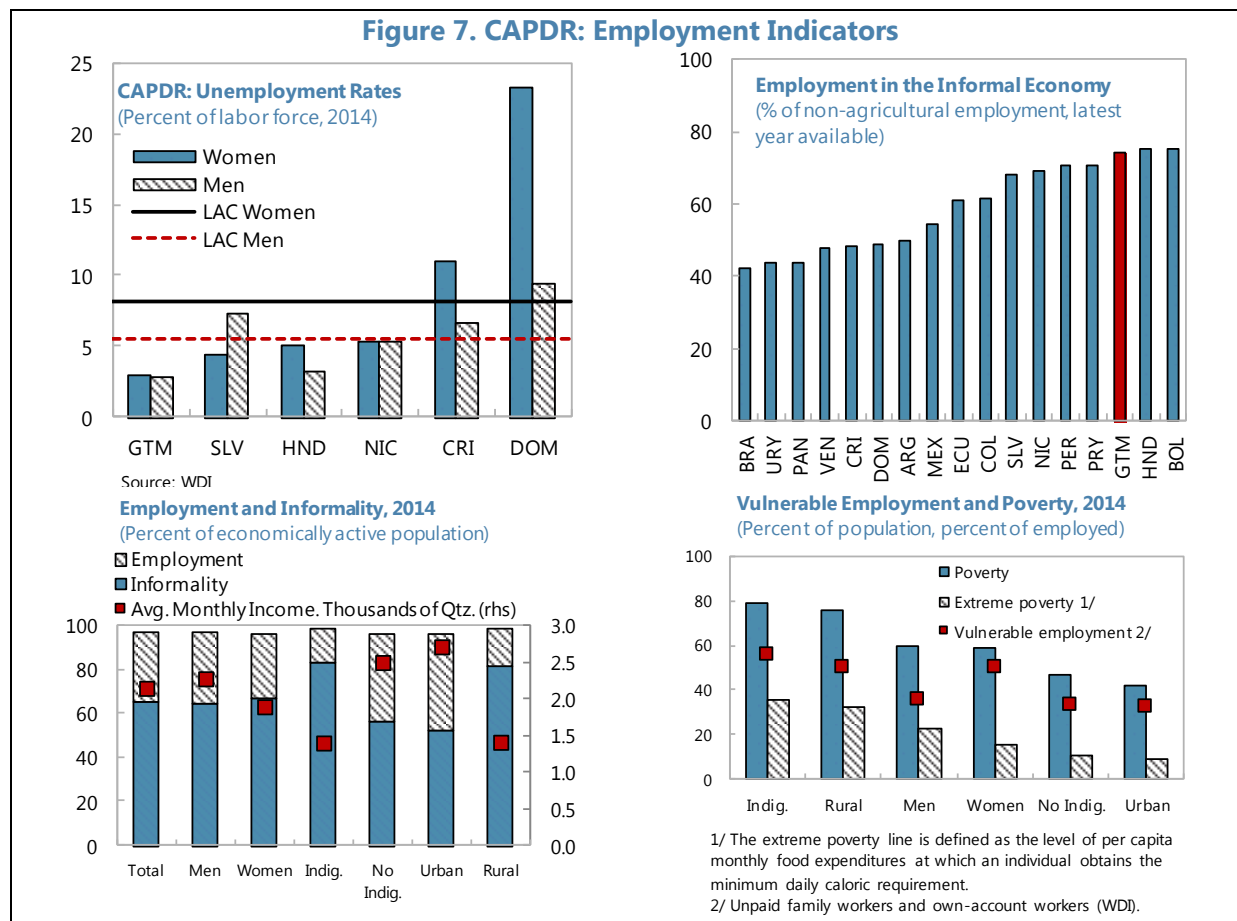
*In contrast to male labor force participation (LFP), which is high in Guatemala by regional standards, female labor force participation is lower than that in other Latin American countries, though at par with that in other CAPDR countries. Using evidence from household surveys and cross-country data, this note examines the determinants of female labor force participation and the factors behind a relatively low female LFP rate in Guatemala. Income, education and fertility levels, are important determinants of female LFP. Increasing access to education, investment in infrastructure and information technology as well as taking measures to support working mothers with children could help raise female LFP in Guatemala.*

### Guatemala's Labor Market

18. **Guatemala's labor market is characterized by low unemployment and high informality and inequality, contributing to sub-par social outcomes.** Unemployment is low and stable in Guatemala, hovering around 3 percent during the last decade, with slightly higher rate for women and slightly lower for men. High degree of informality and poor social protection schemes have likely contributed to low unemployment rates in Guatemala. Inequality of labor conditions across groups within the society is high, with the indigenous and rural populations having the highest rates of informality and lowest average incomes, contributing to their higher poverty rates. Informality is similar for women and men, although the average income is somewhat lower for women. The higher share of vulnerable employment among women does not seem to be associated with worse social outcomes, as they have similar poverty rates and significantly lower extreme poverty rates than men.<sup>10</sup>

<sup>9</sup> Prepared by Jaume Puig-Forne and Victoria Valente.

<sup>10</sup> Vulnerable employment is defined in the World Bank Development Indicators as unpaid family workers and own-account workers.

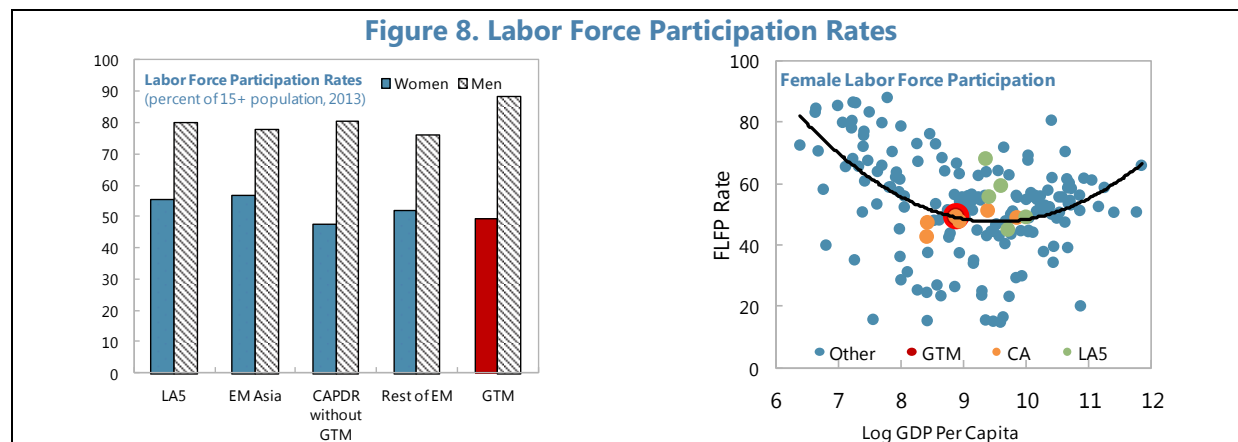


**Cross-Country Evidence**

19. **Guatemala’s relatively low female LFP is consistent with its level of development.** In contrast to male LFP, which is high by regional standards, female LFP is lower than that in other Latin American countries, though at par with that in other CAPDR countries. One potential explanation of the relatively low female LFP in Guatemala, as well as in other countries in Central America, is the country’s relatively low income status (lower middle income). The literature finds a U-shaped relationship between the level of economic development (e.g. GDP per capita) and female LFP rates.<sup>11</sup> Women tend to work out of necessity in poor countries, mainly in subsistence agriculture or home-based production. With income growth, activity tends to shift from agriculture to industry, with jobs which are away from home, making it more difficult for women to juggle children with a market job—especially with limited public childcare services still provided at intermediate levels of development. At the household level, as the husband’s wage rises, there is a negative income effect on the supply of women’s labor. Once wages for women start to rise, however, the substitution

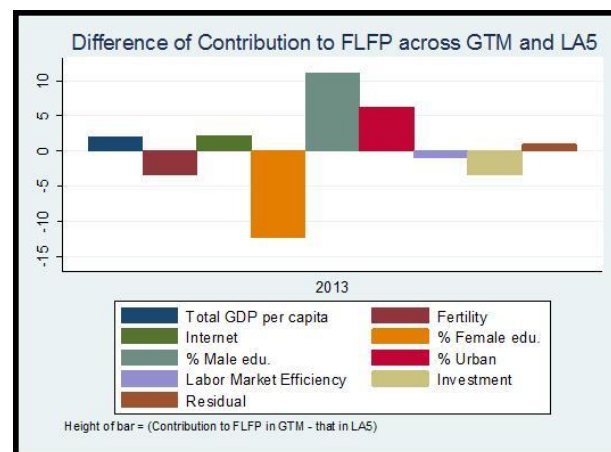
<sup>11</sup> Goldin (1994).

effect increases incentives for women to increase their labor supply, until this effect dominates the negative income effect.<sup>12</sup>



20. **Other factors beyond income level also help explain Guatemala’s relatively low female**

**LFP.** A cross-country panel that analyzes the main factors explaining female LFP across countries is used to analyze the contribution of various factors to explaining the level of female LFP in Guatemala. The gap with LA5 is then computed as the difference between the contribution of various components to explaining LFP in Guatemala and that to explaining that in LA5 on average. The explanatory variables used in the analysis include income per capita, income per capita squared, fertility rate, number of internet users per 100 people, male and female secondary and tertiary education participation rates, percentage of urban residents, an indicator of labor market efficiency, and investment in transportation and telecommunications. In the case of Guatemala, low female participation in education, high fertility rates, and low investment in infrastructure that facilitates access to the labor market are the largest drivers of the female LFP gap with LA5.



**Evidence from Microdata**

21. **To supplement cross-country analysis, we estimate a model linking female LFP with the factors found important in the literature using microdata.**<sup>13</sup> The following regression is run using household survey data from the 2014 household survey data (Encuesta Nacional de Condiciones de Vida, *ENCOVI*):

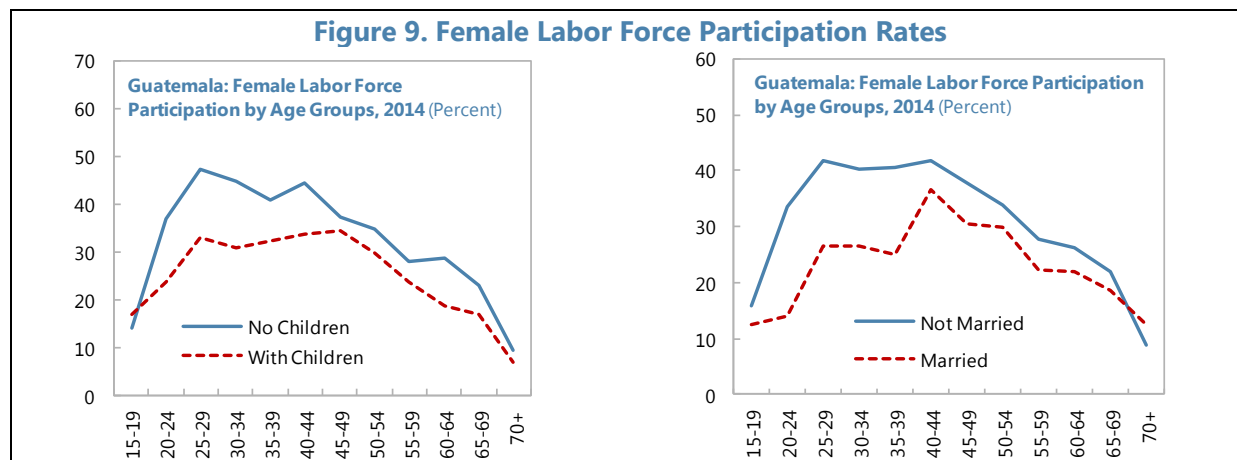
<sup>12</sup> IMF (2016).

<sup>13</sup> We follow the same approach as in IMF (2016).

$$\begin{aligned}
 FLFP_{irt} = & \alpha + \beta_1 prim\_second\_edu_i + \beta_2 second\_tertiary\_edu_i + \beta_3 more\_than\_tertiary\_edu_i \\
 & + \beta_4 urban_i + \beta_5 married_i + \beta_6 age_i + \beta_7 (age)_i^2 + \beta_8 cellphone_i + \beta_9 computer_i \\
 & + \beta_{10} kid\_0to6_i + \beta_{11} kid\_6to12_i + \beta_{12} old\_morethan\_70_i + \beta_{13} \log(headincome)_i + \gamma_r \\
 & + \varepsilon_{ir}
 \end{aligned}$$

where *prim\_second\_edu<sub>i</sub>*, *second\_tertiary\_edu<sub>i</sub>*, and *more\_than\_tertiary\_edu<sub>i</sub>* are dummy variables for the woman *i*'s final educational attainment level, and *urban<sub>i</sub>*, *married<sub>i</sub>*, *cellphone<sub>i</sub>*, and *computer<sub>i</sub>* are dummy variables for the location of the household in urban area, household being a married couple, and household having a cell-phone. *kid\_0to6*, *kid\_6to12<sub>i</sub>*, and *old\_morethan\_70<sub>i</sub>* are equal to one if a household has a member in these categories, respectively.  $\log(headincome)_i$  is the log of income of a household head? Regional fixed effects are also included.

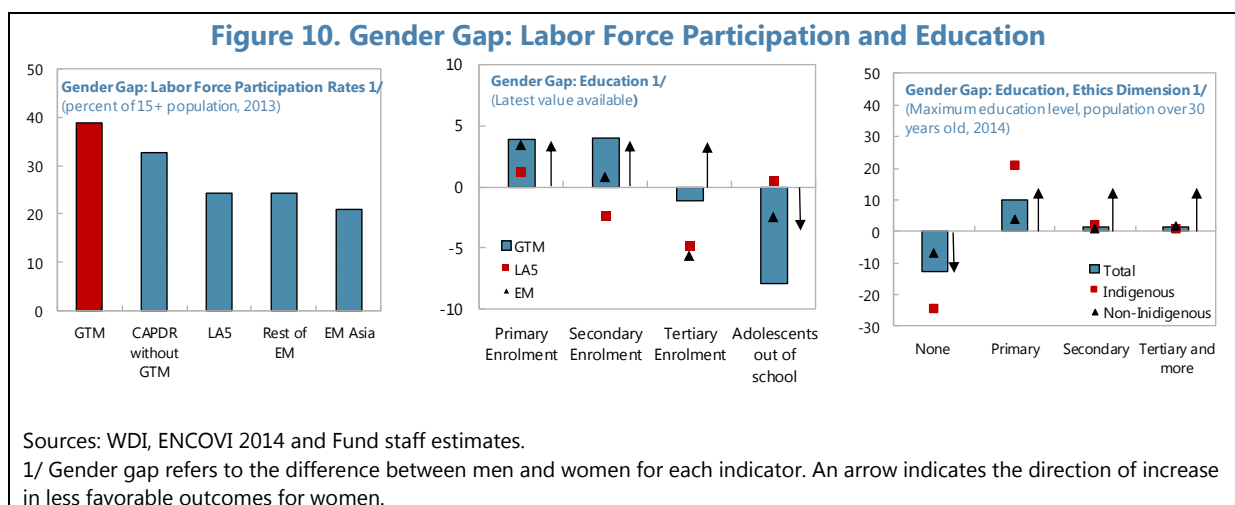
22. **Evidence from micro-data confirms that education, marital status, and urbanization are important factors for female LFP.** The regression results are reported in Table 2. The results show the usual “hump-shaped” relationship between female LFP rates across the life-cycle with the age terms being significant and with the expected signs—the difference in participation rates is particularly large for women aged between 20 and 40, which is also a prime age for accumulation of experience. Second, a higher educational attainment is related to a higher participation rate. Third, ownership of cell-phones and computers, as well as living in an urban area are positively and significantly associated with higher female LFP rate—these results point towards the importance of information and physical ability to reach jobs. Fourth, being married has a negative and significant association with female LFP—the differences reach nearly 15 percentage points during ages 20 to 40. Fifth, the presence of young children and the elderly in the household are also related to lower participation, albeit insignificantly for the latter. Lastly, attesting to the wealth effect in household labor supply, a higher income of the household head is associated with the lower female LFP.



**Policy Recommendations**

23. **Public policies can help raise female FLP.** While increasing female LFP is likely to be a long-term process that will take place naturally as the country develops further and fertility rates fall, policies aimed at improving education, increasing investment in infrastructure and information technology, as well as taking measures to support working mothers with children through increased

provision of childcare services would help support this process. While women’s participation rates in education are only slightly lower than for men, overall participation is much lower than in LA5 countries, highlighting the need for public policies aimed at substantially raising education levels in the country. In this sense, increasing access to education, raising investment in infrastructure and information technology could help raise female labor participation and labor force participation more generally. According to the latest household survey, 65% of the indigenous women above 30 years old have not completed any education level, whereas among non-indigenous, only 26% fall into this category. Guatemala should aim at improving provision of childcare and expanding conditional cash transfer and dedicated programs targeting indigenous women, including to provide training, food assistance and nutrition for their children, and health care for pregnancy could help narrow the gender gap in the labor market.



**Table 2. Regression Results Using Microdata**

Independent variables:	All women			All married women		
	(1)	(2)	(3)	(4)	(5)	(6)
	Dummy on labor force participation					
Less than Secondary	0.055*** (0.007)	0.033*** (0.008)	0.031*** (0.008)	0.057*** (0.010)	0.038*** (0.011)	0.035*** (0.011)
Less than University	0.164*** (0.011)	0.103*** (0.013)	0.100*** (0.013)	0.170*** (0.019)	0.114*** (0.020)	0.117*** (0.021)
University and more	0.281*** (0.020)	0.174*** (0.021)	0.169*** (0.021)	0.311*** (0.034)	0.237*** (0.034)	0.243*** (0.035)
Age		0.019*** (0.001)	0.019*** (0.001)		0.018*** (0.002)	0.016*** (0.002)
Age ^2		-0.000*** (0.000)	-0.000*** (0.000)		-0.000*** (0.000)	-0.000*** (0.000)
Cellphone		0.083*** (0.007)	0.083*** (0.007)		0.058*** (0.010)	0.056*** (0.010)
Urban		0.093*** (0.007)	0.092*** (0.007)		0.095*** (0.011)	0.096*** (0.011)
Married		-0.076*** (0.008)	-0.070*** (0.008)			
With kids 0-6			-0.036*** (0.007)			-0.043*** (0.011)
With kids 6-12			0.009 (0.007)			0.003 (0.010)
With old 70+			0.022** (0.011)			-0.005 (0.018)
Log head income						-0.006* (0.003)
Observations	17,718	17,718	17,718	8,396	8,396	8,128
Region Fes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

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

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## Appendix. Multivariate Filter Methodology

The multivariate filter approach specified in this selected issues paper requires data on three observable variables: real GDP growth, CPI inflation, and the unemployment rate. Annual data is used for these variables for the 7 countries considered. In this section, we present the equations which relate these three observable variables to the latent variables in the model. Parameter values and the variances of shock terms for these equations are estimated using Bayesian estimation techniques.

In the model, the output gap is defined as the deviation of real GDP, in log terms ( $Y$ ), from its potential level ( $\bar{Y}$ ):

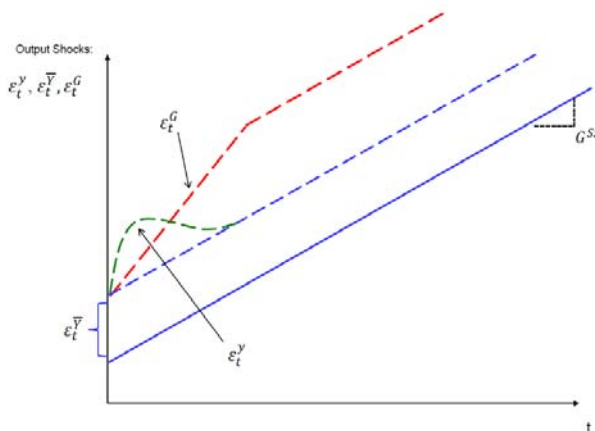
$$y = Y - \bar{Y}$$

The stochastic process for output (real GDP) is comprised of three equations, and subject to three types of shocks:

$$\begin{aligned} \bar{Y}_t &= \bar{Y}_{t-1} + G_t + \varepsilon_t^{\bar{Y}} \\ G_t &= \theta G^{SS} + (1 - \theta)G_{t-1} + \varepsilon_t^G \\ y_t &= \phi y_{t-1} + \varepsilon_t^y \end{aligned}$$

The level of potential output ( $\bar{Y}_t$ ) evolves according to potential growth ( $G_t$ ) and a level-shock term ( $\varepsilon_t^{\bar{Y}}$ ). Potential growth is also subject to shocks ( $\varepsilon_t^G$ ), with their impact fading gradually according to the parameter  $\theta$  (with lower values entailing a slower adjustment back to the steady-state growth rate following a shock). Finally, the output-gap is also subject to shocks ( $\varepsilon_t^y$ ), which are effectively demand shocks.

All else equal, output would be expected to follow its steady-state path, which is shown above by the solid blue line (which has a slope of  $G^{SS}$ ). However, shocks to: the level of potential ( $\varepsilon_t^{\bar{Y}}$ ); the growth rate of potential ( $\varepsilon_t^G$ ); or the output gap ( $\varepsilon_t^y$ ), can cause output to deviate from this initial steady-state path over time. As shown by the dashed blue line, a shock to the level of potential output in any given period will cause output to be permanently higher (or lower) than its initial steady-state path. Similarly, shocks to the growth rate of potential, illustrated by the dashed red line, can cause the growth rate of output to be higher temporarily, before ultimately slowing back to the steady-state *growth rate* (note that this would still entail a higher *level* of output). And, finally, shocks to the output gap would cause only a temporary deviation of output from potential, as shown by the dashed green line. In order to help identify the three aforementioned output shock terms, a Phillips Curve equation for inflation is added, which links the evolution of the output gap (an





unobservable variable) to observable data on inflation according to the process:

$$\pi_t = \lambda\pi_{t+1} + (1 - \lambda)\pi_{t-1} + \beta y_t + \varepsilon_t^\pi$$

Finally, equations describing the evolution of unemployment are included to provide further identifying information for the estimation of the output gap:

$$\begin{aligned}\bar{U}_t &= (\tau_4 \bar{U}^{ss} + (1 - \tau_4)\bar{U}_{t-1}) + g\bar{U}_t + \varepsilon_t^{\bar{U}} \\ g\bar{U}_t &= (1 - \tau_3)g\bar{U}_{t-1} + \varepsilon_t^{g\bar{U}} \\ u_t &= \tau_2 u_{t-1} + \tau_1 y_t + \varepsilon_t^u \\ u_t &= \bar{U}_t - U_t\end{aligned}$$

Here,  $\bar{U}_t$  is the equilibrium value of the unemployment rate (the NAIRU), which is time varying, and subject to shocks ( $\varepsilon_t^{\bar{U}}$ ) and also variation in the trend ( $g\bar{U}_t$ ), which is itself also subject to shocks ( $\varepsilon_t^{g\bar{U}}$ )—this specification allows for persistent deviations of the NAIRU from its steady-state value. Most importantly, we specify an Okun’s law relationship wherein the unemployment gap between actual unemployment ( $U_t$ ) and its equilibrium process (given by  $u_t$ ) is a function of the amount of slack in the economy ( $y_t$ ).

Equations 1–9 comprise the core of the model for potential output. In addition, data on growth and inflation expectations are added, in part to help identify shocks, but mostly to improve the accuracy of estimates at the end of the sample period:

$$\begin{aligned}\pi_{t+j}^C &= \pi_{t+j} + \varepsilon_{t+j}^{\pi^C}, \quad j = 0,1 \\ GROWTH_{t+j}^C &= GROWTH_{t+j} + \varepsilon_{t+j}^{GROWTH^C}, \quad j = 0,\dots,5\end{aligned}$$

For real GDP growth ( $GROWTH$ ) the model is augmented with forecasts from the WEO for the five years following the end of the sample period. For inflation, expectations data are added for one year following the end of the sample period. These equations relate the model-consistent forward expectation for growth and inflation ( $\pi_{t+j}$  and  $GROWTH_{t+j}$ ) to observable data on how WEO forecasters expect these variables to evolve over various horizons (one to five years ahead) at any given time ( $GROWTH_{t+j}^C$ ). The ‘strength’ of the relationship between the data on the WEO forecasts and the model’s forward expectation is determined by the standard deviation of the error terms ( $\varepsilon_{t+j}^{\pi^C}$  and  $\varepsilon_{t+j}^{GROWTH^C}$ ). In practice, the estimated variance of these terms allows WEO data to influence, but not completely override, the model’s expectations, particularly at the end of the sample period. In a way, the incorporation of WEO forecasts can be thought as a heuristic approach to blend forecasts from different sources and methods.

The methodology requires taking a stance on prior beliefs regarding a number of variables. A key assumption fed into the model’s estimation is that supply shocks are the primary source of real GDP fluctuations in Central America. The prior belief that supply is more volatile than demand leads the model to assign much of the observed volatility of real GDP to potential GDP fluctuations. In

addition to the prior distributions of parameters, initial values for the steady-state (long-run) unemployment rate and potential GDP growth rates are provided.

After obtaining estimates of potential output and NAIRU from the multivariate Kalman filter, potential TFP is calculated as a residual in the Cobb-Douglas function:

$$A_t = Y_t / K_t^\alpha L_t^{1-\alpha}$$

where  $Y_t$  is potential output,  $K_t$  and  $L_t$  are capital and labor inputs, while  $A_t$  is the contribution of technology or TFP. Output elasticities ( $\alpha$  is the capital share in the production function and is set at 0.35) sum up to one. Data on the working age population and the labor force participation rate is obtained from the UN Economic Commission for Latin American and the Caribbean (CEPAL). Potential employment is constructed as a product of working age population, the labor force participation rate, and the employment rate (1-NAIRU).

The capital stock series is constructed using a perpetual inventory method where the level of initial capital stock for a given year, 1990 in our case, is calculated assuming a constant level of depreciation rate of 5 percent per annum and a constant investment share of GDP.

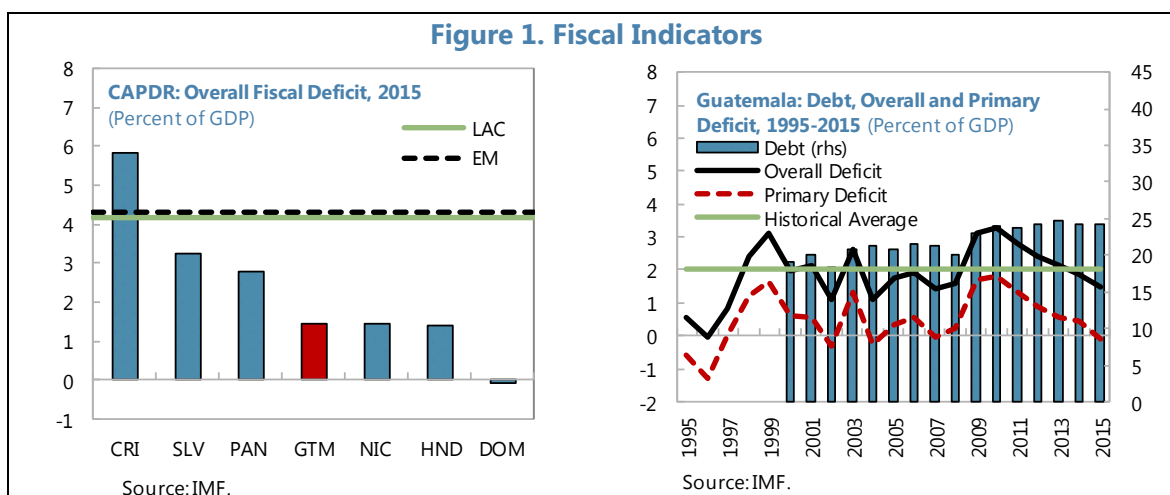
# FISCAL POLICY: SUSTAINABILITY AND SOCIAL OBJECTIVES

## A. Fiscal Sustainability Assessment<sup>1</sup>

*This section presents an assessment of Guatemala’s medium and long term debt sustainability. The results suggest that under the current policies, central government debt is sustainable at 24 percent of GDP and even a short-term relaxation of the fiscal deficit by ½ percent of GDP would only slightly increase the debt-to-GDP ratio in the longer term. Other alternative scenarios based on a permanent relaxation by ½ percent of GDP, historical averages and a large contingent liability shock also indicate debt stabilization in the longer term at levels between 25 and 30 percent of GDP, respectively. The debt path is quite resilient to macro shocks. While not an immediate concern, rising demographic pressures, if left unaddressed, would pose challenges for the budget in the medium and long term.*

### Introduction

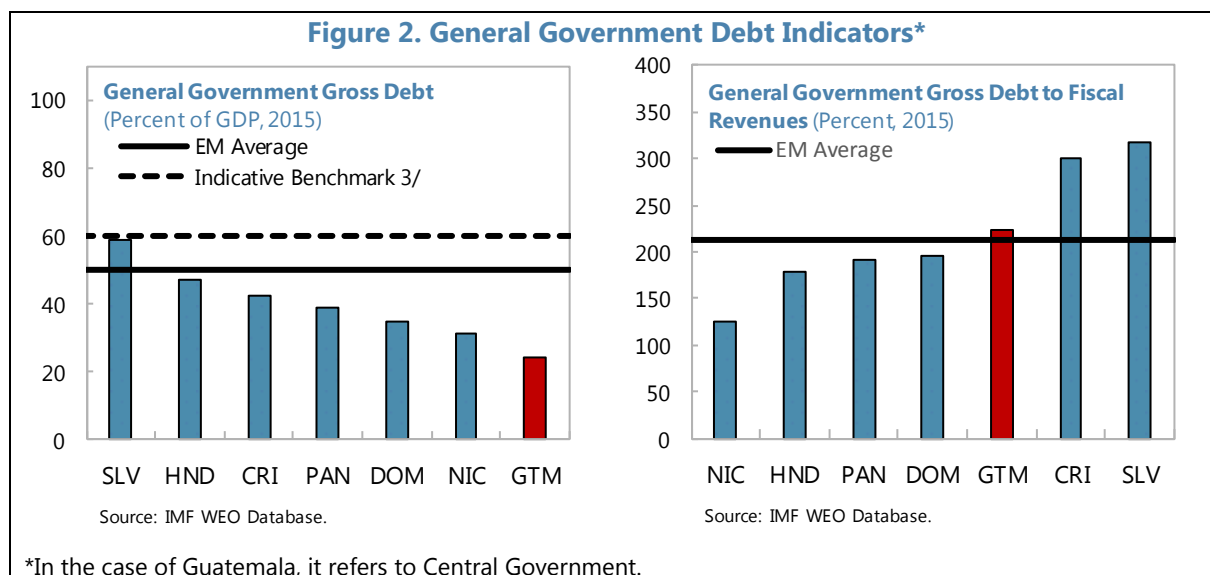
1. **Guatemala has a solid track record of a prudent fiscal policy.** Guatemala’s average overall fiscal balance at 2 percent of GDP and public debt at 21 percent of GDP, over the past 20 years, reflect both prudent fiscal management and stable macroeconomic environment. Fiscal performance deteriorated in the aftermath of the global financial crisis of 2007–08 as the deficit increased from 1½ percent of GDP to over 3 percent of GDP by 2010, but quickly declined to around 2½ percent of GDP by 2012. The deficit fell further to 1½ percent of GDP in 2015 during the political crisis, as revenue shortfalls were offset by even larger expenditure cuts. The improvement in the fiscal position over the past 5 years has been largely driven by the sharp decline in social spending, transfers and capital spending.<sup>2</sup>



<sup>1</sup> Prepared by Carlos Janada.

<sup>2</sup> Primary spending fell from 13 percent of GDP in 2010 to 10.7 percent in 2015.

2. **Guatemala’s debt is low as a share of GDP though it is moderately high in relation to fiscal revenues.** Public debt currently stands at 24½ percent of GDP. It has been virtually unchanged over the last four years. This level compares favorably to other countries in the region and to emerging market peers. Moreover, it is well below an indicative benchmark of 60 percent of GDP for countries with market access.<sup>3</sup> However, Guatemala’s position looks less favorable when debt is compared to revenues since revenues are low by international standards.<sup>4</sup>



3. **Additional efforts to raise tax collections will be needed to ensure adequate provision of basic public goods.** Guatemala’s low revenue capacity constrains the level of government spending, currently at 12 percent of GDP. However, literature finds that the optimal size of the government, in particular, with respect to human development, is at least 15 percent of GDP.<sup>5</sup> Hence, it would be desirable raising fiscal revenues to 15 percent of GDP in the medium term to accommodate higher social and infrastructure spending as well as support efforts to durably reduce crime and corruption. Improving tax performance, however, will require strong and sustained political commitment at the highest levels. The 2012 tax reform provided additional tools for the government to enforce tax controls and supervision, as well as eliminate VAT exemptions and reduce rates of the corporate income tax while broadening its base. The additional revenue from the 2012 tax reform was envisaged at 1–1½ percent of GDP over the course of several years. However, the reform ended up plagued by multiple legal challenges and administrative problems. Most importantly, the customs agency faced significant administrative delays in implementing the reform,

<sup>3</sup> See Annex II of the IMF “Staff Guidance Note for Public Debt Sustainability Analysis in Market Access Countries,” 2013 at <https://www.imf.org/external/np/pp/eng/2013/050913.pdf>.

<sup>4</sup> Guatemala has one of the lowest revenue-to-GDP ratios in the world (see, for example, “Tax Capacity and Growth: Is There a Tipping Point,” by Vitor Gaspar, Laura Jaramillo and Philippe Wingender; FAD Seminar Series, December 9, 2015).

<sup>5</sup>Peden, E. (1991), Karras, G. (1997), Davies (2009), Gunalp and Dincer (2005), On the upper side, estimates vary but mainly fall below 30 percent of GDP.

which were exacerbated by high staff turn-over. As a result, the revenue yield of the reform turned out to be much lower than envisaged with virtually unchanged tax-to-GDP ratio after the reform.

### Assessing Debt Dynamics and Fiscal Sustainability

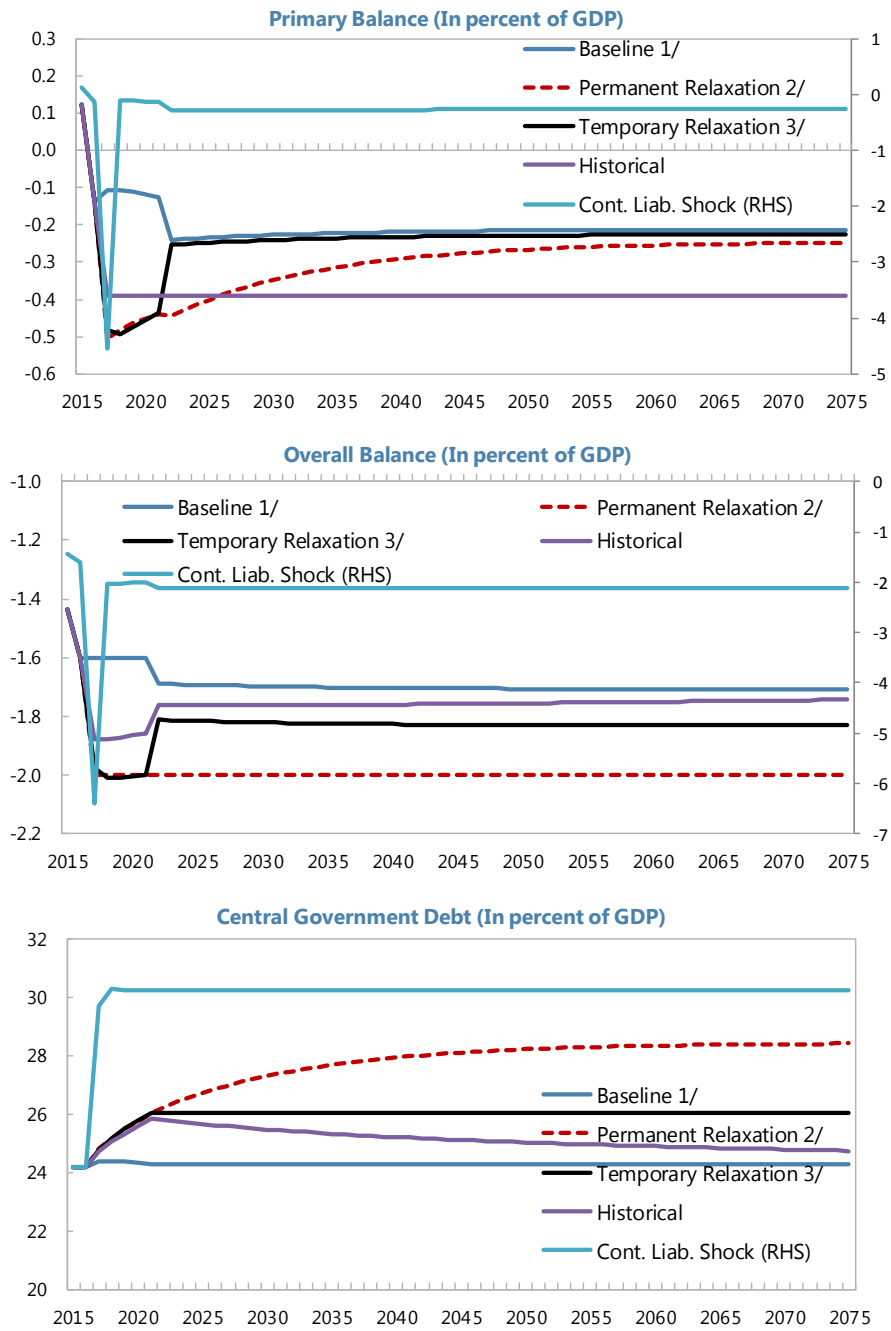
4. **The sustainability of public finances was analyzed under 5 alternative scenarios.** The first scenario (the baseline) assumes a relatively constant primary deficit of 0.1 percent of GDP (a corresponding overall fiscal deficit of 1.6 percent of GDP). The second scenario assumes a *temporary* relaxation (for 5 years) of the overall deficit to 2 percent of GDP—a historical average. The third scenario assumes a primary balance consistent with a *permanent* relaxation of the overall fiscal deficit to 2 percent of GDP. The fourth scenario assumes that real GDP growth rate, real interest rate and the primary balance remain at their historical averages over the past ten years.<sup>6</sup> The fifth scenario assumes that a contingent liability shock of 10 percent of the size of commercial bank assets must be accommodated by the budget.<sup>7</sup>

5. **Fiscal position is sustainable in the long-run under all five scenarios but the debt ratio is higher under the permanent relaxation, and contingent liability shock scenarios.** In the baseline scenario the debt-to-GDP ratio stabilizes at the current level of 24 percent of GDP in the medium and long term; the debt-to-revenue ratio remains at around 210 percent. In the scenario of temporary relaxation, the debt-to-GDP ratio rises slightly in the short term and stabilizes at 26 percent of GDP in the long term while debt-to-revenue ratio increases to 230 percent. In the permanent relaxation scenario, the debt ratio continues rising over a long horizon but stabilizes at 28½ percent of GDP with the debt-to-revenue ratio reaching 250 percent. In the historical average scenario debt to GDP ratio rises only to 24¾ percent of GDP and debt-to-revenue increases to 220 percent. Finally, in the contingent liability shock scenario the debt reaches a 30 percent of GDP level faster than in the permanent relaxation scenario but remains stable thereafter, with the debt to revenue slightly exceeding 260 percent. Under all five scenarios the debt-to-GDP does not exceed an indicative benchmark for countries with market access at 60 percent.

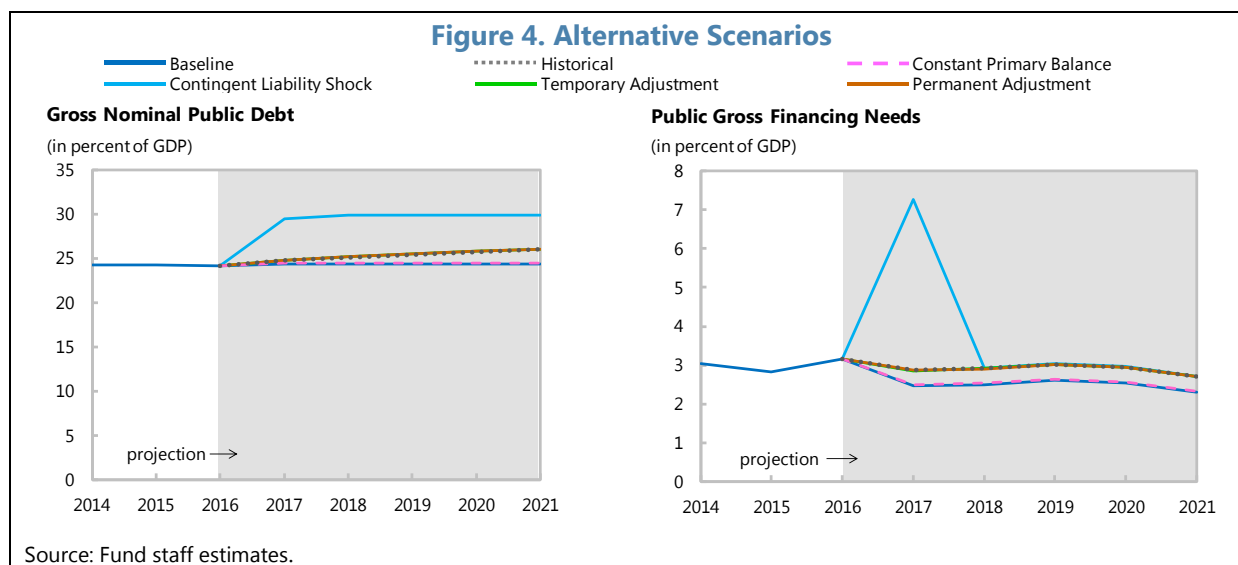
<sup>6</sup> The years of 2009 and 2010, when the effects of the global financial crisis affected Guatemala most deeply, were excluded. The historical sample was extended by two earlier years to compensate (i.e., the historical average is still based on a 10-year sample).

<sup>7</sup> Commercial bank assets were roughly half of GDP at the end of 2015. Therefore, the contingent liability shock is equivalent to 5 percent of GDP. As a reference, the Troubled Asset Relief Program (TARP) in the U.S. was equivalent to about 5 percent of US GDP when it was announced during the financial crisis of 2008.

**Figure 3. Long-Term Sustainability**



- 1/ This path is the baseline through 2021, with a small primary deficit, which stabilizes the debt ratio thereafter.
- 2/ Permanent relaxation begins in 2017. It has a primary deficit compatible with an overall deficit of 2 percent of GDP for the entire period.
- 3/ Temporary relaxation scenario runs a 2 percent of GDP overall deficit between 2017 and 2021, the deficit declines thereafter.



**6. Sensitivity analysis suggests that Guatemala’s public debt is fairly resilient to shocks.**

We consider 5 sensitivity tests, including a shock to the primary balance, a shock to the real GDP growth, a shock to the real interest rate, a shock to the real exchange rate as well as the shock combining all of the above. The size of the shocks was based on the historical standard deviations of the corresponding variables.<sup>8</sup> In addition, a stochastic simulation of the public debt path has been constructed by producing frequency distributions of debt paths under these shocks. Simulations yield a very slight upward trend in public debt-to-GDP ratio, with the median debt forecast reaching about 25 percent of GDP, almost identical to the baseline projection. The 95 percent upper confidence interval reaches 27 percent of GDP. A restricted simulation in which upside shocks are disregarded yields an only slightly-higher 95 percent upper confidence interval of 28 percent of GDP. The narrowness of these ranges reflects the historical stability of Guatemala’s macro variables.

<sup>8</sup> Real GDP Growth Shock: GDP growth rate is reduced by 1 standard deviation for 2 consecutive years; level of non-interest expenditures is the same as in the baseline; deterioration in primary balance lead to higher interest rate; decline in growth leads to lower inflation (0.25 percentage points per 1 percentage point decrease in GDP growth). Primary Surplus Shock: Minimum shock equivalent to 50% of planned adjustment (50% implemented), or baseline minus half of the 10-year historical standard deviation, whichever is larger. There is an increase in interest rates of 25bp for every percentage point of GDP worsening in the primary balance. Interest Rate Shock: Interest rate increases by the difference between average real interest rate level over projection and maximum real historical level, or by 200bp, whichever is larger. Real Exchange Rate Shock: Estimate of overvaluation or maximum historical movement of the exchange rate, whichever is higher; pass-through to inflation with default elasticity of 0.25 for EMs and 0.03 for AEs.

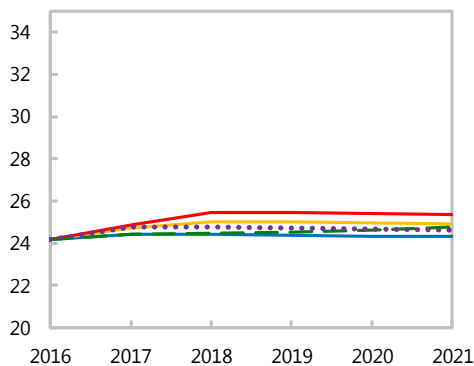
**Figure 5. Public DSA – Stress Tests**

**Macro-Fiscal Stress Tests**

— Baseline  
— Real GDP Growth Shock  
— Primary Balance Shock  
— Real Exchange Rate Shock  
— Real Interest Rate Shock

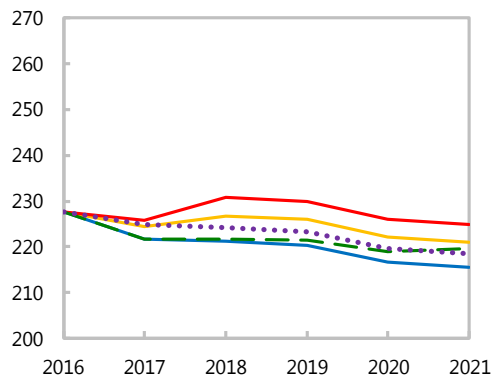
**Gross Nominal Public Debt**

(in percent of GDP)



**Gross Nominal Public Debt**

(in percent of Revenue)



**Underlying Assumptions**

(in percent)

**Primary Balance Shock**

	2016	2017	2018	2019	2020	2021
Real GDP growth	3.8	3.7	3.8	3.8	3.9	4.0
Inflation	4.5	3.2	4.0	4.0	4.0	3.9
Primary balance	-0.1	-0.4	-0.4	-0.1	-0.1	-0.1
Effective interest rate	6.6	6.6	6.6	6.6	6.6	6.6

**Real Interest Rate Shock**

	2016	2017	2018	2019	2020	2021
Real GDP growth	3.8	3.7	3.8	3.8	3.9	4.0
Inflation	4.5	3.2	4.0	4.0	4.0	3.9
Primary balance	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Effective interest rate	6.6	6.6	6.8	7.0	7.2	7.3

**Real GDP Growth Shock**

	2016	2017	2018	2019	2020	2021
Real GDP growth	3.8	2.7	2.7	3.8	3.9	4.0
Inflation	4.5	3.0	3.7	4.0	4.0	3.9
Primary balance	-0.1	-0.3	-0.4	-0.1	-0.1	-0.1
Effective interest rate	6.6	6.6	6.6	6.6	6.6	6.6

**Real Exchange Rate Shock**

	2016	2017	2018	2019	2020	2021
Real GDP growth	3.8	3.7	3.8	3.8	3.9	4.0
Inflation	4.5	4.4	4.0	4.0	4.0	3.9
Primary balance	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Effective interest rate	6.6	6.8	6.6	6.6	6.6	6.5

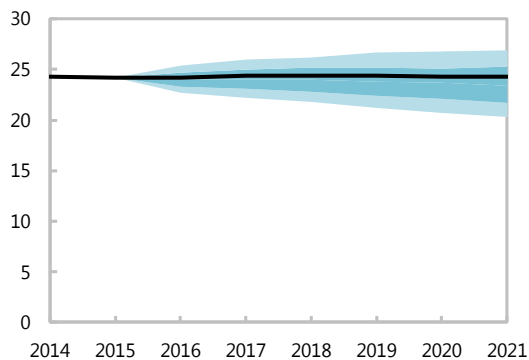
Source: Fund staff calculations.

**Figure 6. Evolution of Predictive Densities of Gross Nominal Public Debt**

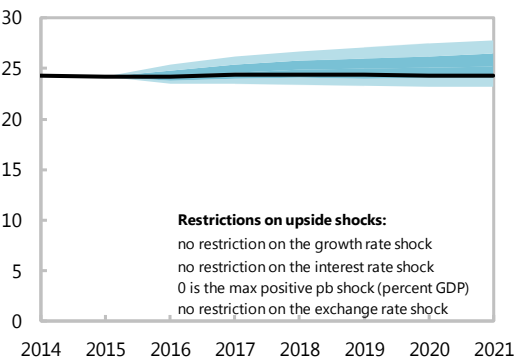
(in percent of GDP)

— Baseline  
 Percentiles: ■ 10th-25th ■ 25th-75th ■ 75th-90th

**Symmetric Distribution**



**Restricted (Asymmetric) Distribution**



Source: Fund staff estimates.



7. **While not an immediate concern, rising demographic pressures, if left unaddressed, would pose challenges for the budget in the medium and long term.** Pension spending in the central government budget has generated a deficit of 0.41 percent of GDP in 2015 and is predicted to rise slightly to 0.45 percent of GDP in 2016 under the baseline scenario. However, rising aging pressures would likely lead to a somewhat higher central government pension spending in the future (currently estimated at an additional  $\frac{1}{4}$  percent of GDP). Given the history of deficit containment, the baseline scenario assumes that these additional expenditure pressures would be accommodated through budget cuts elsewhere, thereby likely reducing even further social and infrastructure spending. In addition, actuarial projections suggest that the social security institute (IGSS) will start running a deficit in 2017 and will deplete its reserves to cover the deficit by 2030. While this rising pension deficit does not directly affect the central government budget, it represents contingent liability for the government. Therefore, in the longer run a parametric reform (for example, an increase in the pension age and contributions) of the pension system will be needed to bring the pension system on a sustainable footing.

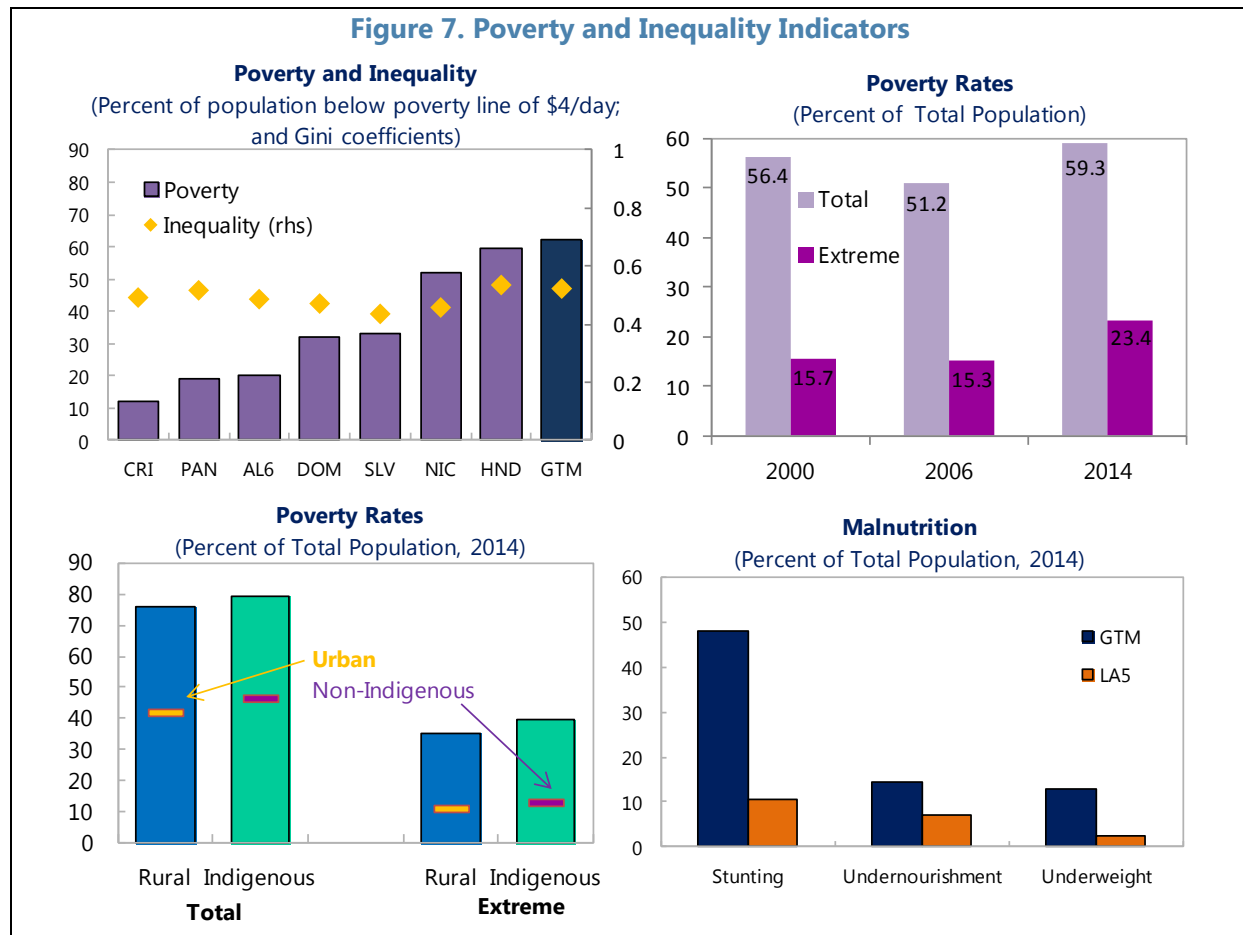
## B. Poverty, Inequality and Fiscal Redistribution<sup>9</sup>

*Guatemala has high levels of poverty and inequality, with distinct patterns in terms of rural-urban as well as ethnic divide. At the same time, low tax revenues constrain the size of the government and thus the scope to pursue social objectives. This section quantifies the poverty gap in Guatemala and estimates the effect on growth and redistribution of alternative tax/spending policy combinations. Results suggest that the extreme poverty gap amounts to about 1 percent of 2016 GDP, while lifting all poor out of total poverty would take at least 7 percent of GDP. Raising revenues through higher and more progressive PIT would be less detrimental to growth and poverty/inequality than the VAT. Redistributing 1 percent of GDP through the existing cash transfer program would reduce extreme poverty by 4 percentage points. Trade-offs on the spending side imply that both cash transfers and public investment need to increase in order to reduce poverty while simultaneously fostering growth.*

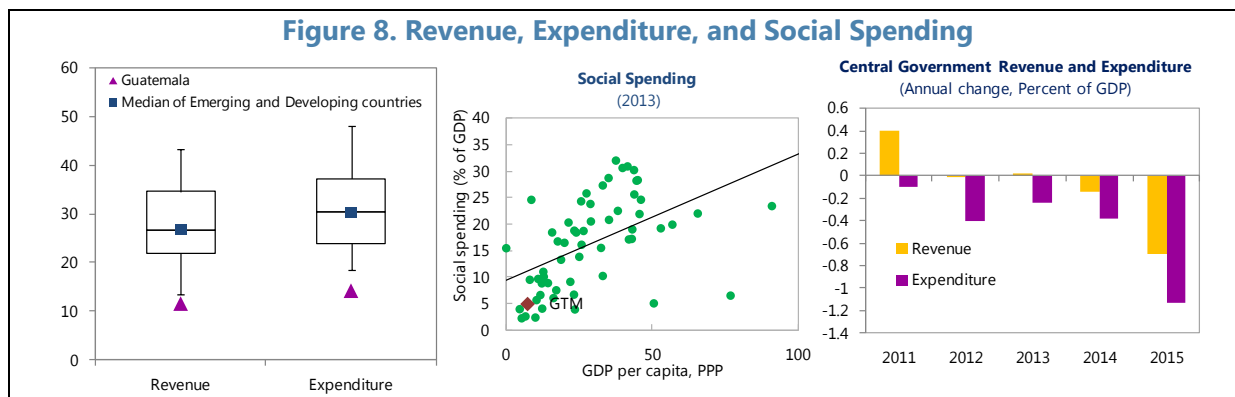
### Trends in Poverty and Inequality

8. **Poverty and inequality in Guatemala are high compared to regional peers.** Contrary to other countries in the region where poverty has decreased over time, both poverty and extreme poverty have increased in Guatemala over the last decade. Poverty incidence also displays a clear regional pattern and is significantly higher in rural compared to urban areas, which also translates in a clear ethnic divide as indigenous populations mostly reside in rural regions. High extreme poverty has dire consequences for basic nutrition outcomes, hence the higher incidence of malnutrition in Guatemala compared to regional peers and other countries in the world.

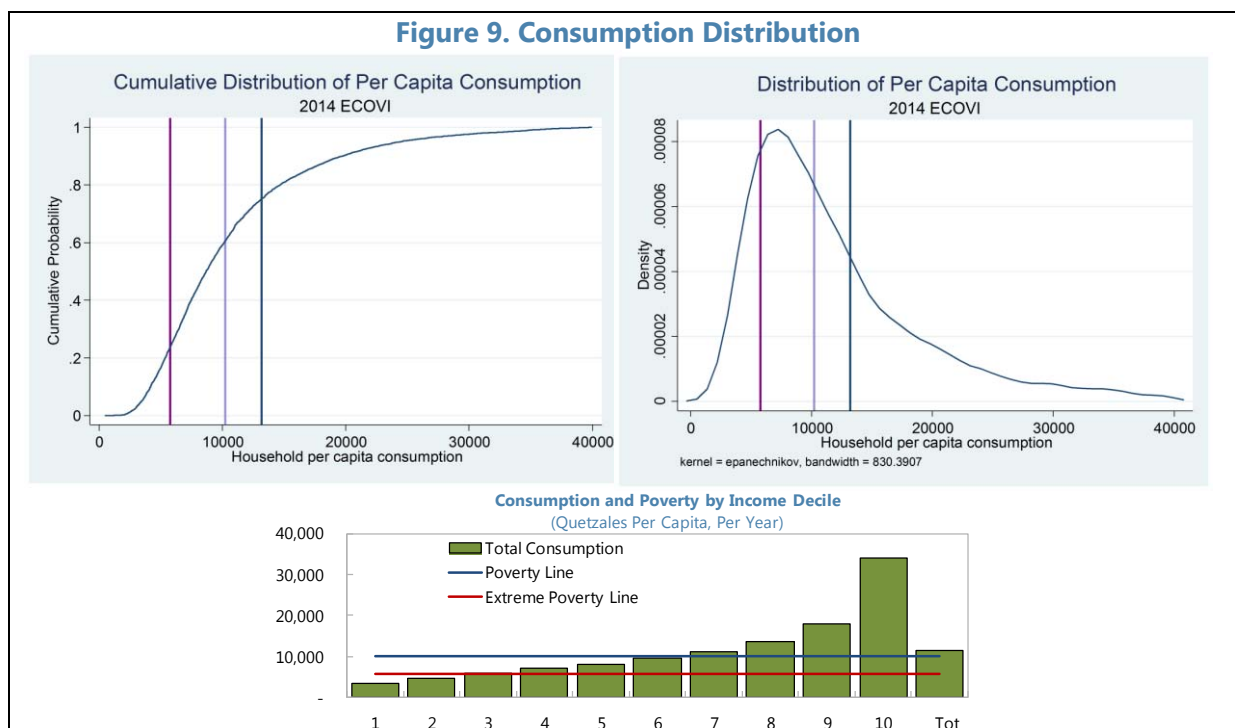
<sup>9</sup> Prepared by Valentina Flamini, Marina Mendez Tavares, Adrian Peralta-Alva, and Xuan Tam.



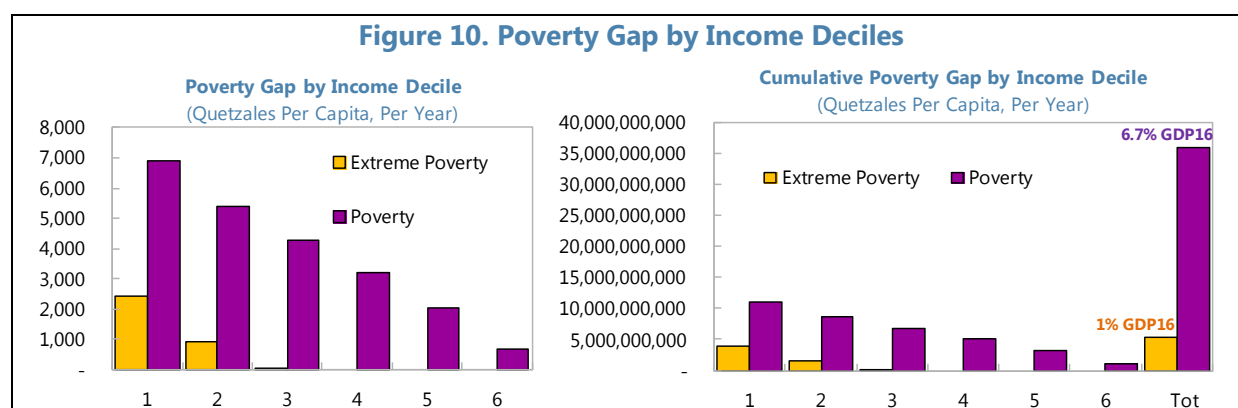
9. **Persistently low tax revenue constrains the size of the budget and limit the government’s capacity to pursue social objectives.** At 10.2 percent of GDP in 2016, tax revenues are among the lowest in the world, which limit the size of government and its spending capacity. As a result, social spending is also very low, even compared to countries with similar per capita income levels. Additionally, revenue to GDP ratios have been declining over the last few years, not least as a consequence of the political crisis in 2015. Given the government’s prudent fiscal policy, spending cuts have overcompensated for such declines and in particular public investment that has typically absorbed the brunt of the fiscal adjustment.



10. Hence, in 2014 more than 20 percent of the population lived in extreme poverty while almost 60 percent were generally poor. The cumulative distribution of household per capita consumption below, based on the released 2014 ENCOVI microdata, shows that the per capita consumption of more than 20 percent of the population remained below the extreme poverty line (first from the left) and was below the general poverty line (second from the left) for about 60 percent of the population. At the same time, the distribution of per capita consumption in the second panel shows how most of the 40 percent of population confined between the two poverty lines are clustered just above extreme poverty as showed by the mode of the distribution approaching the extreme poverty line from the right. The third panel below presents annual households per capita consumption in quetzales by consumption deciles: the consumption of the first two and six deciles is lower than the extreme and general poverty lines respectively, consistently with Guatemala’s extreme poverty rate of 23 and the general poverty rate of 59 percent.



11. **Meeting the SDG target of eradicating extreme poverty would require at least one percent of 2016 GDP, while halving total poverty starting from the most severe would require at least five percent.** To quantify the size of the problem we estimated the average and total poverty gaps, namely the difference between the poverty lines and annual per capita consumption. Results show that the extreme poverty gap amounts to 1 percent of 2016 GDP, and the total poverty gap sums to about 7 percent. This means that meeting the SDG targets of eradicating extreme poverty and halving the number of people living in poverty would require at least 1 and 5 percent of GDP respectively. With respect to the latter target, we are assuming a static scenario in which the most severe poverty is eliminated first, i.e., the bottom three deciles or (4.8 millions) are lifted out of poverty first. This would be the notional annual cost of a perfect cash transfer program perfectly targeted to the poor and perfectly calibrated to exactly fill the per capita consumption gap of each household. In practice, of course, there is no such program: the cost of administration, and imperfect targeting (both in terms of beneficiaries and benefit amount), which crucially depend on the government administrative capacity, will need to be added to these lower bounds.



**Fiscal Policy and Redistribution: Evidence from the Past**

12. **Previous incidence analyses suggest that fiscal policy in Guatemala had little redistributive effect.** Based on the 2009/10 National Survey of Family Income and Expenditures, Cabrera and others (2014)<sup>10</sup> find that the Gini coefficient for disposable income (after direct taxes and transfers) declined by a mere 0.005 points compared to the Gini for market income. When the monetized value of education and health services are incorporated, the decline is still a very small 0.024. Although direct taxes were somewhat progressive, consumption taxes were outright regressive, and inequality of post-fiscal income (after direct and consumption taxes and direct transfers) was the same as market income inequality. At the same time, consumption taxes were regressive enough to more than offset the benefit to the poor of progressive cash transfers, leaving post-fiscal poverty at higher rate than market income poverty.

13. **Direct transfers were progressive, although too low to make a material difference.** According to the same study, the poverty rate based on disposable income was lower than for net

<sup>10</sup> Cabrera, M., N. Lustig, and H. Moran, 2014, "Fiscal Policy, Inequality, and the Ethnic Divide in Guatemala", CEQ Working Paper No. 20.

market income (after direct taxation) suggesting that spending on direct transfers was targeted to the groups with the highest incidence of poverty. At the time, the most relevant program, with a budget of 0.4 percent of GDP, was *Mi Familia Progres*a (MIFAPRO). Introduced in 2008, MIFAPRO provided conditional cash transfers for health and education to poor households with children and pregnant or breast feeding women. Although the average transfer was very small and not adjusted for the number of children in the household, as of January 2011 the program covered about a third of Guatemala's total population, and 33 percent of the poor (UNDP).

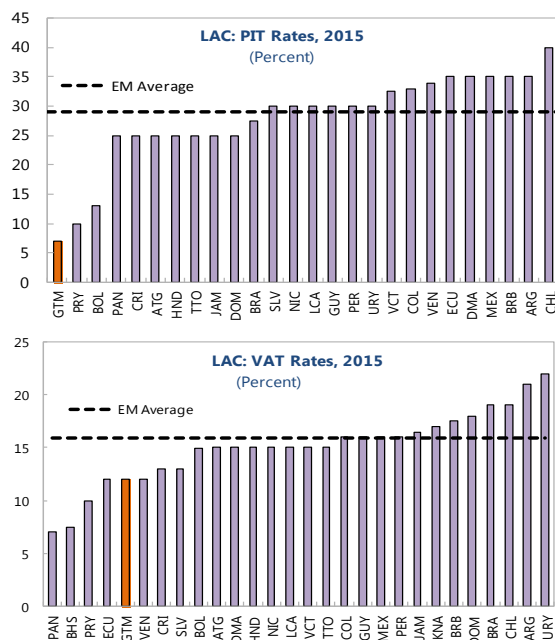
14. **However, reforms and adjustments that occurred since 2010 have reduced the already mild progressivity of direct taxation and transfers.** The MIFAPRO program has shrunk since then, and its budget has been gradually reduced to only 0.1 percent of GDP in 2013, with increasingly irregular payments. In 2015 the program, now renamed *Mi Bono Seguro*, only executed 0.06 percent of GDP in spending and, according to 2014 ENCOVI microdata, covered 27 percent of poor, of which 43 percent extremely poor, resulting in a 36 percent coverage of extreme poor. On the other hand, the tax reform that in 2012 lowered the tax rates applied to both PIT and CIT, and reduced the PIT brackets for wage earners to two, with rates of 5 and 7 percent respectively, is likely to have further reduced the already limited progressivity of direct taxation.

### Looking Forward: Policy Options and Trade-Offs

15. **This section simulates the redistributive and macroeconomic effect of alternative combinations of tax and spending policies.** We use the general equilibrium model described in the Box below and Appendix 1 to simulate the growth and redistributive effect of a tax increase of 1 percent of GDP through higher Value Added Tax (VAT) and Personal Income Tax (PIT) with alternative spending options including: (i) untargeted public consumption, (ii) public investment; and (iii) cash transfers. While the calculations in ¶4, provided the minimum cost of eradicating extreme poverty through perfectly targeted transfers, this analysis looks at the effect on poverty of the same amount of money spent in a less perfectly targeted way.

16. **Compared to PIT, VAT has a stronger negative impact on consumption and GDP, and is regressive, resulting in worse overall poverty and inequality outcomes.** The model results indicate that revenue mobilization through VAT would have a stronger depressive effect on the output level: while GDP only decreases by less than 1 percent compared to the baseline in the PIT scenario, it would fall by almost 2 percent if the additional revenues were raised through VAT. The result on the GDP is unconventional. The VAT is usually considered less distortionary than the PIT, in particular, because of its neutral impact on investment. However, the conventional wisdom may not apply in the case of Guatemala due to the presence of a large informal sector. The informal sector may be able to escape taxation all together, including taxation of intermediate goods, in part, because VAT controls are weak and in part because many goods are unsophisticated and do not have multiple production stages. At the same time, many of the goods produced by the formal and informal sectors are close substitutes. Under these circumstances, the VAT penalizes consumption of goods produced in the formal sector, reduces the demand for these goods with the corresponding decline in their prices, and, thereby, reduces marginal returns of the formal sector firms. As the relative prices of goods shift in favor of a less productive informal sector, which performs only a

small part of investment in the economy (the majority is done by the formal sector), the VAT becomes distortive both in terms of consumption allocations and in terms of investment decisions. Hence, while the PIT is always distortive with or without the informal sector, the VAT can become distortive in the presence of the informal sector. This, however, does not automatically guarantee that the VAT has to be more distortive than the PIT. It is the particular structure of the PIT in Guatemala with extremely low rates and little progressivity and a relatively high VAT rate that help explain the result.<sup>11</sup> At the same time, VAT is regressive, thus poverty and inequality increase more.



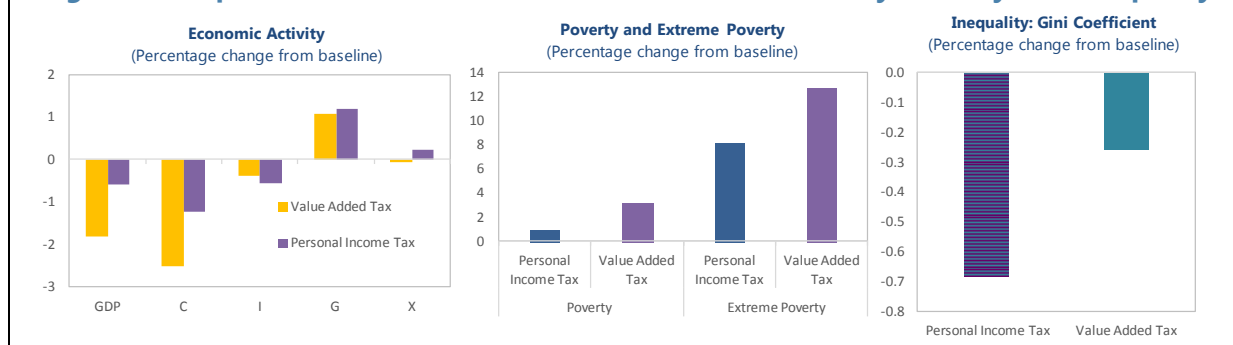
<sup>11</sup> An empirical study by Acosta-Ormaechea and Yoo (2012) also finds that in low income countries PIT does not significantly affect growth, likely due to the low level of PIT collection in such countries (1.5 percent of GDP on average). This result is relevant for Guatemala where PIT collection is only 0.4 percent of GDP.

### Box 1. General Structure of the Model

- Small open economy with three consumption goods: agricultural, services, and manufacturing and modern services.<sup>1</sup>
- There are four types of households: two types in the urban area: skilled and unskilled urban; and two types in the rural area small-land holders, and large-land holders. Within each of the first three types, there is a continuum of households, equal ex ante, but facing idiosyncratic risk. Households solve dynamic optimization problems taking prices and government policies as given. Households receive remittances in a lump-sum fashion, their magnitude and distribution match the data.
- Four goods are produced: (i) agricultural commodities for exports (and not domestically consumed), (ii) agricultural goods for domestic consumption (non-tradable), (iii) manufacturing (tradable), and (iv) services (non-tradable).
- The only financial assets available are one-period capital share holdings. The total amount of capital shareholdings equals the capital stock of the manufacturing sector. These titles are traded among households to allow for risk sharing. The interest rate of these assets and the price of domestic food are determined by supply and demand forces in equilibrium.
- The government collects tax revenue (on income, consumption, etc.). This revenue is used to fund government expenditures (including public sector wages, capital investment and other pro-poor spending).
- The model is thus a dynamic general equilibrium including a continuum of households facing idiosyncratic risk (as in the income inequality literature) and also multiple sectors (as in the structural transformation literature).

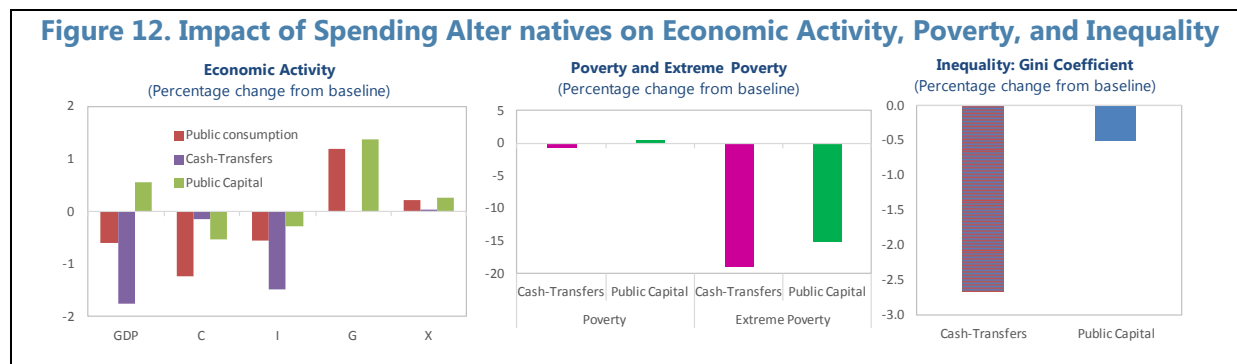
<sup>1</sup> Manufacturing should be understood as the modern, high productivity sector of the economy (and thus include some services like banking, finance, etc.; while services refer to the informal non-taxable activities, such as personal services).

**Figure 11. Impact of VAT and PIT Increases on Economic Activity, Poverty, and Inequality**



17. **Spending in untargeted government consumption would result in a contraction of growth as the distortive effect of taxation would prevail.** Given its superior growth and distributional outcomes, we focus on PIT increases for the analysis of spending scenarios. If the additional revenue was used to finance untargeted government consumption, GDP would shrink following the reduction in private consumption and investment. In addition, since government

consumption is in part spent in tradable goods, some of the expenditure would leak away from the economy in the form of imports, thus exacerbating the distortionary effect of higher taxation.



18. **Additional spending in cash transfers would significantly reduce extreme poverty and inequality but result in a more pronounced fall in GDP.** The model proportionately expands cash transfers according to the distribution of the *Mi Bono Seguro* Program in the ENCOVI 2014 database, which covered 36 percent of extreme poor households, but leaked about 20 percent of its benefits to non-poor households. Given the limited amount of additional funds and imperfect targeting, the effect on poverty is trivial but extreme poverty would drop by almost 20 percent, from 23 to 19 percent of the population. Inequality, as measured by the Gini index, would decrease accordingly by about 2.5 percent to 0.52. Moreover, cash transfers support the consumption of poor households thus the reduction in private consumption is less than in the public consumption scenario. However, cash transfers shift resources away from the groups that save and invest, hence a bigger drop in private investment. In addition, cash transfers are not treated as government consumption in the model, resulting by construction in lower government expenditure—as the revenue becomes a transfer—which depresses private investment further. Thus, the reduction in poverty comes at the expense of lower growth.

19. **Using the additional funds to finance infrastructure would result in a moderate economic expansion.** The model assumes that public investment is efficient, resulting in a higher stock of public capital, which in turn improves the productivity of the private sector. Better infrastructure generates higher private sector productivity, and a lesser decrease in private investment which provides a boost to total output. Higher productivity also increases the demand for labor and its remuneration, which results in higher labor income for poor households. Higher productivity also makes food cheaper, further reducing extreme poverty. Therefore, both extreme poverty and inequality are reduced, although less than in the cash transfer scenario.

Programa Mi Bono Seguro			
Poor households targeting, 2014			
	Extreme Poor		
Beneficiary	No	Yes	Total
No	8376	1213	9,589
Yes	1252	695	1,947
Total	9628	1908	11,536
	Poor		
Beneficiary	No	Yes	Total
No	5,314	4,275	9,589
Yes	325	1622	1947
Total	5,639	5,897	11,536

**Conclusions and Policy Recommendations**



20. **Mobilizing tax revenues is crucial to achieve social objectives.** The government of Guatemala needs tax revenues to improve social conditions and lift its people out of extreme poverty and malnutrition. While in the short term revenue administration measures to widen the tax base should be prioritized, in the medium to long term—once the taxpayers' morale is restored—tax rates increases are likely to be needed. In this respect, improving the collection of VAT will be key, and so would be making the PIT regime more progressive. Our results show that eradicating extreme poverty would require at least 1 percent of GDP.

21. **The way resources are mobilized and spent matters.** Alternative taxes and spending strategies have different outcomes in terms of macroeconomic impact and redistribution, hence a careful analysis of growth and poverty effects is required when designing tax/spending policies. Our analysis suggests that, likely due to its current low rates and relatively neutral structure, PIT would generate a larger reducing effect on inequality and less distortionary impact on growth. Design, of course, matters too, and any identified policy measure can be designed to mitigate the negative effect on growth and the poor.

22. **When it comes to spending, there are trade-offs between growth and redistribution objectives.** While cash transfers are more efficient in reducing extreme poverty and inequality, (efficient) public investment generates better growth outcomes. Hence, both government transfers and public investment will need to rise to spur growth and reduce poverty and inequality. Our results suggest that expanding existing CCT programs by 1 percent of GDP to increase benefits would reduce the extreme poverty rate from 23 to 19 percent. However, growth and social objectives do not need to be incompatible if a virtuous cycle can be started where economic growth improves the living condition of people and a less poor, more productive labor force contributes to faster economic growth. In this respect, effective targeting and efficient public investment spending are key to maximize the social and growth returns of higher tax yields.

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## Appendix. Model Details<sup>1</sup>

We consider a small open economy populated by a continuum of heterogeneous households who live indefinitely and face idiosyncratic shocks. All types of households have the same preferences over the consumption of food,  $c^f$ , manufacturing  $c^m$ , and services,  $c^s$ . We assume that services are non-tradable, while manufacturing and food is tradable, and also the numeraire.

There are three fixed types of households in the model: large farmers, rural households, and urban households. Rural households own a small plot of land and have the occupational choice problem of choosing the amount time to devote to producing food (which requires labor and land), and the amount of time working for large farmers for a competitive wage  $w^r$ . Similarly, urban households have the occupational choice problem of choosing the optimal amount of time to produce services (which use only labor as an input), and how much time to work in manufacturing for a competitive wage  $w$ . We assume that households cannot move across rural and urban sectors.

Large farmers own a large plot of land where they can produce food for the domestic market or exports. They hire labor from small farmers and also accumulate capital, both of which are used to produce agricultural goods for export. Large farmers' capital follows a standard law of motion of capital:

$$k_+^f = x^f + (1 - \delta)k^f$$

Finally, there are competitive firms that produce manufacturing goods using capital and labor as an input. Manufacturing can also be used indistinctly for investment by large farmers or for consumption. Markets are incomplete, urban and rural households can save at a risk-free interest rate  $r$ . Entrepreneurs can borrow at a rate  $(1 + d)r$ , where  $d$  captures the risk premium in lending. We assume that the capital account is closed and trade balance is always zero.

The government collects value added taxes on food  $\tau^a$  and manufacturing goods  $\tau^m$ , trade taxes  $\tau^*$ , corporate taxes  $\tau^f$ , and labor income taxes  $\tau^w$ . The government spends part of its resources on manufacturing goods, and gives or collects lump-sum taxes that may be specific to each household type. In the next section we explain the urban households' problem.

The framework considered here is a continuum of infinitely-lived agents with productivity risk. The model is small open economy with three different agents types: urban households  $u$ , farms  $f$ , and rural households  $r$ . The total mass of agents is normalized to equal 1. All agents maximize the present value of their consumption over three different types of goods: food  $c^a$ , manufactured goods  $c^m$ , and services  $c^s$ .

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<sup>1</sup> This application is part of a research project on macroeconomic policy supported by the U.K.'s Department for International Development (DFID) but should not be reported as representing the views of DFID.

## A. Urban Households' Problem

Urban households are endowed with one unit of time. There are two types of households in urban areas: low-skilled and high-skilled households.  $\mu^l$  share of urban households is low-skilled producing services  $y^s$  and  $(1 - \mu^l)$  share of urban households is high-skilled working on manufacturing for a wage  $w^m$ . Households that live in urban areas maximize the expected present value of utility from stochastic consumption sequences. We will use the superscript  $l$  for low-skilled urban households,  $h$  for high-skilled urban households, and  $u$  for urban households. All urban households face idiosyncratic shocks to their productivity  $\epsilon^l$  and  $\epsilon^h$  and can save in risk-free bonds  $b^l$  and  $b^h$ , for low-skilled and high-skilled urban households. The problem of a low-skilled urban households is given by:

$$\begin{aligned} & \max_{\{c^{l,a}, c^{l,m}, c^{l,s}\}} E \sum_{t=0}^{\infty} \beta^t u(c^{l,a}, c^{l,s}, c^{l,m}) \\ & \quad s. t. \\ & (1 + \tau^a)p^a c^{l,a} + (1 + \tau^m)p^m c^{l,m} + p^s c^{l,s} + b^l \\ & = p^s y^s + (1 + r)b^l + T^l(p^s y^s) + \prod^l(p^s y^s) \\ & \quad y^s = \epsilon^l z^s \end{aligned}$$

The problem of a high-skilled urban household is given by:

$$\begin{aligned} & \max_{\{c^{h,a}, c^{h,m}, c^{h,s}\}} E \sum_{t=0}^{\infty} \beta^t u(c^{h,a}, c^{h,s}, c^{h,m}) \\ & \quad s. t. \\ & (1 + \tau^a)p^a c^{h,a} + (1 + \tau^m)p^m c^{h,m} + p^s c^{h,s} + b^h \\ & = (1 - \tau^w)\epsilon^h w h^h + (1 + r)b^h + T^h(\epsilon^h w h^h) + \Pi^h(\epsilon^l w h^l) \end{aligned}$$

We assume that households face idiosyncratic shocks to their productivities,  $\epsilon^l$  and  $\epsilon^h$ , which follow AR(1) processes. The calibration of these shocks will be such that, as in the data, low productivity households work more on their households' enterprises, while high productivity households spend more time working on the market.

## B. Rural Households' Problem

Households that live in rural areas maximize the expected present value of utility from stochastic consumption sequences. The superscript  $r$  denotes rural households' allocations. Rural households are endowed with one unit of labor and with a small plot of land  $d^r$ . They choose between working on their own plot or working for large farms for a wage  $w^r$ . They face idiosyncratic shocks to their

productivity on their own plot and can save in a risk-free bond  $b^r$ . The maximization problem of a rural household is given by:

$$\begin{aligned} & \max_{\{c^{u,a}, c^{u,m}, c^{r,s}, h^u\}} E \sum_{t=0}^{\infty} \beta^t u(c^{r,a}, c^{r,s}, c^{r,m}) \\ & \text{s.t.} \\ & (1 + \tau^a)p^a c^{r,a} + (1 + \tau^m)p^m c^{r,m} + p^s c^{r,s} + b^r \\ & = (1 - \tau^w)\epsilon^r w^f h^r + p^a y^a + (1 + r)b^r + T^r(\epsilon^h w^f h^f) + \prod^r (\epsilon^r w^f h^f) \\ & y^a = z^a \epsilon^r (d^r)^{\alpha^a} (1 - h^r)^{1-\alpha^a} \\ & h^r \in [0,1] \end{aligned}$$

We assume that households face idiosyncratic shocks to their productivity,  $\epsilon^r$  follows an AR(1) process. The calibration of these shocks will be such that as in the data, low productivity households devote the majority of their time working for big farms, while high productivity households spend more time working on their own farms.

### C. Large Farm's Problem

Farmers that own larger plots of land also maximize their present discounted utility. They do not face any idiosyncratic risk, and the economy is assumed to be in a stationary state so that prices are constant through time. Hence, they do not face any uncertainty. Large farmers produce two goods domestic food and exports. The production of exports requires land  $d^*$ , capital  $k^f$  and labor  $h^*$ , while the production of food only requires land  $d^a$  and labor  $h^a$ . We assume that there is no land market, and consequently the allocation of land between domestic and export goods is fixed. Large farmers choose how much labor to hire to produce for the domestic and the external markets, and how much capital to accumulate. The problem of a larger farmer is given by:

$$\begin{aligned} & \max_{\{c^{f,a}, c^{f,m}, c^{f,s}, k^f, h^a, h^*\}} E \sum_{t=0}^{\infty} \beta^t u(c^{f,a}, c^{f,s}, c^{f,m}) \\ & \text{s.t.} \\ & (1 + \tau^a)p^a c^{f,a} + (1 + \tau^m)p^m c^{f,m} + p^s c^{f,s} + p^m k^f \\ & = Y^* + \tau^* \delta p^m k^f + (1 - \delta)p^m k^f + T^f(Y^*) + \prod^f (Y^*) \\ & \pi^a = p^a z^a (d)^{\alpha_1^a} (h^a)^{1-\alpha_1^a} - w^f h^a \\ & \pi^* = p^* z (d^*)^{\alpha_1^*} (h^*)^{\alpha_2^*} (k^f)^{(1-\alpha_1^*-\alpha_2^*)} - w^f h^a \\ & Y^* = (1 - \tau^r)\pi^a + (1 - \tau^*)\pi^* \\ & h^a, h^* \geq 0 \end{aligned}$$

In addition to paying consumption taxes, large farmers also pay taxes on their land and capital incomes obtained in both, the domestic market, taxed at a rate  $\tau^r$ , and on exports, taxed (after depreciation allowances) at a rate  $\tau^*$ .

#### D. Firm's Problem

We assume that there is a competitive firm that rents capital  $k^m$ , hires effective hours of labor  $h^m$ , and buys intermediate goods  $q^m$  to maximize profit. The firm's problem is given by:

$$\max_{\{k^m, h^m, q^m\}} E \sum_{t=0}^{\infty} \beta^t (z^m (k^m)^{\alpha_1^m} (h^m)^{\alpha_2^m} (q^m)^{1-\alpha_1^m-\alpha_2^m} - w^m h^m - (1+d)r k^m - (1+\tau^m)q^m)$$

Where  $d$  is the risk premium paid by firms and  $\tau^m$  is the consumption tax rate on intermediate goods.

#### E. Government Budget Constraints

The government collects taxes and spend its revenue on manufacturing  $G$  and lump-sum transfers to households  $\{T^r(\cdot), T^u(\cdot), T^f(\cdot)\}$ . In equilibrium the government budget constraint must hold. The expression of the government budget constraint is given by:

$$\begin{aligned} & \tau^a P^a C^a + \tau^m C^m + \tau^* \pi^* + \tau^r \pi^r + \tau^w \mu^u \left( \int \epsilon^{1,u} h^u \Gamma(b^u, \epsilon^u) + \mu^r \int \epsilon^{1,r} h^r \Gamma(b^r, \epsilon^r) \right) \\ & = G + \mu^r \int T^r(w^f \epsilon^r h^r) \Gamma(b^r, \epsilon^r) + \mu^u \int T^u(w \epsilon^u h^u) \Gamma(b^u, \epsilon^u) + \mu^f T^f + \tau^* \delta k^f \end{aligned}$$

where  $\Gamma(b^u, \epsilon^u) = \mu^l \Gamma(b^l, \epsilon^l) + (1 - \mu^l) \Gamma(b^h, \epsilon^h)$ . The government budget constraint implies that the revenue from consumption, corporate and labor income taxes must be equal to government spending on manufacturing, transfers to households, and subsidies for food.

#### F. Market Clearing

In this economy four markets clear in equilibrium. The market clearing conditions depend on the endogenous distribution of shocks and asset holdings  $\Gamma(\cdot, \cdot)$  and on the share of each type of household: urban households  $\mu^u$ , rural households  $\mu^r$ , and large farms  $\mu^f$ . Since labor markets are segmented between urban and rural workers, there are two labor market clearing conditions one for each sector.

- i. Urban labor market

$$\int \epsilon^u h^u \Gamma(b^u, \epsilon^u) = h^m$$

- ii. Rural labor market

$$\mu^r \int \epsilon^r h^r \Gamma(b^r, \epsilon^r) = \mu^f (h^a + h^*)$$

Interest rates must clear the capital market so that households' savings are equal to the capital demanded by manufacturing firms.

- iii. Capital market

$$k^m = \mu^u \int b^u \Gamma(b^u, \epsilon^u) + \mu^r \int b^r \Gamma(b^r, \epsilon^r)$$

Finally, the relative price of services and food must be such that the corresponding markets of such non-tradable goods clear.

- iv. Services market

$$\mu^u \int c^{u,s} \Gamma(b^u, \epsilon^u) + \mu^r \int c^{r,s} \Gamma(b^r, \epsilon^r) + \mu^f c^{f,s} = \mu^u \int \epsilon^u z^s (1 - h^u)^\alpha \Gamma(b^u, \epsilon^u)$$

- v. Food market

$$\begin{aligned} & \mu^u \int c^{u,a} \Gamma(b^u, \epsilon^u) + \mu^r \int c^{r,a} \Gamma(b^r, \epsilon^r) + \mu^f c^{f,a} \\ & = \mu^u \int \epsilon^u z^a (1 - h^r)^{1-\alpha} \Gamma(b^u, \epsilon^u) + \mu^f z^a (d^a)^{\alpha_1} (h^a)^{1-\alpha_1} \end{aligned}$$

## G. Stationary Equilibrium

A competitive equilibrium for this economy is constituted by a stationary distribution of assets holdings and idiosyncratic shocks  $\{\Gamma\}$ , sequences of service and agricultural prices, manufacturing and rural wages, and interest rates  $\{p^s, p^a, w^r, w^f, r\}$ , together with allocations of consumption, investment, time use and bond holdings for each type of households, such that—given manufacturing prices and exported goods prices  $\{p^m, p^*\}$ , sectoral productivity, idiosyncratic shocks, government spending, and predetermined taxes  $\{\tau^m, \tau^a, \tau^w, \tau^f, \tau^*\}$  and transfers  $\{T^r, T^u, T^f\}$ —the stochastic sequence of allocations solve their respective constrained optimization problem, clear markets, and satisfy the government budget constraint. Note that the market clearing conditions along with the fact that the government and individual budgets constraints hold at every period, imply that the external sector condition of a balanced current account is also satisfied (Walras' law).

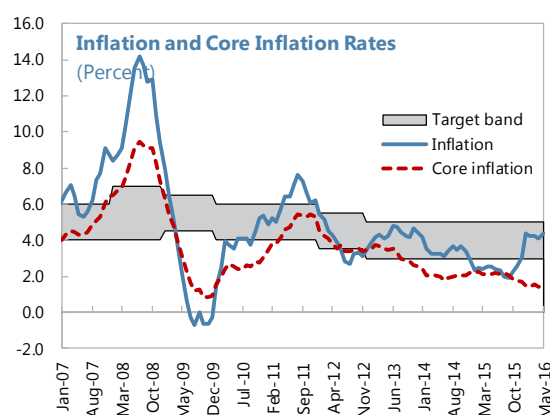
## MONETARY POLICY MANAGEMENT<sup>1</sup>

*The objective of this note is to assess the current stance of monetary policy in Guatemala. We find that the monetary stance is broadly appropriate. The current policy rate is 200 basis points below the estimated neutral nominal interest rate of 5 percent. However, with the output gap closed, core inflation below the target range and declining and expectations firmly anchored within the band an immediate tightening is not warranted, but the central bank should remain vigilant in case inflationary pressures intensify.*

### A. Estimation of the Neutral Policy Rate

#### 1. **Headline inflation was below the target band in 2015, but started rising in early 2016.**

Headline inflation stayed within the target range in 2013 and declined towards the bottom of the range in early 2014 reflecting deceleration in both regional food prices and core inflation, which has been on a declining trend since early 2013. In 2015, inflation was influenced by the fall in international commodity prices, while core inflation remained stable. At the same time, food prices have been steadily rising since mid-2014. Boosted by higher food price inflation headline inflation accelerated in 2016.



Sources: Haver analytics and Fund staff calculations.

2. **We employ a variety of approaches to assess the monetary policy stance and to evaluate monetary policy response under various rules.** First, we use a number of models to assess the nominal neutral interest rate. Second, we employ financial conditions index to analyze the state of the monetary policy. Third, given the uncertainty about the level of potential output and the output gap with current global transitions, we analyze the trends in other important indicators, including core inflation, inflation expectations and the predicted inflation path to obtain a comprehensive assessment of the monetary policy stance. Fourth, we employ a new forward-looking model to assess the macroeconomic impact of different monetary policy rules and the optimal response under various rules to global and domestic shocks.

3. **A combination of models was used to estimate the neutral interest rate for Guatemala.** First, we utilized the models developed in Magud and Tsounta (2012). The first model takes advantage of the uncovered interest parity condition; the second uses a Taylor rule augmented for inflation expectations; and the third solves a general equilibrium model that focuses on aggregate demand-supply equilibrium.<sup>2</sup> In addition, a new forward-looking monetary model, which

<sup>1</sup> Prepared by Iulia Ruxandra Teodoru and Rodrigo Mariscal Paredes.

<sup>2</sup> For methodological details see Magud, N., and E. Tsounta, 2012, "To Cut or Not to Cut? That is the (Central Bank's) Question: In Search of the Neutral Interest Rate in Latin America," Working Paper 12/243 (Washington: International Monetary Fund).



incorporates a New Keynesian Philips curve with international oil prices, an uncovered interest parity condition, a forward-looking IS curve with real exchange rate and foreign demand, and a standard Taylor rule, was developed. The model was employed not only to estimate the neutral monetary policy rate but also to assess the optimal response to various shocks under the different monetary policy rules. Estimation in all the models was based on a period 2001–2015. Looking at the difference between the actual policy rate and the estimated neutral rate, an assessment of the monetary stance can be made taking into account the economy’s current position in the cycle.

4. **According to the average of the model estimates, the neutral nominal interest rate is 200 basis points above the actual nominal policy rate.** With the output gap closed and inflation projected to be within the target range in 2016, the estimates below suggest that the current policy rate of 3 percent implies an accommodative monetary stance (Table 1). However, these results need to be interpreted with caution, given the limitations of the data, the incipient nature of financial markets in Guatemala, and the uncertainty about potential output and the output gap in the global economy and in Guatemala, in particular.

**Table 1. Neutral Real Interest Rate for Guatemala**

		Expected Inflation Dec-2016	4.00
		Actual Monetary Policy Rate	3.00
Method 1/	Neutral Real Interest Rate (NRIR)	Neutral Nominal Interest Rate (NNIR)	Nominal Monetary Policy GAP (bps) 2/
Uncovered Interest Parity	1.6	5.6	260
Forward Looking Monetary Model	0.4	4.4	140
Expected-Inflation Augmented Taylor Rule	1.6	5.6	260
General Equilibrium Model	0.6	4.6	160
Average	1.0	5.0	222

Sources: National authorities and Fund staff estimates.

1/ All units expressed as percent points unless otherwise stated. 2/ (bps): Basis points.

2/ (bps): Basis points.

5. **The uncovered interest parity condition (UIPC) suggests the neutral nominal interest rate of 5.6 percent.** This value of 5.6 percent assumes an implicit annual nominal depreciation in line with the inflation differential with the U.S. to maintain the real exchange rate constant, and takes into account the country’s risk premium (e.g. EMBI spread). The “model” comprises the following equations:

$$i_t = i_t^* + \hat{E} + \rho$$

$$\hat{E} = RER + (\pi - \pi^*)$$

where  $i_t$  is the neutral policy rate in Guatemala,  $i_t^*$  is the current policy rate in the U.S.,  $\hat{E}$  is the expected nominal depreciation of the quetzal vis-à-vis the dollar,  $\rho$  is the risk premium as captured in the country’s external bond spreads,  $RER$  is the real exchange rate,  $\pi$  is the current inflation projection in Guatemala, and  $\pi^*$  is the current inflation projection in the U.S.

6. **The expected-inflation augmented Taylor rule model estimates the neutral nominal interest rate at 5.6 percent.** The model incorporates information from the yield curve and inflation expectations, in addition to the output gap and deviation from the inflation target as is standard in the Taylor rule models. The results show that the real neutral level of the monetary policy rate in this model is 1.6 percent, which corresponds to the neutral nominal interest rate of 5.6 percent taking into account the staff's projected inflation of 4 percent in 2016. These results should again be interpreted with caution given that the model relies on a certain degree of sophistication of a country's financial markets, while Guatemala has thin financial markets and less developed yield curves. The model in this case comprises the following equations:

$$\begin{aligned} r_t &= r_t^* + \pi_{t+1}^e + \beta(\pi_t - \pi_t^*) + \theta \tilde{y}_t + \varepsilon_t^1 \\ R_t &= r_t^* + \alpha + \pi_{t+1}^e + \varepsilon_t^2 \\ r_t^* &= r_{t-1}^* + g_{t-1} + \mathcal{G}_t^1 \\ g_t &= g_{t-1} + \mathcal{G}_t^2 \end{aligned}$$

where  $r_t$  is the short-term rate (rate on the central bank's open-market operations),  $r_t^*$  is the neutral policy rate,  $\pi_{t+1}^e$  are one-year ahead inflation expectations,  $\pi_t - \pi_t^*$  are deviations from the inflation target,  $y_t$  is the output gap,  $R_t$  is the long-term interest rate (10-year government bond yield at issuance), and  $\alpha$  is the term premium.  $g_t$  is the growth rate of the state variable  $r_t^*$ . All disturbance terms ( $\varepsilon_t^1$  and  $\varepsilon_t^2$ ) are assumed to be zero mean variables with constant variances.

7. **The general equilibrium model concludes that the nominal neutral rate is 4.6 percent.** This model relies on an Investment-Savings (IS) equation—that relates the output gap to its own lags and lags of deviations of the monetary policy rate from neutral levels—and a Phillips curve that relates inflation to the output gap. This model depends less on the structure of financial markets; however, it still assumes that the monetary transmission channel works efficiently. The model consists of the following equations:

$$\begin{aligned} (y_t - y_t^*) &= \sum_{s=1}^S \alpha_s^y (y_{t-s} - y_{t-s}^*) + \sum_{v=1}^V \alpha_v^r (r_{t-v} - r_{t-v}^*) + x_{1,t}' \alpha + \varepsilon_t^y \\ \hat{\pi}_t &= \sum_{p=1}^P \beta_p^\pi \hat{\pi}_{t-p} + \sum_{q=1}^Q \beta_q^y (y_{t-q} - y_{t-q}^*) + x_{2,t}' \beta + \varepsilon_t^\pi \\ y_t &= y_t^* + \varepsilon_t^c \\ y_t^* &= y_{t-1}^* + g_{t-1} \\ g_t &= g_{t-1} + \varepsilon_t^g \\ r_t^* &= r_{t-1}^* + \varepsilon_t^r \end{aligned}$$

where  $y_t - y_t^*$  is the output gap,  $r_t - r_t^*$  is the deviation of the policy rate from the neutral policy rate,  $\hat{\pi}_t$  is the deviation of core inflation from the inflation target,  $x_1$  and  $x_2$  are control variables for the output gap and inflation equations respectively that among others include cyclical deviations of the real effective exchange rate and oil prices. All disturbance terms ( $\varepsilon_t^y$  and  $\varepsilon_t^\pi$ ) are assumed to be zero mean variables with constant variances.

8. **The forward-looking monetary model yields a neutral interest rate of 4.4 percent.** The model includes four structural equations derived for a small open economy. Besides the neutral interest rate estimation, the purpose of the model is to evaluate a set of monetary policy rules under uncertain environment for monetary policy making, including uncertainty about the output gap, and under a multiplicity of global shocks. It builds upon Clarida, Gali and Gertler (2000)<sup>3</sup> by including oil prices and the neutral interest rate as a parameter to be estimated rather than calibrated. From a policy perspective, the model can show the response of key variables to possible shocks, depending on the chosen policy rule (see the last section for details). Specifically, the model has a New Keynesian Philips curve with international oil prices; an uncovered interest parity condition; a forward-looking IS curve with real exchange rate and foreign demand; and a standard Taylor rule with a smoothing parameter. Parameters are estimated simultaneously by the generalized method of moments (GMM), on quarterly data from March 2001 to December 2015. The system was solved, simulated and found to be saddle-path stable using Blanchard and Kahn's method.<sup>4</sup> The model consists of the following equations:

$$\begin{aligned}x_t &= x_{t+6} + \alpha(r_t - \bar{r}) + \delta \Delta s_t + \psi \Delta y_t^* + \varepsilon_t^x \\ \Delta s_t &= \theta_0 + \theta_1(r_t - r_t^*) + \varepsilon_t^s \\ \pi_t &= (1 - \phi_1)\pi_{t-1} + \phi_1\pi_{t+6} + \phi_2 x_t + \phi_3 \pi_t^{oil} + \varepsilon_t^\pi \\ r_t &= \rho r_{t-1} + (1 - \rho) \left[ \bar{r} + \beta(\pi_{t+3} - \bar{\pi}_t) + \gamma x_{t+3} \right] + \varepsilon_t^r\end{aligned}$$

where  $x_t$  is the output gap at time  $t$ ,  $\Delta s_t$  is the annual growth rate of the real exchange rate index between  $t$  and  $t-1$ ,  $\Delta y_t^*$  is the annual growth rate of the foreign demand (approximated with the US GDP growth rate),  $\pi$  is the inflation rate, calculated as the annual growth rate of the CPI and for  $\pi^{oil}$  the annual growth rate of the international oil price index;  $r_t$  is the monetary policy rate,  $r_t^*$  is the foreign interest rate (US Federal Funds target rate) and  $\bar{r}_t$  is the neutral (nominal) interest rate. Finally, the error term in each equation,  $\varepsilon_t$ , is a linear combination of forecast errors and exogenous disturbance (by assumption, this error term is orthogonal to the set of instruments).

9. **The real neutral monetary policy rate is well below the potential real GDP growth rate.** Our estimates of the neutral real rate are closer to a short-term real interest rate that prevails when inflation is on target and the output gap is closed, which may not capture fundamental long-term relationships well.<sup>5</sup> Underdeveloped financial markets, including the absence of a secondary market for government securities and a yield curve, financial sector frictions, low quality data and possibly other factors such as the distortionary impact of corruption, crime and informal sector on

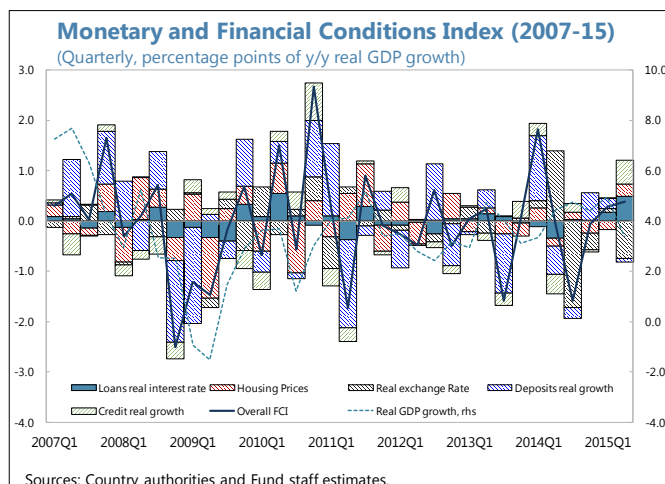
<sup>3</sup> Clarida, R., Gali, J. and Gertler, M. (2000) "Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory," *The Quarterly Journal of Economics*, 115(1), pp. 147-180.

<sup>4</sup> This condition guarantees that the system will converge to the steady state for any given initial value in the state variables and any given change in the value of the control variables that satisfy the feasibility constraints.

<sup>5</sup> The original definition came from Wicksell (1898) who defined the natural rate of interest in three ways (1) the rate of interest that equates saving and investment; (2) the marginal productivity of capital; and (3) the rate of interest that is consistent with aggregate price stability. These definitions implied that the natural rate is (i) consistent with equilibrium, (ii) is a characteristic of the economy in the long run, and (iii) is not fixed but fluctuates according to changes in technology that affect the productivity of capital.

investment and equilibrium short-term interest rates, might explain the divergence of the neutral interest rate and the potential growth rate.

10. **Another approach to assess the appropriateness of monetary and financial conditions is to construct a financial condition index (FCI).** A VAR analysis was used to decompose the contribution of various financial indicators to real GDP growth. The FCI was built as the sum of the cumulative impulse responses of real GDP to each of the relevant financial variables. The financial variables included a summary measure of interest rates (the real interest rate on bank loans), the real effective exchange rate (REER), the real growth of deposits and of credit to the private sector, and a real housing price index (proxied by the housing component of the consumer price index). The model was estimated using quarterly data between 2001 and 2015. The index is normalized so that zero indicates neutral impact of monetary and financial conditions on GDP growth.



11. **The estimated FCI points to somewhat easy monetary conditions in early 2016.** The quarterly FCI shows that financial conditions tightened in the second half of 2014, reflecting mostly an increase in the real effective exchange rate. Starting in the first half of 2015, slightly lower real lending rates, strong credit growth, and higher housing prices offset the appreciation in the real effective exchange rate resulting in somewhat loosened conditions. Financial conditions eased further in early 2016. Relatively underdeveloped financial markets in Guatemala may complicate the interpretation of these results. More generally, the FCI does not only capture the impact of monetary policy, but also broader interactions between financial and real variables.

12. **However, other indicators suggest that monetary policy is broadly appropriate.** Given model uncertainty, in part, associated with the ongoing structural global transitions, which make estimation of the output gap problematic, other indicators should be taken into account. In particular, core inflation is below the target and inflation expectations have been firmly within the target range. Staff also forecasts inflation to end 2016 in the middle of the target range and remain within the range in 2017. Hence, an immediate tightening is not warranted.

13. **Nonetheless, inflation risks are tilted to the upside and the central bank should remain vigilant.** Upward food price pressures that spill out to the core, faster U.S. growth, a rebound in international commodity prices, and possible second-round effects from currency depreciation following the normalization of global interest rates could lead to a faster increase in inflation. Hence, Banguat should stand ready to increase the policy rate promptly if inflationary pressures intensify.

## B. Monetary Policy in the Current Global Environment

14. **In this part, the forward-looking model is used to show the impact of different shocks on macro variables under the three types of monetary policy rules.** First, a Flexible Rule that puts weight on both inflation and output gap was estimated. The second policy rule a *Strict* Inflation Targeting Rule is the one with no direct reaction to the output gap. And finally, a Real Effective Exchange Rate Rule reacts to inflation and the output gap as in the flexible rule, but also to the change in the real effective exchange rate ( $\Delta REER$ ). The parameters of the first rule were estimated, while the weights for the latter two policy rules were taken from the literature.<sup>6</sup>

- **Under a cost-push shock<sup>7</sup>, the three monetary rules react with different magnitudes yet in the same direction.** A cost-push shock is an exogenous shock from a factor not included in the model, like a monopoly markup, a distortionary tax, or a new policy that increase prices. The Strict Rule reacts quickly and pushes up the policy rate more than the others. Inflation increases mildly but the output gap drops more than with any other policy rule. The REER Rule reacts with a lag and much less than the Strict Rule or the estimated Flexible Rule. In this case, inflation increases more than with any other rule and the output gap opens a bit less. However, the REER appreciates more than in any other case because higher inflation makes the country less competitive and pushes the REER up through the UIP condition.

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<sup>6</sup>See for example Bardsen, G.; Eitrheim, Ø.; Jansen, E. S.; and Nymoen, R (2005) *The Econometrics of Macroeconomic Modelling*, Oxford University Press chapter 10; Engel, C. and West, K. (2005) "Exchange Rates and Fundamentals," *Journal of Political Economy*, 113, pp. 485-517.

<sup>7</sup> All shocks displayed are impulses of one unit at time zero and nowhere else. The time period is measured in quarters.

- **Policy rules react similarly in the face of a negative shock to domestic or foreign demand.**

If domestic demand is hit by a negative shock, policy rates are cut to bring both output and inflation to the steady state. The REER depreciates more under the REER Rule because of a slightly higher drop in prices, triggered by a slightly higher policy rate (compared to the other rules). The domestic demand shock takes a bit longer to dissipate than the foreign demand shock.

- **In the face of an oil price shock (similar to the cost-push shock), the three policy rules react with different magnitudes yet in the same direction.** An oil price shock, similarly to the cost-push shock, raises inflation and pulls the output away from the steady state. But, in this case, the shock to inflation is more severe and yet more resilient than with the cost-push shock. The REER, again, appreciates more with the REER Rule because of the increase in both interest rates and inflation.

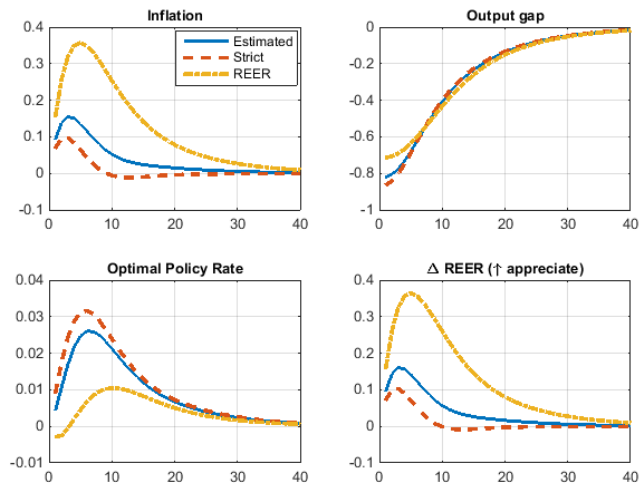
- **Under a shock to the foreign interest rate or the real effective exchange rate, the REER Rule’s reaction is much more pronounced, compared to the other two rules.** As these two shocks impact the REER directly and raise the output gap and inflation, all three policy rules propel a hike in interest rates. But the REER Rule overreacts and inflation comes down below the target, which brings a more depreciated REER relative to the other policy rules. With the Flexible and the Strict Rules, instead, an exchange rate shock has a positive and low pass-through to inflation, and a positive effect on output gap from the beginning.

Forward-looking Model Estimates and Alternative Simulations			
	Estimation 1/	Strict	ΔREER
<i>I-S Curve</i>			
$\alpha$	<b>-1.839</b> (0.05)		
$\delta$	<b>-0.078</b> (0.01)		
$\psi$	<b>0.512</b> (0.02)		
<i>UIP Condition</i>			
$\Theta_0$	<b>2.793</b> (0.10)		
$\Theta_1$	<b>0.177</b> (0.04)		
<i>Augmented Phillips Curve</i>			
$\Phi_1$	<b>0.191</b> (0.01)		
$\Phi_2$	<b>0.370</b> (0.01)		
$\Phi_3$	<b>0.016</b> (0.00)		
<i>Monetary Policy Rules</i>			
$\rho_1$	<b>1.039</b> (0.01)	<b>1.039</b> -	<b>1.039</b> -
$\rho_2$	<b>-0.102</b> (0.02)	<b>-0.102</b> -	<b>-0.102</b> -
$\bar{r}$	<b>4.298</b> (0.06)	<b>4.298</b> -	<b>4.298</b> -
$\beta$	<b>1.943</b> (0.11)	<b>1.500</b> -	<b>1.500</b> -
$\gamma$	<b>0.251</b> (0.05)	<b>0.000</b> -	<b>0.500</b> -
$\gamma_{REER}$	-	-	<b>-0.330</b>
N	150		
J-test	1.693		
p-value	0.9941		

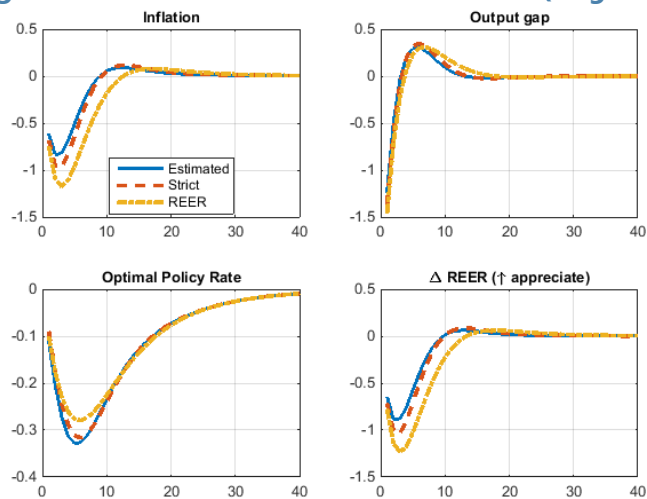
*Standard errors in parentheses*  
 1/ Two step GMM estimation with autocorrelation-consistent (HAC) weight matrix. Set of instruments (with lags): US real Treasury Bill rate, real 10Y US Treasury rate, commodity price inflation, credit growth and variables already in the model.

15. **In conclusion, in the current global environment, where there is uncertainty around the output gap, the central bank should focus targeting deviation of inflation from the target.** The estimated Flexible and Strict rules behave very similarly, as they both share similar paths and magnitudes in response to all the simulated shocks. On the other hand, incorporating the REER as an objective does not help more than the other rules to stabilize output and inflation. Moreover, in some cases, this rule generates more volatility, especially on the REER— a result of the effect on the policy rate and inflation.

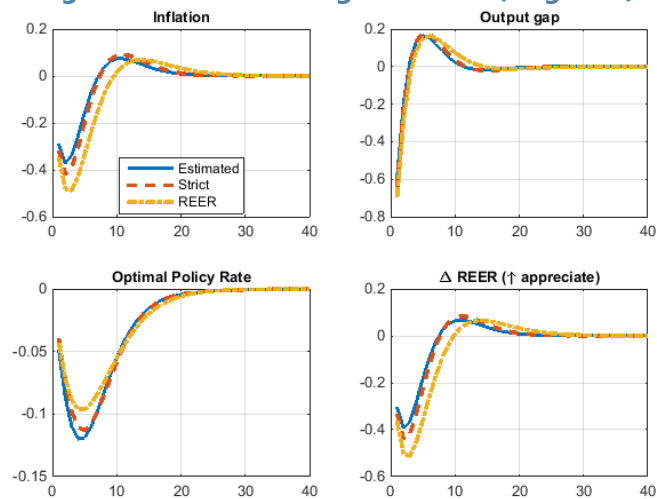
**Figure 1. Results: Cost-Push Shock (Positive)**



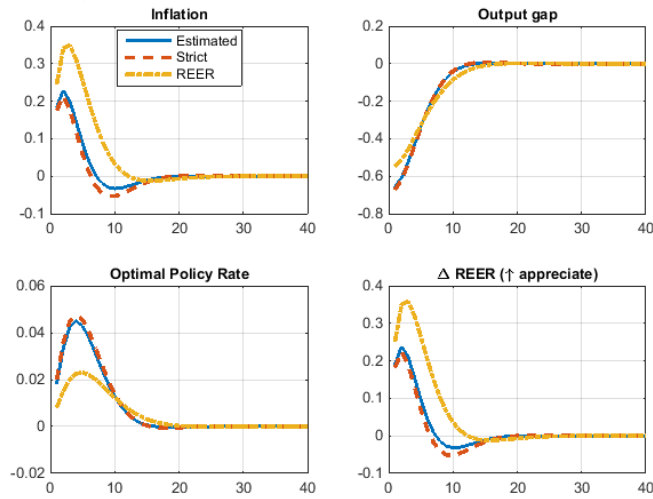
**Figure 2. Results: Domestic Demand Shock (Negative)**



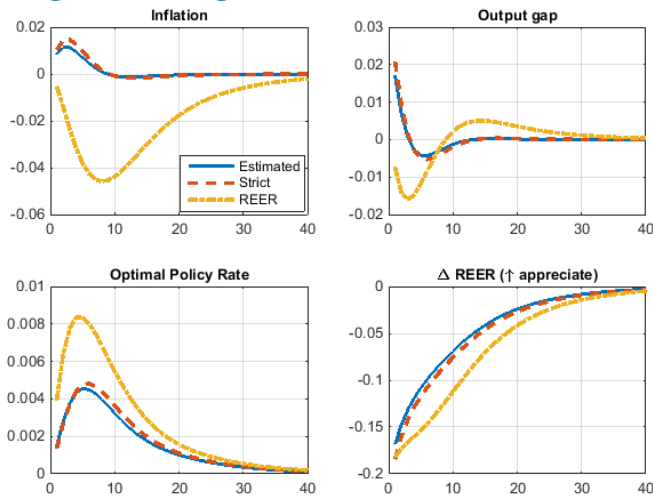
**Figure 3. Results: Foreign Demand (Negative)**



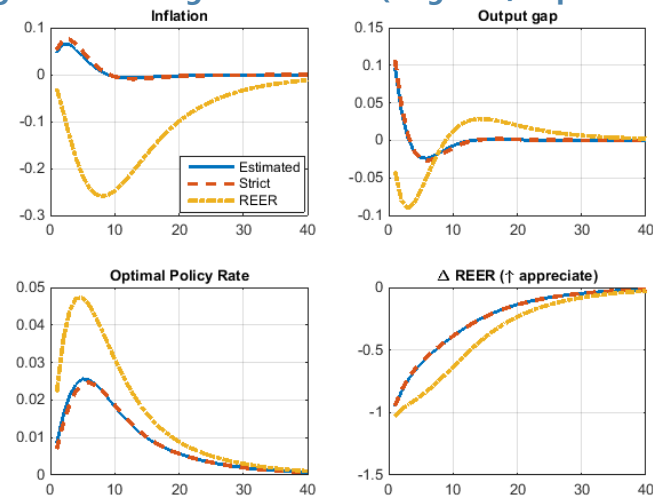
**Figure 4. Results: Oil Price Shock (Positive)**



**Figure 5. Foreign Interest Rate Shock (Positive)**



**Figure 6. Exchange Rate Shock (Negative/Depreciation)**





# MACRO FINANCIAL LINKAGES: ASSESSING FINANCIAL RISKS

## A. Stress Testing the Financial System<sup>1</sup>

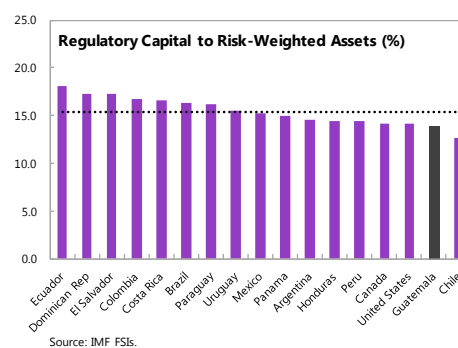
*This section assesses the resilience of the banking system to a variety of shocks. We employ financial soundness indicators and a top-down stress test to evaluate the health of the banking system. The results suggest that the system could withstand a range of sizable shocks but moderately high dollarization of bank loans, relatively large exposure to the government, and growing bank foreign liabilities as well as maturity mismatches in U.S. dollar positions represent vulnerabilities.*

### Introduction

1. **Guatemala's financial system is dominated by banks, which operate as part of financial conglomerates.** Financial system assets were 64 percent of GDP at end-2015, with banking system assets representing 83 percent of the total. Most financial institutions (representing about 90 percent of total assets) are part of the 10 financial conglomerates operating in Guatemala, and the majority of those that are part of conglomerates (2/3) are owned by the three largest domestic conglomerates. Financial conglomerates are organized under a local bank and comprising domestic and foreign subsidiaries as well as off-shore banks. Offshore banks represent about 8.4 percent of total financial system assets, and their role is to raise deposits in U.S. dollars in Guatemala and lend mainly to corporations in Guatemala and to a lesser extent to clients in other countries.<sup>2</sup>

2. **The banking system has gone through consolidation and regionalization in recent years.** Concentration of assets has increased and five banks hold 80 percent of total banking system assets. Latin American and U.S. banks hold 22 percent of assets while Guatemalan banks hold subsidiaries in Costa, Rica, El Salvador and Honduras, and lend abroad to corporates and banks in these three countries.

3. **The financial system appears sound though capital is below the level of regional peers while dollarization and external rollover risks continue to represent vulnerabilities.** At 14.1 percent,<sup>3</sup> reported regulatory capital is above the minimum requirement (10



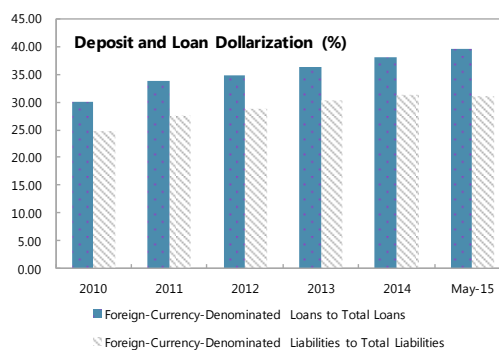
<sup>1</sup> Prepared by Iulia Ruxandra Teodoru.

<sup>2</sup> Offshore banks need to be part of a financial group legally authorized in Guatemala and are subject to the same supervision requirements as domestic banks. The main difference with domestic banks is that they cannot accept small deposits (i.e. less than \$10,000), deposits are not covered by the deposit insurance fund, and interest earnings on deposits are not subject to taxes. Also, information submitted to SIB on deposits is aggregated without revealing depositors' or investors' names.

<sup>3</sup> The stress tests below are using a CAR of 13.9 percent (as of September 2015). The definition of CAR used in the stress tests differs from the regulatory definition of capital.

percent), for the system as a whole and for individual banks. However, capitalization is low by regional standards (including Tier 1 capital) and has been declining over the past few years. The NPL ratio increased slightly in 2015, but at less than 1½ percent of total loans remains low. The ratio of provisions to NPLs stood at about 67 percent, but would be lower if adjustments are made relatively generous rules for collateral valuation.

4. **The banking system has become more dollarized, and over a third of financial intermediation is conducted in U.S. dollars.** The degree of credit dollarization has increased from 27 percent of total loans at end-2010 to 36 percent in March 2016. The dollar loan-to-deposit ratio has been growing over time and reached 180 percent for the system as a whole in 2015 (it was above 200 percent on average for the three largest banks). Credit lines from abroad (mainly by the three largest banks) are used to fund FX loans that are not funded by FX deposits. While liquidity indicators are robust, with liquid assets accounting for 37 percent of total liabilities, rising bank foreign liabilities, currently at a decade high of about 15 percent of the total liabilities (comprising about half of all funding in foreign currency), represent a potential vulnerability. In addition, government bond holdings (11 percent of bank assets) are relatively large and about half of the bonds are in the available-for-sale portfolio used to manage liquidity, hence subject to market risk solely in case those government bonds are sold (excluding those held to maturity) and marked to market. Overall, private credit growth of 11 percent is moderate, and while FX loan credit growth exceeded domestic currency loan credit growth after the global financial crisis, the former has recently slowed sharply as large electricity projects financed by loans in foreign currency have been completed.<sup>4</sup> Growth in FX loans has now come down to 9 percent, below the growth in domestic currency loans of 12 percent.



Source: IMF FSIs.

<sup>4</sup> Also, elimination of the electricity and housing sectors' exemption from higher capital requirements on foreign-currency loans has been announced; this may have also contributed to the credit growth slowdown.

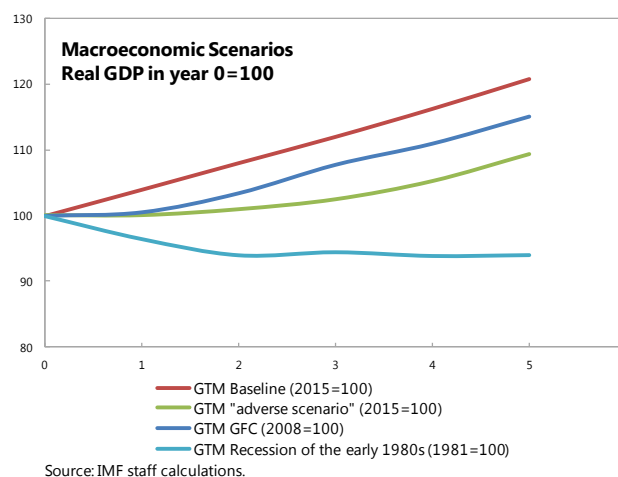
**Table 1. Guatemala: Financial Soundness Heat Map**

Guatemala	2013Q2	2013Q3	2013Q4	2014Q1	2014Q2	2014Q3	2014Q4	2015Q1	2015Q2	2015Q3
<b>Overall Financial Sector Rating</b>	H	M	M	M	M	M	M	M	M	M
<b>Credit cycle</b>	H	L	L	L	L	L	L	L	L	L
Change in credit / GDP ratio (pp, annual)	6.3	1.7	0.9	0.9	1.0	0.2	0.3	0.7	1.0	1.6
Growth of credit / GDP (% annual)	25.2	5.7	2.9	2.9	3.3	0.6	1.1	2.3	3.0	4.9
Credit-to-GDP gap (st. dev)	1.0	0.6	0.0	-0.8	-1.2	-1.6	-1.5	-1.6	-1.4	-1.2
<b>Balance Sheet Soundness</b>	M	M	M	M	M	M	M	M	M	M
<b>Balance Sheet Structural Risk</b>	M	M	M	M	M	M	M	M	M	M
Deposit-to-loan ratio	134.2	129.1	129.9	131.9	131.2	129.8	128.9	129.4	129.6	125.6
FX liabilities % (of total liabilities)	28.2	29.0	30.3	30.4	30.4	30.9	31.1	30.8	30.8	31.1
FX loans % (of total loans)	35.2	36.6	36.3	36.1	37.1	37.2	38.1	39.0	39.4	39.9
<b>Balance Sheet Buffers</b>	L	L	L	L	M	L	M	L	L	L
<b>Leverage</b>	M	M	M	M	M	L	M	L	L	M
Capital-to-assets ratio (%)	7.0	6.8	6.9	7.0	6.9	7.1	6.9	7.0	7.0	7.0
<b>Profitability</b>	L	L	L	L	L	L	L	L	L	L
ROA	1.9	2.0	2.0	1.9	1.9	1.8	1.9	1.9	1.8	1.7
ROE	20.5	21.5	21.4	21.0	20.4	19.3	20.6	20.7	19.9	19.2
<b>Asset quality</b>	L	L	L	L	M	M	M	L	L	L
NPL ratio	1.4	1.3	1.2	1.3	1.56	1.41	1.29	1.35	1.45	1.43
NPL ratio change (% annual)	-8.0	-13.7	-11.3	-3.0	13.3	6.1	7.9	3.6	-6.9	1.8

Source: Fund staff estimates.

### Scenarios for Solvency Stress Tests

5. **Four scenarios were considered in the stress tests to assess the stability of the banking system.** Full-fledged macroeconomic projections were quantified for an adverse macroeconomic scenario. An adverse scenario could have important consequences for Guatemala's economy due to the combined shock: capital inflow shocks, exchange rate depreciation, surge in the domestic interest rate, and less investment. In this first scenario, the cumulative decline in economic growth relative to the baseline is 4 percentage points or 2 standard deviations based on the data from the 1980–2015 (i.e. zero percent), which is less severe than the recession experienced in the 1980s but more severe than the growth shock during the global financial crisis.<sup>5</sup> Second, the shock to the nominal exchange rate assumes a 20 percent depreciation.<sup>6</sup> Third, an interest rate shock assumes a 2 percentage point increase in the nominal interest rate on all assets. Fourth, a combined shock scenario was generated by the general equilibrium model to ensure consistency of



<sup>5</sup> Based on the data from the 1990–2015, 2 standard deviations would imply a higher economic growth (i.e. 1 percent) for the macroeconomic scenario, slightly milder compared to the scenario assumed in the stress test. This period is also characterized by lower exchange rate volatility given improvements in exchange rate management. While this scenario could be considered for the stress test, we chose a scenario which assumes a stronger shock which includes, for instance, a disorderly unwinding of UMP.

<sup>6</sup> The assumption of a 20 percent exchange rate depreciation is illustrative. Large historical depreciations of between 25-50 percent happened in the early and late 1990s.

macro variables. It assumes an initial shock of 20 percent exchange rate depreciation, the associated increase in the risk premium of 200 basis points, which captures an increased credit risk from unhedged borrowers. The model then suggests that a consistent impact on interest rates would be an increase by 2 percentage points and a decline in growth of 4 percentage points.

### Satellite Model for Credit Risk

6. **To assess the impact of the shocks to growth, interest rates and exchange rate on bank-specific non-performing loan ratios a dynamic panel model was employed.** The model was estimated based on a panel dataset including 18 banking institutions and quarterly observations for the period 2001:Q1 through 2013:Q3. The model specification was as follows:

$$\text{LNPL}_{i,t} = \mu_i + \alpha \cdot \text{LNPL}_{i,t-1} + \beta_1 \cdot g_{t-4} + \beta_2 \cdot (\delta g_{t-4})^2 + \gamma_1 \cdot \text{rir}_{i,t-4} + \gamma_2 \cdot \text{infl}_{t-1} + \gamma_3 \cdot \text{RDEP}_{t-1} + \varepsilon_{i,t}$$

where the indices  $i$  and  $t$  indicate, respectively, the banking institution and the time period.

LNPL denotes the logistic transformation of the NPL ratio:  $\text{LNPL} = \ln\left(\frac{\text{NPL}}{1-\text{NPL}}\right)$ ,  $g$  denotes real GDP growth (annual rate);  $\text{rir}$  is a real interest rate,<sup>7</sup>  $\text{infl}$  is the four quarter rate of inflation based on the CPI,  $\text{RDEP}$  denotes the rate of growth of the real (bilateral) exchange rate, where a positive value indicates a real depreciation of the Quetzal against the US dollar, and  $\mu_i$  denotes bank-specific fixed effects. The estimated coefficients are presented in the following table:

<b>Explanatory Variable</b>	<b>Coefficient</b>
LNPL (logit transformation of NPL ratio, one-quarter lag)	0.82 ***
$g$ (annual real GDP growth rate, four-quarter lag)	-3.04 **
$g^2$ (annual real GDP growth rate squared, four-quarter lag)	46.08 **
$\text{rir}$ (real lending rate, four-quarter lag)	3.18 ***
$\text{infl}$ (annual inflation rate, one-quarter lag)	1.96 **
RDEP (real exchange rate depreciation, one-quarter lag)	0.87 *

Note: \*\*\*, \*\*, \* denotes statistical significance at the 1, 5, and 10 percent level.

<sup>7</sup> The real interest rate was measured as the lending rate minus the CPI inflation rate calculated over the previous four quarters.

The estimated model is non-linear in real GDP growth: the NPL ratio increases at an accelerated rate as real GDP growth declines further. Similar results were obtained using slightly different specifications of the equation above.

Overall, the NPL-ratio under stress was computed as:

$$NPL_t^{stress} = \left( \frac{NPL_{t-1}^{initial}}{1 - NPL_{t-1}^{initial}} \right) \exp\{\beta \Delta X_t\} / [1 + \left( \frac{NPL_{t-1}^{initial}}{1 - NPL_{t-1}^{initial}} \right) \exp\{\beta \Delta X_t\}]$$

where  $X_t$  is the vector of macroeconomic factors used and  $\beta$  is the vector of coefficients (from the credit risk model).  $\Delta X_t$  represents the change in the levels of macro variables.

7. **An adjustment of provisions and initial capital was also made.** Specifically, effective provisioning rates were calculated as follows:

$$\text{Adjusted effective provisioning rate} = \text{Nominal provisioning rate} * \left( 1 - \frac{\text{Adjusted collateral value}}{\text{Loan value}} \right)$$

The tests are undertaken under more rigorous rules for collateral valuation, given the difficulty encountered by the banks in recovering collateral. Collateral values are discounted 20 percent relative to the current market values, and a further adjustment is introduced to take account of the average time to recover collateral via lawsuits—about 3 years. Thus, the adjusted collateral value is calculated as follows:

$$\text{Adjusted collateral value} = \text{Original collateral value} * 0.8 * (1 + 0.07)^{-3}$$

In the calculation, the discount rate is set at 7 percent. This value approximates the nominal interest rate at a 3-year horizon corresponding to the baseline yield curve in domestic currency.

With respect to the capital used in the stress tests for the capital adequacy ratio, the capital considered is the equity of banks and does not include such instruments as subordinated debt and other hybrid capital, while the regulatory capital typically counts these instruments as capital.

8. **Estimates from the credit risk model suggest that credit risk in the loan book is an important risk factor for the banking system.** Loans to the economy represent more than half of total banking sector assets, of which a large share is directed towards the corporate sector. As a result of the decline in GDP growth, the depreciation of the Quetzal, and the rise in interest rates, the NPL ratios increase by 1 percentage point in the adverse scenario.

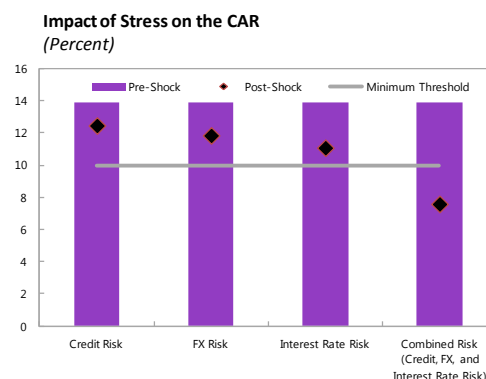
## Results of Solvency Stress Tests

9. **Banks appear quite resilient to high levels of stress, but there are areas of vulnerability.**

- After making adjustments to provisions to conduct the tests under more rigorous rules for collateral valuation and calculation of loan loss provisions, initial capital was adjusted downwards by 0.6 percentage points.

- Under the adverse growth scenario (i.e. zero percent economic growth, see sections on “Scenarios for Solvency Stress Tests” and “Satellite Model for Credit Risk”), the CAR for the system falls by 0.9 percentage points.

- Direct exchange rate risk is contained, given that most banks hold positive net open FX positions in foreign currency, with assets more than offsetting liabilities denominated in U.S. dollars. The net open position is equivalent to 1.3 percent of total assets, and it is negative in only three banks (equivalent to less than 1 percent of assets in 2 banks and 1.6 percent of the assets of a third bank). The situation implies that the banks would benefit from a depreciation of the Quetzal if the “indirect” credit risks associated with the depreciation are ignored. The CAR for the system would improve by 0.4 percentage points, with a depreciation of 20 percent vis-a-vis the U.S. dollar.



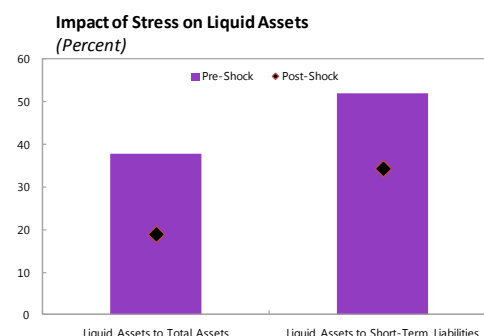
Source: IMF staff calculations.  
 Note: Solvency stress test for FX risk assumes 20 percent depreciation; test for interest rate risk assumes a 2 percentage points nominal interest rate increase; test for combined risk adds impact on the CAR from credit, FX, and interest rate risks.

- Indirect exchange rate risk, however, could trigger credit losses. A depreciation of the Quetzal by 20 percent would increase the debt burden and reduce the repayment capacity of un-hedged foreign currency borrowers. Based on the estimated model for credit risk (see section on “Satellite Model for Credit Risk”), having a 20 percent depreciation will make 13 percent of FX loans become NPLs, which would cause a 0.9 percentage points decline in the CAR. In a different and more adverse scenario, the assumption is that 40 percent of FX loans become NPLs, given that 40 percent of borrowers in foreign currency are un-hedged. This causes a 2.5 percentage points decline in the CAR. In this latter scenario, if the effects from both direct and indirect exchange rate risks are combined, the CAR falls by 2.1 percentage points.
- Potential losses, in particular for larger banks, driven by interest rate risk, which materializes because of losses in interest income and valuation losses on government bonds, are notable. The valuation losses correspond to bonds held in the “available for sale” portfolios that were marked to market. As a result of securities losses, the CAR declines by 2.6 percentage points. If both the net interest income and repricing impacts are assessed, the CAR falls by 2.8 percentage points.
- While the banking system can handle individual shocks well, a combined shock scenario based on a consistent set of assumptions from a general equilibrium macro model with the initial shock of 20 percent depreciation and an increase in interest rates of 2 percentage points would lead to an increase in credit risk from un-hedged borrowers and to valuation losses on government bonds, and will push the capital ratio below the regulatory minimum (i.e. the CAR falls by 7 percentage points).

## Results of Liquidity Stress Tests

### 10. Banks appear quite resilient to severe liquidity shocks, but there are areas of weakness.

- Liquidity stress tests assumed a combination of 10 percent run-off rates on domestic currency and FX deposits, and 5 percent on other FX liabilities and 3 percent on other domestic currency liabilities per month. Under this scenario most banks would remain liquid after 5 months. If 15 percent run-off rates per month are assumed on domestic currency and FX deposits (and the same run-off rates as above on other domestic currency and FX liabilities), more than half of the system becomes illiquid after 5 months.
- Alternatively, if the impact from a 25 percent run-off rates on FX deposits, and 35 percent run-off rates on other FX liabilities (e.g. foreign credit lines) is assessed, one large and one middle-sized bank become illiquid after 5 months. Thus, reliance on foreign credit lines represents an area of vulnerability.
- Maturity mismatches in U.S. dollar positions (which are presumably higher than in domestic currency positions, in particular in the short term) could represent a significant vulnerability though this could not be tested due to the lack of data on the maturity structure of assets and liabilities.



Source: IMF staff calculations.

Note: Liquidity stress test assumes a 10 and 5 percent per month withdrawal of domestic demand deposits and other liabilities respectively, and a 10 and 3 percent per month withdrawal of foreign demand deposits and other foreign liabilities respectively.

**Table 3. Banking Sector Financial Soundness Indicators**

<b>Selected Banking Sector Ratios</b>	<b>All Banks</b>
<i>Capital Adequacy</i>	
Total capital / RWA (CAR)	13.9
<i>Asset Quality</i>	
NPLs (gross)/ total loans	1.5
Specific Provisions/NPLs	66.9
(NPLs-specific provisions)/capital	3.0
FX loans/total loans	40.4
RWA/total assets	66.2
<i>Profitability</i>	
ROA (after-tax)	1.2
ROE (after-tax)	13.4
<i>Liquidity</i>	
Liquid assets/total assets	37.8
Liquid assets/short-term liabilities	52.0
<i>Sensitivity to Market Risk</i>	
Net FX exposure / capital	14.2
<b>Basic Ratio Analysis: Ratings 1/</b>	
<i>Overall</i>	1.8
<i>Capital Adequacy</i>	
Total capital / RWA (CAR)	1.7
<i>Asset Quality</i>	
NPLs (gross)/ total loans	1.0
Provisions/NPLs	2.4
(NPLs-provisions)/capital	1.0
FX loans/total loans	2.6
RWA/total assets	3.0
<i>Profitability</i>	
ROA (after-tax)	2.3
ROE (after-tax)	2.1
<i>Liquidity</i>	
Liquid assets/total assets	1.1
Liquid assets/short-term liabilities	1.7
<i>Sensitivity to Market Risk</i>	
Net FX exposure / capital	2.5

1/ 1=low risk, 2=increased risk, 3=high risk, 4=very high risk.  
The ratings are averaged across banks.



Table 4. Results of Stress Tests

	All Banks
<b>Asset Quality</b>	
NPLs (gross)/ total loans	1.5
Pre-shock CAR (Percent)	13.9
<b>Credit Risk Stress Test 1/</b>	
<i>1. Underprovisioning</i>	
Post-shock CAR (Percent)	13.3
CAR change (Pct Point)	-0.6
<i>2. Proportional increase in NPLs</i>	
Post-shock CAR (Percent)	13.1
CAR change (Pct Point)	-0.9
<b>Interest Rate Risk Stress Test 2/</b>	
<i>1. Net interest income impact</i>	
Post-shock CAR (Percent)	13.6
CAR change (Pct Point)	-0.3
<i>2. Repricing impact</i>	
Post-shock CAR (Percent)	11.1
CAR change (Pct Point)	-2.6
Overall change in CAR (NII and Repricing Impact)	-2.8
<b>FX Risk Stress Test 3/</b>	
<i>1. Direct Foreign Exchange Risk</i>	
Post-shock CAR (Percent)	14.3
CAR change (Pct Point)	0.4
<i>2. Indirect Foreign Exchange Risk</i>	
Post-shock CAR (Percent)	11.9
CAR change (Pct Point)	-2.5
Overall change in CAR (Direct and Indirect)	-2.1
<b>Combined Stress Test 4/</b>	
<i>Credit, FX, and Interest Rate Risks</i>	
Post-shock CAR (Percent)	7.6
CAR change (Pct Point)	-6.3
<b>Liquidity Stress Test (# of liquid banks after 5 months) 5/</b>	
Simple liquidity test (run on all banks, fire-sale of assets)	15
1/ Assumes 20 percent discount to initial collateral values, and another adjustment to take into account the average time to recover collateral is 3 years.	
2/ Assumes a 2 percentage points nominal interest rate increase.	
3/ Assumes a depreciation of the exchange rate of 20 percent, and 40 percent of FX loans become NPLs.	
4/ Adds aggregate losses caused by individual shocks (assumptions on individual shocks are maintained the same).	
5/ Assumes a 10 and 5 percent per month withdrawal of domestic demand deposits and other liabilities respectively, and a 10 and 3 percent per month withdrawal of foreign demand deposits and other foreign liabilities respectively.	

## B. Domestic Bank Network Analysis and Cross-Border Financial Spillovers<sup>8</sup>

*The recent financial crisis has proven that stress events in individual institutions can spill over and undermine the stability of the entire financial system, highlighting the need to track direct and indirect financial interconnections among financial institutions. This note looks at domestic interbank linkages and cross-border bank interconnections in Guatemala to assess whether linkages across institutions within and beyond the country's borders may have systematic implications. Results suggest that the Guatemalan banking sector is relatively resilient to shocks originating both domestically and abroad though some banks deserve higher scrutiny in terms of their vulnerability and the level of contagion they can generate.*

### Bank Network Analysis

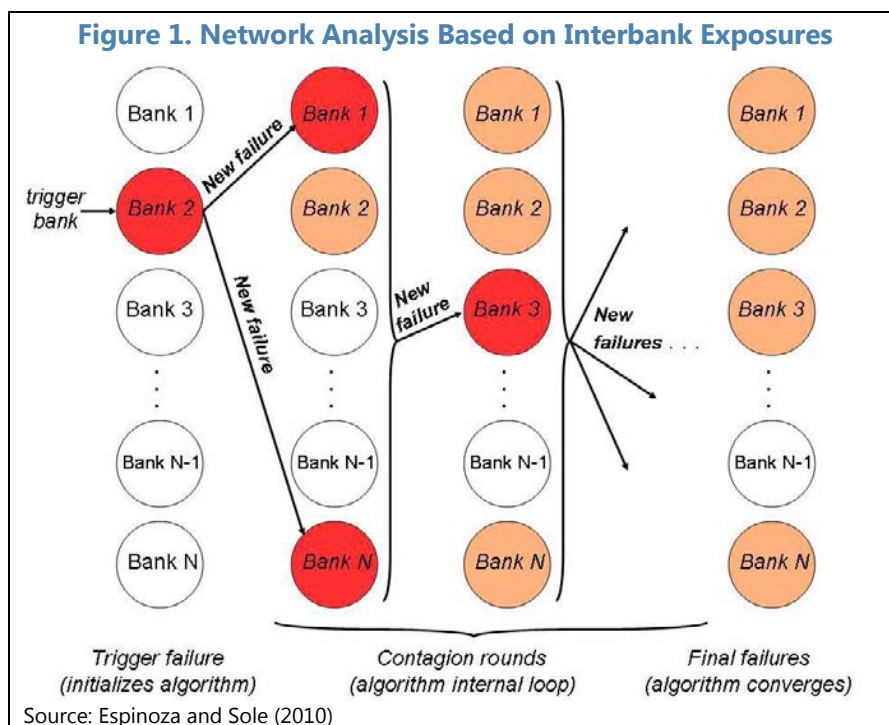
11. **To assess potential systemic implications of domestic interbank linkages we simulate the cascading effect upon the failure of selected banks due to credit and funding shocks.** We do so by using the interbank exposure model developed by Espinosa and Sole (2010)<sup>9</sup> which is designed to track the domino effects triggered by the hypothetical default of each bank in the system through the resulting credit losses and funding shortfalls (Figure 1).

12. **The analysis is based on a stylized balance sheet identity that highlights the role of interbank exposures.** In the identity, bank loans and other assets are funded by (i) capital, (ii) long- and short-term borrowing excluding interbank loans, (iii) deposits, and (iv) interbank borrowing. To analyze the effect of a *credit shock*, the model simulates the individual default of each institution's interbank obligations in the network. For different assumptions of loss given default, it is assumed that the capital of creditor banks absorbs the losses on impact, triggering the creditor bank's default if its capital is insufficient to fully cover losses. In addition to its direct credit exposures to other institutions, a bank's vulnerability also stems from its inability to roll over all or part of its funding in the interbank market, and thus having to sell assets at a discount in order to re-establish its balance sheet identity. In this respect, a credit shock may be compounded by a *funding shock* and associated fire sales losses if default of an institution also leads to a liquidity squeeze. In the model, it is assumed that institutions are unable to replace all the funding previously granted by the defaulted institutions, which in turn generates a fire sale of assets. Default is again triggered if bank capital is not enough to absorb the funding-shortfall induced loss.<sup>10</sup>

<sup>8</sup> Prepared by Valentina Flamini.

<sup>9</sup> Espinosa-Vega, M. and J. Sole, 2012, "Cross-Border Financial Surveillance: A Network Perspective," IMF WP/10/105, Washington, DC.

<sup>10</sup> Calculations assume 100 percent loss given default and funding shortfall, and 10 percent of lost funding being non-replaceable. Interbank exposure and capital data are as of December 31, 2015.

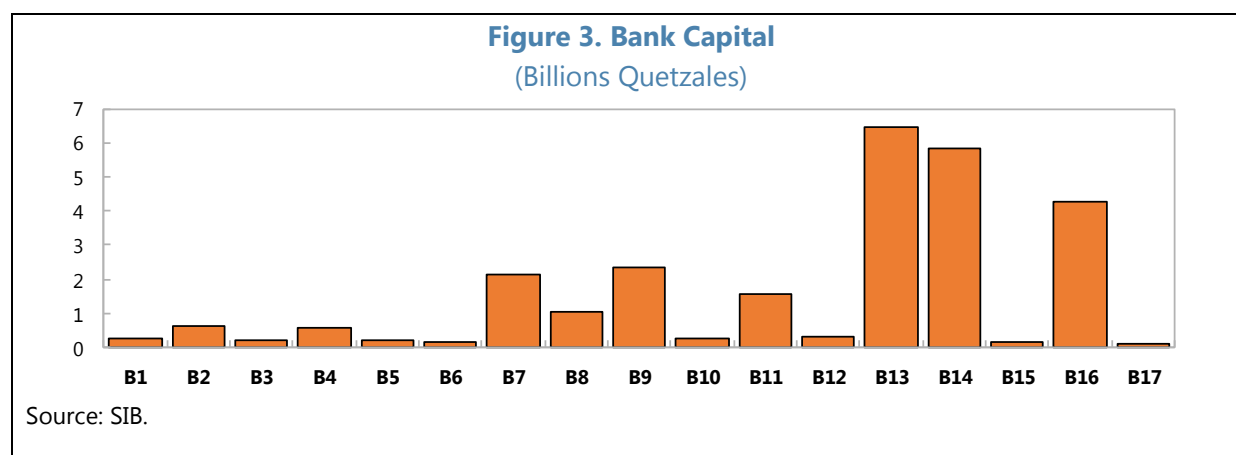


13. **Interbank exposures in Guatemala are small compared to banks’ capitalization.** Interbank positions amount on average to 6 and 5 percent of lenders’ and borrowers’ bank capital respectively, hence the resulting capital and funding risks are contained. Only one bank (B3) has individual credit exposures to 2 other banks (B9 and B16) exceeding 100 percent of its capital (Figure 2). However, interbank exposure ratios mask important differences in bank capitalization, with bank capital ranging between 0.1 and 6 ½ billion quetzales (Figure 3).

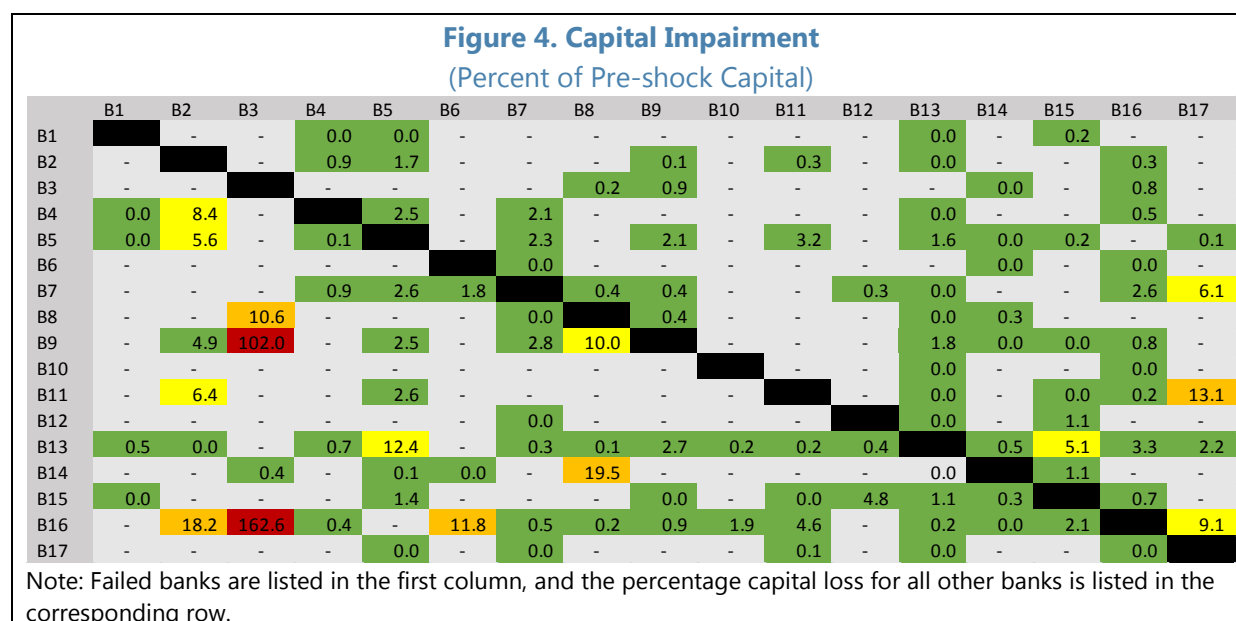
**Figure 2. Interbank Exposures**  
(Percent of pre-shock capital)

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17
B1	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	0.2	-	-
B2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B4	-	8.4	-	-	2.5	-	2.1	-	-	-	-	-	-	-	-	0.5	-
B5	-	5.6	-	-	-	-	2.3	-	2.1	-	3.2	-	1.5	-	-	-	0.1
B6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B7	-	-	-	0.1	0.1	1.8	0.4	0.1	-	-	-	0.3	-	-	-	2.6	6.1
B8	-	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B9	-	4.9	102.0	-	-	-	2.8	9.7	-	-	-	-	1.7	-	0.0	-	-
B10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B11	-	6.4	-	-	0.1	-	-	-	-	-	-	-	-	-	0.0	-	13.1
B12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B13	0.5	0.0	-	0.7	7.5	-	0.3	0.1	2.3	0.2	0.2	0.4	-	0.5	-	3.3	2.2
B14	-	-	0.4	-	0.1	0.0	-	19.5	-	-	-	-	-	-	0.0	-	-
B15	-	-	-	-	1.4	-	-	-	-	-	-	4.8	1.1	0.3	-	0.7	-
B16	-	18.2	162.6	0.1	-	11.8	-	-	-	1.9	4.6	-	-	-	0.1	-	9.1
B17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: SIB. Note: The table shows downstream exposures of the banks in the first column to all other banks in percent of the lender bank’s capital. Note: Grey: No exposure; Green: Exposure <5%; 5%<= Yellow <10%; 10% <= Orange <20%; Red >=20%.

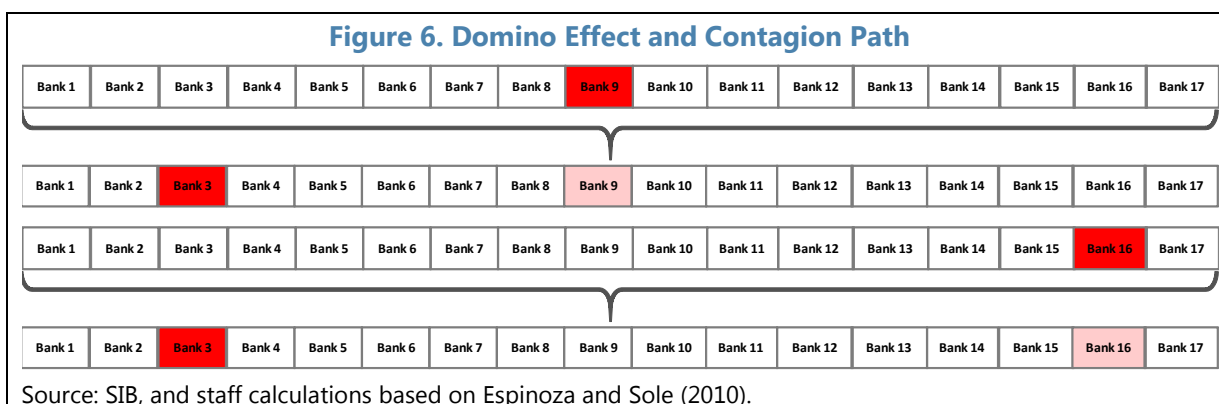
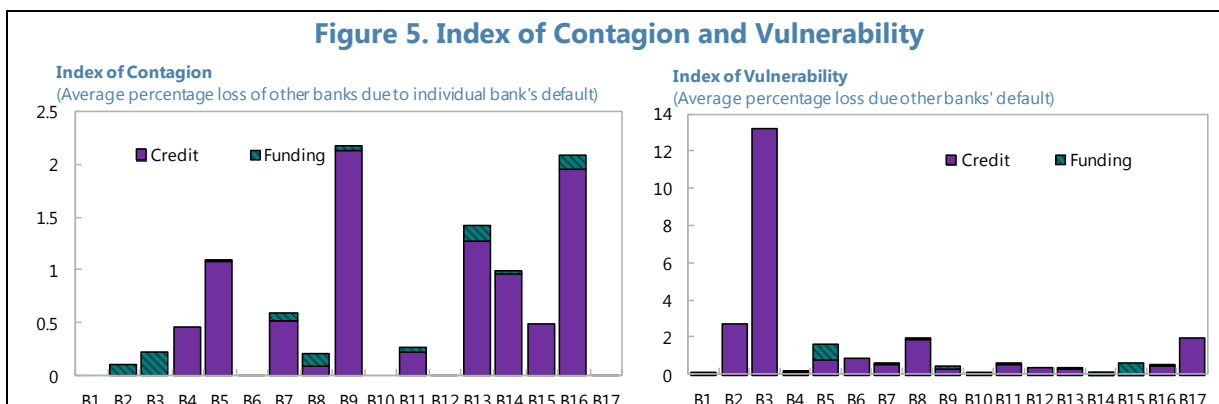


14. **As a consequence, capital impairment due to bilateral interbank exposures is limited.** In particular, capital losses following individual bank defaults—a measure of how much the system would be weakened by the transmission of financial distress across institutions—reach significant levels only for one bank (Figure 4), the same that was identified in the bank exposure matrix. However, such downstream exposure does not translate in significant funding risk for the borrower banks (B9 and B16) given their higher capitalization.



15. **Accordingly, the degree of contagion and vulnerability across the system is contained and, where significant, it arises from credit risk.** Figure 5 presents average capital losses in the network due to the default of individual banks, as opposed to bilateral vulnerabilities shown in the capital impairment matrix. Contagion and vulnerability indices are contained overall, and clustered around a few banks (banks 3, 9 and 16). The analysis also allows distinguishing between the credit and funding channel, with banks 9 and 16 being contagious, and bank 3 reciprocally vulnerable to credit risk due to the high credit exposure of the latter to the formers but not so much to the

funding shocks. Hence, the default of banks 9 and 16 would trigger the default of bank 3 (Figure 6), although contagion would be limited to one round.



16. **The analysis suggests that the domestic bank network is relatively resilient to contagion effects but some banks deserve higher scrutiny.** While interbank exposures are limited on average, the system may be weakened by the transmission of financial stress across institutions. It is therefore important that the regulators track potential systemic linkages and maintain a higher scrutiny on those banks which are relatively more vulnerable (B3) or hazardous (B9 and B16) to the system in order to contain externalities in case of financial distress of individual institutions.

### Cross-Border Financial Spillovers

17. **We used the IMF Bank Contagion Module to assess the impact of financial spillovers to Guatemala from stress in international banks.** Based on BIS banking statistics and bank-level data, the model estimates potential rollover risks for Guatemala stemming from both foreign banks' affiliates operating in Guatemala and foreign banks' direct cross-border lending to Guatemala borrowers.<sup>11</sup> Rollover risks were triggered in the scenarios analyzed here by assuming bank losses in

<sup>11</sup> For methodological details see Cerutti, Eugenio, Stijn Claessens, and Patrick McGuire, 2012, "Systemic Risks in Global Banking: What can Available Data Tell Us and What More Data Are Needed?" BIS Working Paper 376, Bank for

the value of private and public sector assets in certain countries and/or regions. If the banks do not have sufficient capital buffers to cover the losses triggered in a given scenario, they have to deleverage (reduce their foreign and domestic assets) to restore their capital-to-asset ratios,<sup>12</sup> thus squeezing credit lines to Guatemala and other countries. The estimated impact on losses in cross-border credit availability for Guatemala also incorporates the transmission of shocks through Panama, given its central financial role in the region. The assumption is that cross-border lending from Panama to Guatemala declines proportionally to the decline in cross-border lending to Panama from the banking systems where the shocks originate.<sup>13</sup>

**18. Spillovers to Guatemala from stress in international banks are moderate and lower than in regional peers.** The impact on foreign credit availability in Guatemala of the severe stress scenarios in asset values of BIS reporting banks, presented in the text figure and the table below, is lower than in other countries in the region, with the exception of Honduras. As of October 2015, the most sizable impact on claims on Guatemalan borrowers would stem from shocks in the US and Canada. Spillovers from a 10 percent shock to assets originating in the U.S. and Canada would reduce credit in Guatemala by 2.7 percent of GDP (or 5.5 percent of total domestic and cross-border credit to the public and private sectors). In contrast, a similar shock would reduce credit in Panama and El Salvador by 16 and 8 percent of GDP respectively. More generally, the level of upstream exposures of Guatemala to international banks<sup>14</sup> implies an upper limit on the losses of about 7 percent of GDP (or 14 percent of total domestic and cross-border credit to the public and private sectors in Guatemala).<sup>15</sup> This upper limit would correspond to a worst case scenario without any replacement, either domestic or external, of the loss of credit by BIS reporting banks to Guatemalan borrowers.



1/ In Panama, the loss of credit includes credit by banks in the off-shore center with minimal links to the domestic economy.

International Settlements. Banks exposures and spillover estimates were provided by Camelia Minoiu and Paola Ganum (RES).

<sup>12</sup> Bank recapitalizations as well as other remedial policy actions (e.g., ring fencing, monetary policy, etc.) at the host and/or home country level are not taken into account in this model.

<sup>13</sup> Panamanian banks have a more limited integration in the network analysis as they merely transmit the stress in international banks, rather than also being subjected to stress scenarios of losses in their asset values.

<sup>14</sup> Based on consolidated claims on Guatemala of BIS reporting banks—excluding domestic deposits of subsidiaries of these banks in Guatemala.

<sup>15</sup> Total credit to the non-bank sectors in Guatemala is calculated by adding IFS local (both domestic and foreign owned) banks' claims on non-bank borrowers and BIS reporting banks' direct cross-border claims on non-bank sectors (BIS Locational Banking Statistics Table 6B).

**Table 5. Spillovers from International Banks' Exposures**  
(As of October 2015)

Creditor banking system	Magnitude of Shock to Creditor Banks' Exposures 1/	Impact on Credit Availability (% GDP) 2/
USA	10	-2.3
Canada	10	-0.4
USA and Canada	10	-2.7
UK	10	-0.1
Germany	10	-0.4
France	10	0.0
Spain	10	-0.3
Italy	10	0.0
Greece	10	0.0
Ireland	10	0.0
Portugal	10	0.0
GIP 3/	10	0.0
Switzerland	10	0.0
Netherlands	10	-0.2
Japan	10	-0.3
Selected European countries 4/	10	-1.1

Source: Research Department Macro-Financial Division Bank Contagion Module based on BIS, ECB, IFS,

1/ Percent of on-balance sheet claims (all borrowing sectors) that default.

2/ Reduction in foreign banks' credit due to the impact of the shock on their balance sheet, assuming uniform

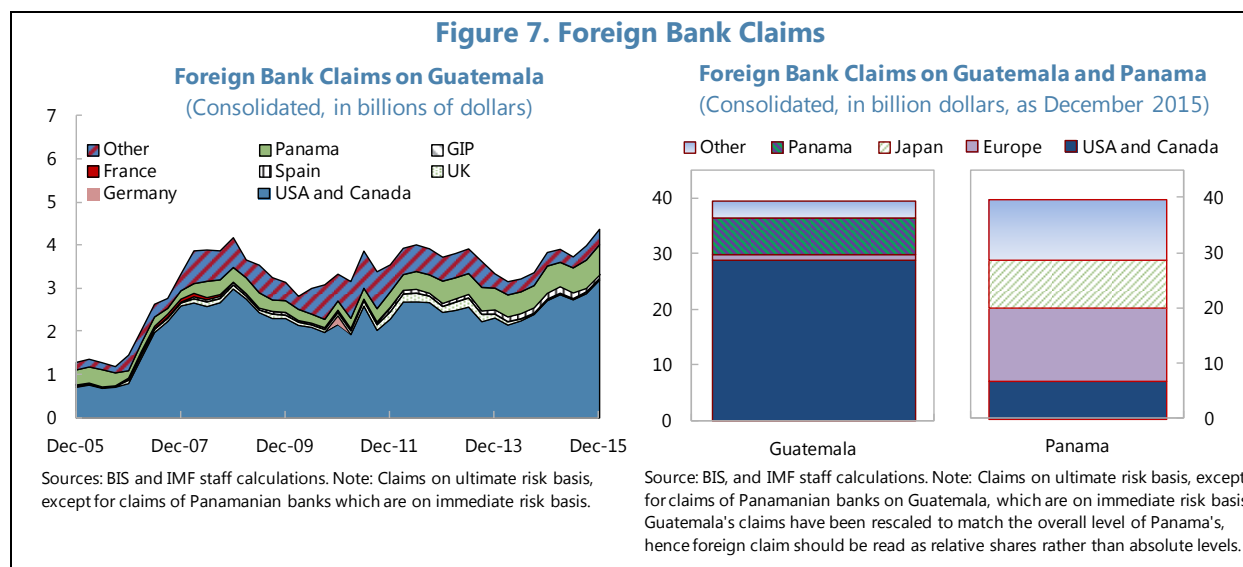
3/ Greece, Ireland, and Portugal.

4/ Greece, Ireland, Portugal, Italy, Spain, France, Germany, Netherlands, and the UK.

19. **Spillovers from a shock originating in the U.S. assets only are relatively larger, and financial regional integration is important in the transmission of shocks.** The impact of a 10 percent loss in U.S. assets value on cross-border credit availability in Guatemala would be 2.3 percent of GDP.<sup>16</sup> This effect stems from the large share of U.S. banks in total foreign bank claims on Guatemala, although the strengthening in international banks' capital buffers and the cross-border deleveraging of assets after the global financial crisis is likely to have mitigated risks. As of October 2015, a 10 percent loss on European assets would result in a reduction in credit availability to Guatemala of about 1.1 percent of GDP.<sup>17</sup> Increasing importance of financial integration with other countries in the region plays an important role in the transmission of shocks from Europe. Indeed, almost one third of the estimated credit losses in Guatemala (0.3 percent of GDP) resulting from a shock originating in Europe would be transmitted through cross-border lending from Panama, which is more dependent on European banks' funding (Figure 7).

<sup>16</sup> Spillovers from exposures to the USA increased significantly compared to the earlier (2013Q3) estimates of 0.25 percent of GDP because the latest simulations require advanced economy banking system to hold 8.5 percent capital ratio to be considered as "adequately capitalized" (in line with Basel III) compared to 6 percent in previous estimates. For any given shock to their balance sheets, this higher required minimum capital leads to a greater deleveraging by the banking system that receives the shock, and therefore to a higher funding risk exposure of the borrower country, in this case Guatemala.

<sup>17</sup> Spillovers from exposures to large European banks are somewhat lower compared to the earlier (2013Q3) estimates of 1.9 percent of GDP because foreign claims decreased significantly, more than offsetting the deleveraging effect caused by the higher minimum capital requirement.



### C. Balance Sheet Analysis<sup>18</sup>

*This section provides an update of the balance sheet analysis (BSA) of the Guatemalan economy presented in the 2013 Article IV report.<sup>19</sup> The net external debtor position of the economy increased further, but this was again driven by continued FDI flows to the private sector, and the country maintained a small net debtor position excluding FDI, implying limited external risks. Risks from currency mismatches appear limited at the aggregate sectoral level, although unhedged borrowers in foreign currency (FX) present vulnerability. Private sector debt has increased moderately over the last decade.*

20. **External risks remain limited given the country's small and stable net external debtor position excluding FDI liabilities.** Guatemala had a total net external debtor position of about 21 percent of GDP in 2015, up from 18 percent in 2012, but this largely reflects continued increase in FDI liabilities, which are a sign of a strong capital structure at the country level, with stronger reliance on equity rather than debt. Excluding FDI liabilities, the economy has a small net debtor position of about 1½ percent of GDP, implying limited risks of a capital account crisis (Figure 8, left and Table 3). This position has been broadly unchanged since 2012, as a small increase in the net external debtor position of the financial sector—from 2 to 3 percent of GDP—and a small decline in the net external creditor position of the central bank were largely offset by the decline in the net external debtor position of the government as a share of GDP (Figure 8, right).<sup>20</sup>

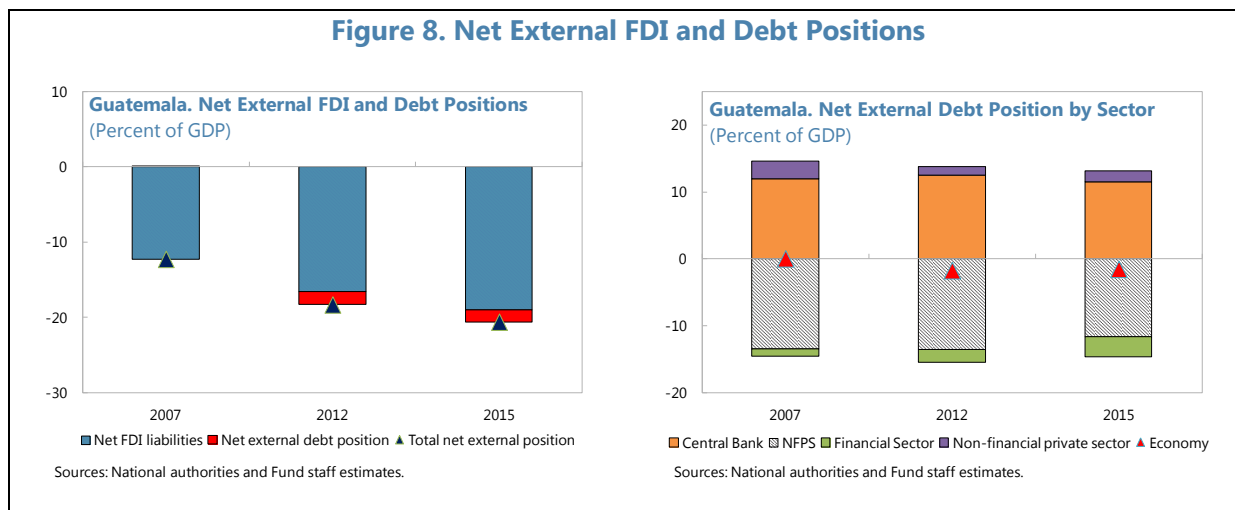
<sup>18</sup> Prepared by Jaume Puig-Forné.

<sup>19</sup> Full intersectoral data required for the BSA analysis are currently available up to September 2015. The BSA analysis in the 2013 Article IV report was based on data as of end-2012 (see IMF (2013)).

<sup>20</sup> While the net debtor position of the financial system is not large relative to the size of the economy, it is large by international standards relative to the size of the banking sector, implying significant but manageable rollover risks (Section B, Domestic Bank Network Analysis and Cross-Border Financial Spillovers).

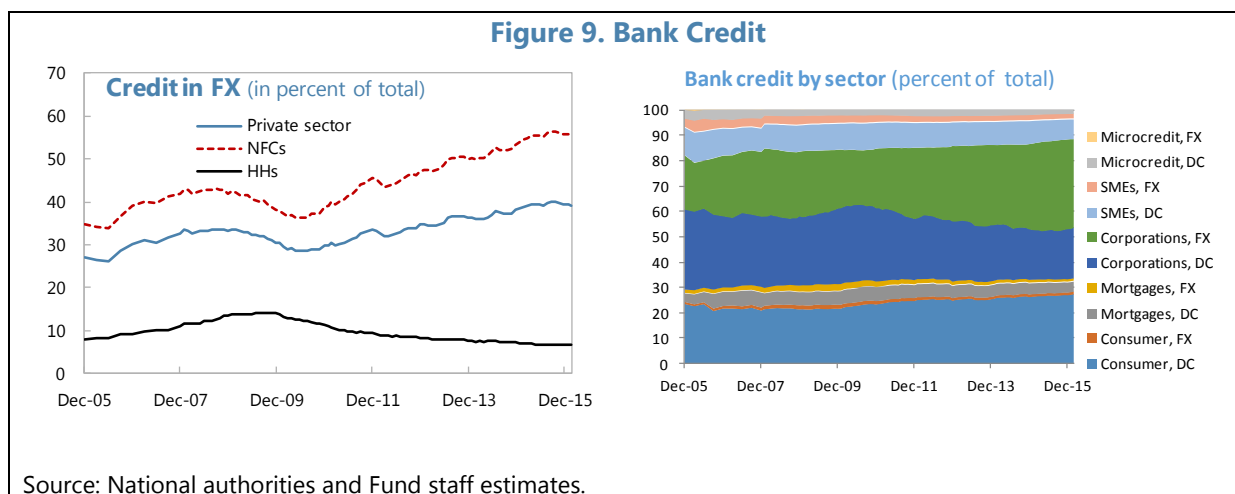


**Figure 8. Net External FDI and Debt Positions**

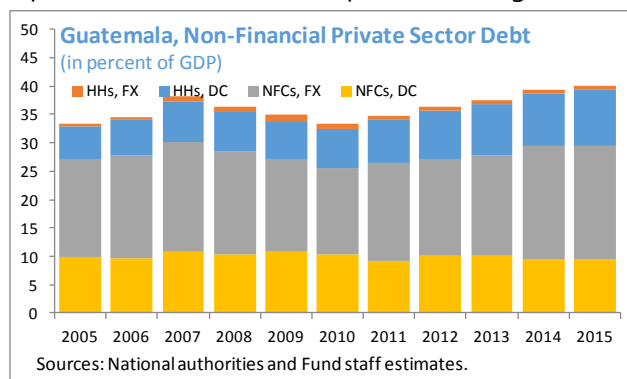


21. **Notwithstanding limited currency mismatches at the aggregate level, the rising share of FX bank credit highlights possible risks from unhedged borrowers.** Currency mismatches by sector were little changed over the last few years. Despite a small decline in reserves of the central bank in percent of GDP, the net negative FX position of the consolidated public sector declined slightly from about 3 percent to about 2¼ percent of GDP since 2012, driven by the decline in external debt of the central government as a share of GDP (Table 6). The net positive FX position of the financial sector increased slightly from about ½ percent of GDP in 2012 to about 1 percent in 2015, as banks continued channeling additional external financing into domestic credit in FX. The non-financial private sector maintained a balanced net FX position—excluding FDI liabilities—with foreign assets broadly offsetting the sector’s small net FX debtor position vis-à-vis banks (Tables 6 and A1). At the same time, the rising share of credit in FX over the last few years highlights possible risks from unhedged borrowers (Section A of this note), although the concentration of such credit in the corporate sector, especially large corporations that are more likely to have natural hedges through export revenues, appears to be a risk-mitigating factor (Figure 9).

**Figure 9. Bank Credit**



22. **Private sector balance sheets appear healthy with limited accumulation of debt in the last decade.** Private sector debt reached about 40 percent of GDP in 2015, up from a trough of 33 percent of GDP in 2010, but only slightly higher than the previous peak of 38 percent of GDP reached in 2007. More detailed bank credit and International Investment Position data by sector shows that credit to non-financial corporates (NFCs) in 2015 was still marginally below the peak reached in 2007, after recovering from 25 percent of GDP in 2010 to almost 30 percent.<sup>21</sup> Credit to the household sector was not affected by the global credit crisis, remaining around 8 percent of GDP through 2007–11, and then gradually rising to 10½ percent of GDP by 2015. Most of the FX loans were on the corporate rather than household side.



<sup>21</sup> Includes domestic bank credit to corporates and external borrowing by corporates from international banks or capital markets.

**Table 6. External and Foreign Currency Positions**

	Central Bank	Non-financial Public Sector	Public Sector	Financial Sector	Non-financial Private Sector	Economy
<b>September 2015</b>						
Gross External Assets	12.4	0.0	12.4	5.1	10.7	28.1
Gross External Liabilities	0.9	11.7	12.6	8.0	28.1	48.8
Net External Position	11.5	-11.7	-0.2	-2.9	-17.5	-20.6
Net External Debt Position 1/	11.5	-11.7	-0.2	-2.9	1.6	-1.6
Gross FC Assets	12.3	0.1	12.4	21.2	22.1	55.7
Gross FC Liabilities	1.5	13.2	14.7	20.4	41.1	76.1
Net FC Position	10.8	-13.1	-2.3	0.9	-18.9	-20.4
Net FX Debt Position 1/	10.8	-13.1	-2.3	0.9	0.1	-1.3
Gross ST FC Assets	11.8	0.1	11.9	3.7	20.2	35.8
Gross ST FC Liabilities	0.9	0.6	1.5	11.4	1.2	14.1
Net ST FC Position	10.9	-0.5	10.4	-7.7	19.0	21.7
<b>End-2012</b>						
(In percent of GDP)						
Gross External Assets	13.7	0.0	13.7	5.0	11.4	30.1
Gross External Liabilities	1.3	13.6	14.8	6.9	26.7	48.4
Net External Position	12.4	-13.6	-1.1	-1.9	-15.3	-18.3
Net External Debt Position 1/	12.4	-13.6	-1.1	-1.9	1.3	-1.8
Gross FC Assets	13.5	0.0	13.6	19.2	22.6	55.4
Gross FC Liabilities	1.6	14.9	16.4	18.6	38.4	73.5
Net FC Position	12.0	-14.8	-2.9	0.6	-15.8	-18.0
Net FX Debt Position 1/	12.0	-14.8	-2.9	0.6	0.8	-1.5
Gross ST FC Assets	13.4	0.0	13.4	2.6	21.0	37.0
Gross ST FC Liabilities	0.9	0.5	1.4	11.1	1.5	14.0
Net ST FC Position	12.5	-0.5	12.0	-8.5	19.5	23.0
<b>End-2007</b>						
Gross External Assets	13.0	0.0	13.0	4.4	15.0	32.3
Gross External Liabilities	1.1	13.5	14.6	5.4	24.6	44.6
Net External Position	11.9	-13.5	-1.6	-1.0	-9.6	-12.3
Net External Debt Position 1/	11.9	-13.5	-1.6	-1.0	2.7	0.0
Gross FC Assets	12.8	0.1	12.9	19.1	25.8	57.8
Gross FC Liabilities	0.9	15.0	15.9	16.7	37.0	69.5
Net FC Position	11.9	-14.9	-3.0	2.4	-11.2	-11.7
Net FX Debt Position 1/	11.9	-14.9	-3.0	2.4	1.1	0.6
Gross ST FC Assets	13.4	0.1	13.5	2.0	24.4	39.9
Gross ST FC Liabilities	0.7	0.6	1.4	10.9	2.6	14.8
Net ST FC Position	12.7	-0.5	12.1	-8.9	21.8	25.1

Sources: Bank of Guatemala and Fund staff estimates.

1/ Excluding net FDI position.

## D. Dynamic Macro Financial Linkages<sup>22</sup>

*This section simulates the effect of financial shocks on the real economy using the IMF Flexible System of Global Models. Results indicate that the monetary stimulus injected in 2015 could continue working through the economy this year or even in the next two years and peak in 2018 if the pass-through proves to be slow but persistent. Enhanced competition in the banking sector resulting in lower interest rate margin, as well as lower collateral requirements could positively and significantly contribute to economic growth, while an exchange rate shock could take a toll on growth through increased NPLs and market risk premia.*

23. **We used the IMF's Flexible System of Global Models (FSGM) to simulate the effect of various financial shocks on macroeconomic variables.** The model was developed by the Economic Modeling Division of the IMF's Research department for policy analysis (Andrle and

<sup>22</sup> Prepared by Valentina Flamini, Benjamin Hunt, and Keiko Honjo.

others, 2015). It comprises a system of multi-region globally consistent general equilibrium models combining micro-founded and reduced-form relationships for various economic sectors. The FSGM has a fully articulated demand side, and the supply side features are pinned down by Cobb-Douglas production technology. International linkages are modeled in aggregate for each country/region. The level of public debt in each country and the resulting implications for national savings determine the global real interest rate in the long run. The parameters of the model, except those determining the cost of adjustment in investment, have been largely estimated from the data using a range of empirical techniques. Real GDP is determined by the sum of the components of demand in the short run and the level of potential output in the long run. The households' consumption-savings decisions are explicitly micro founded as are firms' investment decisions. The OLG formulation of the consumption block gives the model important non-Ricardian properties, whereby national savings are endogenously determined given the level of government debt. Government absorption is determined exogenously, while imports and exports are specified with reduced-form models.

**24. Transmission of financial shocks to the real economy takes place through changes in interest rates and risk premia.** All interest rates are related to the risk-free interest rate, whose closest parallel is the monetary policy rate, from which they deviate because of risk premia or different maturities. The model includes several risk premia: one for the sovereign (which applies to the entire domestic economy), one that applies to both domestic households and firms, one that applies only to firms, and one that applies to the currency (or country). The expectations theory of the term structure determines the 10-year interest rates and there is an additional term premium. Interest rates related to consumption, investment, and holding of government debt and net foreign assets are weighted averages of the 1- and 10-year nominal interest rates. The exchange rate in the short run is determined via the uncovered interest parity condition, while in the long run it adjusts to ensure external stability given households desired holdings of net foreign assets.

**25. We simulate 4 scenarios which capture the macro-economic impact of shocks to monetary policy rate, the exchange rate and market premia, lending margins, and collateral requirements.** The first scenario simulates an expansionary monetary policy shock, modeled as a 100 basis points cut in the monetary policy rate, both under full pass-through and under a slower, but more persistent transmission to lending rates (Panels 1 and 2 in figure below); the second simulation looks at currency depreciations of 5 and 20 percent that assumes a non-linear reaction in market risk premia of 25 and 300 basis points (bp) respectively (Panels 3 and 4); the third scenario considers a reduction in bank lending margins resulting in a reduction in market risk premia of 100 basis points (Panel 5); and the fourth simulates a decrease in collateral requirements, which facilitates higher credit growth that is partially financed by higher foreign borrowing (Panel 6). Aside from nonlinearities that can arise owing to the zero lower bound on nominal interest rates, the model is symmetric and roughly linear; therefore, the simulated shocks can be scaled up or down to consider scenarios of different magnitudes.

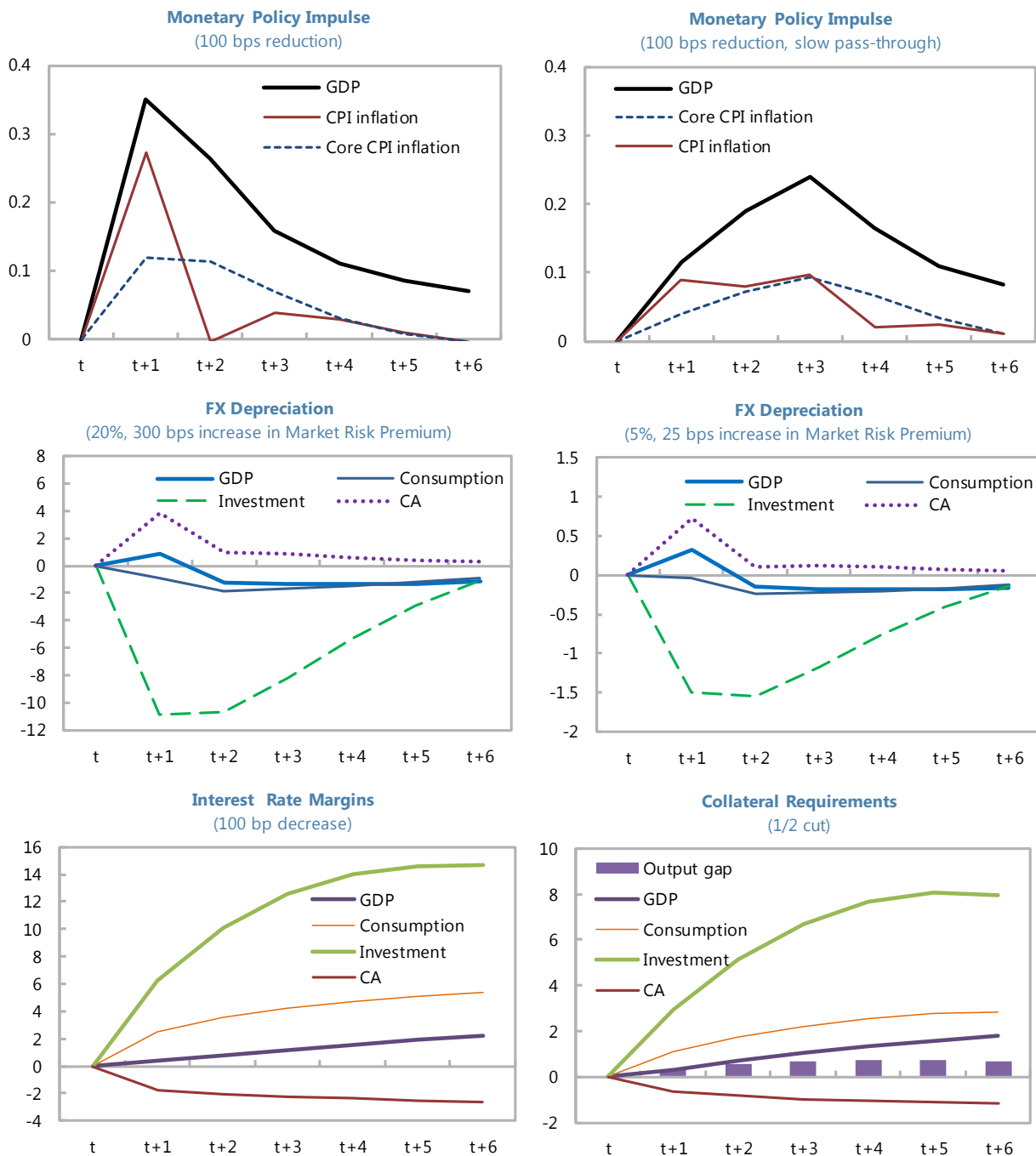
**26. Results indicate that the recent 100 basis points cut in the monetary policy rate could increase GDP substantially this year or even in the next two years.** Specifically, if fully passed

through to domestic lending rates, the monetary impulse provided during 2015 (a cumulative rate cut of 100 basis points to 3 percent amid declining inflation) could increase GDP in 2016 by almost 0.4 percentage points relative to the baseline in the absence of such stimulus due to both higher domestic absorption and export demand. The latter effect is induced by a depreciation of the quetzal following lower real interest rates compared to foreign rates. However, the policy rate signaling function in Guatemala is constrained by weaknesses in the transmission from the monetary policy rate to bank lending rates (and ultimately to prices and output). Under a slower pass-through scenario, where only 1/3 of the impulse is passed to lending rates, the resulting increase in GDP in 2016 would be only 0.1 percent, but the delayed, more persistent impulse would increase GDP by 0.2 percent in the medium term (2017–2019) with a peak impact in 2018.

27. **Conversely, a large currency depreciation could decrease output by up to 1 ½ percent in the short and medium term, through its effect on NPLs and decreased risk appetite.** In scenario 2, a depreciation of the quetzal triggers an increase in market premia due to higher NPLs in the context of the high degree of credit dollarization to un-hedged borrowers (40 percent of total credit). The risk premium reaction to the depreciation is modeled as nonlinear, since defaulting loans—and with them banks' risk aversion—are likely to increase more than proportionally with the extent of the depreciation. Hence, a 5 percent depreciation/20 bp increase in risk premia results in a real GDP contraction of about 0.2 percent in the medium term. Conversely, under a 20 percent depreciation/300 bp increase in risk premia, GDP declines by up to 1 ½ percentage points three years after the FX shock as household consumption and private investment shrink. In both scenarios, the short-term effect is a one-year boost to real GDP as following the depreciation exports increase sufficiently to offset the adverse impact on domestic demand from higher risk premia.

28. **Increasing efficiency and competition in the banking sector could raise GDP by up to 2 percent in the medium term.** At about 8 percent, banks spreads are relatively high in Guatemala, which is a constraint for widespread access to credit and financial inclusion. In scenario 3, we simulate a decrease in banks' net interest rate spreads which translates into a 100bp permanent reduction in market risk premia. Lower rates increase both private investment and household consumption expenditure, fostering domestic absorption. The resulting increase in inflation triggers a policy rate increase that produces an appreciation of the quetzal and lowers exports. The net effect on GDP is positive and persistent, with the increase ranging from less than ½ percent in the first year to more than 2 percent after six years.

**Figure 10. FSGM Model Simulations of Macro Financial Linkages**  
(Percent difference from baseline)



Source: Staff estimates based on IMF/RES FSGM.  
Note: All variables are expressed in real terms.

29. **Reducing collateral requirements would yield a medium term boost to GDP similar to improvements in bank efficiency.** Effective average collateral-to-loan ratio of 157 percent as of 2010 is moderate by regional standards.<sup>23</sup> However, reducing collateral requirements in the longer run could help stimulate growth. In scenario 4, permanently halving collateral requirements is assumed to bring about a 5 percent of GDP increase in domestic credit, slightly less than half of which would be financed by domestic excess liquidity and the remaining by an increase in foreign liabilities. Similarly to the effect of lower margins, this would increase domestic absorption while slightly depressing exports. The increase in private investment would also accumulate into a higher stock of private capital, which contributes to a persistent increase in both actual and potential output. As the latter adjusts more gradually, output rises above potential and a moderate positive output gap opens up. The overall medium term increase in GDP ranges from 0.3 percent in the first year to over 1  $\frac{3}{4}$  percent in the sixth.

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<sup>23</sup> Regulatory limits require that credits may not exceed 70% of the value of the collateral or 80% of the value of mortgage guarantees. However, the effective collateral-to-loan ratio reported by the companies in the Enterprise Survey is higher since the ratio reflects the remaining maturity of the loans (the ratio increases as the loan gets closer to maturity and a portion of the loan is repaid).

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## Annex I. Net Intersectoral Asset and Liability Positions

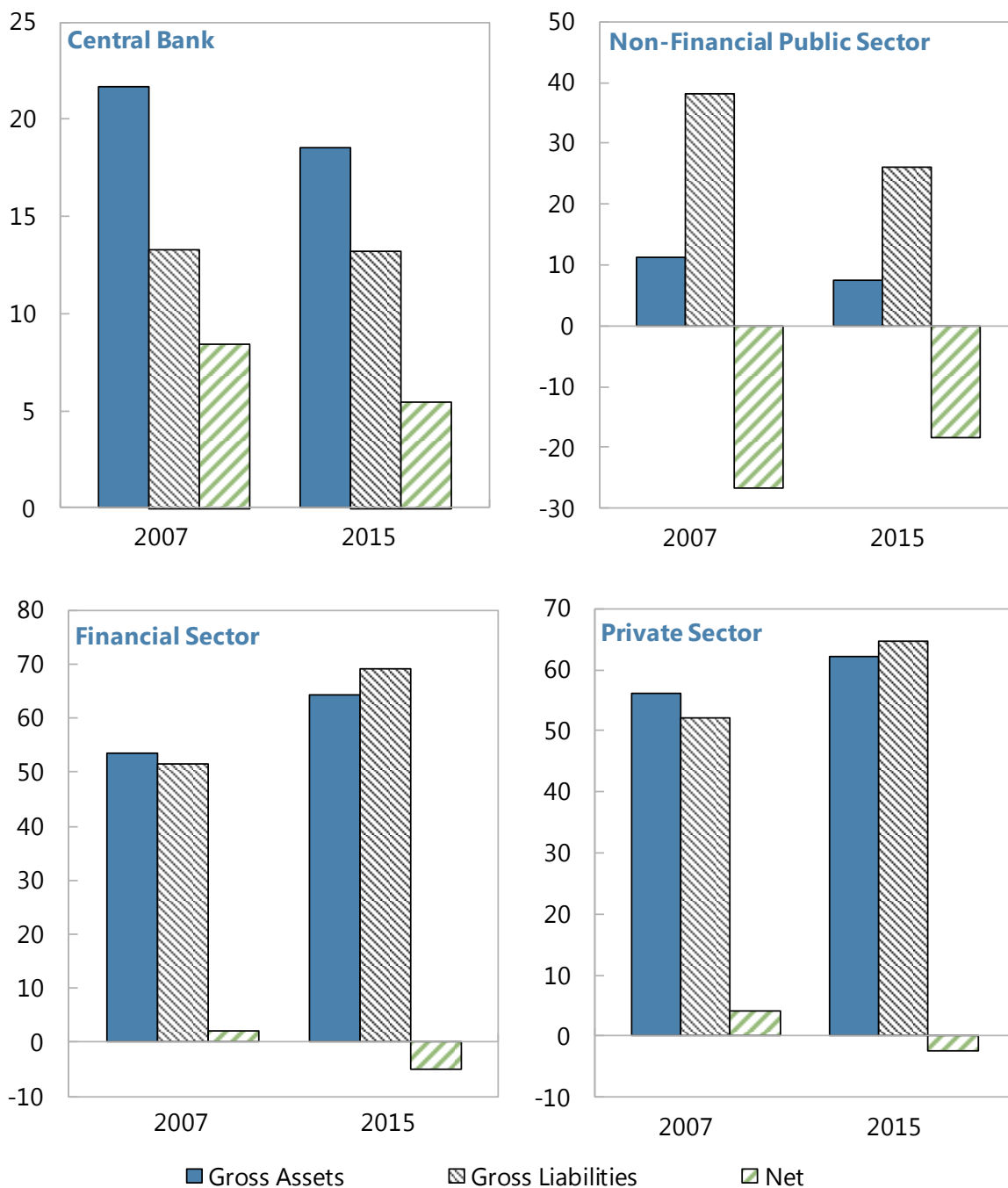
**Table A1. Guatemala. Net Intersectoral Asset and Liability Positions, September 2015**

(in percent of GDP)

Issuer of liability (debtor)  Holder of liability (creditor)	Public sector						Financial Sector						Nonfinancial Private Sector			Rest of the World		
	Non-financial Public sector			Central bank			Other depository corporations			Other financial corporations			Includes non-financial corps and households			Nonresidents		
	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.	Claims	Liabilities	Net pos.
Non-financial public sector				5.2	2.6	2.6	8.4	4.6	3.8	0.6	0.0	0.6	0.0	0.0	0.0	11.7	0.0	11.7
In domestic currency				5.2	2.6	2.6	7.0	4.5	2.4	0.6	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
In foreign currency				0.0	0.0	0.0	1.4	0.1	1.4	0.1	0.0	0.1	0.0	0.0	0.0	11.7	0.0	11.7
Central bank	2.6	5.2	-2.6				9.1	0.9	8.2	0.5	0.1	0.4	0.0	0.0	0.0	0.9	12.4	-11.5
In domestic currency	2.6	5.2	-2.6				8.1	0.9	7.2	0.5	0.1	0.4	0.0	0.0	0.0	0.5	0.1	0.3
In foreign currency	0.0	0.0	0.0				1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	12.3	-11.8
Other depository corporations	4.8	8.4	-3.6	0.9	9.1	-8.2				1.0	3.2	-2.2	50.5	35.9	14.6	8.0	5.0	3.0
In domestic currency	4.7	7.0	-2.2	0.9	8.1	-7.2				0.5	2.8	-2.3	39.3	23.0	16.2	0.0	0.1	-0.1
In foreign currency	0.1	1.4	-1.4	0.0	1.0	-1.0				0.5	0.4	0.0	11.3	12.9	-1.6	8.0	4.9	3.0
Other financial corporations	0.0	0.6	-0.6	0.1	0.5	-0.4	3.2	1.0	2.2				1.0	0.6	0.4	0.0	0.0	0.0
In domestic currency	0.0	0.6	-0.5	0.1	0.5	-0.4	2.8	0.5	2.3				0.8	0.5	0.3	0.0	0.0	0.0
In foreign currency	0.0	0.1	-0.1	0.0	0.0	0.0	0.4	0.5	0.0				0.2	0.1	0.1	0.0	0.0	0.0
Nonfinancial private sector	0.0	0.0	0.0	0.0	0.0	0.0	35.9	50.5	-14.6	0.6	1.0	-0.4				28.1	10.7	17.5
In domestic currency	0.0	0.0	0.0	0.0	0.0	0.0	23.0	39.3	-16.2	0.5	0.8	-0.3				0.0	0.0	0.0
In foreign currency	0.0	0.0	0.0	0.0	0.0	0.0	12.9	11.3	1.6	0.1	0.2	-0.1				28.1	10.7	17.5
Rest of the world	0.0	11.7	-11.7	12.4	0.9	11.5	5.0	8.0	-3.0	0.0	0.0	0.0	10.7	28.1	-17.5			
In domestic currency	0.0	0.0	0.0	0.1	0.5	-0.3	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0			
In foreign currency	0.0	11.7	-11.7	12.3	0.4	11.8	4.9	8.0	-3.0	0.0	0.0	0.0	10.7	28.1	-17.5			
<b>Total</b>	<b>7.4</b>	<b>25.9</b>	<b>-18.5</b>	<b>18.6</b>	<b>13.2</b>	<b>5.4</b>	<b>61.6</b>	<b>65.0</b>	<b>-3.4</b>	<b>2.6</b>	<b>4.3</b>	<b>-1.7</b>	<b>62.2</b>	<b>64.6</b>	<b>-2.4</b>	<b>48.8</b>	<b>28.1</b>	<b>20.6</b>
in domestic currency	7.4	12.7	-5.4	6.3	11.7	-5.4	41.0	45.2	-4.2	2.0	3.7	-1.7	40.1	23.5	16.6	0.5	0.2	0.3
in foreign currency	0.1	13.2	-13.1	12.3	1.5	10.8	20.6	19.8	0.8	0.6	0.6	0.0	22.1	41.1	-18.9	48.3	27.9	20.4

Sources: Standardized Report Forms for Monetary and Financial Data, International Investment Position, and IMF staff estimates.

**Table A2. Guatemala: Gross Financial Assets and Liabilities of Economic Sectors**  
(Percent of GDP)



Sources: National authorities; and Fund staff estimates.

# MACRO FINANCIAL LINKAGES: FINANCIAL DEVELOPMENT AND INCLUSION

## A. Financial Development in Guatemala<sup>1</sup>

*This section examines the current state of financial development in Guatemala, as well as the implications for potential growth and stability from further financial deepening. Guatemala lags its regional peers on financial development, in particular, on markets. However, it overperforms the level of development consistent with its macroeconomic fundamentals. Hence, while at the moment there are no indications of a significant risk build up, further financial development should proceed with caution. In the longer term, as fundamentals continue to evolve, Guatemala could reap further benefits from financial development in terms of growth and stability, provided there is adequate regulatory oversight to prevent excesses. However, care should be taken in not promoting excessive market development when financial institutions are underdeveloped. Laying out strong legal and institutional foundations will be important for supporting healthy financial deepening.*

### Financial Development: Where Does Guatemala Stand?

#### 1. **Guatemala's financial development was assessed using a comprehensive index.**

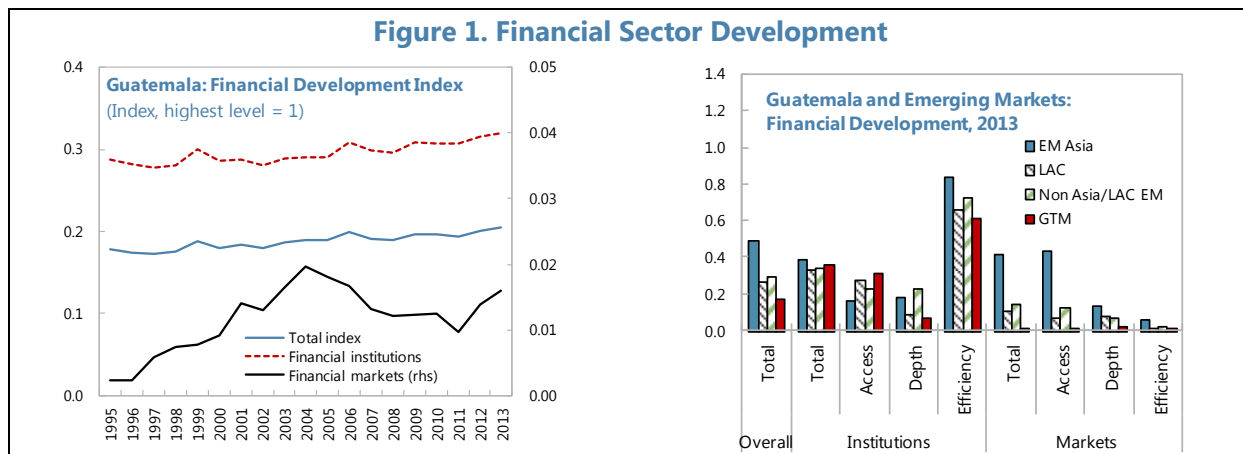
Financial development has proven difficult to measure. Typical proxies in the literature such as the ratio of private credit to GDP and, to a lesser extent, stock market capitalization are too narrow to capture the broad spectrum of financial sector activities. To better capture different facets of financial development, we employ a comprehensive and broad-based index covering 123 countries for the period 1995–2013 (see Appendix 1 and Heng et al (2015) for details). The index contains two major components: financial institutions and financial markets. Each component is broken down into access, depth, and efficiency sub-components. These sub-components, in turn, are constructed based on a number of underlying variables that track development in each area.

#### 2. **Guatemala's financial development has improved only marginally over the past decade, and remains low, compared to the regional peers.**

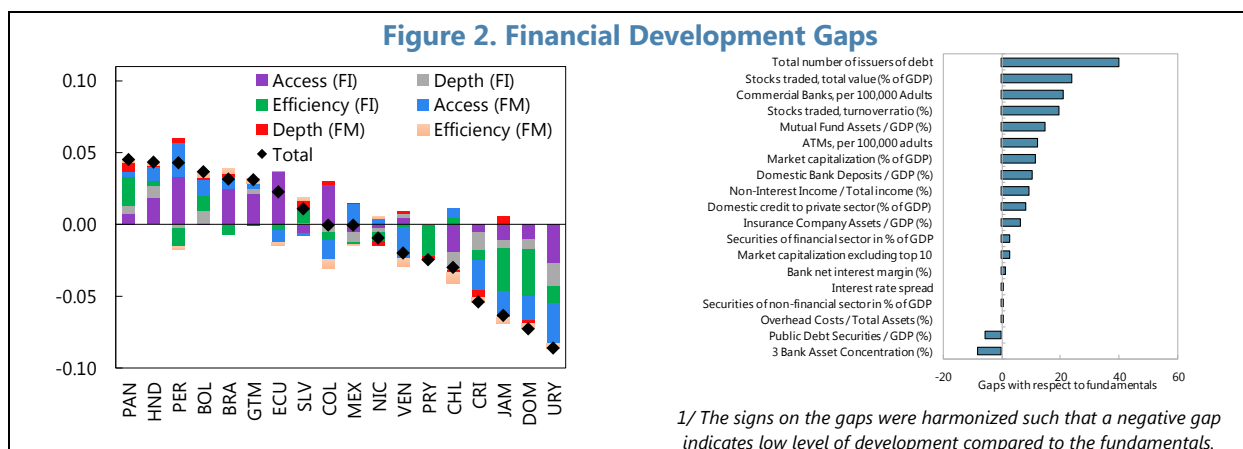
The small improvements came from growth in financial institutions, in particular, better institutional access and improved efficiency. In contrast, improvements in market development during the 90s were reversed in the 2000s. Overall, Guatemala continues to lag behind its regional and emerging market peers on many dimensions. In particular, it lags other EM groups on all of the subcomponents of financial market development. It is also behind other EMs on some aspects of institutional development, though performance varies by component. In fact, Guatemala compares favorably on institutional access, outperforming all other EM country groupings. Good access reflects a wide network of ATMs and bank branches per 100,000 adults. However, the distribution of access points is not uniform (see Section B below). On the other hand, the country lags behind other EMs on institutional efficiency, reflecting moderately

<sup>1</sup> Prepared by Anna Ivanova and Victoria Valente

high interest rate spreads, high overhead costs, and high net interest margins. Finally, Guatemala is behind all other country groupings on institutional depth due to the low level of private sector credit to GDP as well as small mutual fund and insurance industries.



3. **Nevertheless, Guatemala’s financial development is above the level predicted by country’s fundamentals (Figure 2).** A simple cross-country comparison above does not account for differences in the underlying macroeconomic conditions. Financial development gaps—the deviation of the financial development index from a prediction based on economic fundamentals, such as income per capita, government size, and macroeconomic stability—can help identify potential under or overdevelopment of Guatemala, compared to countries with similar fundamentals. These gaps suggest that Guatemala’s financial development is above the level predicted by its macroeconomic fundamentals on all but two subcomponents. The exceptions are one narrow measure of institutional efficiency, namely, 3-bank asset concentration and public debt securities to GDP. While positive gaps could be an indication of inefficiencies and financial stability risks, this analysis is not normative and other measures of financial stability have to be employed to thoroughly analyze the situation. In fact, the analysis of financial stability risks suggests that there are no indications of a significant risk build up at this point (see AN on Macro Financial Linkages: Assessing Financial Risks, Section A) but the supervisor should remain vigilant.



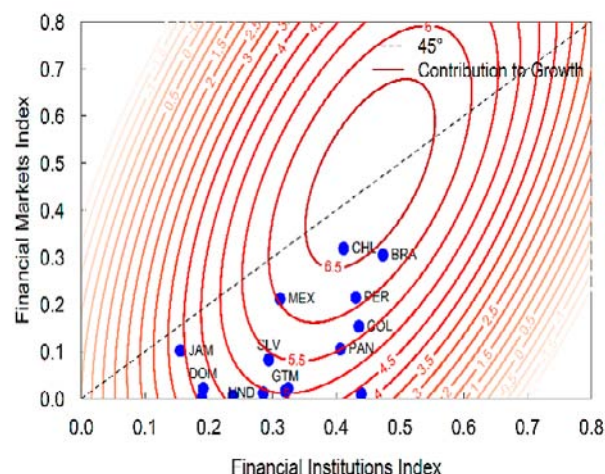
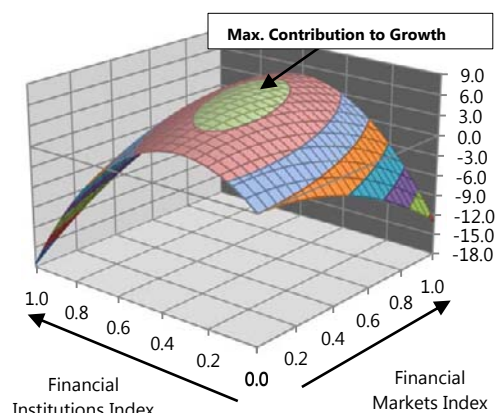
## The Potential for Raising Growth and Stability through Further Financial Deepening in Guatemala

4. **There is a non-linear relationship between growth and stability on the one hand and financial development on the other hand.** Financial development gaps do not address the question of the optimal level of financial development in terms of growth and stability. To explore this question, we examine the relationships between financial development and growth as well as financial development and stability (see Heng et al., 2015). We find that these relationships are nonlinear. In other words, the benefits from financial development are rising at the early stages of development as resources are increasingly channeled into productive uses. However, there is a turning point beyond which the positive growth benefits diminish. Similarly, at the early stages, financial development can help reduce instability, for example, by providing insurance services, but these benefits also start to diminish after a certain point. The turning points likely reflect the fact that large financial systems can eventually divert resources from more productive activities, while excessive borrowing and risk-taking by financial institutions can lead to increased instability and lower long-term growth. Indeed, the inverted U-shaped relationship with growth is driven by the depth of financial institutions, or a measure of size. Access and efficiency, on the other hand, yield unambiguously increasing benefits to growth, although with potential stability costs as reduced bank profitability may encourage risk-taking. Lastly, too much market development at the early stages of institutional development may have negative implications for stability. One reason for this could be increased market volatility, which may more easily set in when financial institutions are not strong enough to help guard against shocks. For similar levels of development, however, institutions and markets are complementary for growth and stability.

5. **Guatemala has not yet reached the levels of institutional and market development that yield maximum benefits to growth and stability.** In Latin America and the Caribbean, Brazil and Chile are closest to reaping the maximum benefits (Figure 3). Guatemala, in contrast, is still far away from reaping the maximum benefits to growth and stability, in particular, in terms of financial market development. Note that these estimates stem from a partial analysis that assumes that all other growth determinants (such as income level, inflation, government size etc.) are held constant while financial development is consistent with the level of macroeconomic fundamentals. Thus, in the longer term, reaping maximum benefits from financial development for growth and stability would also require adjusting Guatemala's macroeconomic fundamentals, which in turn would support further development of the financial systems. This is an interactive process whereby financial systems are shaped by fundamentals, and fundamentals evolve partly as a function of more developed financial systems. Estimates should, however, be interpreted with caution since it is difficult to disentangle causality in econometric terms, even though instrumental variables were used to address potential endogeneity issues.<sup>2</sup>

<sup>2</sup> We use *system GMM* estimation (Arellano and Bover, 1995; Blundell and Bond, 1998) to address the dynamic dependence of our variables of interest and potential endogeneity of control variables. We also employ additional instrumental variables used in the literature, namely, rule of law (Kaufmann, Kraay and Mastruzzi 2010) and a set of dummies for the country's legal origin (La Porta, Lopez-de-Silanes and Shleifer 2008).

**Figure 3. Financial Institutions and Market Development, and Economic Growth**



Source: IMF staff calculations.

Note: surface shows the predicted effect in growth for each level of the indices, holding fixed other sets of controls.

## Policy Recommendations

### Short-Term:

- Remain vigilant about financial excesses since the level of development is above that predicted by the macroeconomic fundamentals though there are no indications of a significant risk buildup at the moment
- To stimulate the development of the secondary bonds market it will be important to dematerialize government securities market and standardize government securities. Adopting Securities Market Law and Public Debt Law are also key priorities.

### Long-Term:

- Continue developing regulation and supervision that are consistent with the existing level of financial development and embed enough flexibility to address future challenges of financial deepening.
- Given that sequencing of reforms could be important, care should be taken in not promoting excessive market development when financial institutions are underdeveloped, since this could jeopardize macroeconomic and financial stability.
- More generally, preparing adequate legal and institutional ground for a well-functioning financial system will be key. This includes developing strong property and ownership rights, including strengthening protection of minority shareholders, improving efficiency of the legal system, reducing corruption and improving corporate governance, as well as continuing to develop provision of adequate financial information.

## B. Financial Inclusion in Guatemala<sup>3</sup>

*This section examines the current status of financial inclusion in Guatemala, identifies the remaining gaps, and analyzes the impact of removing impediments to financial inclusion on growth and inequality. Guatemala has excelled in providing physical access to financial infrastructure but lags behind peers on creating an enabling regulatory environment for financial inclusion and on the use of financial services by households and firms. While low use to a large extent reflects Guatemala's current state of economic development, strengthening regulatory environment and reducing entry costs—with the latter helping stimulate growth and reduce inequality—are matters of high priority. In the longer run, creating better conditions for income growth, improving education, particularly, of women, reducing the size of the informal economy and strengthening the rule of law will help raise financial inclusion further.*

### Introduction

6. **Guatemala can benefit from further financial inclusion.** Financial inclusion can help boost economic growth and reduce poverty and inequality by mobilizing savings and providing households and firms with greater access to resources needed to finance consumption and investment and to insure against shocks. Financial inclusion can also foster formalization of the economy, helping, in turn, to boost government revenues and strengthen social safety nets. Given a relatively low level of income per capita, high inequality, low savings and investment as well as high labor informality, the benefits from further financial inclusion can be pronounced in Guatemala.

7. **The note takes three separate approaches for examining different faucets of financial inclusion and its impediments in Guatemala.**<sup>4</sup> First, an empirical approach focuses on measuring financial inclusion, identifying financial inclusion gaps, and their underlying drivers. It is based on composite measures of household and firm financial inclusion as well as a measure physical access to financial infrastructure using recently updated FINDEX dataset (World Bank), Enterprise Survey (World Bank), and Financial Access Survey (IMF). These measures help place Guatemala in a temporal and cross-country perspective. Second, a regression analysis is employed to identify characteristics of the individuals who use financial services (i.e. those financially-included). Third, a novel theoretical framework is employed to identify the most binding financial sector frictions that impede financial inclusion in Guatemala. This framework allows examining the implications of alleviating financial frictions on inequality and growth.

<sup>3</sup> Prepared by Noelia Camara (BBVA), Yixi Deng, Anna Ivanova, and Joyce Wong (all IMF).

<sup>4</sup> The first and the third approaches follow closely those proposed in the IMF working paper "Financial Inclusion: Zooming in on Latin America" by Era Dabla-Norris, Yixi Deng, Anna Ivanova, Izabela Karpowicz, Filiz Unsal, Eva VanLeemput, and Joyce Wong.

## Empirical Approach I: Cross-Country Data

### A. Where Does Guatemala Stand on Financial Inclusion Compared to Peers?

8. **Guatemala has excelled on physical access to financial infrastructure though access points are concentrated around Guatemala City (Figure 4).** We measure physical access by the number of commercial bank branches and ATMs per 100,000 adults and per 1,000 square kilometers (see the Figure 4 and Appendix 2 for details). Guatemala has made substantial progress on improving physical access to financial infrastructure in the past decade with the number of commercial bank branches per 100,000 adults rising from 18.8 in 2004 to 37 in 2014. In fact, Guatemala now stands as one of the champions on physical access to financial infrastructure in Latin America and the Caribbean (LAC) with 37 branches and 36 ATMs per 100,000 adults, outpacing LAC averages of 24 for branches and 25 for ATMs. In addition, Guatemala has a network of bank correspondents, which are used more widely than elsewhere in LAC.<sup>5</sup> The distribution of access points, however, is not uniform. Commercial bank branches are concentrated in the area surrounding Guatemala City while banking correspondents are located in remote areas.

9. **Guatemala, however, lags behind peers on creating an enabling regulatory environment for financial inclusion.** It scores below average of other emerging markets on the Global Microscope index, which assesses the regulatory environment for financial inclusion across 12 indicators and 55 countries. This is in contrast to many LAC countries, which score well on this index with Peru being the world champion. In 2015 Guatemala ranked relatively well on two Microscope indicators: (i) regulation and supervision of branches and agents and (ii) requirements for non-regulated lenders. It was on par with other LAC countries on average (though generally below emerging Asia) on (i) regulation and supervision of deposit-taking activities, (ii) regulation and supervision of credit portfolios, (ii) regulatory and supervisory capacity for financial inclusion, and (iii) regulation of insurance for low income population. However, Guatemala underperformed on other sub-components of the Global Microscope Index, including, (i) government support for financial inclusion, largely due to the absence of a formal comprehensive financial inclusion strategy, (ii) regulation of electronic payments, (iii) market conduct rules, (iv) grievance redress and operation of dispute resolution, (v) credit reporting systems, and (vi) prudential regulation. The authorities, however, are already working on addressing some of the weaknesses, including the recent adoption of the regulation of mobile financial services and the microfinance law as well as the preparation of the national financial inclusion strategy.

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<sup>5</sup> Banking correspondents are non-financial commercial establishments that offer basic financial services under the name of a financial services provider, facilitating access points to the formal financial system, in particular, for low-income customers. The establishments are spread across diverse sectors (grocery shops, gas stations, postal services, pharmacies, etc.) as long as they are brick-and-mortar stores whose core business involves managing cash. In its basic form, banking correspondents carry out only transactional operations (cash in, cash out) and payments but, in some cases, they have evolved as a distribution channel for the banks' credit, saving and insurance products. See Camara, Tuesta, and Urbiola (2015) for details.

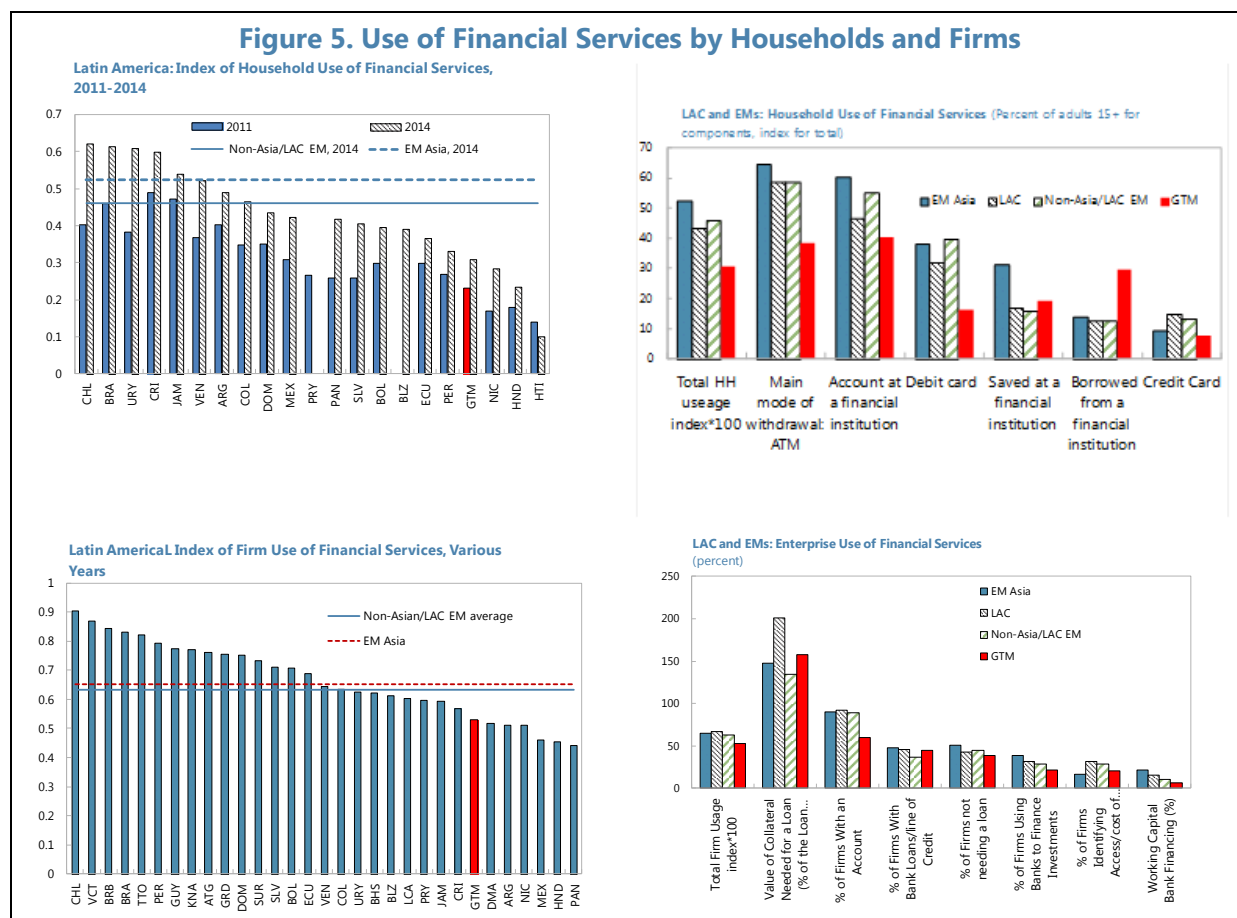




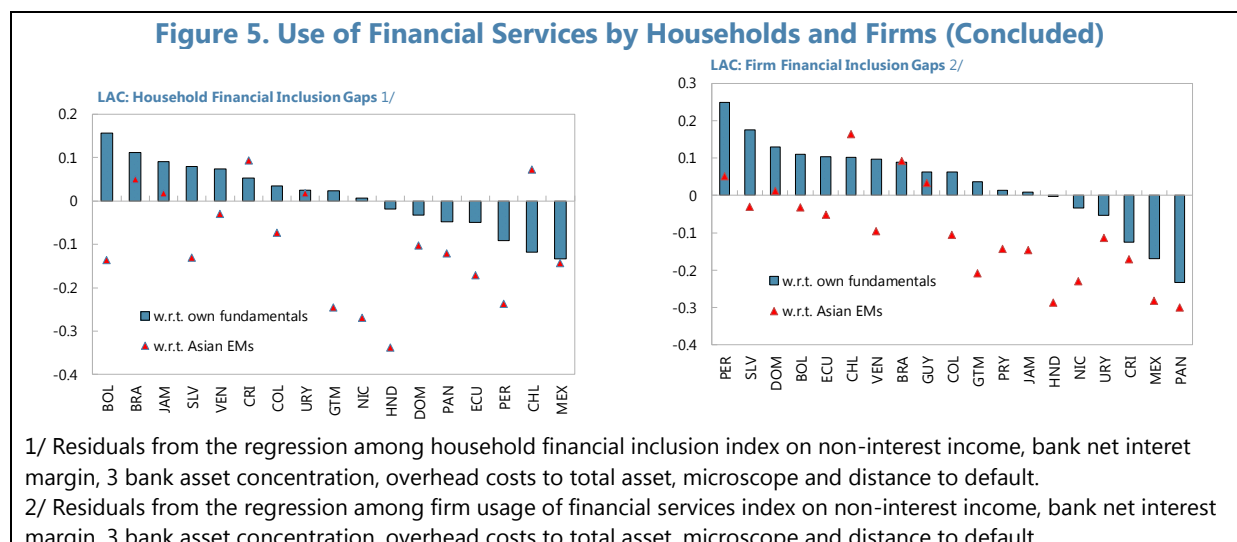
10. **The use of financial services by households and firms is low, compared to other emerging markets.** We employ multi-dimensional indices to capture different facets of the use of financial services by households and SMEs. The diagram in Appendix II illustrates indicators included in each of the indices. While the use of financial services by households has improved in the past 4 years (Figure 5), Guatemala lags behind other emerging and LAC countries on this dimension.<sup>6</sup> The low score reflects low share of the population having an account at a formal financial institution, and

<sup>6</sup> Alternative multidimensional indices of financial inclusion developed in Camara and Tuesta (2014) suggest similar results.

using ATMs, debit and credit cards. Indeed, while the share of adult population having an account at a formal financial institution increased dramatically over the past few years – from 22 percent in 2011 to 41 percent in 2014 – it remains below that of other LAC countries on average (46.5 percent) and even more so of emerging Asia (60.35 percent). Guatemala, however, is at par with the regional peers on savings and borrowing from a formal financial institution. Nonetheless, informal finance remains important with the share of population using savings clubs in 2014 as large as that saving at a formal financial institution (12 percent versus 8 percent in LAC on average) and 20 percent of the population reporting borrowing from family and friends, compared to only 14 percent in LAC. Guatemala also does not compare favorably to its regional and emerging market peers on the use of financial services by firms. This reflects low account ownership by SMEs with only 60 percent of firms reporting having a checking or savings account, compared to a LAC average of 92 percent. Low share of firms using banks to finance investments and working capital and somewhat high collateral value, compared to emerging markets outside of LAC, also contribute to a lower firm score.



**Figure 5. Use of Financial Services by Households and Firms (Concluded)**



**B. Where Does Guatemala Stand on Financial Inclusion Compared to Macroeconomic Fundamentals?**

11. **Financial inclusion gaps help account for the differences in the underlying macroeconomic conditions.** We compute financial inclusion gaps with respect to own fundamentals as deviations of financial inclusion indices from the values predicted by the exogenous domestic factors such as income per capita, education, size of the shadow economy, the rule of law, the share of foreign-owned firms, and the importance of fuel exports. The calculated negative gaps could capture possible distortions or market frictions while positive gaps may reflect financial excesses or inefficiencies.<sup>7</sup> We find that financial inclusion is higher in countries with the following characteristics (Table 1 and Dabla –Norris et al, 2015): higher income per capita (for households and firms), higher education (for households), stronger rule of law (for households), lower degree of informality (for households), lower prevalence of foreign-owned firms (for firms and access to financial institutions), lower fuel exports (for firms and access to financial institutions). In the longer run, as domestic fundamentals continue to evolve, there may be scope for further gains in financial inclusion. To identify such possibilities, we have constructed gaps with respect to an Asian benchmark—a recognized success story on financial inclusion in countries with relatively strong fundamentals.

12. **Guatemala is broadly in line with its own fundamentals on financial inclusion of households and firms though it falls behind the world “frontier” Asian economies.** Financial inclusion gaps in relation to domestic fundamentals are virtually zero for both households and firms though there are large negative gaps, compared to Asian emerging markets. This suggests that Guatemala’s relatively low level of financial inclusion, compared to peers can be explained by the

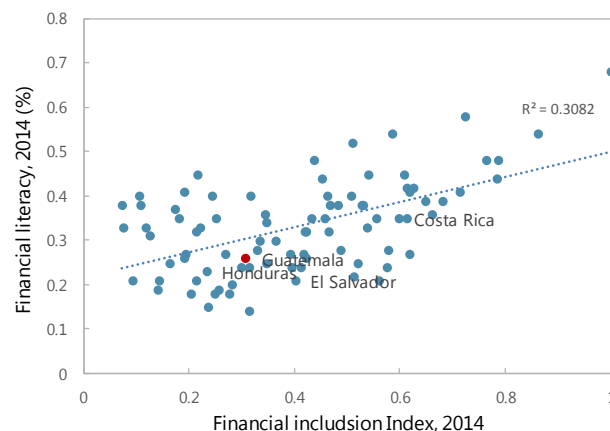
<sup>7</sup> The regressions explain a large portion of the variation in financial inclusion, with R-squares close to 0.7 in the regressions for households and firms. Nonetheless, the lack of a solid theory on the factors driving financial inclusion implies that the correct model specification is subject to uncertainty. Hence, the gaps should be interpreted with due caution, in particular, with respect to causality. Nevertheless, they could be useful in indicating a possible area where financial inclusion is lacking. The explanatory power for access to financial institutions regression is low and we omit the discussion of the results of this regression for Guatemala.

constraints imposed by the current level of development, including its current relatively low income level, low education level, including financial education, the large size of the shadow economy, and the relatively weak rule of law. Looking at the gaps on the individual subcomponents, most of the household inclusion gaps are small positive with the exception of the gap on ATM use—an area where some improvement is possible even in the short run. On the firm side, the negative gaps on account holdings and the usage of banks to finance investment and working capital suggest additional areas for improvement. The large negative gaps with respect to Asian benchmarks indicate that in the longer run, as domestic fundamentals continue evolving, there will be scope for further financial inclusion gains.

13. **An econometric examination of the factors behind financial inclusion gaps reveals the importance of strengthening regulatory environment in Guatemala.** The results of a simple regression analysis (Table 2 and Dabla-Norris et al) suggest that higher (more positive/less negative) financial inclusion gaps with respect to domestic fundamentals are associated with lower non-interest income (for household and firms), lower bank safety buffers (for households), lower bank efficiency, as measured by the overhead costs (for firms) and stronger regulatory environment, as measured by the Global Microscope score (for firms). However, the direction of causality is not clear, in particular, in the case of bank safety buffers and efficiency, which could reflect consequences of inclusion instead of the underlying drivers. In the case of Guatemala, however, one unambiguous conclusion that can be drawn from this analysis is that strengthening regulatory environment for financial inclusion could help improve the inclusion of firms.

## Empirical Approach II: Microdata

14. **Econometric investigation using micro data confirms the importance of income and education levels, in particular, for women, for being financially included.** We estimate a set of probit models that link various measures of financial inclusion with individual characteristics such as education, income level, age, and gender. The dependent variables are dummy variables that are equal to one if (1) an individual has an account in a financial institution; (2) an individual has a debit card; (3) an individual has a savings account; and (4) an individual has a credit card. We find that education and income level have strong positive relationship with all the dependent variables, meaning that more educated and higher income individuals are more likely to have a bank account, a debit or a credit card, or savings holding other variables constant. We also find that all the dependent variables except savings are positively associated with age suggesting that older people are more likely to have a bank account, debit or credit card but are less likely to save. Finally, the results indicate that women are generally less likely to use financial services though there is a



mitigating impact of better education—the coefficient on an interaction term between a dummy variable equal to one for women and that equal to one for those with secondary education. Hence, while women generally are less financially included those who have better education have better access to finance.

## Theoretical Approach

15. **We apply a micro-founded structural model to shed light on the implications of relaxation of various constraints to financial inclusion for fostering growth and reducing inequality.** Appendix 2 and Dabla-Norris et al. (2015) provide details of the model description. We group financial constraints into three broad categories:

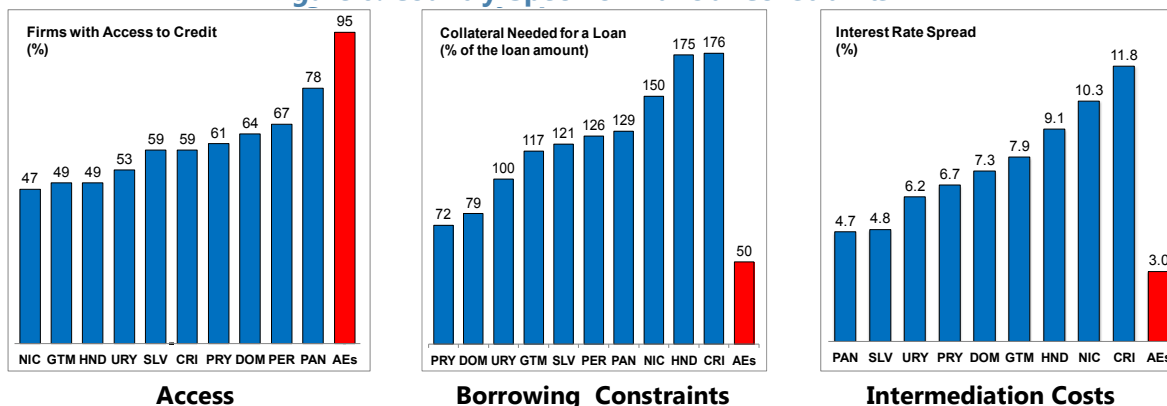
- *Participation (entry) costs.* These typically reflect high documentation requirements by banks for opening, maintaining, and closing accounts, and for loan applications that impede access to finance. These can also reflect various forms of barriers, including red tape and the need for informal guarantors as connections to access finance.
- *Borrowing constraints.* The amount firms can borrow (the depth of credit) once they have access to banking systems is generally determined by collateral requirements, which depend on the state of creditors' rights, information disclosure requirements, and contract enforcement procedures, among others.
- *Intermediation costs.* High intermediation costs resulting from information asymmetries between banks and borrowers and limited competition in the banking system can lead to smaller and less capitalized borrowers being charged higher interest rates and fees.

The model's key parameters are calibrated to match the moments of firm distribution from the Enterprise Survey Data, such as the percent of firms with credit and the firm employment distribution, as well as the economy-wide nonperforming loan ratio, and interest rate spread (Figure 6). We conduct policy experiments to identify the most binding constraints to financial inclusion and examine the macroeconomic effects of removing these constraints. Three illustrative simulation scenarios includes: (i) reducing the financial participation cost to 0, (ii) relaxing borrowing constraints in the form of collateral requirements to the world minimum (iii) increasing intermediation efficiency (i.e., reducing monitoring costs to 0 by equalizing spreads to the proportion of non-performing loans).<sup>8</sup>

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<sup>8</sup> Specifically, we focus on changes in the steady state of the economy when these constraints changes. These examples are illustrative, however, as the targets for the illustrative scenarios are chosen arbitrarily (i.e. there is no reason why participation costs could or should be zero in Guatemala, for example). Moreover, in practice, as many reforms are implemented on various fronts contemporaneously they are likely to affect the frictions in unison with additive effects.

Figure 6. Country-Specific Financial Constraints<sup>1</sup>

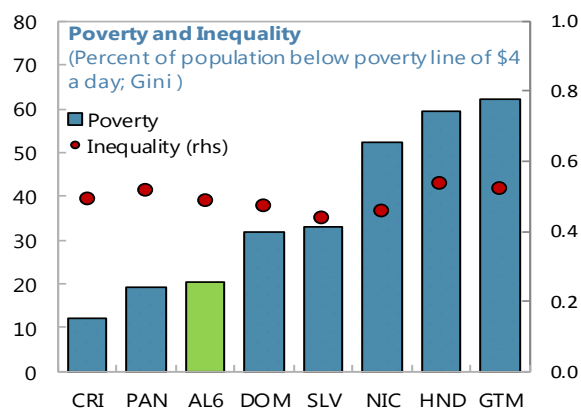


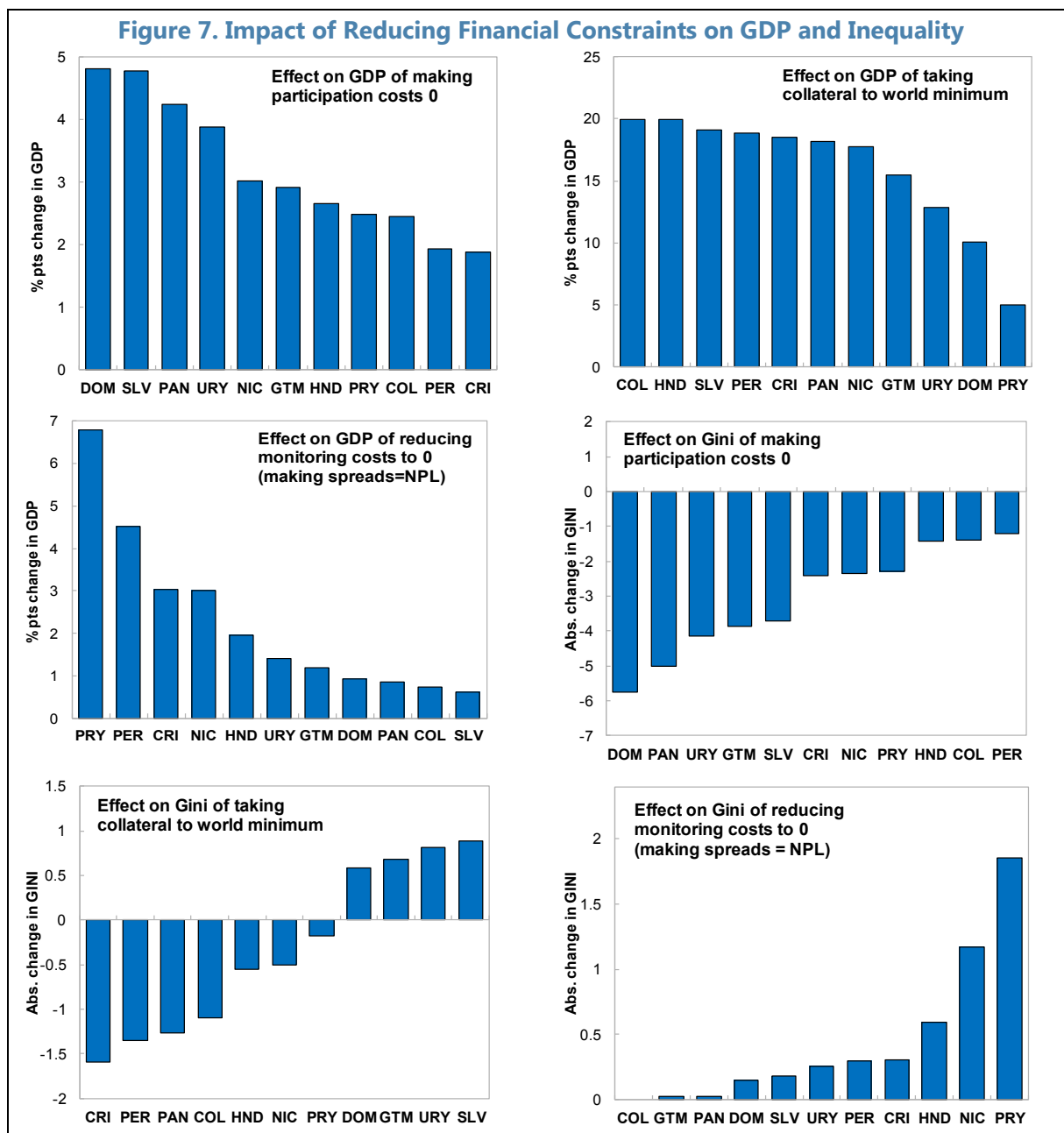
Source: World Bank Enterprise Surveys.

1/ Firms with access to credit represents the percent of firms with a bank loan/line of credit

16. **In Guatemala high entry costs appear to be the most binding constraint.** Compared to other LAC countries, Guatemala has moderate collateral levels and intermediation costs. Median collateral is 117 percent of the loan value versus 125 percent in LAC while lending-deposit spread of about 8 percentage points is close to the LAC average of 7 percentage points. Moderate levels of collateral and spreads reflect high concentration of credit among a small number of large clients who are well-known to the bank. However, Guatemala’s firms have low level of access to credit, which offsets the positive effects created by moderate borrowing and intermediation costs. Among firms, 49 percent have lines of credit with the bank compared to the LAC average of 55 percent while among the SMEs only 60 percent of firms have a bank account, compared to a LAC average of 92 percent.

17. **Given the high level of inequality in Guatemala, reducing entry costs should be a matter of first priority.** According to the model results (Figure 7), the loosening of any of the three constraints to financial inclusion will generate an improvement in growth but lowering the spreads and the collateral level would also worsen inequality. Intuitively, this is because, due to their already moderate levels, the loosening of these two constraints generates much larger marginal benefits for those at the top of the talent and wealth distribution. In this situation, very talented or very wealthy entrepreneurs can significantly increase their leverage and their production. In contrast, the loosening of the participation constraint (reduction in entry costs) will both raise growth and reduce inequality. Given the high level of income inequality in Guatemala (Gini coefficient of 52), policies should focus on loosening participation constraints in the first instance.





## Policy Recommendations

### Short-term

- Improve regulatory environment for financial inclusion, in particular, finalize and adopt the national financial inclusion strategy, improve regulation of electronic payments, market conduct rules, and credit reporting systems. The recently adopted mobile money regulation was an important step and continuing developing e-money will facilitate access in remote areas.

- Reduce entry/participation costs such as documentation requirements/guarantees while safeguarding for financial stability. The introduction of the simplified accounts currently under consideration would be an important milestone in this regard.

### Long-term

- Create better conditions for income growth, improve education, particularly for women, and pay special attention to financial education, reduce the size of the informal economy. This will likely require raising fiscal spending, in particular, on education.
- As demand-side barriers are addressed, regulators should examine financial institutions' lending practices and credit concentration limits.
- As entry/participation barriers are relaxed and previously unbanked businesses enter the financial system, credit bureau implementation should be improved in order to lower information costs and collateral requirements, especially for new clients. At the same time, increased competition in the banking sector should be promoted to improve efficiency and maintain low spreads.

**Table 1. Financial Inclusion and Fundamentals**

VARIABLES	(1)	(2)	(3)	(4)	(5)
	HH 2011	HH 2011 & 2014	HH 2014	Firm	Access to Financial Institutions (Physical Infrastructure)
log_GDP_pcap	0.0918*** (0.0295)	0.104*** (0.0190)	0.111*** (0.0255)	0.142*** (0.0461)	0.131*** (0.0467)
Mean years of schooling (of adults) (years)	0.0173** (0.00815)	0.0160*** (0.00543)	0.0162** (0.00738)	0.00927 (0.0120)	-0.0189 (0.0157)
Shadow Economies Index	-0.00118 (0.00143)	-0.00188* (0.00108)	-0.00268* (0.00146)	-0.000872 (0.00228)	0.00149 (0.00216)
Fuel exports (% of merchandise exports)	-0.000506 (0.000628)	-0.000389 (0.000506)	-0.000285 (0.000726)	-0.00235** (0.00110)	-0.00200* (0.00110)
Prevalence of foreign ownership, 1-7 (best)	-0.0281 (0.0241)	-0.0159 (0.0155)	0.00585 (0.0223)	-0.107*** (0.0284)	-0.0634** (0.0267)
Rule of Law (-2.5(weak) to 2.5(strong) )	0.0733*** (0.0266)	0.0657*** (0.0193)	0.0502** (0.0242)	0.0670 (0.0412)	0.0330 (0.0405)
Constant	-0.414** (0.205)	-0.509*** (0.153)	-0.614*** (0.221)	-0.122 (0.366)	-0.487 (0.352)
Observations	78	158	80	45	111
R-squared	0.732	0.708	0.738	0.658	0.215

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



**Table 2. Determinants of the Financial Inclusion Gaps**

VARIABLES	HH FI Gap 2014	Firm FI Gap 2011	Access Gap 2011
Non-Interest Income / Total income (%)	-0.00428** (0.00171)	-0.00515* (0.00289)	0.00272 (0.00381)
Bank net interest margin (%)	-0.0144 (0.0137)	-0.0202 (0.0159)	0.0399 (0.0248)
3 Bank Asset Concentration (%)	0.000987 (0.00133)	0.000895 (0.00127)	0.000984 (0.00174)
Overhead Costs / Total Assets (%)	0.0183 (0.0167)	0.0320* (0.0157)	-0.0216 (0.0272)
Microscope-Overall Score (0-100, 100 best)	0.000430 (0.000967)	0.00314* (0.00178)	0.000585 (0.00256)
Distance to default	-0.00261** (0.00123)	-0.00243 (0.00236)	-0.000316 (0.00265)
Constant	0.115 (0.0971)	0.00381 (0.127)	-0.303 (0.189)
Observations	43	30	46
R-squared	0.200	0.268	0.154

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 3. Characteristics of Financially-Included Population**

VARIABLES	(1) Account Fin. Institution	(2) Debit Card	(3) Savings	(4) Credit Card
Coefficients and standard errors				
Woman	-0.647*** (0.152)	-0.679*** (0.224)	-0.487*** (0.137)	-0.72* (0.375)
Education	0.442*** (0.121)	0.6*** (0.137)	0.358*** (0.114)	0.836*** (0.166)
Woman*secondaryeducation	0.357* (0.194)	0.182 (0.267)	0.118 (0.18)	0.221 (0.4)
Woman*tertiaryeducation	0.13 (0.376)	0.23 (0.422)	-0.076 (0.37)	0.329 (0.54)
Income_quintile	0.192*** (0.040)	0.308*** (0.0534)	0.177*** (0.037)	0.11* (0.057)
Age	0.01*** (0.003)	0.007*** (0.003)	-0.007*** (0.003)	0.011*** (0.004)
_cons	-2.32*** (0.263)	-3.167*** (0.311)	-1.317*** (0.247)	-3.5*** (0.379)
Marginal effects				
Woman	-0.156	-0.1	-0.145	-0.056
Education	0.105	0.084	0.106	0.06
Woman*secondaryeducation	0.094	0.028	0.036	0.018
Woman*tertiaryeducation	0.033	0.037	-0.022	0.031
Income_quintile	0.046	0.043	0.052	0.008
Age	0.002	0.001	-0.002	0.001
Observations	987	1000	1000	999
Pseudo R2	0.142	0.233	0.114	0.227

Standard errors in parentheses

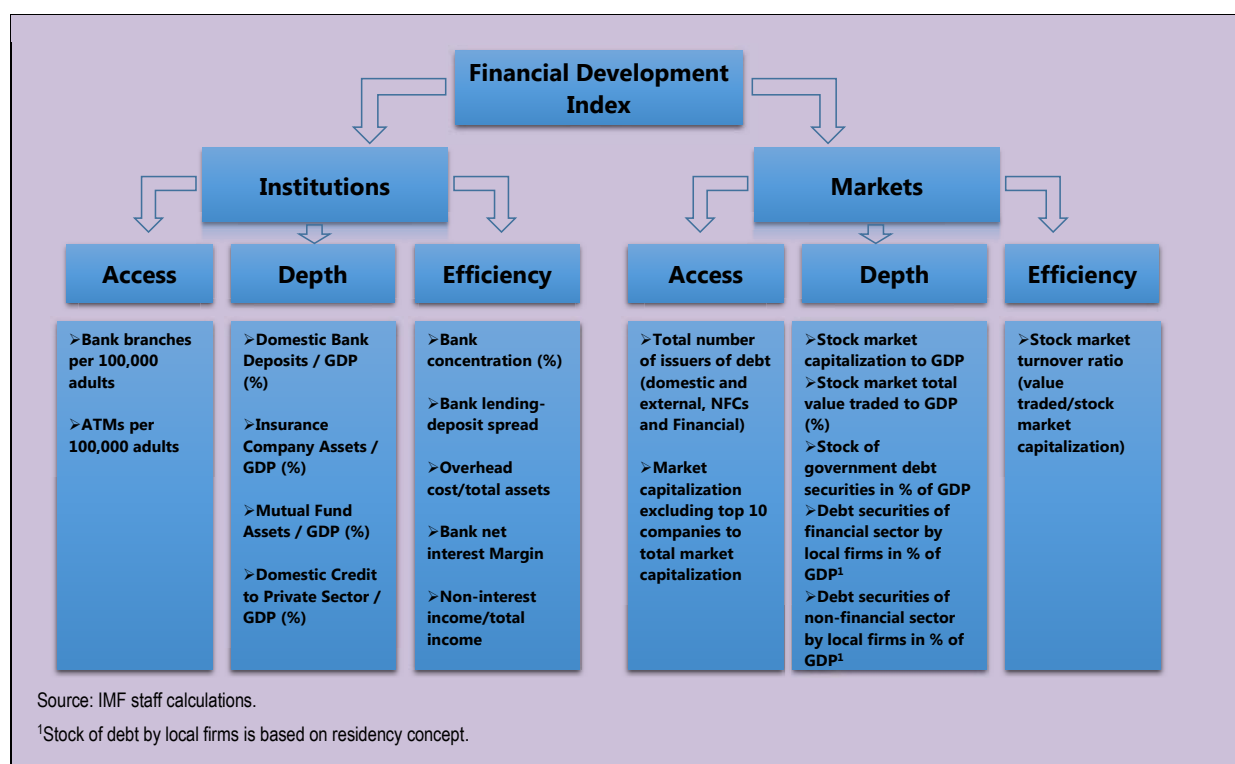
\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

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## Appendix 1. Measuring Financial Development

To measure financial development we employ the same framework as in Heng et al., 2015.<sup>1</sup>



### Sources and Data Processing

- The data generally cover the period 1995 to 2013 with gaps, in particular, for countries in the Middle East, Sub-Sahara Africa and Latin America. For some variables, e.g., ATMs per thousands of adults, the data were only available starting in 2004. Our data came from numerous sources: World Bank’s World Development Indicators (WDI), FinStats, Non-Bank Financial Institutions database (NBF), Global Financial Development database (GFD); International Monetary Fund’s International Financial Statistics (IFS); Bureau van Dijk, Bankscope; Dealogic’s debt capital markets statistics; World Federation of Exchanges (WFE); and Bank for International Settlements’ debt securities statistics.
- After a gap filling process to generate a balanced panel, all variables were normalized using the following formula:

$$I_{x,it} = \frac{x_{it} - \min(x_{it})}{\max(x_{it}) - \min(x_{it})}$$

<sup>1</sup> The framework in Heng and others, 2015, in turn, follows Sahay and others (2015). For further details, see “Advancing Financial Development in Latin America and the Caribbean,” forthcoming, IMF working paper.

where  $I_{x,it}$  is the normalized variable  $x$  of country  $i$  on year  $t$ ,  $\min(x_{it})$  is the lowest value of variable  $x_{it}$  over all  $i$ - $t$ ; and  $\max(x_{it})$  is the highest value of  $x_{it}$ . For variables capturing lack of financial development, such as interest rate spread, bank asset concentration, overhead costs, net interest margin, and non-interest income, one minus the formula above was used.

The weights were estimated with principal component analysis in levels and differences, factor analysis in levels and differences, as well as equal weights within a subcomponent of the index. For most of the methods the weights were not very different from equal weights and econometric results were robust to the method of aggregation. For simplicity, we use an index with equal weights.

### Regression Frameworks

- Regressions use 5-year averages in order to abstract from cyclical fluctuations, and estimated using dynamic panel techniques common in the growth literature.

### Financial Development Gaps

- The benchmarking regressions link financial development (FD), institutions (FI) and markets (FM) development indices to fundamentals. Following the literature on benchmarking financial development (Beck and others 2008) fundamentals ( $X_{it}^{FI}$ ) included initial income per capita, government consumption to GDP, inflation, trade openness, educational attainment proxied by the average number of years of secondary schooling for people 25+, population growth, capital account openness, the size of the shadow economy (given its importance for the LAC region) and the rule of law. Instruments ( $Z_{it}$ ) for financial development such as the rule of law and legal origin dummies were also used. Predicted norms were computed using the following equation:

$$FI_{it} = \delta'_1 X_{it}^{FI} + \delta'_2 Z_{it} + h_t^{FI} + e_{it}^{FI},$$

where  $FI_{it}$  stands for one of the financial indices (FD, FI or FM). Gaps shown are the difference between the actual values of the index and the calculated norms.

### Financial Development, Growth, and Stability

- The link between financial development, growth and stability was examined using a dynamic panel regression framework. Real GDP growth ( $^D Y_{it}$ ) is linked to financial development allowing for a potential non-linearity by adding a square of financial development while controlling for other factors that are likely to affect growth (below). In the case of individual sub-components of FI and FM, the interaction term between these two indices is included. The controls for the

growth regression  $\mathbf{X}_{it}^Y$  were the same as in the benchmarking regression ( $\mathbf{X}_{it}^{FI}$ ) with two additional variables: ratio of FDI to GDP and capital account openness.

- The impact of financial development on financial and macroeconomic instability used a similar framework. Financial instability ( $FS_{it}$ ) is measured by the first principal component of the inverse of the distance to distress (z-score),<sup>2</sup> real credit growth volatility, and real and nominal interest rate volatility. This combined variable allows capturing different facets of financial instability, thus improving over previous research which typically focused on a single variable. Growth volatility ( $GV_{it}$ ) is measured by the standard deviation of GDP growth. The controls included initial income per capita, government consumption to GDP, trade openness, changes in terms of trade, growth in per capita income, capital flows to GDP, exchange rate regime, a measure of political stability, and an indicator for whether a country is an offshore financial center.
- The following three equations were estimated using the Arellano-Bond approach:

$$DY_{it} = (a_0 - 1)\ln(Y_{it-1}) + b'f(\text{FinDev}_{it}) + \dots$$

$$g'X_{it}^Y + h_t^Y + n_i^Y + e_{it}^Y$$

$$FS_{it} = a_0FS_{it-1} + b'f(\text{FinDev}_{it}) + g'X_{it}^S + \dots$$

$$h_t^S + n_i^S + e_{it}^S$$

$$GV_{it} = a_0GV_{it-1} + b'f(\text{FinDev}_{it}) + g'X_{it}^V + \dots$$

$$h_t^V + n_i^V + e_{it}^V$$

Where  $f(\text{FinDev}_{it})$  have two forms, one with the aggregated index:  $f(FD_{it}) = b_1FD_{it} + b_2FD_{it}^2$ ;

$$f(FI_{it}, FM_{it}) = b_1FI_{it} + b_2FI_{it}^2 + b_3FM_{it} + \dots$$

$$b_4FM_{it}^2 + b_5FI_{it} \times FM_{it}$$

and one with the subcomponents:

Table A5.1 shows the results of the estimated equations for growth and instability.

<sup>2</sup> Z-score is a measure of financial health. Z-score compares the buffer of a country's commercial banking system (capitalization and returns) with the volatility of those returns.

Estimated Equations						
Dependent Variable	Financial Instability		Growth Volatility		Growth	
FD	-6.457*		-21.42***		11.47*	
	(3.814)		(7.270)		(6.279)	
FD <sup>2</sup>	6.263		23.74**		-12.38*	
	(5.735)		(10.82)		(6.556)	
Δ FD	5.283**		8.423**		5.698*	
	(2.160)		(4.008)		(3.075)	
FI		-13.75**		-27.89***		30.83***
		(5.419)		(9.533)		(8.788)
FI <sup>2</sup>		18.64**		36.38**		-48.36***
		(8.123)		(14.45)		(11.58)
FM		-0.772		-6.779		-0.586
		(3.119)		(5.345)		(3.987)
FM <sup>2</sup>		3.360		18.02**		-12.35**
		(4.886)		(8.324)		(5.314)
FM*FI		-5.140		-5.354		27.27**
		(9.730)		(15.81)		(13.16)
Δ FI		4.753**		14.08***		7.088**
		(2.114)		(3.708)		(2.958)
Δ FM		3.190*		-2.335		0.508
		(1.672)		(2.846)		(2.222)
Obs.	143	143	158	158	301	301

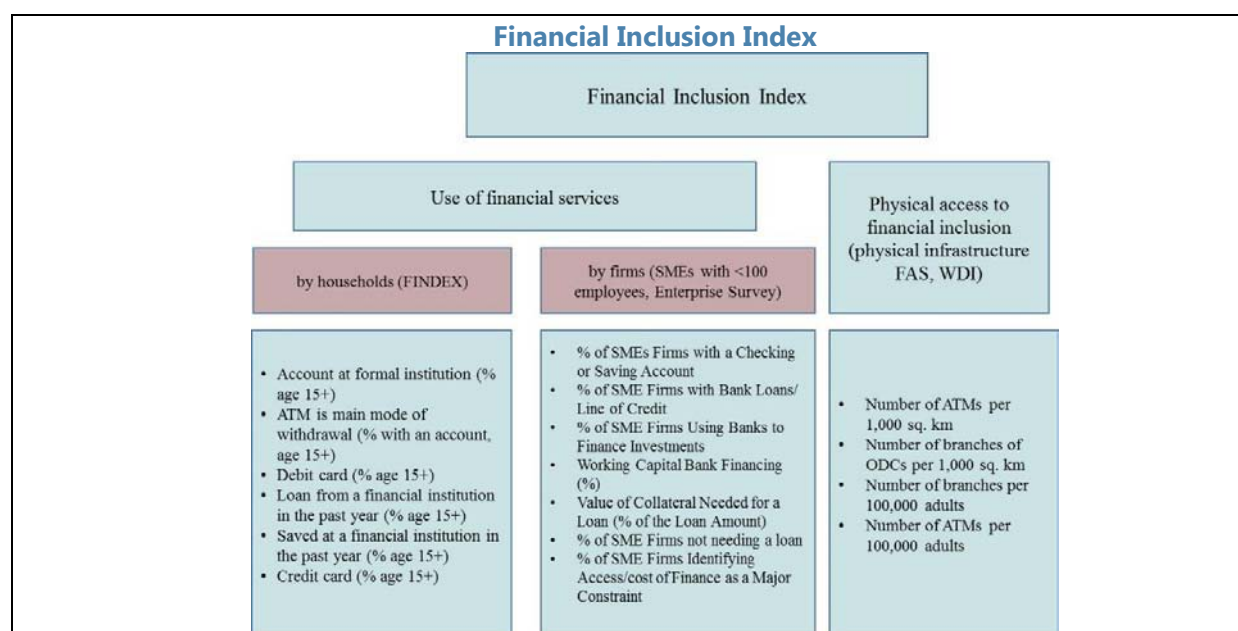
Source: IMF staff calculations.  
Note: Standard errors in parentheses\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Appendix 2. Construction of the Financial Inclusion Index

This Appendix explains the construction of Indices of Financial Inclusion and its components and provides an overview of the data and its processing for the construction of indices.

### Measuring Financial Inclusion

Since there is no commonly accepted definition of financial inclusion we used a practical definition for the purpose of this note, namely, access and effective usage of financial services by households and firms. We employ multi-dimensional indices to capture different facets of financial inclusion. In particular, we construct three multi-dimensional indices capturing different angles of financial inclusion: (i) usage of financial services by households (Findex); (ii) usage of financial services by SMEs (Enterprise Survey); and (iii) access to financial institutions (Financial Access Survey). The diagram below illustrates indicators included in each of the indices. We chose indicators that cover the most important aspects of financial inclusion emphasized in the literature, while taking into account data constraints. For example, the household inclusion index encompasses information on the use of bank accounts, savings, borrowing, and payment methods but omits information on insurance due to data constraints. We also chose not to combine the three indices into a single index, notably because cross-country data coverage across households and firms varies substantially. Instead, we compare Guatemala and other LAC countries to other regions and for households across time,<sup>1</sup> separately on each dimension.<sup>2</sup>



<sup>1</sup> Findex data is available for two years: 2011 and 2014.

<sup>2</sup> We explore different aggregation methods, namely, weights derived from the principle component analysis (Camara, N., and D. Tuesta, 2014), factor analysis (Amidžić et al., 2014) and equal weights. The results are similar when using alternative measures (see Appendix 2). For simplicity of exposition we present the results for indices constructed using equal weights.

## Data Sources and Processing

Table below shows the main data sources. The data from Global Findex covers the period for 2011 and 2014 only. The data point from enterprise survey is the latest observation available.

From the components to the composite index

All variables were normalized using the following formula:  $I_{x,it}$

$$I_{x,it} = \frac{x_{it} - \min(x_{it})}{\max(x_{it}) - \min(x_{it})}$$

Where  $I_{x,it}$  is the normalized variable  $x$  of country  $i$  on year  $t$ ,  $\min(x_{it})$  is the lowest value of variable  $x_{it}$  over all  $it$ ; and  $\max(x_{it})$  is the highest value of  $x_{it}$ . For those variables that capture a lack of financial inclusion, such as *Value of collateral needed for a loan* and *percent of firms identifying access or cost of finance as major constraint*, the reverse formula was used:

$$I_{x,it} = 1 - \frac{x_{it} - \min(x_{it})}{\max(x_{it}) - \min(x_{it})}$$

Several methods were used to estimate the weights: principal component analysis with the variables in levels and in differences, factor analysis with the variables in levels and in differences, as well as equal weights within a subcomponent of the index. For most of the methods the weights were not very different from equal weights and econometric results were robust to the method of aggregation. Thus, for simplicity of exposition the paper presents an index with equal weights.



Indicies	Subcomponents	Variables	Sources
Use of Financial Services	Households	Account at a formal financial institution (% age 15+)	Global Findex
		ATM is main mode of withdrawal (% with an account, age 15+)	Global Findex
		Debit card (% age 15+)□	Global Findex
		Loan from a financial institution in the past year (% age 15+)	Global Findex
		Saved at a financial institution in the past year (% age 15+)	Global Findex
	Firms/SMEs (Enterprise Survey, <100 employees)	% of SMEs Firms With a Checking or Savings Account	Enterprise Survey
		% of SME Firms With Bank Loans/line of Credit	Enterprise Survey
		% of SME Firms Using Banks to Finance Investments	Enterprise Survey
		Working Capital Bank Financing (%)	Enterprise Survey
		Value of Collateral Needed for a Loan (% of the Loan Amount)	Enterprise Survey
		% of SME Firms not needing a loan	Enterprise Survey
		% of SME Firms Identifying Access/cost of Finance as a Major Constraint	Enterprise Survey
	Access to financial infrastructure		Number of ATMs per 1,000 sq km
Number of branches of ODCs per 1,000 sq km			IMF, Financial Access Survey
Number of branches per 100,000 adults			IMF, Financial Access Survey
Number of ATMs per 100,000 adults			IMF, Financial Access Survey

**Household Inclusion Index**

Region	2011
East Asia and Pacific	9
Europe and Central Asia	29
Latin America	20
Middle East and North Africa	9
South Asia	6
Sub-Saharan Africa	31
Total	104

Region	2014
East Asia and Pacific	9
Europe and Central Asia	29
Latin America	20
Middle East and North Africa	9
South Asia	6
Sub-Saharan Africa	31
Total	104

**Firm Inclusion Index**

Region	M.R.A. 1/
East Asia and Pacific	9
Europe and Central Asia	2
Latin America	31
Middle East and North Africa	5
South Asia	4
Sub-Saharan Africa	28
Total	79

**Access Index**

<b>Region</b>	<b>M.R.A. 1/</b>
East Asia and Pacific	24
Europe and Central Asia	46
Latin America	32
Middle East and North Africa	15
North America	2
South Asia	7
Sub-Saharan Africa	35
Total	161

1/ Most recent year available.

### Appendix 3. Model Calibration

The model features an economy where agents differ in their talent and wealth. Each person has to decide whether to become a worker (earn wages) or an entrepreneur (earn profits) and whether to pay a fixed *participation cost* to be able to borrow from the banking system. Entrepreneurs then decide on how much of their wealth to invest in their business, whether and how much to borrow at the going interest rate, and how many workers to employ at the going wage rate. The output from business projects depends on the amount of capital invested, the amount of labor hired, as well as on the entrepreneur's talent. In the model, the magnitude of the participation cost represents the cost of financial contracting. The higher is this cost, the more agents remain in credit autarky. Moreover, it tends to disproportionately exclude poor but talented individuals as the fixed cost amounts to a larger fraction of their wealth.

Once in the banking system, the amount of credit available is constrained by other financial frictions. If an entrepreneur has paid the participation cost, he or she can borrow from the banking system at the going interest rate. The model assumes that a business can fail for external reasons ("bad luck"), with some probability. Given imperfect enforceability of contracts, entrepreneurs have to post personal wealth as collateral for the loan. Since banks run the risk that entrepreneurs can defraud them, this constrains the amount that can be borrowed. Therefore, weak contract enforceability leads to lower leverage, imposing *borrowing constraints* on entrepreneurs. A second friction is modeled as arising from asymmetric information between the bank and the borrower. The underlying intuition is that if the entrepreneur does not pay back the loan, the bank cannot be sure whether the business actually failed. Banks have to pay an audit or monitoring cost to find out. Otherwise, entrepreneurs could benefit from claiming failure and keep the profits. These costs—measure of the degree of *intermediation costs* in the economy—are recuperated by banks through interest rates and high overhead fees.<sup>1</sup>

In the baseline, the model is calibrated to data for 12 LAC countries. Firm-level data for 2005 from the World Bank Enterprise Survey are used, in addition to standard macroeconomic and financial variables (savings rate, non-performing loans (NPLs), and interest rate spreads) for 2010 or the latest year available. While lack of financial inclusion is an even more acute problem for firms in the informal sector, the model focuses primarily on formal sector firms. The model's key parameters are jointly chosen to match the simulated moments, such as the percent of firms with credit and the firm employment distribution, with the actual data for each country (see Dabla-Norris et al., 2015, for details).

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<sup>1</sup> In the model, the bank's optimal verification strategy follows Townsend (1979), whereby verification only occurs if the entrepreneur cannot pay the face value of the loan. This happens when the entrepreneur is highly leveraged and also faces a production failure. As a result, banks only monitor if a production failure is reported and the loan contract is highly-leveraged. A low-leveraged loan implies that entrepreneurs are not borrowing much from the bank and therefore the required repayment is small.