Modeling the Revenue and Distributional Effects of Tax Reform in Paraguay: Challenges and Lessons

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In 2019, the Government of Paraguay (GOP) embarked on a comprehensive tax reform to simplify and modernize its tax system. At the request of the Ministry of Finance (MOF), and building on long-standing policy dialogue with the country, the World Bank (WB) Poverty team worked quickly to develop a micro-simulation tool to inform policymakers on the potential revenue and distributional effects of the reform as it was being developed. In this note, we summarize the context, approach, challenges, and lessons learned from constructing the Fiscal Simulation Tool and highlight the tool’s long-term value for policy dialogue and decision making.

Until 2019, Paraguay’s tax collection capacity was limited with an insignificant contribution of the personal income tax (PIT) and a negligible resource redistribution. Overall tax revenues—the main source of fiscal receipts—were just under 10 percent of GDP in 2018, while the regional average was 22.8 percent. Value-added taxes (VAT) and excise taxes accounted for about 65 percent of total tax collections, while PIT contributed only 1.2 percent (Figure 1). This is in stark contrast to the LAC average of 11 percent or the Organization of Economic Cooperation and Development (OECD) country average of 34 percent. Additionally, evidence from the Commitment to Equity Institute initiative shows that Paraguay’s tax system has limited redistributive impact compared to other countries in the region. These characteristics have long constrained the Government’s ability to provide high-quality public services, invest in the country, and implement interventions to reduce poverty and increase prosperity.

Paraguay introduced the PIT later than most countries, has relatively low tax rates, and allows unlimited deductions. The PIT has only been effective since 2012 with a relatively simple structure and low rates, positioning Paraguay as the country with the second lowest PIT rates in the region. The high degree
of labor informality, along with unrestricted expenditure deductions from taxable income, further limited revenue collection. Unlimited deductions rendered statutory rates uninformative with a large number of zero effective rates observed at all income levels. As a result, the number of contributors to the system is very low, and the incidence of direct taxes barely changes across the income distribution (Figure 2).

Figure 2 - Incidence of Direct taxes by income decile


VAT and excise taxes contribute 51 percent and 14 percent to total revenue, respectively, and have low tax rates by regional standards. The VAT was first introduced in Paraguay’s Fiscal Reform of 1991, with a general tax rate of 10 percent. Over time, the list of goods and services subject to VAT has grown, although some items have qualified for a 5 percent VAT reduction. Excise taxes are imposed on 6 main groups of goods: tobacco and derivatives, beverages, alcohol, fuels and derivatives, and luxury goods. Rates on these goods vary from 1 percent to 50 percent, and fuels and derivatives contribute to about 74 percent of the total excise tax revenues.

Government’s 2019 comprehensive tax reform aimed to simplify the tax system and improve its efficiency. While the biggest changes of the tax system were related to PIT, the reform also included changes in corporate taxes and an increase in excise tax rates for cigarettes, beverages, and fuels.

The main changes to PIT included:
(a) Creating differential rules and rates for capital, labor, and dividend incomes (before they were processed together).
(b) Making deductions of personal expenses applicable only apply to labor income.
(c) Keeping the simple regime for micro-sized firms but as part of corporate taxes rather than PIT.

Paraguay: Building a Fiscal Policy Micro-Simulation Tool

Paraguay’s Ministry of Finance (MOF) requested the World Bank (WB) to build a micro-simulation tool to estimate potential revenue and distributional impacts from the tax reform. The request built on long-standing policy dialogue and WB technical assistance on fiscal issues, which gained momentum during preparation of a Development Policy Loan (DPL). The WB Poverty Team had just coauthored a Commitment to Equity report with MOF authorities that highlighted the limitations of the current tax system. With priority on the PIT, the WB team built on this work and quickly constructed a micro-simulation tool to inform reform drafts as they were being developed. Analysis of these early versions, in turn, helped improve the modeling and technical aspects of the tool. Later, the tool incorporated changes to excise taxes.

While the tool was based on household survey data, adding administrative records was critical for capturing the defining characteristics of the Paraguayan PIT system. The introduction of administrative records was essential to calibrate the model for 2 reasons. First, household expenditure levels reported in the survey did not represent the levels and scope of deductions reported in tax records. For example, in 2016, 50 percent of individuals registered with the PIT had zero tax after deductions. Second, the distribution of income in the household survey did not capture very high-income earners, where the very small tax base concentrates. Official statistics, for instance, estimate about 850,000 workers in the formal sector in 2016, but only 42,000 individuals were registered for PIT. The tool allowed alternative imputation methods.

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6 The percentage of informal employment in Paraguay stood at nearly 69 percent of the total employed population in 2019 (ILO 2020).
7 Co-led by the Macroeconomics, Trade and Investment, the Poverty and Equity, and Governance global practices.
8 Additionally, tax collection is also highly concentrated. The top 10% contributors account for 50% of PIT collection.
We estimated modest revenue and distributional effects from Paraguay’s tax reforms, with the highest impact on the top deciles of the income distribution. The PIT changes were estimated to increase PIT collection by about 75 percent, and increase the number of contributors by three times (but from a very small base). Tax collection would continue to come almost exclusively from the top decile of the distribution, yet individuals from lower deciles would begin contributing. Effective PIT rates are expected to increase only marginally among the top deciles. If excise rates on all items were to increase to the maximum allowed under the reform,\textsuperscript{11} collection from excise taxes is estimated to increase by 43 percent. The highest burden would come from higher-income deciles, though the increased dependency of excise taxes over gross market income\textsuperscript{12} is expected to be higher at the lower end of the income distribution.\textsuperscript{13}

**Lessons and Moving Forward**

Micro-simulation can be a powerful tool to analyze and inform potential reforms and policies. Quick sensitivity analysis can help identify the most effective options. More detailed micro-simulations can provide insights about the distributional impacts of changes to the tax system.
fiscal policy changes. For example, by changing built-in PIT parameters in the tool, users can clearly see that limiting expenditure deductions (even at levels as high as the 90th percentile of the distribution of submitted deductions) would have a significantly higher impact on tax collection and income inequality relative to increasing tax rates.

The tool was programmed in blocks so that new modules focusing on other fiscal interventions can be incorporated relatively easily. This structure allows users to analyze trade-offs across policies or among packages of policies (for example, a revenue-neutral increase in taxes accompanied by an expansion of cash transfers). With the rise of COVID-19, the team included select policies that the Government put in place in 2020. In particular, the tool was enhanced by including the simulation of subsidies and transfers offered to households and informal workers (Pytyvo and Nangareko).

Proper documentation is critical for the full potential of these fiscal modeling tools to be realized. It is unlikely for all fiscal interventions to be modeled at once, and even if they are, governments do not usually embark on multiple reforms all at once. The team documented assumptions and processes carefully to allow future teams to build off previous work. The algorithms are designed in a way so that various policy changes can be incorporated easily. Furthermore, a detailed user manual explains all the options built into the tool and a detailed methodological document lays out the assumptions and decisions made throughout the process. As of now, the tool has already been transferred seamlessly to another WB team.

Trust and coordinated work with government counterparts was essential to deliver a high-quality product. Access to administrative data was crucial to model the Paraguayan tax system. Additionally, direct, frequent access to technical staff within the GOP improved understanding of the reform and allowed timely feedback on model assumptions. This helped ensure that the tool was designed to best meet policymakers’ needs.

Even with relatively high technical government capacity, programming complexity was much higher than anticipated. This prevented full hand-over of the tool to the GOP to use to model future reforms. While some Government staff had advanced programming skills and understood the structure and logic of the programs, the modeling techniques were ultimately quite advanced. While the tool was rendered to be user-friendly (it had an excel-based interface for easy analysis of built-in policy changes), changing model parameters and assumptions, or incorporating new fiscal interventions will continue to require WB involvement.

WB Global Practice (GPs) collaboration is needed to maximize the tool’s impact and embed it into the on-going policy dialogue. The tool was built on a long-standing fiscal policy dialogue between the Paraguayan Government and the WB Poverty and Macro teams. The development of the tool leveraged a DPL co-led by the WB Macro, Governance, and Poverty teams. This context made the tool’s development extremely timely and relevant, thereby enhancing the Government’s ownership.

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