Growth and Volatility of Tax Revenues in Latin America

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Summary. — Against the backdrop of high macroeconomic instability and the need to meet the demands of public spending, we analyze the trade-off between growth and volatility of tax revenues in Latin America. Short-run and long-run elasticities for a sample of 11 economies are estimated accounting for state-dependent asymmetric reactions. Controlling for composition of revenue sources and other idiosyncrasies, we find revenues above (below) its long-run equilibrium to react stronger (weaker) to business cycle dynamics. Our detailed elasticity estimates can give some orientation on how to stably reach higher tax levels on the way to develop an adequate internal tax system.
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1. INTRODUCTION AND MOTIVATION

(a) *Motivation*

In general, collecting taxes is justified by the generation of revenue to finance public goods and services like infrastructure, education, health, and other social programs. Providing these prerequisites for economic performance is crucial, especially in developing economies, to foster growth and to reduce inequality and poverty (Cornia, 2010; Gordon & Li, 2009; Székely, 2003). Given a notoriously high macroeconomic instability of Latin American economies (Catão, 2007; Lama, 2011; Neumeyer & Perri, 2005), the dependence on external financial factors and the presence of capital market constraints (Christiano, Gust, & Roldos, 2004; Mendoza & Smith, 2002) tax revenues need to be both stable and growing in order to meet these prerequisites. This need is all the more obvious given that many Latin American economies generally were and still are dependent on the shackles of commodities exploitation, which provides the livelihoods of their citizens but leaves their economies perennially susceptible to boom–bust cycles and currency fluctuations. The historical roots of this fact are outlined in Engerman and Sokoloff (2005). Nevertheless, commodity prices in the region have remained remarkably stable during what has become known as the period of the Great Recession, which started in the last years of the preceding decade. Most countries seem to have coped relatively well with the global crisis. Accumulating international reserves at rates never seen before, domestic markets perform relatively better than in many other regions of the world. However, as Latin American economies still go through transition from an international trade taxes regime to raising revenues from other tax categories, there remains the question of an adequate structure: Given idiosyncrasies of a country in the region, how responsive are the different categories to economic fluctuations? Are there differences in their potential to generate revenue in the long run?

As state governments in the US are also constrained in their external financing and habitually tend to suffer from cyclical budget contractions, the vast majority of the existing literature on tax revenue growth and volatility is concerned with US federal states. It dates back to the seminal study by Groves and Kahn (1952). Early studies that followed (e.g., Legler & Shapiro, 1968; Wilford, 1965) analyzed state and local tax revenue, conditioning revenues on income using standard OLS and not distinguishing between the long and short run. By the early 1970s, Williams, Anderson, Froehle, and Lamb (1973) demonstrated that two taxes can follow the same growth trend while experiencing a distinct variability around it. Their findings suggest that a single statistic for revenue elasticity cannot be used to analyze growth and variability at the same time and that a possible trade-off between growth and stability exists. The succeeding studies by White (1983) and Fox and Campbell (1984), therefore, considered different taxes and tax structures, confirming this trade-off and finding personal income tax (PIT) and corporate income tax (CIT) to be not only the fastest growing but also the most unstable taxes. While, for example, White (1983) restricted his analysis to one state,

Dye and McGuire (1991) applied White's methodology to all federal states. Sobel and Holcombe (1996) further improved this methodology by accounting for problems of residual variability, serial correlation, and non-stationarity of revenue series. The latest development in this agenda is Bruce, Fox, and Tuttle (2006) who combine the structured approach of Fox and Campbell (1984) with the refined methodology proposed by Sobel and Holcombe (1996). For our estimates, we will widely adhere to their approach, which can be displayed as part of the more general class of nonlinear autoregressive distributed lag models (NARDL). In econometric terms, it uses short run partial sum decompositions in an ARDL framework to estimate asymmetric dynamic multipliers (Shin, Yu, & Greenwood-Nimmo, 2011). To the best of our knowledge, these techniques by now have—besides for US federal states—only been used to study a few other countries; see Wolswijk (2009) for the Netherlands and Acquaah and Gelardi (2008) for British Columbian revenues.

(b) Theoretical considerations

Although some tax revenue elasticity estimates for Latin American economies can be found in the literature (usually intended to calculate cyclically adjusted balances), the evidence remains scattered across the different countries and mostly stems from researchers located in governmental organizations in the region (e.g., Basso, 2006; Cárdenas, Ventosa-Santaulà-ria, & Gómez, 2008; De Mello & Moccero, 2006; Rincón, Berthel, & Gómez, 2003; Salazar & Prada, 2003; Schenone & De la Torre, 2005; Tapia, 2003). With few exceptions (Antelo, 2003; Fuentes & Tobar Silva, 2003) this literature is focused on a long-run relationship, i.e., the growth aspect of tax revenues. Neither is the issue of growth and stability of revenues analyzed jointly nor is a potential trade-off examined. However, such a trade-off is also an implication of theoretical models like the one recently proposed by Gordon and Li (2009), who argue that in the course of a developing financial sector more firms are pulled into using it, increasing CIT revenues in the long run. On the other hand, revenues from CIT will be volatile and as a share of gross domestic product (GDP) low in the short run. This is due to two reasons. In the short run, domestic banks pass through business cycle volatility in the form of cyclically varying loan conditions to capital-intensive firms. For the substantial contribution of real interest rates to output volatility in emerging economies see Neumeyer and Perri (2005). Additionally, some firms shift into the informal economy in order to evade the CIT ("threat of disintermediation"). Thus, CIT in the Gordon–Li model, though bearing a substantial growth potential of its revenues, is at the same time generating only relatively low and volatile revenues in the short and medium run. Hence, raising CIT revenues that were eventually also collected in the US until the 1930s (Gordon & Li, 2009, p. 856) theoretically implies a clear-cut growth-volatility trade-off for emerging economies. The results of the study by Keen and Lockwood (2010) also imply such a trade-off of growth and volatility for the value added tax (VAT), which started its spread in the second half of the 1960s, primarily among the initial members of the EU and in Latin America. Using an unbalanced panel of 143 countries with and without VAT adoption for the period from 1975 to 2000, their IV estimates show that VAT implementation generated a "sizeable revenue gain" of 4.54% (compared to economies that did not implement a VAT) in the long run. Additionally, a robustly positive coefficient for the interaction term of VAT adaption and income per capita is estimated. The latter, of course, implies a certain volatility of VAT revenues

at business cycle frequencies. Again, there seems to be a growth-volatility trade-off that is particularly pronounced for developing countries, where administration and compliance of the VAT can be affected by business fluctuations in the short and medium run.

The above reasoning can be summarized and briefly rationalized as follows. Let total welfare W in a developing economy depend on a series of revenue collections R_i from different sources, e.g., from income tax (IT), VAT, or commodities. Considering a state having to choose a portfolio from N different revenue sources in order to maximizes welfare, we may summarize its objective as

$$\max_{S_i} W = \int F\left(\sum_i^N R_i(t)\right) dt, \text{ where } i = 1, \ldots, N;$$

$$S_i = \frac{R_i}{\sum_i^N R_i} \text{ and } \sum_i^N S_i = 1,$$

i.e., S_i representing the share of revenue instrument i in the portfolio. If we disregard the time dimension for notational ease and introduce the volatility-growth trade-off described in the above sketched literature, the state objective function becomes

$$\max_{S_i} \widetilde{W} = F\left(R_i; C_i = \mu_{\Delta R_i}/\sigma_{\Delta R_i}\right) \text{ with } \frac{\partial F}{\partial R_i} > 0 \text{ and } \frac{\partial F}{\partial C_i} > 0 \text{ and}$$

$C_i = \mu_{\Delta R_i}/\sigma_{\Delta R_i}$ denoting the inverse of the coefficient of variation of growth rates ΔR_i of revenue component R_i. What makes this problem a non-trivial task and formally reflects potential volatility-growth trade-offs is the uncertainty about the sign of the cross-differentiation of the arguments in $\widetilde{W}$, i.e.

$$\frac{\partial^2 F}{\partial R_i \partial C_i} > 0 \text{ or } < 0.$$

Reconsidering time, this sign might not only depend on more or less time-invariant idiosyncratic characteristics of a country but also on the phase of the business cycle it is facing. Households, firms, or, in general, economic actors might change their behavior depending on different phases of the cycle. For example, households might under-proportionally cut down consumption of basic needs goods during recessions, while spending proportionally more (less) on other goods during expansions (contractions). Under these circumstances, overall VAT revenues react less pronounced to changes in GDP during downturn phases than during expansion. Likewise if labor market turnover increases more during periods of acceleration than it is slowing down in downturns, the short-run elasticity of PIT is likely to be higher in boom than in bust.

The present study contributes to the literature by applying recently developed econometric techniques to estimate short-run and long-run elasticities of tax revenues in Latin America, accounting for asymmetric reactions of short-run elasticities over the business cycle. Considering the composition of the revenues of PIT, CIT, internal and external VAT, social security contributions, and revenues from commodities exploitation, we find revenues above (below) its long-run equilibrium to react stronger (weaker) to business cycle dynamics. Our detailed elasticity estimates can give some orientation on how to reach necessary higher tax levels evading sudden stops in revenues due to business cycle instabilities on the way to develop an adequate internal tax system.

The remainder of the paper is organized as follows. Section 2 describes the recent development of tax collection in Latin