IDB WORKING PAPER SERIES No. IDB-WP-431

Taxation and Economic Growth in Latin America

Gustavo Canavire-Bacarreza
Jorge Martinez-Vazquez
Violeta Vulovic

August 2013

Inter-American Development Bank
Fiscal and Municipal Management Division

Taxation and Economic Growth in Latin America

Gustavo Canavire-Bacarreza
Jorge Martinez-Vazquez
Violeta Vulovic

Universidad EAFIT
International Center for Public Policy. Andrew Young School of Public Studies. Georgia State University
The World Bank

Inter-American Development Bank
2013

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Canavire-Bacarreza, Gustavo.
Taxation and economic growth in Latin America / Gustavo Canavire-Bacarreza, Jorge Martinez-Vazquez, Violeta Vulovic.
p. cm. (IDB working paper series ; 431)
Includes bibliographical references.
1. Fiscal policy—Latin America. 2. Economic development —Latin America. I. Martinez-Vazquez, Jorge. II. Vulovic, Violeta. III. Inter-American Development Bank. Fiscal and Municipal Management Divison. IV. Title. V. Series.
IDB-WP-431

http://www.iadb.org

Taxation and Economic Growth in Latin America[*]

Gustavo Canavire-Bacarreza[†] Jorge Martinez-Vazquez[‡] Violeta Vulovic[§]

Abstract

Tax policy is among the most common and relevant instruments in the toolkit of policy-makers when thinking about promoting growth, yet there is not compelling evidence regarding its effect in Latin American countries. Using a variety of approaches, we estimate the effects on growth of the most important taxes for the region, namely personal income tax, corporate income tax, general taxes on goods and services, including value added and other sales taxes, and revenues from natural resource. We evaluate the effect of these tax instruments on growth for Argentina, Brazil, Mexico, and Chile using vector autoregressive techniques, and for close to the entire region and a worldwide sample of developing and developed countries using panel data estimation. We find that, for the most part, personal income tax does not have the expected negative effect on economic growth in Latin America, which is largely explained by the small collections in the region. For corporate income tax, our results suggest reducing tax evasion and greater reliance on collection may boost economic growth in the region as a whole and especially for natural resource exporting countries. But, we also find small negative effects of corporate income tax on growth for individual countries, specifically Argentina, Mexico, and Chile. Finally, our results suggest that greater reliance on consumption taxes has significant positive effects on growth in Latin American in general, although we again find slight negative effects in some of the selected countries. On the other hand, natural resource revenues do not seem to contribute to growth.

JEL Classification: C32, C33, H23, H25, N46, O43.
Keywords: taxation, growth, Latin America, personal income tax, corporate income tax, goods and sales tax, natural resources tax.

[*] Funding for this study comes from the Inter-American Development Bank under the project "Fiscal Policy for Sustainable and More Equitable Growth in Latin America and the Caribbean." We are grateful to Ana Corbacho, Gustavo Garcia, Teresa Ter-Minassian, Jimena Zuniga and the referees and participants of the Discussion Seminars at the IDB for useful comments and suggestions.
[†] Universidad EAFIT, Medellín Colombia. Email: gcanavir@eafit.edu.co
[‡] International Center for Public Policy. Andrew Young School of Policy Studies. Georgia State University. Email: jorgemartinez@gsu.edu
[§]The World Bank. Email: vvulovic@worldbank.org.

Introduction

What public policies can be effective for improving economic growth performance is a critically important issue at the national and international levels. The general well-being of the population and the prospects for poverty reduction are intimately related to economic growth. Moreover, the issue of potential growth is at the heart of recent discussions on stabilization policy. Different public policies are being applied to boost growth and to reduce poverty in different regions of the world, but fiscal policies have become the most common and relevant instruments in the toolkit of policy-makers (Tanzi and Zee, 1997).

Over the past decades growth rates in the world have varied greatly. The Asian tigers have been among the top performers, with average per-capita growth rates of over 5.5 percent between 1960 and 2010. On the other hand, many countries in Latin America have recorded less than 1.0 percent growth during the same period. This comparison becomes important as both regions had a similar departing point in 1960. However, Latin America has performed relatively well over the past crisis, with growth rates of about 4–5 percent in 2011.[1]

Fiscal policy remains one of the most powerful tools to address the objectives of enhanced economic growth and poverty reduction in Latin America mainly due to its potential to correct market failures and increase the benefits of redistribution policies. As Tanzi and Zee (1997) and Fu, Taylor, Yücel, et al. (2003) argue, the most relevant channels through which fiscal policy can affect growth are taxation and public expenditures.

While the effect of public expenditures seems to be fairly positive for growth and poverty reduction, the effect of tax policy in general tends to be ambiguous. As a matter of fact, there is no compelling evidence regarding the effect of different tax instruments for Latin American countries. In addition, not much research has been carried out on the structural composition of tax systems in Latin America and its consequence in relation to the real economy.[2]

This paper describes, identifies, and analyzes the potential impact of tax policies on economic growth for selected Latin American countries and draw conclusions for several specific countries and for the region as a whole. More specifically, using a novel dataset, we examine the effect of the most conventional tax instruments: personal income tax (PIT),

[1] http://www.caribbean360.com/index.php/news/345135.html#axzz1ge2BDQM9

[2] Generally, there has been less research on this question; this literature is reviewed in Martinez-Vazquez, Vulovic, and Liu (2011).

corporate income tax (CIT), general taxes on goods and services (GTGS), including value added (VAT) and other sales taxes, and natural resource revenues (NRES).

We evaluate the effect of these tax instruments on growth in Argentina, Brazil, Mexico, and Chile using vector autoregression (VAR) techniques, and for almost the entire Latin American region and for a worldwide sample of developing and developed countries, using panel data estimation methods. We find that, for the most part, relying on personal income tax does not have the expected negative effect in Latin America, which is largely explained by the small collections in the region. In the case of corporate income tax, our results suggest reducing tax evasion and greater collection may boost economic growth in the region as a whole. But, we also find small negative effect of corporate income tax on growth for individual countries, specifically Argentina, Mexico, and Chile. Finally, our results suggest that greater reliance on general taxes on goods and services has significant positive effect on growth in Latin American countries, although we find slight negative effects in some of the selected countries. On the other hand, we do not find strong evidence of a positive effect of revenues from natural resource on economic growth in Latin America. The rest of the paper is organized as follows: an overview of tax policies in Latin America; the estimation strategy for the main tax instruments in the region and for the selected countries; the empirical results; and our conclusions and suggested alternatives for policy reform.

Taxation in Latin America

Although it is frequently addressed in fiscal matters as a homogeneous block of countries, the Latin American region shows considerable diversity in economic structure as well as in tax systems (Gómez Sabaini, Martner, and Bernardi, 2007; Tanzi, Barreix, and Villela, 2008). This diversity in tax systems is induced by diversity in per capita income, with low, low-medium, and medium-high income countries in the region; in the availability of natural resources that can represent substantial alternative sources of public revenues; and in size, with three large federations (Argentina, Brazil, and Mexico) representing over two-thirds of the region's gross product. Of particular relevance for tax systems is the importance of non-tax revenue sources in some countries in the region. For example, in recent years, non-tax revenues in Ecuador and Peru comprised close to half of total revenues; in Mexico, over one-third; and in Chile, over one-quarter.

From one perspective, the tax structures of Latin American countries look like those of countries in other regions of the world, including income taxes (personal and corporate), some

social security taxes, and consumption taxes, including VATs, excise taxes, and import tariffs. Yet, as can be seen in Table 1, there is certain heterogeneity in tax characteristics even across the biggest countries of the region. From another perspective, the tax structures of Latin American countries do not look like those of most other countries in that it is frequent to observe the use of what have been called "heterodox" taxes, including taxes on financial transactions, on business assets, and even on exports.

Traditionally, personal income tax has raised relatively low revenues in most Latin American countries.[3] The reasons for this appear to be multiple (Tanzi, et al., 2008; Profeta, Puglisi, and Scabrosetti, 2009) and include:

(i) the presence of exceptionally large informal economies;

(ii) the low share of workers compensation in the composition of national incomes—less than 30 percent in many countries in the region compared with over 70 percent in most industrial countries—and therefore a lower role played by withholding and automatic reporting mechanisms;

(iii) political economy considerations related to the pronouncedly uneven distribution of income—with Gini coefficients approaching 0.60—and the successful opposition of the best-off groups to significantly progressive taxation;[4]

(iv) high exemption levels and other provisions that narrow the base (which is not unrelated to political economy considerations);[5] and

(v) the low taxation of capital income, in particular, which is often taxed at lower rates—if not exempted completely—in combination with considerable capital flight.[6]

[3] Some countries, like Brazil and Chile and more recently Argentina, are somewhat of an exception, but even in these countries the use of the personal income tax is limited by international standards.

[4] As Tanzi and Zee (1997) point out, this outcome contradicts the prediction in public choice theory that political majorities would use their power to redistribute income in their favor. Profeta and Scabrosetti (2008) explain the political economy puzzle for the lack of tax redistribution in Latin America by the role played by "vested interests, the financial sector, and populist economic policies." These authors argue that Latin American political parties only weakly represent voters' political preferences and that these are more heavily influenced by elites and interest groups. Profeta and Scabrosetti also make an argument for weaker tax administration in Latin America due to disintermediation and lower penetration of financial institutions in the economy—an argument originally made by Gordon and Li (2009).

[5] Castelletti (2008) points out that in the vast majority of countries in Latin America most earnings are below the minimum exempt threshold (over 90 percent in Brazil, Chile, Colombia, and Costa Rica).

[6] For example, Peru exempts interest and capital fear of capital flight has been a real force. In particular, capital still flows to the U.S. in large amounts, in part due to the fact that there deposits by "non-resident aliens" enjoy tax free status (Tanzi and Zee, 20081997).

Table 1: Tax Characteristics for Selected Latin American countries

Country	Personal Income Tax					Corporate Income Tax				Sales Tax							
	Tax unit	**Brackets**	**Rates**	**Tax base**	**Exemptions**	**Tax rate (%)**	**Dividends**	**Carry forward of losses**	**Tax Incentives**	**Standard rate (%)**	**Increased rate (%)**	**Reduced rate (%)**	**Import**	**Export**	**Cigarettes (%)**	**Excises unleaded gasoline (%)**	**Diesel fuel (%)**
Arg.	Individuals and undivided estates; spouses file a separate tax return	7	9.35	Worldwide income from real estate, capital business income, and personal services	Gifts, inheritances, and legacies; domestic-source dividends from registered shares; public and private bonds	35	Generally exempt; however, they are taxed (35%) when exceeding taxable profits (equalization tax)	5	R&D Tax Credit	21	27	10.5	Included	0	60	62–70	19
Brazil	Individuals; spouses file a joint tax return	3	27.5	Worldwide income from salaries, capital, raffles, and personal services	Domestic-source dividends; interest on savings accounts	15 (+ surtax of 10% above $110,000 and 9% of social contributions)	Exempt	Unlimited (up to 30% of taxable profits)	R&D Tax Credit, export tax credits, regional development tax incentives	Inter-state: 12 Intra-state: 17	Intra state: 25–35	Inter-state: 7 Intra-state: 7	Included	0	Federal excise tax (IPI) from 0% to 365%		
Chile	Individuals; spouses must file a joint tax return in some cases	8	40	Worldwide income from any source	Domestic-source dividends as tax credit	17	Taxed with full tax credit	Unlimited	Investment tax credit, export tax incentives; regional development incentives	19	36		Included	0	60.4	6 tax units per cubic meter	1.5 tax units per cubic meter
Mexico	Individuals; spouses taxed separately	5	29.3	Worldwide income from any source	Domestic-source dividends; financial interest income, gifts and bequest	29	Taxed with full tax credit	10	Export promotion; job creation tax credit; R&D tax credit	15		0-10	Included	0	110	Different %	

Source: IBFD (2006) Latin America - Taxation & Investment, Amsterdam: IBDF CD ROM 1/2006.

Corporate income tax is different. The experience and performance of Latin American countries with corporate income tax is similar to that in other countries and in some ways comparable to those in OECD countries. The structure of corporate income tax is not as diverse, but tax rates differ markedly, from about 10 percent to about 38 percent. The region has joined the worldwide trend toward lower corporate tax rates, with the difference being that tax bases have not been broadened as much as in other countries because of ongoing exemptions and special tax advantages and incentives.[11] Nevertheless, tax revenues from corporate income tax have improved recently because tax bases are now better adapted to deal with inflation than in the past and also because of sharp increases in international prices and the profits of companies exploiting natural resources. To address the problem of the "hard to tax", almost every country in the region has introduced a simplified taxation system for small enterprises, often based on presumptive methods of defining the tax bases. Social security taxes are not as important or as common in the region as in OECD countries, but here again there is considerable diversity. For example, Brazil raises over 15 percent of its GDP to finance social security services.

On the side of consumption taxes, the VAT is generally a success in the region and the most important form of indirect taxation in some countries, such as Brazil, Chile, and Uruguay, where the VAT raises over 8 percent of GDP in tax revenues—comparable to other successful experiences in OECD countries (Tanzi and Zee, 1997). Rates, which have been increasing, vary considerably (e.g., Panama at 5 percent versus Uruguay at 23 percent) and on average are by almost 5 percentage points below those in the European Union. Most countries operate on a single general rate. The productivity of the VAT—the ratio of actual collections to GDP times the standard VAT rate—is low in some countries (e.g., less than 25 percent in Mexico) because of the application of multiple rates and the narrowing of the base as a result of exemptions. Like in other regions of the world, the operation of the VAT has suffered from fraud, with fake credits and delays in paying the legitimate refunds to exporters and other taxpayers. Overall, even though the VAT has been performing well in the region, there is ample room to increase its yield. Excise taxation has been declining in importance in part due to the lack of indexation of specific rates. Finally, customs revenues have also declined as the result of international trade reforms, although revenues from export taxes are quite significant, at least in Argentina.

[11] Tax expenditures vary from about 1.4 percent for Brazil to 7.4 percent for Colombia (Gómez Sabaiani, Martner, and Berandi, 2007).

The Evolution of Tax Levels (tax-to-GDP ratio)

For decades, the Latin American region has been identified as a low tax pressure region compared to other regions of the world, with average levels even below much poorer African countries (Bird, Martinez-Vazquez, and Torgler, 2006). This has changed over the past decade, with fiscal pressure increasing from an average of 12 percent in the 1990s to an average of 18 percent in the 2000s, but is still less than half of the average tax pressure in OECD countries (Gómez Sabaini, Martner, and Bernardi 2007; Tanzi and Zee, 1997). However, these average figures mask important persistent differences in tax pressure across countries in the region, with persistent underperformers like Guatemala and Paraguay collecting less than 10 percent of GDP and countries like Mexico, which has consistently only been able to collect 12 percent of GDP for decades.[12] Gómez Sabaini, Martner, and Bernardi (2007) aptly classify the countries in the region into three groups:

- the relative high performers (Argentina, Brazil, Uruguay, Costa Rica), which had tax revenues (including Social Security contributions) as percent of GDP of 26.0 in 2005, with Brazil as high as 37.4 percent and Costa Rica at 20.5 percent;
- a middle group, with most countries having an average ratio in 2005 of 17.0 percent; and
- a lower group with a mean value of 11.7 percent, which includes Guatemala and Haiti both at 9.7 percent of GDP, as well as countries like Venezuela and Ecuador, which have significant non-tax revenues from natural resources, and Panama which has substantial non-tax revenues from the Panama Canal.

The improvements in the tax-to-GDP ratio in countries like Argentina, Bolivia, Colombia, and Nicaragua have generally been attributed to policy reforms, improvements in tax administration with the incorporation of information technology, and increases in international prices for those countries exporting natural resources, although this latter is only partially reflected in tax revenues and more so in non-tax revenues.

Typically the discussion of tax levels is accompanied by an analysis of tax effort. This latter is defined as the comparison of the actual taxes to those that a country would theoretically collect given its economic structure and if it were to use certain standards (average or maximum) of diligence in tax collection. In order to control for economic structure or availability of tax bases, typically GDP per capita, openness (exports plus imports to GDP ratio), value added in agriculture, population growth, etc., are used as control variables. Table 2 reports a recent

[12] See Martinez-Vazquez (2008) for a discussion of the "Mexican constant" tax pressure.

calculation of tax effort in Latin American countries by Cyan, Martinez-Vazquez, and Vulovic (2012) estimated by using a stochastic frontier approach.[13]

Table 2. Tax Ratio and Tax Effort for Selected Latin American Countries

Country	Revenues (tax and non-tax) (% of GDP)	Estimated revenue effort (collected over potential, %)
Argentina	27.13	85.85
Brazil	32.32	128.58
Bolivia	15.12	71.98
Chile	22.68	89.99
Colombia	17.66	86.40
Costa Rica	22.73	101.21
Dominican Republic	15.76	87.35
Ecuador	13.91	80.00
El Salvador	12.82	72.99
Guatemala	11.50	74.28
Honduras	14.66	83.89
Mexico	15.05	78.46
Nicaragua	19.85	125.30
Panama	15.97	69.14
Paraguay	12.31	68.82
Peru	17.87	74.80
Uruguay	22.73	103.53
World	26.12	87.00
OECD	41.24	87.00
Developing	21.76	87.00
Latin America and the Caribbean	18.96	87.00

Source: Cyan, Martinez-Vazquez, and Vulovic (2012).

It is notable how effort varies across countries, with Paraguay collecting at 68.8 percent of its potential, while Brazil, Nicaragua, Uruguay, and Costa Rica collect above their potential. Poor performance is generally explained by low buoyancy and elasticity in the tax system, a large underground economy, high levels of tax evasion, underperforming tax administration, high tax expenditures (multiple exemptions and deductions), and political reasons to keep tax effort low. In many cases, these are interconnected reasons present in many tax systems in the region, but obviously with quite different incidence and consequences.

[13] This study excluded countries with over 30 percent in total revenues coming from non-tax sources.

Identifying Tax Impacts

Review of the Empirical Literature on the Effects of Tax Policy on Economic Growth

Alongside the theoretical modeling of optimal taxation and the empirical literature on the determinants of tax effort, a separate base of literature has developed over the past several decades examining the impact of reliance on different tax instruments for different aspects of economic activity, including economic growth. Generally speaking, these empirical studies have found significant results for the effects of different tax instruments on growth. An earlier set of papers, including Atkinson and Stern (1980); Poterba, Rotemberg, and Summers (1987); Ocran (2011); and Easterly and Rebelo (1993), find small long-term effects of taxation on economic growth. On the other hand, more recent papers, including Martinez-Vazquez, Vulovic, and Liu (2011); Li and Sarte (2004); Kneller, Bleaney, and Gemmell (1999); and Padovano and Galli (2001), find strong significant effects of tax structure on growth.

More specifically, Kim (2003); Li and Sarte (2004); and Martinez-Vazquez, Vulovic, and Liu (2011) find evidence that greater reliance on consumption taxation, as opposed to income taxation, has significant positive effects on economic growth. Along similar lines, Kneller, Bleaney, and Gemmell (1999) suggest that in OECD countries, while income taxes reduce growth, consumption taxes do not. For the same group of countries, Wildman (2001) find similar evidence for personal income taxation, especially with higher progressivity, measured in terms of the long-run income elasticity of tax revenues. Wildman suggests that personal income tax progressivity affects growth not so much through accumulation of physical capital as through accumulation of human capital. Similarly, Li and Sarte (2004) find evidence that the decrease in progressivity associated with the *Tax Reform Act* of 1986 (*TRA-86*) in the United States led to small but non-negligible increases in U.S. long-run growth (from 0.12 to 0.34 percentage points).

More recently, using a sample of 70 countries, Gordon and Li (2009) find that higher corporate tax rates are associated with lower economic growth rates. Goolsbee (2004) suggests similar results for a wider sample of countries. Along similar lines, Arnold (2008) finds that both personal and corporate income taxes have significant negative effects on growth relative to using consumption and property taxes. The effect of corporate income tax is significantly more negative than that of personal income tax. Bird and Zolt (2005) and Tanzi, et al. (2008), on the other hand, argue that the limited role played by personal income tax in developing countries may restrict its effects on economic growth, which could easily be the case for Latin American countries.

The existing literature shows mixed results for the effect of consumption taxes on growth. While some authors, such as Emran and Stiglitz (2005), find negative effects, others, such as Rebelo (1992) and Mendoza, Milesi-Ferretti, and Asea (1997), find evidence that consumption taxes have no effect on the rate of economic growth, findings that are in line with Harberger's (1962) conclusions.

Besides the focus on economic growth, a number of papers have analyzed the impact of tax systems on income distribution. Li and Sarte (2004) find that the progressivity change associated with *TRA-86* in the United States had a significant effect on income inequality. More recently, using cross-country data, Weller (2007) and Duncan and Sabirianova Peter (2008) find positive effects of progressive taxation on income distribution. Martinez-Vazquez, Vulovic, and Liu (2011) find that the effect of the ratio between direct and indirect taxes on income inequality depends on the overall size of taxation. In countries with relatively smaller tax systems, the tax ratio tends to increase income inequality, whereas its negative (equalizing) effect increases with enlarged tax-to-GDP ratios.

In summary, there is increasing empirical evidence that the choice of tax systems can have significant consequences for economic growth and other important macroeconomic variables, such as income distribution. So far, knowledge of how the choice of tax system may have affected economic growth in Latin America has been lacking. In the sections below we address this question in depth.

Methodology

This section discusses the methodology and data that we use to examine the impact of tax policy on economic growth in Latin America. We apply two methodologies: VAR for individual country data and the system generalized method of moments (GMM) for panel data. The choice to use these two methodologies is related to the heterogeneity of the countries in the region and worldwide. While panel estimates give a regional perspective of the effects, single country analysis brings insights to the heterogeneity of the effects. We start the analysis with the VAR methodology, which allows us to identify the dynamic simultaneous effects of tax policies on economic growth for a single country. The advantages of using VAR over reduced form models are mainly related to the possibility of drawing policy implications of tax policy shocks on the dynamic behavior of economic growth in the context of a single country. However, the VAR approach can be used only for a few Latin American countries because of data availability.

The second part of the analysis of the relationship between tax policy and growth is a more aggregated approach, namely, the system GMM. Despite the level of aggregation, this approach allows us to derive more general conclusions based on the cross-country variations for the entire region. In order to investigate the relationship between tax policy and economic growth in Latin America, we use a sample of 19 Latin American countries[14] between 1990 and 2009.[15] However, some tax instruments, such as personal income tax, are underused in Latin American countries, and this sample may not capture the full dynamics of the effects of tax policy on growth. Thus, we expand the analysis to a larger worldwide sample of 81 developing and developed countries.[16] In this larger data set, we identify Latin American countries with a dummy variable. Using the worldwide sample also allows us to compare the results in Latin America with the rest of the world.

Data on the tax variables are extracted from the novel datasets of CIAT-IADB, the IMF GFS database, and the OECD revenue statistics, while data on control variables are taken from different sources, including the World Bank World Development Indicators, the Polity IV dataset, Schneider, Buehn, and Montenegro's (2010) dataset, and the World Tax Indicators dataset.[17] However, we acknowledge that low data coverage often significantly reduces the number of observations used in each regression.

Empirical Approach

Some recent literature argues that no single indicator sufficiently represents the fiscal policy stance of a government; therefore, it can be risky to attempt to estimate the impact of a single tax instrument while omitting the simultaneous effects of other important fiscal variables or sources of fiscal shocks. As suggested by Fu, et al. (2003), combinations of the related fiscal indicators

[14] Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

[15] While we acknowledge the small sample bias that can exist when estimating VAR, we chose this period for several reasons. Consistent data are not fully available for previous years. In addition, regional changes are more consistent since the 1990s in Latin America (Tanzi, Barreix, and Villela, 2008). Jarociński and Marcet (2010) argued that there is no single method to correct small sample bias; however, they proposed that excluding cyclical components would help to attenuate it.

[16] Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Finland, France, Germany, Greece, Guatemala, Honduras, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Latvia, Lithuania, Luxembourg, Madagascar, Mexico, Moldova, Mongolia, Morocco, Netherlands, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Tunisia, Ukraine, United Kingdom, United States, Uruguay, Venezuela, Vietnam, and Zambia.

[17] A full description of the variables used is provided in Table A.2 in the appendix.

(i.e., a set of taxes) may better capture fiscal policy actions, and using them simultaneously can yield plausible stable results that lend themselves to interpretation. In the first part of our analysis where we apply the VAR technique, we follow this approach and simultaneously control for our four selected tax instruments. The VAR permits us to simultaneously estimate the shocks from tax variables on growth for a single country. In addition, this approach allows us to capture linear interdependencies among multiple time series simultaneously. The VAR approach does not require expert structural knowledge of the relationships, which in the past had been used in structural models with simultaneous equations. Because of the limited availability of reliable data and the requirement of the VAR methodology for using complete time-series data, we perform the unrestricted VAR analysis of economic growth for only selected countries: Argentina, Brazil, Mexico, and Chile. Considering that each of the VAR equations contains *k* lag values, for the *t* period, we estimate the following system of equations:

$$GDPPCg_{it} = \alpha_i + \sum \alpha_j \, TAX_{it} + \varepsilon_{it}, i = 1, \dots, n, t = 1, \dots, T \; (1)$$

$$TAX_{it} = \alpha_i + \sum \alpha_i \, GDPPCg_{it} + \varepsilon_{it} \; (2)$$

where i indicates country and t denotes the time period. The variable $GDPPCg$ represents the GDP per capita growth rate, and TAX represents a vector of tax variables (personal income tax, corporate income tax, general taxes on goods and services, and revenues from natural resources), all measured as a percent of GDP. Equations (1) and (2) represent an unrestricted VAR system that aims to capture the relationship between tax policy and economic growth. Given that our interest is to examine the structural relationship between tax policy and economic growth, we apply the Hodrick-Prescott filter to the variables to exclude cyclical components.[18] In addition, before performing the estimation, unit root tests were carried out. Also, following Shepard and Harvey (1990), we carried out the estimations in levels to attenuate small sample bias. We did not choose a vector error correction approach for two reasons. First, the degrees of freedom were limited by the short span of the dataset. Second, only the set of tax variables is stationary and therefore the two series cannot be co-integrated. We also carried out lag selection tests and tested the stability of the system.

[18] This approach is not new and has been applied to study the effects of fiscal policies on growth (see Ocran [2011]; Aghion, et al. [2009]; Safdari, et al. [2011]; and Easterly and Rebelo [1993]; among others) and aims to exclude the cyclical components from the series and focus on the structural effect of the shock.

The estimated VAR system is used to simultaneously assess the impact of shocks to more than one variable in the system. The standard Cholesky decomposition is used to identify the structural shocks, where the shocks are normalized to two standard deviations of the structural form disturbances in the VAR systems. The Generalized Impulses, as defined by Pesaran and Shin (1998), generate an orthogonal set of innovations that do not depend on the VAR ordering. The generalized impulse responses from an innovation to the *j-th* variable are derived by applying a variable-specific Cholesky factor estimated with the *j-th* variable at the top of the Cholesky ordering. Consequently, we adopted the Generalized Impulses in estimating the responses of the identified policy variables as a result of shocks from the policy (tax) variables on economic growth.

To derive more general conclusions about the relationship between tax policy and economic growth in Latin America, we use the system GMM approach. We believe that this strategy provides more precise estimates of the effects of current tax policy on economic growth in Latin America. First, we apply this approach on the panel data set for only Latin American countries. However, by doing so, we potentially sacrifice capturing sample variation that we believe is highly relevant for the study. For this reason we perform the same estimations on an enlarged worldwide panel data set of developed and developing countries, with a dummy variable identifying Latin American countries. This allows us to estimate the potential effects on economic growth for Latin American countries for tax policy decisions that right now may be outside the experience in the region. For example, we could investigate the effect of much heavier use of personal income tax than is now the case in the region.

Therefore, to investigate the aggregate effect of tax policy on economic growth, we estimate the following equation with the Latin American sample only,

$$GDPPCg_{it} = \alpha_1 GDPPCg_{it-1} + \alpha_2 GDPPC_{i0} + \beta TAX_{it} + \gamma CONTROLg_{it} + \upsilon_i + \varepsilon_{it};\ i = 1, \dots, n, t = 1, \dots, T \quad (3)$$

When we use the worldwide sample, we estimate the following equation:

$$GDPPCg_{it} = \alpha_1 GDPPCg_{it-1} + \alpha_2 GDPPC_{i0} + \beta_1 TAX_{it} + \beta_2 TAX_{it} * LA_i + \gamma CONTROLg_{it} + \upsilon_i + \varepsilon_{it};\ i = 1, \dots, n, t = 1, \dots, T \quad (4)$$

Equations (3) and (4) posit that economic growth, measured by the GDP per capita growth rate ($GDPPCg$) for country i in year t, is a function of

- the economic growth rate in the previous year or the lagged dependent variable, which is included because economic growth is persistent over time;
- the GDP per capita at the beginning of the observation period (i.e., the convergence term);

- the tax variables of interest; and
- a set of control variables, $CONTROL$, that have been found in previous literature to be significant determinants of economic growth.

Based on data availability, we include the following control variables in the growth equation: income inequality (INEQ), globalization (GLOB), education (EDUC), unemployment (UNEM), inflation (INFL), perception of corruption (CORRUPT), quality of bureaucracy (BUREAU), size of shadow economy (SHADOW), urbanization (URBAN), and government size indicating the overall needs for financing (GOVTS). Also, υ_i are unobserved country fixed effects and ε_{it} are idiosyncratic errors. Finally, LA is a dummy variable that equals one when the country is in Latin America.

The estimation of equations (3) and (4) raises some potential econometric problems. First, the lagged dependent variable is correlated with the country-specific fixed effects, υ_i (Nickell, 1981). Moreover, using ordinary least squares (OLS) to estimate these two equations could produce biased results if the lagged dependent variable is correlated with other explanatory variables—the tax variables or the control variables (Baum, 2006). Second, the fiscal variables may not be strictly exogenous and therefore they could be correlated with the idiosyncratic errors, ε_{it}. Third, the time-invariant unobserved country fixed effects, υ_i, may be correlated with the explanatory variables.

To address these potential problems, we use the system GMM estimator, a methodology proposed by Blundell and Bond (1998) that augments the Arellano and Bond (1991) estimator. The Blundell and Bond estimator is designed for models with independent variables that are not strictly exogenous, with the presence of fixed effects and heteroscedasticity and autocorrelation within countries. The Blundell and Bond estimator augments Arellano and Bond (1991) by assuming that the first differences of the instrumenting variables are uncorrelated with the fixed effects. This allows the use of more instruments and improves efficiency. The Blundell and Bond estimator combines two equations, one in levels and one in first-differences. The equation in levels uses lagged first-differences as instruments for the endogenous variables, whereas the equation in first-differences uses lagged levels as instruments.

The significant advantage of the Blundell and Bond GMM estimator is that it helps overcome the potential problems listed above. The first differencing of equations (1) and (2) eliminates the country fixed effects because they do not vary over time. This solves the third problem (fixed effects) and the endogeneity of the lagged dependent variable (the first problem)

as long as the idiosyncratic errors, ε_{it}, are not serially correlated. In the level equation, differences in the instruments are used to make them exogenous to the fixed effects. Also by applying the GMM estimator, we overcome the potential problem of biased OLS estimates due to the lagged dependent variable being correlated with other explanatory variables.

The second problem of the tax variables being correlated with the idiosyncratic errors, ε_{it}, arises if there is reverse causality between economic growth and tax policies. For example, countries with faster growth may increasingly rely on direct taxes for equity or economic stability reasons. This means that tax policies may affect economic growth but also that growth may affect tax policies. Finding valid external instruments for all the different tax and government expenditure variables is a challenge. The Blundell and Bond GMM estimator helps overcome the potential endogeneity problem and the lack of external instrumental variables by instrumenting differences with levels and levels with differences.

Tax Variables

As mentioned above, we consider the following tax variables: personal income tax, corporate income tax, general taxes on goods and services, and revenues from natural resources, all measured as a percent of GDP. We also separately observe taxes on natural resources and non-tax revenues from natural resources (i.e., royalties)[19], as well as government size indicating the overall needs for financing. Government size is measured by total revenues to GDP.

Greater reliance on personal and corporate income taxes are generally thought to reduce growth because they introduce distortions in the allocation of resources and reduce economic incentives for work effort and investment. When evaluating the impact of personal income tax in a panel framework, it is important to take into account the level of progressivity. For that reason, when estimating equation (3), we interacted personal income tax revenue with a personal income tax progressivity measure constructed by Sabirianova Peter et al. (2010).[20] The progressivity measure is based on simulations of the countries' personal income tax systems, including information about statutory tax rates, tax brackets, country-specific tax legislation, basic

[19] Using natural resource taxes and royalties from natural resources separately does not, however, change our final results.

[20] For the VAR analysis of individual country cases for Argentina, Brazil, Mexico, and Chile, and the period between 1990 and 2009, there are no data on the progressivity in the personal income tax; therefore, we did not include progressivity measures in the VAR analysis.

allowances, standard deductions, tax credits, national surcharges, and local taxes. For the estimation we use Sabirianova Peter et al.'s average rate of progression variable. [21]

When assessing the impact of corporate income tax revenue, we believe it is important to take into account that the progressivity of corporate income tax on economic growth may be affected by countries' openness. In his seminal paper on the incidence of corporate income tax, Harberger (1962) shows that in a closed economy with two perfectly competitive sectors and fully mobile factors of production, imposing a tax on capital in one sector would cause capital to move from the taxed to the untaxed sector, further causing a reallocation of labor among the two sectors and changes in factor and output prices. Using elasticities typical for the U.S. economy, Harberger finds that, in these circumstances, all capital, and not just corporate capital, bears approximately the full burden of the corporate income tax. In his two more recent papers, Harberger (1995, 2006) revisits the incidence of corporate income tax in an open economy where capital can flow freely across international borders. In this setting, he found that the burden of corporate tax is more than fully shifted to labor. To account for these effects, we interacted the corporate income tax variable with a globalization index, measured by the KOF index (Dreher, 2006; Dreher, Gaston, and Martens, 2008), which takes values between 0 and 100 (a higher value meaning a greater degree of globalization).

The evidence on the impact of greater reliance on general taxes on goods and services, including VAT (and also turnover taxes and retail sales taxes), on economic growth is mixed. While distorting consumption versus savings decisions, reliance on taxes on goods and services rather than on income taxes reduces typical workers' and savers-investors marginal tax rates and may increase their incentive to work, save, and invest. Therefore, the sign on the coefficient for general taxes on goods and services in the growth equation could be positive or not significantly different from zero.

Finally, because of the nature of natural resources (i.e. inelastic supply), taxes on natural resources tend to be less or not at all distortionary. In addition, one of the main reasons to impose taxes on natural resources is to redistribute a share of natural resource wealth from enterprises to the population. If this redistribution is done in terms of productive spending in sectors such as

[21] Sabirianova Peter et al. (2010) derive the progressivity measure as follows. Average tax rates are first computed for each country for each year at 100 different levels of pre-tax income, which are evenly spread in the range from 4 to 400 percent of a country's GDP per capita. The average rates (for each country and each year) are then regressed on the log of the 100 income data points that are formed around per capita GDP. A country's tax structure in a particular year is interpreted as progressive, neutral, or regressive if the estimated slope coefficient is positive, zero, or negative.

education and infrastructure development, greater reliance on natural resource taxation is expected to have an additional positive impact on economic growth (Bluffstone, 1997).

Control Variables

In this section, we discuss the expected effect of control variables on economic growth. As we discussed above, we include the following control variables in the growth equation (5): gross domestic product growth, income inequality, globalization, education, unemployment, inflation, risk of corruption, quality of bureaucracy, size of shadow economy, urbanization, and government size.

Income inequality can be both beneficial and damaging to growth. On the one hand, higher income inequality could promote economic growth due to higher aggregate savings rates that may increase investments and growth rates (Lewis, 1954; Kaldor, 1955; Stiglitz, 1969). On the other hand, greater income inequality may harm growth because capital markets are less willing to lend funds to lower-income households, reducing aggregate lending and investment (Saint-Paul and Verdier, 1992; Galor and Zeira, 1993; Perotti, 1993). Moreover, greater income inequality may lead to social and political instability that could also discourage investments (Arjona, Ladaique, and Pearson, 2001).

Technological progress and globalization of trade and finances have been found to have growth enhancing effects (IMF, 2007). A higher level of education is expected to increase labor productivity. Similarly, higher unemployment is associated with a reduction in economic growth because it reduces the use of the available stock of human capital. Inflation is not only the most regressive tax but it is also highly distortionary. An increase in inflation, measured by the annual percent changes in consumer prices, reduces the level of business investment and the overall efficiency with which productive factors are put to use (Fischer, 1993). Corruption has generally been found to discourage investment and limit economic growth (Mauro and Driscoll, 1997). We measured corruption with the International Country Risk Guide's (ICRG) assessment of corruption within the political system. This variable takes values from 0 to 6, with a higher value indicating low risk of corruption.

Economic growth also depends on governance in terms of quality of the bureaucracy. In his monumental study "Economy and Society", Max Weber (1968) argues that bureaucracy is one of the institutional foundations of economic growth, and numerous empirical studies have

attempted to shed evidence on the "Weberian" hypothesis.[22] We measured the quality of bureaucracy by the ICRG's index that gives high points to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services and is independent of political pressure. In such environments, the rule of law protects property rights, leading to lower investments risks for investors, potentially leading to higher capital accumulation (Acemoglu, Johnson, and Robinson, 2005).

The empirical evidence of the effect of a shadow economy on economic growth is not conclusive. On the one hand, a larger shadow economy may negatively affect economic growth by reducing the availability of public services and by reducing the efficiency of existing public services (Loayza, 1996). On the other hand, the shadow economy may have positive effects on consumer expenditures (Bhattacharyya, 1993 and 1999). There is a significant body of literature on the positive role of urbanization in economic growth (see Davis and Henderson [2003] for a review of this literature). We measured urbanization by the percentage of population living in urban areas. Urban places provide physical infrastructure capital and managerial resources, and enhance information spillovers and knowledge accumulation, which are important factors for increasing capital productivity.

In addition, the size of government indicates not only the overall budget constraint and financing needs, but may also directly affect economic growth. Larger governments may be more able to invest in education and health, increasing the level of human capital (Lucas, 1988). Besides investing in basic social services, larger governments may be more able to invest in public infrastructure and research and development, both also important determinants of growth (Barro, 1990; Romer, 1990). On the other hand, a larger public sector may crowd out private investment and entrepreneurial activity and therefore retard growth (Afonso and Furceri, 2010). As indicated above, the size of government is measured by total revenues as a percent of GDP.[23]

Empirical Findings

We proceed now to discuss our empirical results. Table 3 shows the descriptive statistics for the Latin American sample and for the entire worldwide sample. Several features are worth highlighting. For Latin America, general consumption tax revenues are double of those from corporate income tax and far higher than the revenues from personal income tax. In contrast, for

[22] See, for example, Evans and Rauch, 1999.

[23] We obtain similar results by using total revenues (excluding grants from foreign governments and international organizations) to GDP and by using total tax to GDP.

the world sample, personal income tax revenues are as important as consumption taxes and almost double corporate income tax revenues. This heterogeneity shows the importance of contrasting the results from the Latin American sample with those of a larger worldwide sample. While there is quite a significant dispersion of growth rates, over the period 1990–2009, the region experienced positive economic growth; yet the average growth rate in the region has been slower than for the entire world sample.

Table 3. Descriptive Statistics (1990–2009)

Variable	Latin American sample		World sample	
	Mean	Std. dev.	Mean	Std. dev.
GDP per capita growth (GDPPCG)	2.44	3.67	3.05	3.38
GDP per capita	1942.80	10,125.70	9869.30	35,472.00
Inequality (INEQ)	50.70	8.64	38.78	11.03
Globalization Index (GLOB)	56.98	6.48	68.62	14.99
Unemployment (UNEM)	8.76	4.28	8.25	4.27
Corruption (CORRUPT)	2.69	0.88	3.57	1.41
Government Size (GOVTS)	18.00	5.15	32.43	14.06
Education (EDUC)	0.82	0.08	0.88	0.11
Inflation (INFL)	0.27	1.52	0.13	0.86
Urbanization (URBAN)	69.90	14.55	67.81	16.93
Bureaucracy (BUREAU)	1.92	0.65	2.80	1.07
Shadow Economy (SHADOW)	39.43	13.62	27.42	14.17
Personal Income Tax (PIT)	1.17	0.79	6.26	5.61
PIT Progressivity (PRGRS)	0.44	1.44	10.76	10.44
Corporate Income Tax (CIT)	2.49	1.54	2.84	1.61
Sales Tax (GTGS)	5.75	2.53	6.31	2.50
Natural Resource Revenues (NRES)	19.86	7.91		
Natural Resource Taxes (NRESTAX)	11.87	4.96		
Natural Resource Non-Tax Revenues (ROYAL)	6.26	3.62		

Source: Authors' estimations based on different sources.

Inequality and informality (the latter reflected in the size of the shadow economy) have prevailed in the region and are higher than in the world sample; the small dispersions accompanied by the high means show the magnitude of these problems in Latin America. Other institutional factors, such as corruption, bureaucracy, and government size, show significant dispersion in the Latin American sample, reflecting large disparities in the experiences across countries in the region.

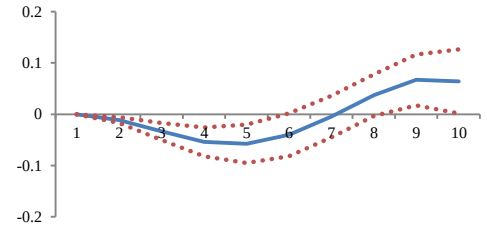
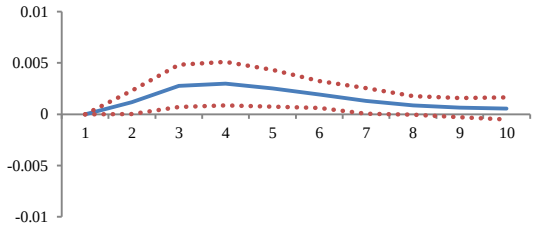
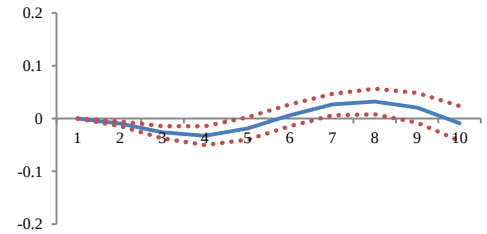
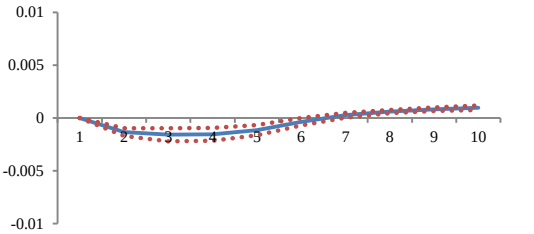
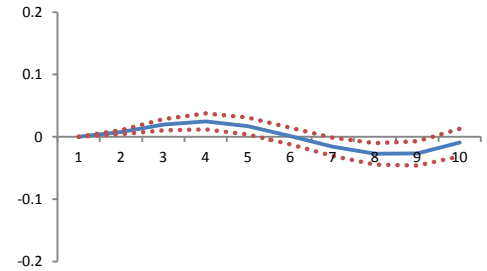
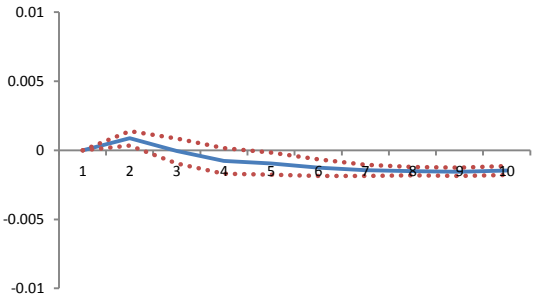
Turning now to our main interest, the effects of tax policy on economic growth, Figure 1 presents the VAR impulse response functions for individual countries, Table 4 presents the estimation results obtained by using the system GMM on only the sample of Latin American countries, and Table 5 presents the corresponding results obtained by using the worldwide sample. With few exceptions, the period of observation is between 1990 and 2009.

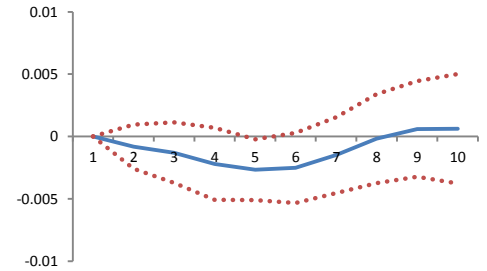
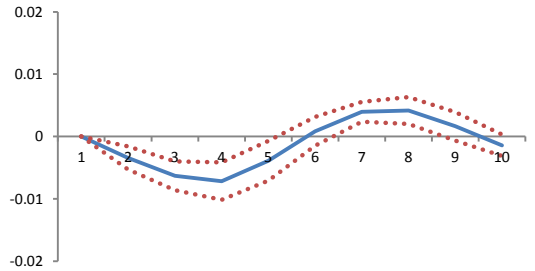
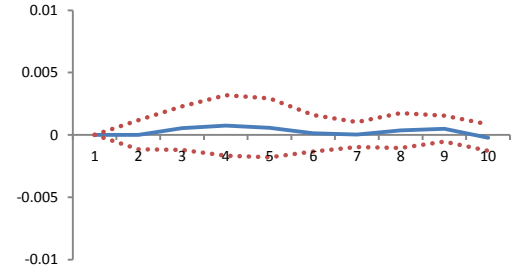
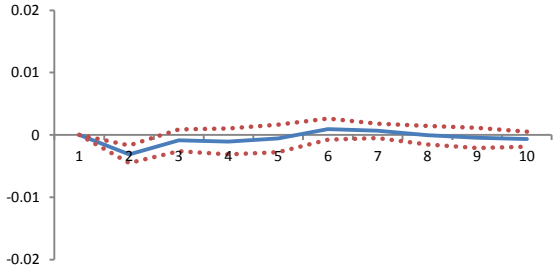
Single Country Results

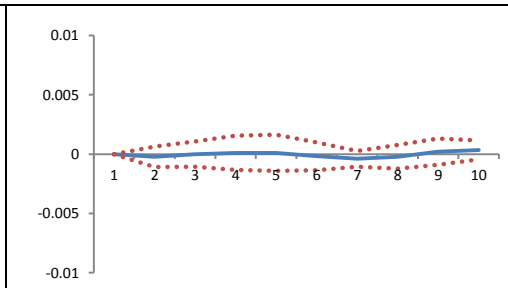
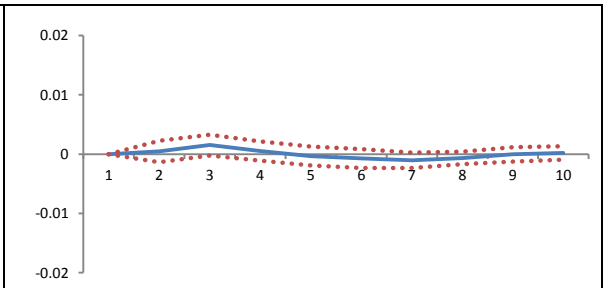
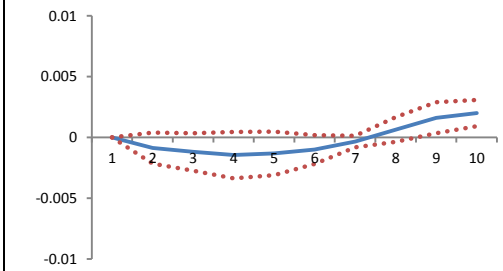
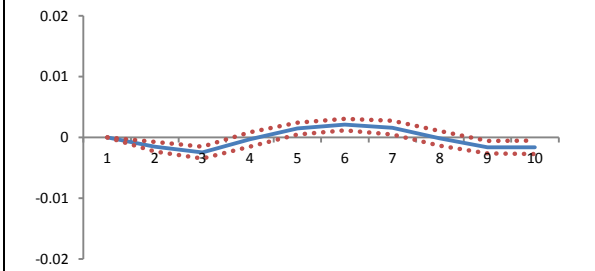
The results of the effect of personal income tax on economic growth from the in-country VAR estimations, shown in Figure 1, are generally in line with expectations. However, we highlight two qualifications: some heterogeneity and the overall small effect that personal income tax appears to have on economic growth. Following Lutkepohl and Reimers (1992), if a given shock generates a response path that returns to its previous equilibrium value of zero after some period, then it is referred to as temporary; on the other hand, if the response path does not return to the initial equilibrium, it is referred as permanent. Along these guidelines, all the shocks from personal income tax in the VAR analysis of the four specific countries can be characterized as temporary shocks. In Argentina, Mexico, and Brazil, a shock that increases collection of personal income tax by two standard deviations reduces economic growth in the short run, with a recovery and even a slight positive effect in the long run (more than 3 years).[24] The results for Chile are quite different. A slightly positive temporary shock is clear from the impulse response functions; however, this effect is not statistically significant or persistent. These results for individual country estimations using VAR are in line with those obtained with the panel estimations (see below), especially in the short run. Increases in collection of personal income tax have a negative effect on economic growth, yet it is very small for most of the countries and even insignificant in Chile.

[24] A word of caution should be noted since long run forecasting with small samples increases the errors and therefore the confidence interval.

Figure 1: Impulse Response Functions: Effects of Tax Instruments on Economic Growth (Response to Cholesky One S.D. Innovations +- 2 S.E.)

Tax Instrument	Argentina	Brazil
Corporate Income Tax		
Personal Income Tax		
Goods and Services Tax		

Tax Instrument	Chile	Mexico
Corporate Income Tax		
Personal Income Tax		

Goods and Services Tax		
Taxes on Natural Resources		

As described above, personal income tax has been remarkably unproductive in terms of revenue yield in most Latin American countries. This tax is definitely an area where the differences in revenue structure between Latin American and industrial countries has been the greatest. The VAR results showing the small effects that personal income tax has had on economic growth are likely to be directly related to its relatively minor role in Latin American countries. As discussed above, the relatively low revenues are due to several factors, including high levels of exemptions, tax evasion (mainly due to informality), and generally low tax rates.

In case of the corporate income tax, the single country impulse response functions show, for the most part, a long lasting small negative effect on economic growth. However, as in the case of personal income tax, some heterogeneity in the results is present. While growth in Argentina and Mexico seems to be more sensitive in the short run to changes in corporate tax, the changes in growth for Chile are much less significant.[25] Moreover, in Brazil, we found a very small but significant positive effect. In the long run, we did not find any significant effects. Note that for Argentina and Mexico, corporate income tax seems to lead to a slight positive impact after more than five years, which tends to be characteristic of small samples (Nickelsburg, 1985) like those in this study. In terms of size of the impacts, the impulse response functions show effects that are slightly larger than the ones for personal income tax. The negative effects found

[25] The shocks that are imposed are relative shocks that correspond to a standard deviation of the variables (i.e., corporate income taxes).

for corporate income tax are pretty much replicated for natural resource taxes. In the short run, we found slight but consistent negative effects of natural resource taxes that tend to disappear over time and become slightly positive (especially in Chile). Yet, the effects seem to be smaller and much less significant than those found for corporate income tax.

As was pointed out earlier in the paper, general consumption taxes (mainly the VAT) are very important in the tax system of Latin American countries. A VAT imposed on a broad base and with a single rate can be a very effective instrument for raising revenues with relatively small economic distortions and excess burden losses. The effects of greater reliance on the VAT on economic growth in the single country analysis tend to be fairly consistent. The estimates show small, not significant, and temporary short run positive effects of the shocks, especially in Mexico and Argentina, and to a lesser extent Brazil. Chile presents a slightly different scenario, with a fairly neutral effect in the short and long run. In sum, the effects of the VAT found in the VAR analysis tend to be small and positive in the short run and practically vanish in the long run.

Regional Panel Estimation Results

We turn now to our estimation results using panel data and the system GMM estimation. The results for the Latin American sample are provided in Table 4 and the results obtained with the larger international panel are provided in Table 5.

Table 4. Panel Estimations of the Effects of Taxation on Economic Growth *(Latin American sample)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$GDPPCG_{-1}$	-0.059	-0.111	-0.111	-0.053	-0.128**	-0.196*	-0.212**	-0.149**	-0.346***
	(0.058)	(0.070)	(0.070)	(0.058)	(0.058)	(0.103)	(0.103)	(0.071)	(0.066)
$GDPPC_0$	-0.001	-0.008***	-0.008***	-0.000	-0.002**	-0.012	-0.010	-0.007***	0.006
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.009)	(0.009)	(0.002)	(0.004)
INEQ	-0.007	-0.003	-0.002	-0.013	-0.029	0.017	0.027	-0.018	-0.045**
	(0.025)	(0.024)	(0.024)	(0.025)	(0.024)	(0.038)	(0.041)	(0.025)	(0.019)
GLOB	-0.102	-0.054	-0.057	-0.171**	-0.098	-0.045	-0.038	-0.251**	0.824***
	(0.063)	(0.069)	(0.072)	(0.076)	(0.060)	(0.128)	(0.131)	(0.101)	(0.140)
UNEM	-0.606***	-0.736***	-0.736***	-0.615***	-0.765***	-1.008***	-1.022***	-0.751***	-0.758***
	(0.111)	(0.125)	(0.125)	(0.111)	(0.110)	(0.222)	(0.223)	(0.127)	(0.185)
CORRUPT	-0.547*	-0.494	-0.495	-0.634**	-0.529*	-0.611	-0.520	-0.172	0.290
	(0.312)	(0.344)	(0.344)	(0.314)	(0.296)	(0.822)	(0.805)	(0.356)	(0.481)
GOVTS	0.148	0.050	0.043	0.105	-0.147	-0.028	-0.189	-0.172	-0.647**
	(0.123)	(0.133)	(0.142)	(0.140)	(0.134)	(0.382)	(0.461)	(0.156)	(0.307)
EDUC	17.383***	22.133***	22.334***	16.597***	16.577***	15.838	17.161	18.708***	51.687***
	(5.766)	(5.454)	(5.620)	(5.782)	(5.523)	(19.677)	(19.216)	(5.755)	(10.794)
INFL	-0.028	-0.328***	-0.327***	-0.020	-0.018	-1.850	-2.531	-0.328***	-20.939***
	(0.129)	(0.120)	(0.120)	(0.128)	(0.124)	(3.590)	(3.634)	(0.120)	(5.742)
URBAN	0.237*	-0.033	-0.036	0.246*	0.117	0.404	0.275	0.016	-1.565***
	(0.138)	(0.135)	(0.136)	(0.139)	(0.135)	(0.439)	(0.443)	(0.136)	(0.582)
BUREAU	0.029	1.412***	1.409***	-0.061	0.293	-1.423	-1.132	1.477***	-2.847***
	(0.434)	(0.438)	(0.438)	(0.452)	(0.423)	(1.105)	(1.137)	(0.436)	(0.997)
SHADOW	-0.470***	-0.489***	-0.477***	-0.415***	-0.493***	-0.257	-0.253	-0.420***	-0.509***
	(0.105)	(0.108)	(0.133)	(0.110)	(0.100)	(0.204)	(0.208)	(0.109)	(0.161)
PIT		-1.118	-0.835					-1.574**	-12.745***
		(0.717)	(2.037)					(0.725)	(3.120)
PIT*SHADOW			-0.007						0.168**
			(0.048)						(0.078)
PIT*PRGRS		0.844**	0.837**					1.024***	0.445
		(0.378)	(0.381)					(0.382)	(0.341)
CIT				-1.127				-2.806	16.581***
				(1.049)				(2.394)	(3.018)
CIT*GLOB				0.023				0.072*	-0.261***
				(0.017)				(0.042)	(0.052)
GTGS					1.132***			0.577*	5.252***
					(0.290)			(0.338)	(0.835)
NRES						0.256			-0.624**
						(0.259)			(0.256)
NRESTAX							0.472		
							(0.385)		
ROYAL							0.401		
							(0.290)		
Constant	-5.009	44.598***	44.344***	-3.944	11.906	-0.494	4.431	48.148***	54.054*
	(9.308)	(10.846)	(10.982)	(10.797)	(9.986)	(19.005)	(19.561)	(11.651)	(27.698)
Observations	200	129	129	200	197	75	75	129	41
Number of countries	19	16	16	19	19	7[2]	7[2]	16	5[3]
Sargan[1]	0.382	0.296	0.364	0.310	0.293	0.299	0.294	0.171	0.175
AR2[1]	0.186	0.172	0.178	0.280	0.223	0.194	0.152	0.284	0.235

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; [1] P-value; [2] Countries included: Bolivia, Chile, Colombia, Ecuador, Mexico, Peru, and Venezuela; [3] Dropped Colombia and Venezuela comparing to column 6.

Table 5. Panel Estimations of Taxation on Economic Growth *(worldwide sample)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDPPCG_{-1}$	0.276***	0.280***	0.253***	0.256***	0.214***	0.264***	0.231***
	(0.038)	(0.035)	(0.033)	(0.034)	(0.036)	(0.033)	(0.033)
$GDPPC_0$	0.017**	0.031**	0.030**	0.016	0.043***	0.001	0.014
	(0.008)	(0.013)	(0.014)	(0.014)	(0.013)	(0.014)	(0.014)
INEQ	-0.001	0.031	0.045**	-0.001	-0.016	0.035*	0.037**
	(0.022)	(0.020)	(0.019)	(0.019)	(0.020)	(0.018)	(0.018)
GLOB	-0.004	-0.005	0.003	-0.043	0.006	-0.036	-0.017
	(0.035)	(0.033)	(0.033)	(0.038)	(0.033)	(0.039)	(0.039)
UNEM	-0.100**	-0.055	-0.006	-0.105**	-0.120***	0.032	0.051
	(0.049)	(0.044)	(0.043)	(0.045)	(0.045)	(0.043)	(0.042)
CORRUPT	0.181	0.233	0.288*	0.163	0.172	0.364**	0.361***
	(0.173)	(0.152)	(0.148)	(0.157)	(0.150)	(0.144)	(0.140)
GOVTS	0.108**	0.094*	0.083	0.055	0.016	-0.046	-0.030
	(0.051)	(0.054)	(0.051)	(0.049)	(0.053)	(0.055)	(0.054)
EDUC	13.417***	14.765***	14.755***	14.794***	12.309***	13.078***	13.212***
	(4.179)	(3.897)	(3.761)	(3.863)	(3.914)	(3.880)	(3.761)
INFL	0.135	-0.203*	-0.240**	0.127	0.179*	-0.221**	-0.251**
	(0.115)	(0.113)	(0.108)	(0.106)	(0.107)	(0.105)	(0.102)
URBAN	-0.044	-0.198***	-0.146**	0.003	-0.119*	-0.097	-0.080
	(0.070)	(0.069)	(0.068)	(0.067)	(0.069)	(0.068)	(0.066)
BUREAU	0.196	0.591**	0.950***	0.124	0.292	0.805***	1.003***
	(0.283)	(0.273)	(0.266)	(0.277)	(0.275)	(0.266)	(0.260)
SHADOW	-0.141**	-0.057	-0.184**	-0.130**	-0.207***	-0.065	-0.239***
	(0.063)	(0.062)	(0.078)	(0.060)	(0.058)	(0.060)	(0.076)
PIT		-0.510***	-0.936***			-0.089	-0.683***
		(0.159)	(0.182)			(0.125)	(0.166)
PIT*LA		-1.738***	2.006			-2.125***	-0.170
		(0.670)	(1.554)			(0.624)	(1.538)
PIT*SHADOW			0.027***				0.028***
			(0.006)				(0.005)
PIT*SHADOW *LA			-0.109***				-0.061*
			(0.036)				(0.035)
PIT*PRGRS		0.006***	0.006***			0.005***	0.007***
		(0.002)	(0.002)			(0.002)	(0.002)
PIT*PRGRS*LA		0.533	0.462			0.955***	0.636**
		(0.380)	(0.325)			(0.315)	(0.313)
CIT				-1.081*		-1.291**	-1.141**
				(0.633)		(0.555)	(0.539)
CIT*LA				1.771**		6.330***	4.920***
				(0.881)		(1.478)	(1.470)
CIT*GLOB				0.014*		0.019***	0.016**
				(0.008)		(0.007)	(0.007)
CIT*GLOB*LA				-0.020		-0.077***	-0.056**
				(0.013)		(0.024)	(0.024)
GTGS					0.013	0.403**	0.381**
					(0.200)	(0.178)	(0.173)
GTGS *LA					0.810***	-0.469	-0.337
					(0.278)	(0.325)	(0.316)
Constant	-7.986**	-13.489***	-13.942***	-6.477	-10.115**	-3.113	-5.372
	(3.490)	(4.916)	(4.852)	(5.691)	(4.940)	(5.950)	(5.875)
Observations	598	507	507	634	621	496	496
Number of countries	75	74	74	80	79	72	72
Sargan[1]	0.282	0.266	0.264	0.210	0.193	0.229	0.274
AR2[1]	0.126	0.142	0.118	0.180	0.123	0.174	0.192

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; [1] P-value

The system GMM results for the Latin American sample (Table 4) show that personal income tax has the expected negative impact on economic growth. However, the existing level of progressivity of personal income tax in Latin America does not significantly influence the effect of this tax on economic growth. This latter result is not surprising considering that the average progressivity index for personal income tax in Latin American countries is 0.44 while in the worldwide sample it is 14.65. But these results should be evaluated with caution because they are not robust to changes in specification. More importantly, the estimated coefficients for the personal income tax using the worldwide sample in Table 5 are negative, as found in previous studies.

While we cannot conclude that personal income tax in Latin America has had any significant harmful effects on economic growth thus far, we could also argue that, based on the wider international experience, there is a compelling case for anticipating potential negative effects of this tax on economic growth if Latin American countries were to make wider use of it. To put the results in perspective we need to remember that the average share of personal income tax in GDP in Latin American countries included in our analysis is 1.17 percent, while the average in the worldwide sample is 6.26 percent. This comparison highlights the potential gains of using the out of sample estimation strategy that is shown in Table 5. From the results in Tables 4 and 5, we also found that, in the presence of the informal sector, personal income tax has significant effect on economic growth in Latin America and in the rest of the world. However, unlike the rest of the world where the presence of the shadow economy seems to have a positive but small effect on economic growth, in Latin America this effect appears to be negative and larger, though this result is not robust to changes in specification.

For the corporate income tax in the regressions for the Latin American sample (Table 4) we found non-robust, slightly positive (considering the mean of the globalization index for the region) and statistically insignificant effects on economic growth. These results largely overlap with those obtained from the VAR analysis. However, these results are not robust to the inclusion of revenues from natural resources in the regression. In this case, the estimated coefficients change in magnitude and sign.[26] In the estimations in Table 5 using the worldwide sample, the general impact of corporate income tax on economic growth is negative and statistically significant, as expected. However, this effect is positive and highly significant for Latin American countries, as identified with the interaction term with the dummy variable. Here

[26] In fact, inclusion of revenues from natural resources reduces the sample size by around 60 percent.

again we confront a Latin American exception that is difficult to interpret. Even though the region has higher levels of tax evasion and informality compared to other regions of the world (IDB, 2010), it is far from clear how these factors may interact to produce the observed results.[27] These results of positive or no effect of corporate income tax on economic growth in Latin America are too persistent across estimation approaches and samples to be simply brushed aside. Another differential factor of corporate income tax in Latin America compared to the rest of the world, as we pointed out in in the review of tax systems above, is the heavy presence of revenues from the extraction of natural resources or other geographical advantages such as the Panama Canal. Thus, we could speculate that increases in corporate tax revenues in GDP are associated with periods of increased exports of natural resources and overall economic growth.

For the interaction of corporate income tax with the level of globalization, Table 5 shows a positive and significant coefficient for the worldwide sample. This means that the negative effect of corporate tax on economic growth for the worldwide sample is attenuated by the openness of the economy. The estimated effect of the interaction of corporate income tax with openness of the economy for Latin America also has an unexpected sign, which is opposite to the rest of the world. This effect may be due to the fact that an increase in globalization in Latin America may mean more inflows of capital, rather than outflows. Nevertheless, this effect is not very large in magnitude—a 1 percentage point increase in globalization leads to a reduction of around 0.05 percentage points in the effect of corporate income tax on economic growth.

To further investigate the reasons behind the estimated positive sign for corporate income tax on growth in Latin America and to make sure that it does not originate in not-controlled-for endogeneity, we applied an instrumental variables approach. For instruments for each tax policy variable we used the following formula:

$$TaxIV_{it} = \frac{1}{\sum_{j=1}^{n} \frac{1}{d_j}} \sum_{j=1}^{n} \frac{1}{d_j} Tax_{jt}; i \neq j; t = 1, \dots, T$$

[27] De Mooij and Nicodeme (2007) explain that the positive effect of the corporate income tax to GDP ratio on growth may happen because of the negative relationship between statutory corporate tax rates and revenues. In a sample of 14 "old" European Union member countries (excluding Luxembourg) between 1985 and 2004, they found that a 1 percentage point increase in the statutory corporate tax rate results in a fall in corporate tax to GDP ratio by 0.03. Hence, corporate income tax as a share of GDP may have a positive effect on economic growth because of a growth enhancing reduction in statutory corporate tax rates.

That is, we instrument each tax policy variable with the weighted average of the same variable for all other countries in the sample, where the weights are the inverse of the distance d_j between the two largest cities of countries i and j. The underlying intuition for using these instruments is that economic growth in other countries should have no effect on the design of the tax system in the country in question.

However, using the instrumental variables methodology does not satisfactorily resolve the puzzle of the unexpected sign for corporate income tax for the Latin American sample. Only when we use the worldwide sample do we find a negative effect of corporate tax on economic growth in Latin America. When we focus only on the Latin American sample, we still obtain the unexpected positive sign for corporate income tax. [28,]

Our panel estimation results for the Latin American sample generally support the hypothesis that the more intensive use of consumption taxes has a positive effect on economic growth in Latin America (see Table 4 above) [29]. For the worldwide sample, the estimated coefficient for all countries is positive and significant, also indicating a positive effect of the use of this form of taxation on economic growth (see Table 5 above). Note that in Table 5 the coefficient for the interaction term with the Latin American dummy is negative but not statistically significant, meaning that no differential effect exists for Latin American countries compared to the worldwide sample. Thus, the results strongly suggest that greater reliance on consumption taxes has been beneficial for economic growth in Latin America, despite the fact that Latin American countries already rely quite extensively on consumption taxes.

Finally, our results suggest a positive but statistically insignificant effect of revenues from natural resources on economic growth in Latin America (Column 6, Table 4). This result largely coincides with our results in the single country VAR analysis. Note that given that we do not have data on taxes on natural resources for countries outside of Latin America, we do not include this variable in the panel regression when we use the worldwide sample (Table 5).

[28] We present these results in Table A.4 of the Appendix.

[29] We experimented with several other approaches to further examine this issue. For example, we also estimated equations 3 and 4 by using the top marginal tax rates for personal and corporate income taxes and the standard VAT rates instead of the tax to GDP ratios, but fundamentally we obtained similar results.

Conclusions and Policy Implications

This paper examined the effects of taxation policy on economic growth in Latin America. In the empirical analysis we used two empirical approaches. First, we used VAR analysis for Argentina, Brazil, Chile, and Mexico. This approach is constrained by data availability for other countries in the region. Second, we used panel data analysis for the Latin American region alone and also for a larger worldwide sample of developed and developing countries, identifying Latin American countries with a dummy variable. This combination of approaches allowed us to probe the robustness of the effects we found and to navigate a tradeoff between more precise estimates for the Latin American region and exploiting greater heterogeneity in tax levels and tax structures across countries.

While similar in their core structure, Latin American tax systems differ across countries with respect to tax structure, the efficiency of collections, and tax effort levels. Despite these differences, there are certain characteristics that are common to the region, including the relative complexity of the tax structures, the frequent use of heterodox forms of taxation, high levels of tax evasion, generally low levels—by international standards—of tax revenues to GDP, significant reliance on general consumption taxes, and lower reliance on personal income taxation relative to industrial countries.

Overall, our empirical results suggest that, for the most part, personal income taxation has not had any significant negative effects on economic growth. This finding is somewhat expected given the relatively small importance of this tax in the region. However, the regression results using the worldwide sample indicate that at higher levels of taxation, personal income tax could have significant negative effects on economic growth in Latin America.

In the case of corporate income tax, our results, which are quite robust, suggest that the negative effects of this tax on economic growth observed in other regions of the world are not generally present in Latin America or are quite the opposite. However, there is some heterogeneity in the results. Using VAR analysis for individual countries, we detect small negative temporary shocks to economic growth associated with higher corporate income tax in Argentina, Mexico, and Chile. The positive or no effect of heavier reliance on corporate income tax on economic growth in Latin American countries remains an unexplained puzzle. A possible explanation could be the heavy dependence of corporate tax revenues in the region on the profits generated by natural resource industries. However, our analysis of the available data does not confirm this conjecture.

In case of the consumption taxes, our results strongly suggest that larger reliance of Latin American countries on this form of taxation has been a source of economic growth. As for revenues from natural resource, our results do not provide strong evidence that this source of revenue has been beneficial for economic growth in Latin America, but that may be because of a very small sample of countries for which we had the necessary data availability.

These conclusions should be placed in a wider framework of the portfolio of economic policy objectives pursued by most governments. Even though the heavier reliance on indirect taxation has been more conducive to growth, this choice probably has had adverse effect on other important economic objectives, such as income redistribution and poverty reduction.

A final word of caution must also be added regarding the potential caveats in our findings. In the paper we have made it clear that there are still very significant limitations in the data needed to econometrically disentangle the complex relationships between tax policy choices and economic growth. As more data become available, further research will be needed to improve our understanding of how tax policy affects the prospects for economic growth in the Latin American region.

References

Acemoglu, D., Johnson, S., and Robinson, J.A. 2005. "Institutions as the Fundamental Cause of Long-run Growth." In: P. Aghion and S.N. Durlauf (Eds.), *Handbook of Economic Growth*, Volume 1: Elsevier.

Afonso, A., and Furceri, D. 2010. "Government Size, Composition, Volatility and Economic Growth." *European Journal of Political Economy*, 26(4):517–32.

Aghion, P., Hemous, D., and Kharroubi, E. 2009. "Credit Constraints, Fiscal Policy and Industry Growth." NBER Working Paper Series. Working Paper No. 15119. Cambridge, MA: NBER.

Arellano, M., and Bond, S. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *The Review of Economic Studies* 58(2): 277–97.

Arnold, J. 2008. "Do Tax Structures Affect Aggregate Economic Growth? Empirical Evidence from a Panel of OECD Countries." OECD Economics Department Working Papers. Washington, DC: OECD.

Arjona, R., Ladaique, M., and Pearson, M. 2001. "Growth, Inequality and Social Protection." OECD Labour Market and Social Policy Occasional Papers, 51. Washington, DC: OECD.

Atkinson, A.B., and Stern, N.H. 1980. "On the Switch from Direct to Indirect Taxation. *Journal of Public Economics* 14(2):195–224.

Barro, R.J. 1990. "Government Spending in a Simple Model of Endogeneous Growth." *Journal of Political Economy* 98(5):S103–25.

Baum, C.F. 2006. *An introduction to Modern Econometrics Using Stata.* College Station, Texas: Stata Press.

Bhattacharyya, D.K. 1993. How Does the 'Hidden Economy' Affect Consumer Expenditures?" An Econometric Study of the U.K. (1960–84). Berlin: International Institute of Public Finance.

Bhattacharyya, D.K. 1999. "On the Economic Rationale of Estimating the Hidden Economy." *The Economic Journal* 109(456): 348–59.

Bird, R., Martinez-Vazquez, J., and Torgler, B. 2006. "Societal Institutions and Tax Effort in Developing Countries." In: J. Alm, J. Martinez-Vazquez, and M. Rider (eds.), *The Challenges of Tax Reform in the Global Economy*. New York, NY: Springer.

Bird, R. and Zolt, E. 2005. “The Limited Role of the Personal Income Tax in Developing Countries.” *Journal of Asian Economics* 16: 928–46.

Bluffstone, R. 1997. “What Tax is Best? The Economics of Natural Resource Taxation in Lithuania.” HIID, Environment Discussion Paper No. 14. Cambridge, MA: Harvard Institute for International Development.

Blundell, R., and Bond, S. 1998. “Initial Conditions and Moment Restrictions in Dynamic Panel Data Models.” *Journal of econometrics* 87(1): 115–43.

Castelletti, B. 2008. “Taxes in Latin America: Do Wealth and Inequality Matter?” OECD Development Centre Policy Insights. Washington, DC: OECD.

Cyan, M., Martinez-Vazquez, J., and Vulovic, V. 2012. “Measuring Tax Effort: How Much Does the Estimation Approach Matter” Paper prepared for the Conference on “Taxation and Development: The Weakest Link (Essays in Honor of Roy Bahl).” Stone Mountain, Georgia, September 13–15, 2012.

Davis, J.C., and Henderson, J.V. 2003. “Evidence on the Political Economy of the Urbanization Process.” *Journal of Urban Economics* 53(1): 98–125.

De Mooij, R and Nicodeme, G. 2007. "Corporate Tax Policy, Entrepreneurship and Incorporation in the EU." European Economy - Economic Papers 269, Directorate General Economic and Monetary Affairs (DG ECFIN). Brussels, Belgium: European Commission.

Dreher, A. 2006. “Does Globalization Affect Growth? Evidence from a New Index of Globalization.” *Applied Economics* 38(10): 1091–110.

Dreher, A., Gaston, N., and Martens, W. J. M. 2008. *Measuring Globalisation: Gauging its Consequences*. New York, NY: Springer.

Duncan, D., and Sabirianova Peter, K. 2008. “Tax Progressivity and Income Inequality.” Andrew Young School of Policy Studies Research Paper 08-26. Atlanta, GA: Georgia State University.

Easterly, W., and Rebelo, S. 1993. “Fiscal Policy and Economic Growth.” *Journal of Monetary Economics* 32(3): 417–58.

Emran, M. S., and Stiglitz, J. E. 2005. “On Selective Indirect Tax Reform in Developing Countries.” *Journal of Public Economics* 89: 599–623.

Evans, P., and Rauch, J. E. 1999. “Bureaucracy and Growth: A Cross-National Analysis of the Effects of ‘Weberian’ State Structures on Economic Growth.” *American Sociological Review* 64(5): 748–65.

Fischer, S. 1993. “The Role of Macroeconomic Factors in Growth.” *Journal of Monetary Economics* 32(3): 485–512.

Fu, D., Taylor, L. L., Yücel, M. K., and Dallas, F. R. B. O. 2003. “Fiscal Policy and Growth.” Dallas, TX: Federal Reserve Bank of Dallas.

Galor, O., and Zeira, J. 1993. “Income Distribution and Macroeconomics.” *The Review of Economic Studies* 60(1): 35–52.

Goolsbee, A. 2004. “The Impact of the Corporate Income Tax: Evidence from State Organizational Form Data.” *Journal of Public Economics* 88(11): 2283–99.

Gómez Sabaini, J. C., Martner, R., and Bernardi, L. 2007. “Taxation Structure and Main Tax Policy Issues.” CEPAL - Serie Macroeconomía del desarrollo N° 118. Santiago, Chile: Economic Commission for Latin America and the Caribbean (ECLAC).

Gordon, R., and Li, W. 2009. “Tax Structures in Developing Countries: Many Puzzles and a Possible Explanation.” *Journal of Public Economics* 93(7–8): 855–66.

Harberger, A. C. 1962. “The Incidence of the Corporation Income Tax.” *Journal of Political Economy* 70(3): 215–40.

———. 1995. “The ABCs of Corporation Tax Incidence: Insights into the Open Economy Case.” In *Tax Policy and Economic Growth: Proceedings for a Symposium*. Washington, DC: American Council for Capital Formation.

———. 2006. “Corporate Tax Incidence: Reflections on What Is Known, Unknown and Unknowable.” In: J.W. Diamond and G.R. Zodrow (Eds.), *Fundamental Tax Reform: Issues, Choices, and Implications.* Cambridge, MA: MIT Press.

IDB (Inter-American Development Bank). 2010. *The Age of Productivity: Transforming Economies from the Bottom Up*. Washington, DC: Inter-American Development Bank.

IMF (International Monetary Fund) 2007. *World Economic Outlook, October 2007: Globalization and Inequality*. Washington DC: International Monetary Fund.

Jarociński, M., and Marcet, A. 2010. “Autoregressions in Small Samples, Priors about Observables and Initial Conditions.” Washington, DC: European Central Bank.

Kaldor, N. 1955. “Alternative Theories of Distribution.” *The Review of Economic Studies* 23(2): 83–100.

Kim, Y. 2003. “Income Distribution and Equilibrium Multiplicity in a Stigma-based Model of Tax Evasion.” *Journal of Public Economics* 87(7–8): 1591–616.

Kneller, R., Bleaney, M. F., and Gemmell, N. 1999. “Fiscal Policy and Growth: Evidence from OECD Countries.” *Journal of Public Economics* 74(2): 171–90.

Lewis, W. A. 1954. “Economic Development with Unlimited Supplies of Labour.” *The Manchester School* 22(2): 139–91.

Li, W., and Sarte, P. 2004. “Progressive Taxation and Long- run Growth.” *American Economic Review* 94(5): 1705.

Loayza, N. V. 1996. “The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America.” *Carnegie-Rochester Conference Series on Public Policy* 45(0): 129–62.

Lucas Jr., R. E. 1988. “On the Mechanics of Economic Development.” *Journal of Monetary Economics* 22(1): 3–42.

Lutkepohl, H. and Reimers, H. 1992. “Granger-causality in Cointegrated VAR Processes: The Case of the Term Structure.” *Economics Letters* 40(3): 263–68.

Martinez-Vazquez, J. 2008. “Evaluating Mexico’s Tax System.” In: B. Moreno-Dodson and Q. Wodon (eds.), *Public Finance for Poverty Reduction: Concepts and Case Studies from Africa and Latin America*. Washington, DC: The World Bank.

Martinez-Vazquez, J., Vulovic, V., and Liu, Y. 2011. “Direct versus Indirect Taxation: Trends, Theory and Economic Significance.” In: E. Albi and J. Martinez-Vazquez (eds.), *The Elgar Guide to Tax Systems*. Northampton, MA: Edward Elgar Publishing Limited.

Mauro, P., and Driscoll, D.D. 1997. *Why Worry About Corruption?* Washington, DC: International Monetary Fund.

Mendoza, E.G., Milesi-Ferretti, G.M., and Asea, P. 1997. “On the Ineffectiveness of Tax Policy in Altering Long-run Growth: Harberger's Superneutrality Conjecture.” *Journal of Public Economics* 66(1): 99–126.

Nickell, S. 1981. “Biases in Dynamic Models with Fixed Effects.” *Econometrica*, 49(6): 1417–26.

Nickelsburg, G. 1985. “Small-Sample Properties of Dimensionality Statistics for Fitting VAR Models to Aggregate Economic Data: A Monte Carlo Study.” *Journal of Econometrics* 28(2): 183–92.

Ocran, M.K. 2011. “Fiscal Policy and Economic Growth in South Africa.” *Journal of Economic Studies* 38(5): 604–18.

Padovano, F., and Galli, E. 2001. “Tax Rates and Economic Growth in the OECD Countries.” *Economic Inquiry* 39(1): 44–57.

Perotti, R. 1993. “Political Equilibrium, Income Distribution, and Growth.” *The Review of Economic Studies* 60(4): 755–76.

Pesaran, H.H., and Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics letters*, 58(1):17–29.

Poterba, J.M., Rotemberg, J.J., and Summers, L.H. 1987. “A Tax-Based Test for Nominal Rigidities.” Cambridge, MA: National Bureau of Economic Research.

Profeta, P., Puglisi, R., and Scabrosetti, S. 2009. “Does Democracy Affect Taxation? Evidence from Developing Countries.” Societa Italiana di Economia Pubblica. Pavia: Italy.

Profeta, P., and Scabrosetti, S. 2008. “Political Economy Issues of Taxation.” In L Bernardi, A. Barreix, A. Marenzi, and P. Profeta (eds.), *Tax Systems and Tax Reforms in Latin America*. New York, NY: Routledge.

Rebelo, S. T. 1992. “Long-run Policy Analysis and Long-run Growth.” Cambridge, MA: National Bureau of Economic Research.

Romer, P. M. 1990. “Endogenous Technological Change.” *Journal of Political Economy* 98(5): S71–S102.

Saint-Paul, G., and Verdier, T. 1992. “Historical Accidents and the Persistence of Distributional Conflicts.” *Journal of the Japanese and International Economies* 6(4): 406–22.

Sabirianova-Peter, K., P. Buttrick, and D. Duncan. 2010. “Global Reform of Personal Income Taxation, 1981–2005: Evidence from 189 Countries.” *National Tax Journal* 63(3): 447–78.

Safdari, M., Mahmoodi, M., and Mahmoodi, E. 2011. “The Causality Relationship between Export and Economic Growth in Asian Developing Countries.” *American Journal of Scientific Research* (25): 40–5.

Schneider, F., Buehn, A., and Montenegro, C. E. 2010. “Shadow Economies All Over the World: New Estimates for 162 Countries from 1999 to 2007.” World Bank Policy Research Paper Series 5356. Washington, DC: World Bank.

Shephard, Neil G., and Andrew C. Harvey. 1990. “On the Probability of Estimating a Deterministic Component in the Local Level Model.” *Journal of Time Series Analysis* 11: 339–47.

Stiglitz, J. E. 1969. “Distribution of Income and Wealth among Individuals.” *Econometrica* 37(3): 382–97.

Tanzi, V., Barreix, A., and Villela, L. 2008. *Taxation and Latin American Integration*. Cambridge, MA: Harvard University, David Rockefeller Center for Latin American Studies.

Tanzi, V., and Zee, H. H. 1997. “Fiscal Policy and Long-run Growth.” International Monetary Fund Staff Papers, 179–209. Washington, DC: International Monetary Fund.

Weber, M. 1968. *Economy and Society*. New York, NY: Bedminster.

Weller, C. E. 2007. “The Benefits of Progressive Taxation in Economic Development.” *Review of Radical Political Economics* 39(3): 368–76.

Wildman, J. 2001. “The Impact of Income Inequality on Individual and Societal Health: Absolute Income, Relative Income, and Statistical Artifacts. *Health Economics* 10(4): 357–61.

Appendix

Table A.1: Var Tests

Argentina

VAR Lag Order Selection Criteria
Endogenous variables: GDPPCG_TREND CIT_TREND GTGS_TREND PIT_TREND
Sample: 1990 2010
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
0	89.75930	NA	1.34e-09	-9.084367	-8.688646	-9.029802
1	315.3999	32.8542	1.13e-19	-32.37777	-31.19061	-32.21408
2	435.7483	106.9763*	1.66e-24	-43.97203*	-47.99342*	-43.69921
3	511.1918	33.53048	1.03e-26*	-43.57687	-46.80683	-50.19492*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: GDPPCG_TREND CIT_TREND GTGS_TREND PIT_TREND
Sample: 1990 2010
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
0	89.75930	NA	1.34e-09	-9.084367	-8.688646	-9.029802
1	315.3999	300.8542	1.13e-19	-32.37777	-31.19061	-32.21408
2	435.7483	106.9763*	1.66e-24	-53.97203	-47.99342*	-43.69921
3	511.1918	33.53048	1.03e-26*	-50.57687*	-47.80683	-50.19492*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Brazil

VAR Lag Order Selection Criteria
Endogenous variables: GDPPCG_TREND PIT_TREND GTGS_TREND CIT_TREND
Sample: 1990 2010
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC
0	131.2836	NA	1.33e-11	-13.69817	-13.30245
1	369.5738	317.7203	2.76e-22	-38.39709	-37.20993
2	440.0974	62.68764	1.02e-24	-54.45527*	-42.47666
3	542.4669	45.49756*	3.20e-28*	-54.05188	-51.28183*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: GDPPCG_TREND PIT_TREND GTGS_TREND CIT_TREND
Sample: 1990 2010
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC
0	131.2836	NA	1.33e-11	-13.69817	-13.30245
1	369.5738	317.7203	2.76e-22	-38.39709	-37.20993
2	440.0974	62.68764	1.02e-24	-54.45527*	-42.47666
3	542.4669	45.49756*	3.20e-28*	-54.05188	-51.28183*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Mexico

VAR Lag Order Selection Criteria
Endogenous variables: GDPPCG_TREND PIT_TREND GTGS_TREND CIT_TREND
Sample: 1990 2010
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
0	84.35323	NA	1.56e-09	-8.928136	-8.730276	-8.900854
1	320.7656	341.4845	3.83e-20	-33.41840	-32.42909	-33.28198
2	454.4421	133.6765*	1.12e-25	-49.49357	-44.71282	-46.24803
3	498.5397	24.49865	1.52e-26*	-49.61552*	-47.04333*	-49.26085*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Chile

VAR Lag Order Selection Criteria
Endogenous variables: GDPPCG_TREND CIT_TREND GTGS_TREND PIT_TREND
Sample: 1990 2010
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
0	55.28912	NA	3.94e-08	-5.698791	-5.500930	-5.671508
1	314.3865	374.2518	7.77e-20	-32.70961	-31.72031	-32.57320
2	389.0410	74.65448	1.60e-22	-59.22678*	-37.44603	-38.98124
3	460.6859	39.80271*	1.02e-24*	-45.40954	-42.83736*	-45.05487*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: GDPPCG_TREND CIT_TREND GTGS_TREND PIT_TREND
Sample: 1990 2010
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
0	55.28912	NA	3.94e-08	-5.698791	-5.500930	-5.671508
1	314.3865	374.2518	7.77e-20	-32.70961	-31.72031	-32.57320
2	389.0410	74.65448	1.60e-22	-49.22678*	-47.44603*	-38.98124
3	460.6859	39.80271*	1.02e-24*	-45.40954	-42.83736	-45.05487*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table A.2: Variables Descriptions and Sources

Variable	Description	Source
GDPPCG	Annual percentage growth rate of GDP per capita based on constant local currency	WDI
GDPPC	GDP per capita (USD)	WDI
INEQ	Income inequality, measured by the Gini Coefficient	UNU-WIDER World Income Inequality Database (WIID)
GLOB	Globalization index. Measures the three main dimensions of globalization: economic, social, and political	KOF
UNEM	Unemployment rate (% of total labor force). Refers to the share of the labor force that is without work but available for and seeking employment	WDI
CORRUPT	Assessment of corruption within the political system. The index ranges from 1 to 6, where a higher number means lower risk of corruption	ICRG
GOVTS	Government size, measured by Total Revenues to GDP (%)	IMF GFS Database, OECD National Accounts, and CEPAL
EDUC	Education index	UN Stats
INFL	Inflation, consumer prices	WDI
URBAN	Urban population, (% of total)	WDI
BUREAU	Quality of bureaucracy. High points (min 0, max 4) are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services.	ICRG
SHADOW	Size of shadow economy, % of official GDP	Schneider et al. (2010)
PIT	Personal Income Tax, % of GDP	CIAT-IADB and the IMF GFS database
PRGRS	Personal Income Tax Progressivity	CIAT-IADB and the IMF GFS database
CIT	Corporate Income Tax, % of GDP	CIAT-IADB and the IMF GFS database
GTGS	General tax on goods and services, % of GDP	CIAT-IADB and the IMF GFS database
NRES	Revenues from natural resources, % of GDP	CIAT-IADB
NRESTAX	Taxes on natural resources, % of GDP	CIAT-IADB
ROYAL	Royalties from natural resources, % of GDP	CIAT-IADB
SOPE	Social protection expenditure	IMF GFS database and the IFPRI's SPEED database
EDUE	Education expenditure	IMF GFS database and the IFPRI's SPEED database
HEAE	Health expenditure	IMF GFS database and the IFPRI's

SPEED database

Table A.3: Descriptive Statistics (means) by Latin American Country

Variable	Argentina	Bolivia	Brazil	Chile	Colombia	Costa Rica	Dominican Republic	Ecuador	El Salvador	Guatemala
GDPPCG	4.88	1.50	1.35	4.47	1.75	2.85	4.51	0.12	2.42	1.19
GDPPC	1010.4	347.3	793.2	926.8	681.7	780.4	553.3	618.1	551.2	403.9
INEQ	47.50	38.98	57.89	54.33	56.44	47.68	50.22	54.24	50.06	53.24
GLOB	59.44	49.71	57.37	64.65	52.20	58.71	50.14	52.13	61.09	53.69
UNEM	11.81	4.91	8.16	6.60	11.95	5.54	16.48	8.35	6.78	2.44
CORRUPT	2.82	2.46	2.85	3.46	2.53	3.95	2.85	3.00	2.97	2.07
GOVTS	22.40	16.47	29.39	22.46	16.48	21.08	14.48	11.41	13.36	12.38
EDUC	0.92	0.81	0.81	0.88	0.80	0.85	0.78	0.84	0.74	0.67
INFL	0.20	0.07	2.16	0.08	0.17	0.14	0.12	0.22	0.03	0.07
URBAN	89.38	61.03	80.94	85.10	71.29	57.94	62.80	60.81	59.18	46.37
BUREAU	2.45	1.39	2.33	2.49	2.46	2.03	1.28	2.00	2.00	2.00
SHADOW	23.92	62.31	37.30	16.75	35.80	24.54	31.10	31.56	45.11	50.58
PIT	0.89	0.35	1.84	1.44	0.38	0.86	0.69	0.44	1.71	0.22
PRGRS	0.00	0.71	0.00	0.00		0.00	0.00	0.00	0.00	0.00
CIT	1.91	1.43	2.61	3.48	4.02	1.77	2.20	1.92	1.86	2.66
GTGS	8.79	7.13	10.99	7.83	4.91	4.74	3.10	4.36	6.10	5.14
NRES		26.03		2.4	25.7			23.4		
NRESTAX		17.0		1.8	14.3			9.9		
ROYAL		7.3		0.4	8.6			10.8		

Table A.3: Descriptive Statistics (means) by Latin American Country (cont'd)

Variable	Honduras	Jamaica	Mexico	Nicaragua	Panama	Paraguay	Peru	Uruguay	Venezuela
GDPPCG	1.93	0.92	2.82	2.21	2.99	0.24	2.87	2.48	1.27
GDPPC	296.3	698.8	1166	224	805.3	386.1	592.6	929.6	988.9
INEQ	54.86	45.50	52.00	50.40	55.76	55.90	52.17	44.57	46.32
GLOB	53.32	66.99	58.97	53.08	63.09	53.55	56.88	62.30	58.46
UNEM	4.00	11.44	3.55	6.03	13.22	7.53	7.88	12.32	11.38
CORRUPT	2.09	1.50	2.48	3.08	2.00	1.26	2.74	3.00	2.44
GOVTS	14.84	32.00	14.71	20.44	15.48	12.19	18.76	22.74	14.45
EDUC	0.68	0.80	0.83	0.75	0.85	0.85	0.87	0.92	0.84
INFL	0.14	0.14	0.11	0.08	0.01	0.08	0.03	0.19	0.34
URBAN	44.30	52.52	74.66	55.42	65.24	57.12	70.87	91.29	89.04
BUREAU	1.67	3.00	2.67	1.00	1.94	1.00	1.95	1.85	1.39
SHADOW	45.99	33.90	28.34	44.55	60.96	38.69	57.00	48.29	31.69
PIT	0.96	5.80	2.13	1.25	2.32		1.47	1.18	
PRGRS	0.00	0.00	4.23	0.00	0.12	0.00	0.00	0.00	1.46
CIT	2.73	4.00	2.42	2.30	1.41	1.90	2.41	1.92	4.64
GTGS	4.55	8.50	3.21	6.25	1.57	4.89	5.52	7.82	4.76
NRES			19.9				18.3		22.4
NRESTAX			10.4				13.8		13.4
ROYAL			6.2				2.7		8.3

Table A.4. Fixed Effects IV Regression, Latin American Sample

	(1)	(2)	(3)	(4)	(5)	(6)
$GDPPCG_{-1}$	-0.043	0.386	0.422	-0.071	-0.059	-0.432
	(0.067)	(0.480)	(0.541)	(0.071)	(0.083)	(0.307)
$GDPPC_0$	0.002*	0.007	0.004	0.006***	0.003	-0.002
	(0.001)	(0.013)	(0.013)	(0.002)	(0.003)	(0.016)
INEQ	0.013	-0.168	-0.201	0.027	0.009	0.127
	(0.028)	(0.192)	(0.245)	(0.030)	(0.034)	(0.123)
GLOB	-0.139*	0.652	0.764	-0.106	-0.138*	-1.176
	(0.074)	(0.742)	(0.909)	(0.111)	(0.078)	(0.820)
UNEM	-0.644***	-1.263*	-1.306	-0.648***	-0.693***	-0.156
	(0.132)	(0.716)	(0.802)	(0.139)	(0.157)	(0.518)
CORRUPT	-0.393	2.198	2.374	-0.407	-0.446	-0.598
	(0.370)	(2.520)	(2.849)	(0.420)	(0.367)	(1.275)
GOVTS	0.175	-1.442	-1.255	-0.243	0.097	0.660
	(0.141)	(1.550)	(1.515)	(0.211)	(0.267)	(0.900)
EDUC	6.199	46.464	41.059	10.152	8.111	-0.056
	(7.316)	(42.135)	(42.372)	(7.777)	(7.796)	(27.797)
INFL	0.042	2.148	2.249	0.043	-0.034	-2.099
	(0.146)	(2.274)	(2.501)	(0.153)	(0.170)	(1.316)
URBAN	-0.227	-0.138	0.011	-0.278	-0.270	-0.085
	(0.187)	(0.832)	(1.075)	(0.203)	(0.193)	(0.629)
BUREAU	-0.708	1.204	1.482	-1.569***	-0.773	0.768
	(0.501)	(2.716)	(3.165)	(0.607)	(0.704)	(2.204)
SHADOW	0.103	0.174	-0.293	0.193	0.074	-0.221
	(0.190)	(0.629)	(1.250)	(0.205)	(0.203)	(1.037)
PIT		26.312	17.497			-24.898
		(25.073)	(26.888)			(23.484)
PIT*SHADOW			0.251			0.138
			(0.649)			(0.369)
PIT*PRGRS		-4.626	-4.290			4.741
		(6.643)	(7.005)			(5.111)
CIT				4.502**		-4.723
				(2.282)		(18.504)
CIT*GLOB				-0.063*		0.198
				(0.038)		(0.332)
GTGS					-0.100	-1.000
					(1.400)	(4.224)
Constant	25.260	-88.761	-80.289	16.202	30.287*	101.435
	(17.493)	(154.145)	(153.306)	(18.791)	(17.472)	(92.920)
Observations	200	129	129	200	197	129
R-squared	0.567	0.620	0.588	0.532	0.574	-0.926

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table A.5. Fixed Effects IV Regression, Worldwide Sample

	(1)	(2)	(3)	(4)	(5	(6)
$GDPPCG_{-1}$	0.263***	0.278**	0.170	0.208***	0.249***	0.522***
	(0.038)	(0.139)	(0.224)	(0.053)	(0.046)	(0.168)
$GDPPC_0$	0.038*	0.002	0.000	-0.125**	0.048**	-0.002
	(0.020)	(0.002)	(0.001)	(0.052)	(0.023)	(0.002)
INEQ	0.010	0.234	0.156	0.036	-0.017	0.214
	(0.021)	(0.151)	(0.142)	(0.028)	(0.039)	(0.139)
GLOB	-0.056	0.088	0.124	-0.343***	-0.108	-0.137
	(0.044)	(0.230)	(0.188)	(0.105)	(0.126)	(0.310)
UNEM	-0.107**	0.062	0.102	-0.099	-0.086	0.477**
	(0.052)	(0.166)	(0.165)	(0.074)	(0.075)	(0.239)
CORRUPT	0.051	-0.083	0.158	0.001	0.034	-0.061
	(0.188)	(0.589)	(0.490)	(0.274)	(0.199)	(0.413)
GOVTS	0.043	0.841	0.048	0.171	-0.119	0.024
	(0.054)	(0.638)	(0.739)	(0.112)	(0.230)	(0.344)
EDUC	13.168***	3.871	6.178	22.994***	11.879*	11.725
	(4.655)	(22.444)	(19.584)	(6.904)	(6.272)	(17.148)
INFL	0.051	4.749	4.555	0.168	0.224	-1.219
	(0.120)	(4.438)	(4.415)	(0.156)	(0.199)	(2.268)
URBAN	-0.139*	-0.759	-0.216	0.226	-0.158	-0.166
	(0.081)	(0.640)	(0.499)	(0.161)	(0.098)	(0.311)
BUREAU	0.315	-0.560	1.336	0.892	0.182	-0.282
	(0.297)	(1.889)	(2.275)	(0.630)	(0.672)	(1.346)
SHADOW	-0.109	-0.301	-0.223	0.012	-0.149	-2.507*
	(0.095)	(0.568)	(0.971)	(0.147)	(0.101)	(1.470)
PIT		-2.388	-0.867			-3.065*
		(2.214)	(3.119)			(1.683)
PIT*LA		26.963	80.854			-61.419
		(23.922)	(110.962)			(50.853)
PIT*PRGRS		-0.039	0.012			-0.023
		(0.049)	(0.060)			(0.034)
PIT*PRGRS*LA		-3.884	-7.317			1.993
		(4.714)	(9.109)			(2.447)
PIT*SHADOW			0.022			0.160*
			(0.068)			(0.091)
PIT*SHADOW*LA			-1.491			1.644
			(2.492)			(1.358)
CIT				-12.599***		-15.910
				(4.081)		(12.496)
CIT*LA				11.341***		11.142
				(2.940)		(16.176)
CIT*GLOB				0.155***		0.197
				(0.053)		(0.152)
CIT*GLOB*LA				-0.120***		-0.158
				(0.035)		(0.313)
GTGS					1.430	-1.119
					(3.028)	(1.323)
GTGS *LA					-0.190	0.443
					(1.621)	(8.185)
Constant	-7.909	0.703	-10.225	52.813***	-8.324	101.515
	(6.425)	(37.830)	(35.992)	(19.623)	(8.071)	(68.861)
Observations	641	347	347	576	563	335
R-squared	0.553	-0.172	0.175	0.323	0.548	0.242

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1