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## **Taxation and inequality in developing countries**

Lessons from the recent experience of Latin America

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**Abstract:** This paper aims to advance understanding about the relationship between taxation and inequality in developing countries, focusing on the recent experience of Latin America. Although the tax system was regressive in the 1990s, tax changes promoted equality in the first decade of the 2000s. In particular, the increasing contribution of direct taxes with respect to indirect taxes promoted the progressivity of the tax system and contributed to the reduction of inequality. Yet, the effectiveness of taxation in promoting equality in Latin America is still limited by several factors such as the low average tax revenue as percentage of gross domestic product, the relative high contribution of indirect taxes, the inability to tax top incomes, and the low contribution of taxes on property.

**Keywords:** tax policy, inequality, redistribution, Latin America

**JEL classification:** D31, D63, H20

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## 1 Introduction

The role of tax policy and in particular its effectiveness to influence inequality in developing countries is one of the most debated topics in economics (Bird and Zolt 2013). In particular, opposing views have dominated the discussion around the role of taxation in different periods influencing tax revenue and tax composition. Initially, taxation was believed to be a powerful policy tool that could be used to mobilize revenue (Musgrave 1959) whereas progressive taxes were thought to be strategically important to improve income distribution and to favour a more inclusive process of economic development (Kaldor 1963). Following this idea, in the post-Second World War period, policymakers assigned to taxation the specific role of promoting redistribution through the introduction of high tax rates on personal and corporate income (Bird 2003). Yet, the arrival of the crisis in the early 1970s cast some doubts about the effectiveness of taxation on influencing income distribution and correcting market failures. In addition, there was a growing consensus that taxation could generate negative consequences in terms of growth affecting consumption and investment decisions (Feldstein 2012). As a result, it had been suggested on multiple occasions that the only way to achieve effective results in terms of equality was through public expenditure (Bird and Zolt 2005). The strength of these ideas and their capacity to affect policy design was particularly evident in developing countries where the role of taxation to promote equality was believed, both conceptually and practically, to be more difficult owing to the presence of a large informal sector and the lack of proper administrative structures (Mahon 2009).

Recently, taxation is back at the centre of the policy and research agenda. Indeed, while both developed and developing countries dramatically reduced tax rates, inequality has sharply increased during the last decades, generating outrage across the world. Some of the most prominent economists (e.g. Atkinson 2015; Piketty 2014) have resumed to propose taxation as a powerful solution to promote a more equal income distribution. While the majority of these contributions focuses on developed countries, less attention is paid on the rest of the world.

This work contributes to fill this gap analysing the redistributive role of tax policy in Latin America. This region represents an emblematic case study for several reasons. The level of taxation has been historically lower in Latin America than in other regions. The inability to promote the development of a proper tax system was due to the strong relationship between wealth and political power, which was inherited from the colonial period. In a similar setting, a small elite was able to resist the levying of direct forms of taxation perpetuating interests against those of the majority of people in the society (Bogliaccini and Luna 2016; Brededa et al. 2008; Edwards et al. 2007). In addition, in this region more than in others, tax policy design has suffered from the influence of the above-mentioned alternative views. In particular, Latin America was heavily influenced by advice from the Washington Consensus which promotes the view that the tax system should assure efficiency and horizontal equity, whereas taxation was considered ineffective in terms of redistribution (Bird and Zolt 2005). Nonetheless, since the early 2000s, social and political factors have called for more attention on the progressivity design of tax policy. As a result, Latin America has recorded a sizeable increase in tax revenue driven mainly by a rise in direct taxation. Over the same period, the region has experienced significant results in terms of inequality reduction (Cornia 2014).

Along these lines, the aim of this paper is to investigate empirically whether the recent changes in the level and composition of taxation observed in the region have contributed to the reduction of inequality recorded in the majority of the Latin American countries during the last decade. The analysis uses a longitudinal dataset compiled across 18 Latin American countries over the

period 1990–2010. The results of our analysis show that the impact of taxation is not neutral. In particular, the tax system was regressive in the 1990s fuelling disparities; in contrast, the increasing contribution of direct taxes with respect to indirect taxes contributed to the decline of inequality in the 2000s.

This paper contributes to the existing literature in a variety of ways. First, it contributes to the interesting and rich literature reporting evidence on the impact of taxation on inequality. Although the majority of works focuses on advanced economies (Atkinson and Leigh 2010) or uses a large number of countries (i.e. developed and developing ones) for a long period of time (see Martínez-Vázquez et al. 2012; Weller and Rao 2008), only few studies, in the author's knowledge, have tried to investigate the contribution of taxation to the recent decline of inequality in Latin American countries. The papers close to the present study are those of Cornia et al. (2011) and Tsounta and Osueke (2014). Similar to them, this paper investigates the contribution of tax changes on the recent decline of inequality but, contrary to these papers, the specific contribution of different types of taxes (i.e. direct taxes and indirect taxes) is disentangled, providing further evidence on this issue. Furthermore, the impact of taxation on different parts of the distribution is tested. Whereas the previous analyses focus on Gini coefficient, here the impact of taxation on other indicators of inequality, such as the 95/50 and the 95/80 percentile ratios, is also tested. Finally, this paper contributes to the political economy literature providing policy implications for other middle-income countries.

This paper is organized as follows. Section 2 describes the evolution of inequality, tax revenue, and changes during the last two decades. Section 3 describes the empirical analysis and reports the regression results. Section 4 concludes.

## **2 Inequality and tax changes during the last two decades<sup>1</sup>**

### **2.1 Inequality in Latin American countries**

Inequality in Latin America has been historically high given an institutional structure inherited from the colonial period which promoted the interests of a small elite and perpetuated disparities through the time (Acemoglu et al. 2002; Engerman and Sokoloff 2005). In the mid-twentieth century, the region recorded the highest world levels of Gini coefficient resulting from the high land concentration, the dominance of the export of primary commodities, the persistency of disparities in the human capital distribution, and an urban bias in policies which penalized rural areas increasing spatial forms of inequality (Cornia 2014; De Ferranti et al. 2003). Inequality remained stable in the aftermath of the Second World War (Prados de la Escosura 2007). Yet, the worsening of external conditions, the frequent financial crises, and especially consequences of the neoliberal policies adopted since the mid-1970s provoked a further increase of inequality which reached its peak value in 2002 (Cornia 2014).

Fiscal policy was one of the areas most affected by neoliberal reforms. Whereas taxation was considered ineffective in terms of redistribution, policymakers promoted a number of policies intended to rationalize tax schemes and widen the tax base (Bird and Zolt 2005). On the one hand, value-added tax (VAT) and other consumption taxes played a crucial role in replacing

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<sup>1</sup> For a detailed description of tax changes implemented in Latin American countries over the last decades, see Cornia et al. (2011) and Gómez-Sabaíni et al. (2016, forthcoming).

trade taxes; on the other hand, personal and corporate income taxes were lowered to reduce, as much as possible, the supposed negative consequences on efficiency and economic growth (Gómez-Sabaíni et al. 2016, forthcoming). International organizations also played a key role influencing tax policy design in many countries; indeed, the International Monetary Fund as well as the World Bank adjustment programmes started to include specific advice in terms of tax policy and tax administration (Lledo et al. 2004).

However, the poor performance recorded in the 1980s pushed Latin American governments to engage in successive corrective measures. In particular, policymakers started expanding tax bases, reducing tax evasions, and extending taxation to all sources of income or sectors previously excluded. The minimum threshold on individual income taxation was decreased whereas other exemptions or deductions were reduced or abolished. Furthermore, governments implemented important administrative reforms and introduced new technologies (Tanzi 2013). As a result, these measures contributed to improving the ability of Latin American governments to mobilize revenue since the 1990s even though the impact of the tax system remained regressive (Cornia et al. 2011).

## **2.2 Role of taxation in contributing to the recent reduction of inequality**

Income inequality started to decline in the early 2000s as well documented (Cord et al. 2016; Cornia 2014; Gasparini et al. 2009; López-Calva and Lustig 2010; Torre et al. 2014). Between 2002 and 2012, Gini decreased by 6 points achieving a value lower than the average recorded in the pre-Washington consensus period (Cornia 2016, forthcoming). Different factors have been advanced to explain this unexpected result. First, Latin America experienced a period of rapid economic growth in the mid-2000s that contributed to pushing up income at the bottom of the distribution (Azevedo et al. 2013; Tsounta and Osueke 2014; World Bank 2011).<sup>2</sup> Other authors argue that the unexpected result was also due to the improvement in external conditions (Székely and Mendoza 2015). Nevertheless, these explanations are not enough to justify this positive performance considering that Gini coefficient kept on decreasing during the recent economic crisis. Thus, some authors refer to other factors that should be included in order to understand the recent evolution of inequality in Latin America. For example, Cornia (2014) emphasizes the role of policy. In particular, the left governments elected in the early 2000s implemented a policy model that focused on a more pragmatic approach aiming at promoting a more equitable development. Similarly, López-Calva and Lustig (2010) argue that the recent welfare improvements were related to social policy as well as to the drop of wage disparities driven by a shrinking earnings gap between skilled and low-skilled workers.<sup>3</sup>

Despite these, Cornia et al. (2011) and Gómez-Sabaíni et al. (2016, forthcoming) note that the contribution of taxation is also a significant aspect (and often ignored) behind the recent and extraordinary performance of Latin America. Indeed, inequality started to decrease when tax revenue steadily increased. In particular, the ratio of tax revenue on gross domestic product (tax/GDP) increased by 3 points over the period 2002–08 (Figure 1). The arrival of the Great Recession affected economic conditions of the region and provoked a decline in the tax/GDP ratio by around 1 point. However, the tax/GDP ratio recovered the upward trend and kept on increasing to a level near 17 per cent of GDP (Figure 1). Of course, there are important

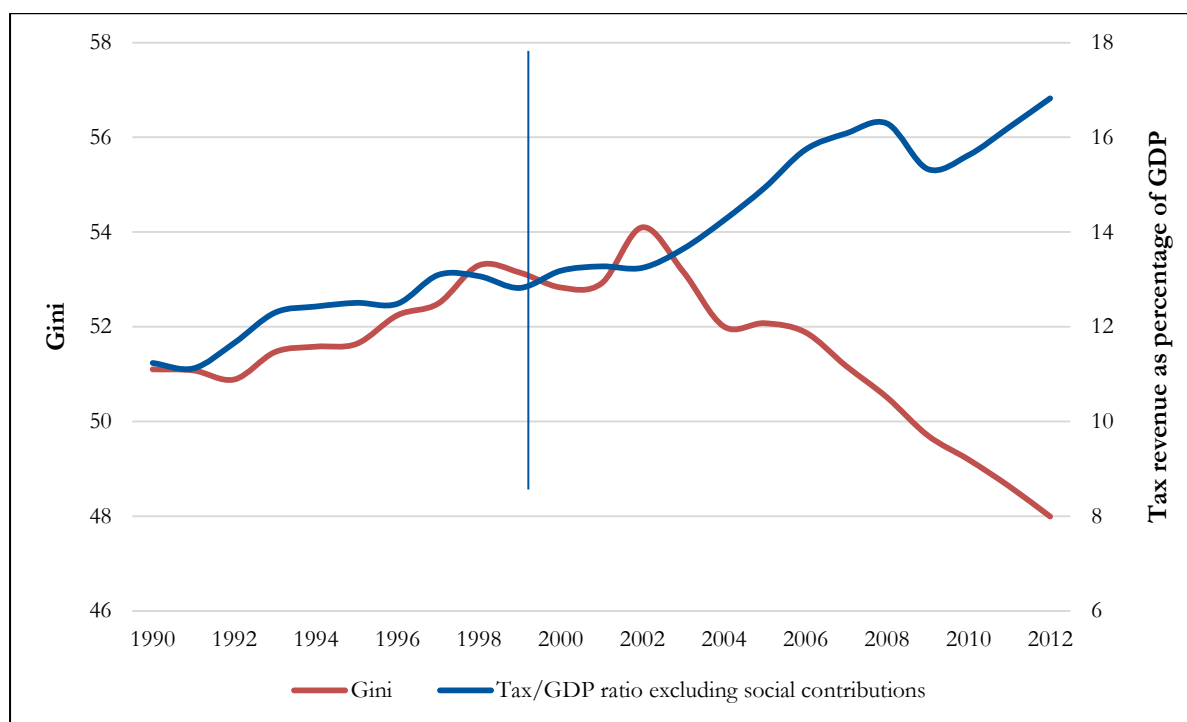
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<sup>2</sup> In particular, the gross domestic product per capita returned positive in 2003 and recorded an average annual growth rate of 4.3 per cent over the period 2004–08.

<sup>3</sup> Soares et al. (2009) highlight that conditional cash transfers contributed massively to reduce inequality in three major countries Brazil, Mexico, and Chile.

differences in terms of the magnitude of observed changes as well as a substantial heterogeneity in the level of the tax/GDP ratio across countries. On the one hand, tax revenue sharply increased in Argentina (by 8 points) and especially in Bolivia (by 14 points) thanks to the important contribution of non-renewable natural resources. On the other hand, the tax/GDP ratio remained stable in the Dominican Republic, Costa Rica, Guatemala, and Honduras. Looking at the level of the tax/GDP ratio, Argentina and Bolivia together with Brazil reported the highest levels of tax revenue on GDP in 2012. In particular, the tax/GDP ratio grew up to 31 per cent of GDP in Bolivia, whereas it was close to 25 per cent in Brazil and 23 per cent in Argentina. The tax/GDP ratio was near 20 per cent in Colombia and Uruguay, whereas it remained  $\leq 15$  per cent in Central American countries.

Figure 1: Gini coefficient and tax revenue in 18 Latin American countries, 1990–2012



Source: Inequality data are extracted from the Income Distribution in Latin America Dataset and the Socio-Economic Database for Latin America and the Caribbean; the tax/GDP ratio is from the 2015 Government Revenue Dataset.

Yet, the recent changes in tax revenue level are not enough to explain the evolution of inequality during the last decade. Indeed, Figure 1 shows that tax revenue increased in the 1990s and in the 2000s whereas inequality decreased only after 2002. However, a more detailed analysis shows a fundamental difference between these two periods related to changes in tax composition. In particular, the increase in tax revenue in the 1990s was mainly driven by the rise in taxes on sales and more specifically by the notable growth recorded by VAT, which has become an important tax tool in the region. Table 1 shows that the relative contribution of taxes on sales increased by 8 points between 1990 and 2002. In contrast, the relative contribution of taxes on income, profits, and capital gains decreased by 2 points whereas that of other taxes (e.g. taxes on international trade) fell by around 6 points (Table 1).

The scenario changed completely in the following decade in which inequality decreased. In contrast to its historical trend, the growth recorded in tax revenue was mainly driven by the extraordinary performance recorded by taxes on income, profits, and capital gains, which improved the progressivity of the tax system in many countries. Notably, the average contribution of these taxes to the average tax revenue increased by 7 points between 2002 and

2011 (Table 1). On the other hand, the contribution of other taxes decreased. In particular, the contribution from taxes on property and other taxes decreased by 2 and 3 points, respectively, whereas those on sales decreased by 2 points after the good performance in the previous decade (Table 1).

Table 1: Tax composition in 1990, 2002, and 2011

	Taxes on income, profits, and capital gains	Taxes on property	Taxes on sales	Other taxes
1990	28	5	33	34
2002	26	5	41	28
2011	33	3	39	25
Variation for 1990–2002	–2	0	8	–6
Variation for 2002–11	+7	–2	–2	–3

Source: Author's elaboration on the ICTD 2015 Government Revenue Dataset (Prichard et al. 2014).

### 2.2.1 Factors promoting tax changes in the 2000s

Tax changes in the 2000s were promoted by many factors. First, the positive economic performance in the 2000s contributed to generate more and better jobs, a new middle class that in turn promoted an expansion of the tax base. ‘In Brazil, for example, a combination of increases in income, formalization of employment, and strengthened tax administration resulted in over 50 percent of those declaring income in 2011 paying income tax, compared to only 36 percent a decade earlier’ (Bird and Zolt 2013: 21–2). Second, over the same period, the positive evolution of external conditions heavily influenced Latin American economies (Fricke and Süßmuth 2014). In particular, the revenue capacity of countries exporting oil and non-oil commodities was affected by the changes in international markets, particularly by the increase of commodity prices and the demand of primary products. Some countries (i.e. Argentina, Bolivia, Chile, and Venezuela) implemented explicit measures in order to take advantages of these conditions (Gómez-Sabaíni and Morán 2014).<sup>4</sup> Third, Latin American governments kept on introducing more pragmatic policies that take into account the country's characteristics. Among the most interesting examples of heterodox forms of taxation were the implementation of simplified or presumptive system of taxation developed to improve taxation on small taxpayers as well as the introduction of taxes on financial transactions (Cornia et al. 2011; Gómez-Sabaíni et al. 2016, forthcoming).

Finally, the new left governments elected in the early 2000s implemented explicit measures to strengthen the redistributive capacity of their tax systems mainly focusing on personal income taxation. In contrast to the tax reforms implemented in the 1980s and 1990s, some South American countries increased tax rates or introduced new ones (ECLAC 2013). For example, the Ecuador government introduced a tax reform in 2008 aiming explicitly at increasing the progressivity of personal income tax and, therefore, equality. As reported by Cano, ‘this was done, firstly by creating two additional income tax brackets along with a top marginal tax rate of

<sup>4</sup> Yet, as Gómez-Sabaíni and Morán state: ‘The wide range of instruments used in the region raises a series of challenges for the identification of the share of total tax revenues that can be attributed to natural resources. Some tax measures explicitly take into account the exploitation of non-renewable resources as a tax base, which makes it easy to associate them with the resource sector even if they are not all classified as taxes. In some cases, the application of criteria to identify a tax can be particularly problematic. As mentioned earlier, the best example is hydrocarbon production rights in Mexico, where there is no general consensus on their classification as a tax’ (2014: 27).

35%, and secondly by incorporating new personal income tax deductions for expenses on housing, education, health, clothing and food' (2015: 3). In addition, a number of countries introduced a dual tax system reform following the experience of Scandinavian countries. The 2007 Uruguayan tax reform was one of the most emblematic examples of this new trend in Latin America. Aiming to achieve more equality without sacrificing efficiency, the new reform introduced a progressive taxation on labour income consisting of six rates ranging from 0 to 25 per cent and a flat rate on capital income of 12 per cent (Martorano 2014). In addition, in 2012, the top rate of personal income tax was further increased to 30 per cent. In 2009, Peru implemented a similar tax reform. In particular, the Peruvian government introduced a progressive taxation on labour income with rates ranging from 0 to 30 per cent, with a tax rate of 6.25 per cent on 80 per cent of capital income. A number of Central American countries approved similar policies in the following years, 'setting flat rates of between 10% and 15% on capital income that was previously tax exempt (with exceptions for non-residents), combined with higher rates on business earnings and progressive rates for labor income' (Gómez-Sabaíni and Morán 2014: 37)

### *2.2.2 Impact of the recent tax changes on inequality*

The relationship between taxation and inequality in Latin American countries has been studied for a long time. The vast majority of studies conclude that taxation has a modest (and sometimes regressive) impact on income distribution (Hanni et al. 2015). According to Goñi et al. (2011), this is because of the neutral profile of the tax system and the poor performance in collecting revenue. However, as explained earlier, only few studies have tried to investigate whether and how the recent tax changes have contributed to the recent decline of inequality in Latin American countries. For example, Tsounta and Osueke (2014) show that higher tax revenue is associated with more equality. Cornia et al. (2011) show that the greater reliance on direct taxes during the recent decade has significantly contributed to the reduction of inequality on average by 0.4–0.8 points.

Moreover, there is growing and recent tax incidence literature showing that changes in tax level and composition have generated important consequences in terms of progressivity and redistributivity (Gómez-Sabaíni et al. 2016, forthcoming) (Table 2). This is particularly evident in South America. For example, Martorano (2014) reports that the 2007 tax reform in Uruguay generated a positive impact on equity as well as on efficiency.<sup>5</sup> Cruces and Gasparini (2008) and Rossignolo (2016) point out that the redistributive capacity of the Argentinian tax system has increased since the early 2000s. In contrast, tax systems still show a modest capacity to redistribute in the Andean and Central American countries. Cano (2015) reports that personal income taxation is highly progressive in Ecuador but its ability to redistribute is low because rich people still benefit from many legal tax deductions that affect their taxable income. Despite the progress with respect to the past, the redistributivity incidence of taxation in Nicaragua is small considering that the Reynolds-Smolensky index is close to zero (Cornia et al. 2011). Finally, the tax system in Bolivia, El Salvador, and Honduras is regressive because of the high reliance on indirect taxes and small contribution of direct taxes (Cornia et al. 2011; ECLAC and IEF 2014; Gómez-Sabaíni et al. 2016, forthcoming).

Overall, the progressivity and redistributivity capacity of the tax system in Latin American countries is still modest (Lustig 2016) even though important progresses have been recorded with respect to the past (Cornia et al. 2012). Indeed, although income taxes (and to a lesser

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<sup>5</sup> Burdín et al. (2014) confirm that the new tax system contributes to reducing inequality by 2 Gini points.



extent other direct taxes) are progressive in all countries of the region (ECLAC and IEF 2014), the high share of indirect taxes on total tax revenue reduces the ability of government to redistribute via taxation, as documented by the recent studies on tax incidence (Amarante and Jiménez 2016).

Table 2: Change in Reynolds-Smolensky (RS) indices for taxes in selected Latin American countries in the 1990s and 2000s

Country	1990s		2000s	
	Year	RS	Year	RS
Argentina	1997	-0.020	2008	0.004
Bolivia	2000	-0.011	2009	-0.007
Brazil	1999	-0.007	2009	0.016
Chile	1996	-0.008	2009	0.021
Costa Rica	1988	-0.010	2004	0.012
Ecuador	1998	-0.007	2003	0.007
El Salvador	2000	-0.014	2006	-0.008
Guatemala	2000	-0.008	2006	0.012
Honduras	2000	-0.028	2005	-0.001
Mexico	1989	-0.044	2010	0.017
Nicaragua	1998	-0.052	2001	0.002
Panama	2000	0.000	2003	0.009
Peru	2000	-0.008	2009	0.011
Uruguay	1996	-0.002	2011	0.020

Notes: The RS index on Bolivia's tax system refers only to indirect taxes. Considering the small contribution of direct taxes, the RS index of the overall tax system should not be different.

Source: Gómez-Sabaini et al. (2016, forthcoming).

### 3 Regression analysis

#### 3.1 Empirical framework

Whether changes in taxation promoted the recent reduction of inequality remains an open question. Although the previous results on tax incidence provides some interesting information on the redistributive effect of tax systems, they do not reveal a lot in terms of causality about the specific contribution of taxation on the evolution of income distribution in Latin American countries over the last two decades. This work aims to fill this gap, extending the previous analysis of Cornia et al. (2011) and providing new evidence disentangling the specific contribution of different kinds of taxes on inequality. In doing so, information has been collected for 18 Latin American countries over the period 1990–2010. Starting from the empirical literature (see Cornia et al. 2011) the following baseline model is estimated:

$$Gini_{it} = a_0 + a_1 Tax/GDP_{it} + a_2 Z_{it} + h_i + u_{it}, \quad i = 1, 2, \dots, N; t = 2, 3, \dots, T, \quad (1)$$

where  $i$  and  $t$  identify country and year, and  $\eta_i$  and  $u_{it}$  define the time-invariant country fixed effects and the idiosyncratic error term, respectively.

The dependent variable is extracted from the Income Distribution in Latin America (IDLA) Dataset.<sup>6</sup> The original data have been updated using information from the Socio-Economic Database for Latin America and the Caribbean (CEDLAS and World Bank, n.d.). These two databases include statistics on inequality for Latin American countries over the last decades. Taxation data are extracted from the new 2015 edition of the Government Revenue Dataset. This dataset provides comparable information aiming to overcome some of the weaknesses related to other existing sources (Prichard et al. 2014). Furthermore, it provides disaggregated information that helps to analyse in more detail the impact of different types of taxes on income inequality. However, this database lacks detailed tax data for Colombia and information on taxes on income, profits, capital gains for Honduras.

Beyond this,  $Z$  identifies a set of variables included in the econometric model to control for a number of economic, institutional, and political factors (discussed earlier) that may have affected the evolution of inequality in Latin America over the period being considered. The first factor is the growth rate of GDP per capita which is expected *ex ante* to have a negative sign. Indeed, as explained earlier, part of the existing literature suggests that the recent economic boom benefitted mostly people at the bottom of the distribution (Azevedo et al. 2013; World Bank 2011). The second factor is the index of the terms of trade that gives rise to the possibility of understanding the extent to which income distribution was affected by changes in external conditions. As reported earlier, the idea is that favourable external conditions have promoted the equality in the 2000s (Lustig 2013; Székely and Mendoza 2015). Foreign direct investment and remittances are some additional controls that are expected to influence inequality in opposite ways. According to the existing empirical literature, foreign direct investment would increase the Gini coefficient (Basu and Guariglia 2007; Feenstra and Hanson 1997; Wood 1997) whereas there is less consensus on the impact of remittances (Cornia 2014). Yet, the recent evidence for some Latin American countries (i.e. El Salvador and Mexico) shows that remittances contributed to reducing inequality (Acevedo and Cabrera 2012; Campos-Vázquez et al. 2012). Another factor of interest is the share of the debt on GDP, which is expected *ex ante* to have a positive sign in a context such as Latin America that was historically affected by debt crises with important distributional consequences (Cornia and Martorano 2012).

To proxy macroeconomic policies, the real effective exchange rate is included. The adoption of a stable and competitive exchange rate regime promotes economic equality (Helleiner 2011). Labour market policies are proxied by the minimum wage index; as reported in the literature, inequality should be lower in a context where labour market institutions protect the most vulnerable workers (Freeman 1996). Finally, the supply of educated workers is proxied by the share of workers with secondary education. It is expected that more education contributes to reducing inequality, thus buffering the pressure from market forces (Cornia and Martorano 2012). Table 3 describes the variables included in the regression analysis.

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<sup>6</sup> The IDLA database has been developed by Martorano and Cornia (2011) in the context of the UNU-WIDER's Research Project on 'The New Policy Model, Inequality and Poverty in Latin America: Evidence from the Last Decade and Prospects for the Future'.

Table 3: Variable definition, description, and data sources

Variable description	Unit of measure	Source
Gini	Index range 0–100	IDLA Dataset and SEDLAC
Taxes excluding social contributions	Percentage of GDP	2015 Government Revenue Dataset
Direct taxes excluding social contributions, including resource revenue	Percentage of GDP	2015 Government Revenue Dataset
Taxes on income, profits, and capital gains	Percentage of GDP	2015 Government Revenue Dataset
Indirect taxes	Percentage of GDP	2015 Government Revenue Dataset
Gross domestic product (GDP) per capita (growth rate)	Growth rate	World Development Indicators
Terms of trade	Index, 2000 = 100	World Development Indicators
Real effective exchange rate (REER)	Index, 2005 = 100	Darvas (2012)
Foreign direct investments (FDIs)	Percentage of GDP	UNCTADstat (UNCTAD, n.d.)
Remittances	Percentage of GDP	UNCTADstat (UNCTAD, n.d.)
Debt	Percentage of GDP	Cornia and Martorano (2012)
Variation of working population with secondary education	Yearly difference	Barro and Lee (2013)
Minimum wage	Index, 2000 = 100	CEPALSTAT (ECLAC, n.d.)

Source: Author's compilation.

In order to test the model in this study, a simple ordinary least-squares estimator or panel estimation technique can be used. Yet, the adoption of a lagged dependent variable specification is more suitable because of the path-dependent and slow-moving nature of the dependent variable (i.e. the Gini coefficient). In this case, the estimators mentioned earlier cannot be used because they may provide biased results. Additional problems of endogeneity are related with some explanatory variables in this model, such as GDP per capita growth, the supply of educated workers, and the level of debt. In this setting, the 'system generalized method of moments' estimator seems the most suitable empirical strategy to overcome these problems, despite its potential limitations in using macro data with a small number of countries (Blundell and Bond 1998). The Arellano–Bond test shows that there is an autocorrelation of the second order (AR2) but no autocorrelation of the first order (AR1). Furthermore, instruments of this model are valid as shown by the Sargan test of over-identifying restrictions (i.e. the null hypothesis is not rejected).

### 3.2 Regression results

Table 4 reports the results of the analysis. First, the high persistence of the Gini coefficient is observed. In particular, Table 4 confirms that the current level of inequality is strongly correlated to its past level. In addition, Model 1 in Table 4 points out that the increase in tax revenue reduces the level of inequality. The coefficient is positive and statistically significant at 5 per cent, confirming the results of Tsounta and Osueke (2014). Yet, the tax/GDP ratio coefficient is no longer statistically significant after the inclusion of other control variables. As expected, changes in inequality can be explained by the good economic performance, the improvements in external conditions, as well as the changes in supply of educated workers and labour market policies. These results are robust across the different specifications with the only exception of the GDP per capita growth rate that turns out not to be significant in some cases. So, the rest of the paper focuses exclusively on the relationship between taxes and inequality.

Table 4: Regression results, taxation, and inequality in Latin American countries

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Gini ( $t-1$ )	0.990*** [0.017]	0.931*** [0.019]	0.935*** [0.017]	0.946*** [0.015]	0.933*** [0.016]	0.921*** [0.021]	0.932*** [0.020]
Tax revenue	-0.049** [0.023]	0.014 [0.016]					
Direct taxes			-0.020 [0.030]				
Taxes on income				-0.044** [0.022]			
Indirect taxes					-0.008 [0.030]		
Taxes on sales						0.032 [0.023]	
Direct taxes on indirect taxes							-0.419** [0.184]
GDP per capita (growth rate)		-0.046* [0.025]	-0.045** [0.023]	-0.040 [0.025]	-0.038 [0.025]	-0.033 [0.024]	-0.045** [0.023]
Terms of trade		-0.012*** [0.003]	-0.011*** [0.004]	-0.010*** [0.004]	-0.012*** [0.004]	-0.008** [0.003]	-0.011*** [0.004]
REER		0.002 [0.002]	0.003** [0.001]	0.004** [0.001]	0.003** [0.002]	0.004*** [0.001]	0.003 [0.002]
FDI		0.025 [0.026]	-0.001 [0.024]	0.011 [0.026]	0.007 [0.026]	0.025 [0.021]	0.008 [0.026]
Remittances		-0.016 [0.015]	-0.036*** [0.010]	-0.027*** [0.009]	-0.024* [0.014]	-0.015 [0.013]	-0.040*** [0.010]
Debt		0.001 [0.002]	-0.000 [0.001]	-0.000 [0.001]	0.000 [0.001]	0.003 [0.002]	-0.000 [0.001]
Variation of working population with secondary education		-0.351** [0.158]	-0.280* [0.164]	-0.334** [0.165]	-0.287** [0.134]	-0.354** [0.162]	-0.371** [0.175]
Minimum wage		-0.007** [0.003]	-0.005** [0.002]	-0.006*** [0.002]	-0.007*** [0.003]	-0.007*** [0.002]	-0.005** [0.002]
Constant	1.006 [0.878]	5.200*** [1.159]	5.026*** [1.137]	4.507*** [0.931]	5.338*** [1.125]	5.061*** [1.183]	5.437*** [1.263]
Observations	374	331	290	298	301	229	290

Notes: Robust standard errors in brackets. \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

Source: Author's compilation.

Table 4 also distinguishes between direct and indirect taxes that are expected to have different redistributive results. In particular, the existing literature shows that the former group of taxes (and especially income taxes) has a positive effect on income distribution whereas the latter tends to increase inequality (Amarante and Jiménez 2016; Woo et al. 2013). However, results seem to confirm that the levels of direct and indirect taxation are not able to influence income distribution in Latin America. Yet, a more detailed analysis shows that the coefficient of taxes on income, profits, and capital gains is negative and statistically significant at 5 per cent.<sup>7</sup> This result confirms that taxation in Latin America has a modest impact on income distribution but, in contrast to existing literature (e.g., see Goñi et al. 2011; Hanni et al. 2015), regression analysis in the present study shows that taxes on income, profits, and capital gains may contribute to reducing inequality even in developing countries (Cornia et al. 2011; Gómez-Sabañi et al. 2016, forthcoming). Finally, how changes in tax composition proxied by the share of direct taxes on indirect taxes affect inequality is also tested. As can be seen in Model 7 in Table 4, its coefficient is negative and statistically significant, confirming the previous results of Cornia et al. (2011). Thus, it can be concluded that the recent changes in tax composition experienced by Latin

<sup>7</sup> This is mainly due to the increasing contribution of taxes on individuals whereas the effect of taxes on corporate income is not statistically significant (see Appendix A).

American countries contributed (even though marginally) to influencing income distribution over the period 1990–2010.

### 3.3 Taxation and inequality: 1990s versus 2000s

In this section, the initial hypothesis is tested: whether taxation was effective in promoting equality only in the last decade. In doing so, the previous model specification is replicated splitting the sample period in two sub-periods, that is, 1990–2001 and 2002–10. Table 5 summarizes the coefficient related to the tax/GDP ratio and the different types of taxes. The complete regression analyses are reported in Appendix Tables A1 and A2.

As explained, although both these periods are characterized by the increase of tax revenue, they present interesting differences related to tax composition. In particular, the increase in tax revenue in the 1990s was driven by the rising contribution of indirect taxes, whereas the tax increase in the 2000s was mainly promoted by changes in direct taxes. Analysis confirms that the differences in tax composition observed in the 1990s and 2000s translated into opposite effects on inequality. In particular, Model 2 in Table 5 shows that the coefficient of the tax/GDP ratio is positive and statistically significant. This means that the increase in tax revenue recorded in the 1990s contributed to increase inequality. This is due to the role of taxes on sales and their growing contribution during the 1990s. Indeed, Model 2 in Table 5 shows that the coefficient of taxes on sales is positive and statistically significant as well.

In contrast, the results of Model 3 in Table 5 are similar to those reported in the baseline model. In particular, the coefficient of the tax/GDP ratio is not statistically significant whereas that of taxes on income, profits, and capital gains is negative and statistically significant. Concerning the latter variable, the only difference with respect to the baseline model is related to the size of the coefficient. In particular, Model 3 in Table 5 shows that increasing the taxes on income, profits, and capital gains by 1 point (on GDP) would result in reducing wage inequality by more than 0.1 points.

Table 5: Regression results, taxation, and inequality in Latin American countries, different period

	Baseline model	1990–2001	2002–10
Taxes	0.014 [0.016]	0.075* [0.044]	0.008 [0.028]
Direct taxes	–0.02 [0.030]	0.113 [0.073]	–0.101 [0.062]
Taxes on income, profits, capital gains	–0.044** [0.022]	0.081 [0.075]	–0.140*** [0.043]
Indirect taxes	–0.008 [0.030]	0.017 [0.053]	0.037 [0.043]
Taxes on sales	0.032 [0.023]	0.094*** [0.030]	0.041 [0.042]

Notes: Robust standard errors in brackets, \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

Source: Author's compilation.

Overall, these results confirm that the increasing contribution of direct taxes has promoted the progressivity and redistributivity of taxation in Latin America. In addition, they provide further evidence that taxes on income may promote redistribution in developing countries too.

### 3.4 Different dependent variable

Previous studies focus only on aggregate income Gini coefficient. Nevertheless, this could mask important information. To overcome this problem, the present study replaces the Gini index with a number of indicators such as the 95/50 and the 95/80 percentile ratio. Table 5 summarizes the results and the complete regression analyses are reported in Appendix Tables A3

and A4. These results give better explanations for the incidence of taxation and in particular for the incidence of different types of taxation on the different parts of the distribution.

Model 1 in Table 6 shows that direct taxes and in particular taxes on income, profits, and capital gains tend to reduce the gap between the top and the middle of the distribution (i.e. the 95/50 percentile ratio decreases). As expected, the size of the coefficient of income taxes, profits, and capital gains is higher than that of direct taxes. This means that other forms of direct taxes are less effective in reducing inequality (e.g. property taxes). Model 2 in Table 5 shows the impact of taxes on income distribution considering the 95/80 percentile ratio. In this case, only taxes on income, profits, and capital gains seem able to influence the distribution of income. In particular, an increase on these taxes would slightly reduce the distance between the 95th and the 80th percentile.

Table 6: Regression results, taxation, and inequality in Latin American countries, 1990–2010 (alternative dependent variables)

	95/50	95/80
Taxes	-0.004 [0.005]	0.001 [0.001]
Direct taxes	-0.016* [0.009]	-0.002 [0.002]
Taxes on income	-0.020*** [0.007]	-0.003** [0.001]
Indirect taxes	-0.005 [0.007]	0.001 [0.002]
Taxes on sales	0.001 [0.006]	0.002 [0.002]

Notes: Robust standard errors in brackets. \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

Source: Author's compilation.

Overall, results of this study confirm that income taxation influences the upper part of the distribution, reducing the distance between the middle class and the upper class. Yet, it also confirms that the low effectiveness of taxation in promoting equality is most probably due to the inability of governments to tax top incomes (Amarante and Jiménez 2016).

## 4 Conclusions

This paper confirms that the recent changes in taxation have influenced the evolution of inequality in Latin America during the last two decades. In particular, it shows that both tax level and tax composition matter. Tax revenue increased since the 1990s and especially during the 2000s. However, tax changes in the first period were mainly driven by the rise in taxes sales and more specifically by the notable growth recorded by VAT. In contrast, the increase in tax revenue in the second period was related to the performance recorded by taxes on income, profits and capital gains, which contributed to promoting progressivity and redistributivity of taxation in Latin American countries. Furthermore, this work provides some useful insights on the impact of taxation on different parts of the distribution. In particular, the analysis shows that income taxation influences the distribution mainly by reducing the distance between the middle class and the upper class. However, the effect is limited at the top of the distribution.

Overall, it is evident that the effectiveness of taxation in promoting equality in Latin America is still limited by several factors. The redistributive capacity of the tax system is small because of the inability of governments to mobilize tax revenue to increase the tax/GDP ratio to its potential. Cornia et al. (2011) estimate that, on average, the tax/GDP ratio could still be raised by near four points in the 2000s, and even more excluding Argentina and Brazil as they have a tax/GDP ratio above the international norm. The relative contribution of indirect taxes is still high and reduces the progressivity of the tax system. In particular, around 2010, the share of taxes on sales on total tax revenue was around 40 per cent whereas it was less than 30 per cent in

OECD (Organization for Economic Cooperation and Development) countries. The contribution of personal income taxes is still low owing to the tax rate structures, the narrow tax base, the high level of informality, and tax evasions. Lastly, the contribution of property taxes on total tax revenue is still limited by the historical ties between political and economic elites that have reduced the possibility to tax, for example, the large *haciendas* or *fazendas*.

To promote the redistributive role of taxation, Latin American governments should promote tax revenue mobilization balancing the contribution between direct and indirect taxes. In particular, there is some room to strengthen income taxation by increasing the effective top tax rates considering their current low level and the disproportionate share of income owned by top income earners. Among the recent examples of reform, the dual tax system represents one of the most interesting solutions. At the same time, it is necessary to highlight that taxing people is not a technocratic exercise. Governments should strengthen the fiscal pact with their citizens ensuring that the increases in taxes meet peoples' expectations in terms of the quantity and quality of public services.

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## Appendix A Regression results

Table A1: Regression results, taxation, and inequality in Latin America before 2002

	(1)	(2)	(3)	(5)	(6)	(9)
Gini ( $t-1$ )	0.899*** [0.041]	0.895*** [0.033]	0.911*** [0.031]	0.917*** [0.026]	0.852*** [0.064]	0.910*** [0.030]
Tax revenue	0.075* [0.044]					
Direct taxes		0.113 [0.073]				
Taxes on income			0.081 [0.075]			
Indirect taxes				0.017 [0.053]		
Taxes on sales					0.094*** [0.030]	
Direct taxes on indirect taxes						-0.313 [0.265]
Gross domestic product (GDP) per capita (growth rate)	-0.073** [0.034]	-0.068*** [0.025]	-0.064** [0.027]	-0.067** [0.030]	-0.037 [0.032]	-0.059** [0.030]
Terms of trade	0.008 [0.011]	0.015 [0.010]	0.010 [0.010]	0.006 [0.010]	0.023* [0.012]	0.002 [0.009]
Real effective exchange rate (REER)	0.001 [0.003]	0.003 [0.002]	0.003 [0.002]	0.002 [0.002]	0.001 [0.003]	0.002 [0.003]
Foreign direct investments (FDIs)	-0.052 [0.048]	-0.056 [0.043]	-0.043 [0.041]	-0.028 [0.040]	0.003 [0.047]	-0.022 [0.044]
Remittances	0.020 [0.033]	0.020 [0.035]	0.011 [0.030]	-0.001 [0.027]	0.005 [0.028]	-0.013 [0.028]
Debt	-0.000 [0.001]	-0.001 [0.001]	-0.001 [0.001]	-0.002 [0.001]	0.016*** [0.004]	-0.002 [0.001]
Variation of working population with secondary education	-0.529 [0.363]	-0.448 [0.340]	-0.422 [0.345]	-0.485 [0.346]	-0.453** [0.200]	-0.493 [0.426]
Minimum wage	0.008 [0.006]	0.003 [0.006]	0.001 [0.006]	0.001 [0.007]	0.011 [0.010]	0.001 [0.006]
Constant	3.505** [1.655]	3.753*** [1.443]	3.629*** [1.352]	4.065** [1.725]	3.613 [3.130]	5.168*** [1.567]
Observations	172	151	151	151	94	151

Notes: Robust standard errors in brackets. \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

Source: Author's compilation.

Table A2: Regression results, taxation, and inequality in Latin American countries after 2002

	(1)	(2)	(3)	(5)	(6)	(9)
Gini ( $t-1$ )	0.915*** [0.026]	0.926*** [0.021]	0.933*** [0.030]	0.915*** [0.020]	0.929*** [0.024]	0.918*** [0.021]
Tax revenue	0.008 [0.028]					
Direct taxes		-0.101 [0.062]				
Taxes on income			-0.140*** [0.043]			
Indirect taxes				0.037 [0.043]		
Taxes on sales					0.041 [0.042]	
Direct taxes on indirect taxes						-1.437*** [0.488]
GDP per capita (growth rate)	-0.052 [0.035]	-0.060* [0.031]	-0.045 [0.032]	-0.051 [0.033]	-0.024 [0.032]	-0.054* [0.028]
Terms of trade	-0.011*** [0.004]	-0.008 [0.005]	-0.005 [0.005]	-0.012** [0.005]	-0.011** [0.005]	-0.007 [0.005]
REER	0.008* [0.005]	0.010*** [0.004]	0.009** [0.004]	0.010* [0.005]	0.013*** [0.005]	0.009** [0.004]
FDI	0.081 [0.055]	0.036 [0.042]	0.063 [0.045]	0.045 [0.046]	0.031 [0.039]	0.075* [0.041]
Remittances	-0.015 [0.022]	-0.039** [0.016]	-0.018 [0.017]	-0.018 [0.019]	-0.021 [0.015]	-0.039** [0.017]
Debt	0.004 [0.003]	0.002 [0.002]	0.003 [0.003]	0.003 [0.003]	0.004 [0.002]	0.001 [0.002]
Variation of working population with secondary education	-0.228 [0.150]	-0.106 [0.186]	-0.140 [0.178]	-0.171 [0.107]	-0.399* [0.211]	-0.231 [0.148]
Minimum wage	-0.008** [0.003]	-0.004** [0.002]	-0.006*** [0.002]	-0.008*** [0.003]	-0.007*** [0.003]	-0.005*** [0.002]
Constant	5.046*** [1.793]	4.271*** [1.352]	3.871** [1.692]	4.855*** [1.551]	3.790** [1.544]	5.218*** [1.299]
Observations	159	139	147	150	135	139

Notes: Robust standard errors in brackets. \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

Source: Author's compilation.

Table A3: Regression results, taxation, and inequality (95/50 percentile ratio) in Latin American countries

	(1)	(2)	(3)	(5)	(6)
95/50 ( $t-1$ )	0.901*** [0.028]	0.925*** [0.039]	0.922*** [0.031]	0.898*** [0.027]	0.906*** [0.026]
Tax revenue	-0.004 [0.005]				
Direct taxes		-0.016* [0.009]			
Taxes on income			-0.020*** [0.007]		
Indirect taxes				-0.005 [0.007]	
Taxes on sales					0.001 [0.006]
Direct taxes on indirect taxes	-0.009 [0.006]	-0.009 [0.006]	-0.008 [0.006]	-0.008 [0.006]	-0.009 [0.006]
GDP per capita (growth rate)	-0.002* [0.001]	-0.001 [0.001]	-0.001 [0.001]	-0.002** [0.001]	-0.001** [0.001]
Terms of trade	0.001*** [0.000]	0.001*** [0.000]	0.001*** [0.000]	0.001*** [0.000]	0.001** [0.000]
REER	0.006 [0.005]	0.006 [0.004]	0.005 [0.004]	0.005 [0.005]	0.006 [0.004]
FDI	0.000 [0.003]	-0.002 [0.003]	-0.001 [0.002]	-0.001 [0.003]	-0.001 [0.003]
Remittances	0.002 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]	0.001 [0.001]
Debt	-0.039 [0.027]	-0.030 [0.031]	-0.035 [0.029]	-0.031 [0.024]	-0.021 [0.037]
Variation of working population with secondary education	-0.000 [0.000]	0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
Constant	0.487*** [0.179]	0.387 [0.248]	0.394** [0.199]	0.566*** [0.212]	0.417** [0.208]
Observations	163	143	151	151	125

Notes: Robust standard errors in brackets. \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

Source: Author's compilation.

Table A4: Regression results, taxation, and inequality (95/80 percentile ratio) in Latin American countries

	(1)	(2)	(3)	(5)	(6)
95/80 ( $t-1$ )	0.889*** [0.037]	0.905*** [0.036]	0.900*** [0.037]	0.894*** [0.033]	0.903*** [0.035]
Tax revenue	0.001 [0.001]				
Direct taxes		-0.002 [0.002]			
Taxes on income			-0.003** [0.001]		
Indirect taxes				0.001 [0.002]	
Taxes on sales					0.002 [0.002]
Direct taxes on indirect taxes	-0.002 [0.002]	-0.002 [0.002]	-0.001 [0.002]	-0.001 [0.002]	-0.002 [0.002]
GDP per capita (growth rate)	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
Terms of trade	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
REER	0.003** [0.001]	0.003** [0.001]	0.003** [0.001]	0.003** [0.001]	0.003** [0.001]
FDI	-0.001 [0.001]	-0.002*** [0.001]	-0.001*** [0.001]	-0.001** [0.001]	-0.002** [0.001]
Remittances	0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
Debt	-0.015* [0.008]	-0.010 [0.008]	-0.011 [0.009]	-0.014* [0.008]	-0.012 [0.008]
Variation of working population with secondary education	-0.000** [0.000]	-0.000 [0.000]	-0.000* [0.000]	-0.000* [0.000]	-0.000* [0.000]
Constant	0.282*** [0.095]	0.262*** [0.090]	0.277*** [0.092]	0.275*** [0.085]	0.256*** [0.085]
Observations	276	248	256	259	210

Notes: Robust standard errors in brackets. \*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$ .

Source: Author's compilation.