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The Growth-Inequality Tradeoff in the Design of Tax Structure: Evidence from a Large Panel of Countries*

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Abstract

This paper examines the potential tradeoff between economic growth and income inequality in the design of tax structure by using a structural model and a large panel data set of 150 developed and developing countries for the period 1970-2009. Tax structure, which is treated as an endogenous variable in the estimations, is comprehensively proxied by a series of indicators, including major tax categories measured in both levels and rates, an index for overall tax mix, and an index for tax progressivity. While we find clear evidence of a tradeoff between growth and inequality for some key tax instruments (e.g. income taxes), it appears that this tradeoff may be avoided in the design of a few other taxes (e.g. excise taxes). Nevertheless, from a policy perspective, due either to the relative small estimated marginal effects or to the actual small changes in the size of tax instruments, the overall growth and distributional impacts of the changes in tax structure over the past decades have not been very large.
Keywords: Growth; inequality; tradeoff; tax structure
JEL Classifications: D31, H20, O15, O41, O50

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1 Introduction

Tax systems are complex institutions that countries have devised from time immemorial to collect adequate revenues for the expenditure needs of the state. But the taxes used to collect these revenues can have quite different costs to the economy in terms of distortions or "excess burden losses", as economic agents change their behavior when confronted with the changes in incentives associated with taxes. These excess burdens or efficiency losses when sustained through time will reduce the rate of economic growth of the economy. Since there are practically no taxes that at the same time yield significant revenue and are non-distortionary, the optimal choice of taxes involves those with the lowest efficiency losses, or in other words, those that can allow the maximum rate of economic growth over time.

Also important from an economic viewpoint, but even more important from a political economy viewpoint, the same exact revenues can be raised with very different distribution of final burdens or incidence across different income or other groups of individuals in society. Even though there is wide acceptance that the distribution of tax burdens should be fair or just, there is much less consensus on how progressive or redistributive tax systems should be. And as in the case of efficiency-growth, different taxes have different degrees of effectiveness in reducing income inequality. The main challenge in the design of tax structures is that generally there is a conflict or tradeoff between the objectives of efficiency and equity. While direct taxes, such as the individual income tax or the corporate income tax, have great potential for reducing inequality, these are also taxes with which we can associate larger efficiency losses. On the other hand, indirect taxes, such as the value-added tax or excises, tend to lead to lower efficiency losses but also yield less equitable outcomes.

Thus, given a certain amount of tax revenues to be raised, the optimal design of a country's tax structure involves a careful consideration of its potential impacts on the tradeoff between growth and inequality. A number of studies have explored the related impact of tax structure, but most of them have treated the issues separately—looking either at the link between tax structure and economic growth (e.g., Lee and Gordon, 2005; Arnold et al.,

2011) or at the link between tax structure and income inequality (e.g., Weller, 2007; Duncan and Sabirianova Peter, 2012). Neither isolated aspect of the analysis is ultimately useful to policy makers, because when contemplating tax reform policy makers need to balance simultaneously the impacts of alternative tax structures on both growth and inequality.

A related important issue in this literature, but one that has garnered less of a consensus is the measurement of tax structure. Existing studies have used either tax levels (i.e., revenues collected), for example Arnold et al. (2011), or statutory tax rates, for example Lee and Gordon (2005). From a theoretical standpoint, these two measures capture different aspects of tax system, but they are also related, as the former is the outcome of the latter along with many other determinants. Statutory rates tend to capture the marginal effects on economic behaviors but may not be that decisive on determining efficiency losses or changes in the income distribution if overall tax collections are low because of other offsetting aspects of the tax structure, such as exemptions or deductions. Therefore, applying both measures of tax structure to the same country sample is meaningful and should allow us to identify whether measurement would matter in exploring the economic impacts of tax structure.

In this paper we present new cross-country evidence for the potential tradeoff between economic growth and income distribution in the design of tax structure,[1] by using a panel dataset for 150 countries covering the period between 1970 and 2009. We seek to contribute to the literature in four ways. First, we utilize a large sample of countries from both the developed and developing world for the past four decades. This should be more informative than most other relevant cross-country studies that have focused only on high-income countries (e.g., Arnold et al., 2011; Muinelo-Gallo and Roca-Sagalés, 2011, 2013); in particular, it will allow us to discern whether similar tradeoffs are present in the developing world. Second, we construct a series of tax indicators for tax structure based on: tax levels and tax rates for the major tax instruments, an index for the overall tax mix (i.e., the ratio of

[1]This tradeoff has been long recognized in the economics literature (e.g., Okun, 1975; Scully, 1991) and more recently it has been the subject of theoretical modeling (e.g., García-Peñalosa and Turnovsky, 2007) and applied policy analysis (e.g., Ramos and Roca-Sagales, 2008; Muinelo-Gallo and Roca-Sagalés, 2011).

direct versus indirect taxes), and an index for tax progressivity; this allows us to capture the most comprehensive aspects of a country's tax system. Third, rather than relying on a single reduced form, as has been the norm in past studies, we employ a structural model to explore the joint impacts of tax policies on both growth and income distribution; this allows us to account for the potential causality between growth and inequality.[2] Although there are a fairly large number of studies examining the impact of tax policies on growth, much less research has been conducted on how changes in taxation have actually impacted income distribution trends, especially in developing countries. Even though some researchers have minimized the ability of tax policy to affect income distribution (e.g., Harberger, 2006), we still know little about how current worldwide trends toward lower progressivity and broader bases of income taxes or the increasing importance of the value-added taxes (VAT) may have affected income distribution. Fourth, we deal with the potential endogeneity issue of the "tax variables"—an issue that has been largely overlooked by previous studies and that may have biased their estimation results.

In our empirical estimation we find significant effects of tax structure choices on economic growth and income distribution. These effects generally support the findings in the previous literature regarding economic growth with direct taxes, mainly personal income taxes (PIT) and corporate income taxes (CIT), retarding growth and with their substitution for indirect taxes, mainly the VAT or GTGS (general tax on goods and services), having positive effects. Interestingly, our results also highlight that the growth and distributional effects of CIT are only statistically significant when it is measured in rates. With regard to income distribution, our results generally validate the findings obtained in past individual country incidence analysis studies, which generally follow a set of conventional assumptions regarding final tax incidence. While reliance on progressive income taxes (the PIT and CIT) has a positive impact on income distribution, contributing to decreasing inequality, indirect taxes, in particular the GTGS, have a negative impact on income distribution, leading to increasing

[2] Muinelo-Gallo and Roca-Sagalés (2011, 2013) are notable exceptions in the literature since they conduct a similar structural estimation. Below we discuss how our approach differs from theirs.

inequality. Also among the indirect taxes, the generally recognized distortionary customs tariff (CUST) turns out to be negatively associated with economic growth, but at the same time helps reduce income inequality. As for other separate tax instruments, it appears that the general tradeoff between growth and inequality may be less acute—an increase in social security and payroll taxes (SSCPAY) help reduce income inequality without—in some of the estimations–apparently serious negative effects on economic growth, while heavier reliance on excise taxes (EXC) has a positive effect on promoting economic growth while lessening income inequality. Lastly, property taxes (PROP) have no detectable significant impact on either growth or income distribution. In line with the theoretical justifications in the literature, an overall shift from indirect taxes to direct taxes and/or an increase in the overall level of tax progressivity present clear tradeoff between the two policy objectives of growth and income distribution. Even though tax structure issues are frequently in the very front of the political debate in many countries, our findings do not support this emphasis. In fact, the actual growth and distributional impacts of the changes in tax structure over the past several decades have not been very large. This would appear to be the combined result of the relatively small estimated marginal effects and the relatively small changes in the size of tax instruments.

The rest of the paper is organized as follows. In section 2 we briefly review the relevant literature. In section 3 we provide an overview of the international trends on changes in tax structure over the last four decades. In section 4 we review the empirical methodology and data. In section 5 we present the estimation results. In section 6 we simulate the growth and inequality implications of actual tax policy changes for our sample countries. In section 7 we conclude.

2 Review of the Literature

2.1 Taxation and economic growth

Alongside the theoretical modeling on optimal tax structure an empirical literature has developed over the past several decades examining the impact of tax instruments on different aspects of economic activity, including economic growth. The empirical findings are varied and not always consistent. While earlier studies including Atkinson and Stern (1980); Poterba et al. (1986), and Easterly and Rebelo (1993) find only small long-term effects of taxation on growth, more recent studies, including Kneller et al. (1999); Padovano and Galli (2001); Li and Sarte (2004); Lee and Gordon (2005); Fisman and Svensson (2007); Arnold et al. (2011), and Martinez-Vazquez et al. (2011) find strong significant effect of taxation on growth. In particular, consistent evidence has been built indicating that the form of taxation has a significant differential impact on growth; Kim (2003); Li and Sarte (2004), and Martinez-Vazquez et al. (2011) find evidence that greater reliance on consumption taxation, as opposed to income taxation, has significant positive growth effects. In addition, Kneller et al. (1999) find for OECD countries that income taxes reduce growth and consumption taxes do not. For OECD countries also, Wildman (2001) finds similar evidence for the personal income tax, especially with higher progressivity, measured in terms of the long-run income elasticity of tax revenue.

In addition, using a sample of 70 countries, Lee and Gordon (2005) find that higher corporate tax rates are associated with lower growth rates. Similar results are also found by Goolsbee (2004) for a wider sample of countries. Along similar lines, Arnold et al. (2011) find that both personal and corporate income taxes in OECD countries have significant negative effects on growth relative to consumption and property taxes. The effect of corporate income taxes is significantly more negative than that of personal income taxes.

Note, however, that some of the existing literature shows mixed results for the effect of consumption taxes on growth. While some authors, such as Emran and Stiglitz (2005), have

found negative effects, others such as Rebelo (1991) and Mendoza et al. (1997), in line with Harberger (1964)' conclusions, find that consumption taxes have no effect on the rate of economic growth.

2.2 Taxation and income distribution

Over the years a fairly large literature on tax incidence has developed, which for the most part assumes a priori what the incidence of main taxes ought to be vis-à-vis income and then proceeds to estimate changes in the income distribution based on those assumptions (Martinez-Vazquez, 2008). The earliest theoretical work on tax incidence is Harberger (1962)'s model on the incidence of corporate income tax; he 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 reallocation of labor among two sectors and changes in factor and output prices. Using elasticities typical for the U.S. economy, Harberger finds that, in these circumstances, 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 the international borders and finds that, in this case, the burden of a corporate tax is more than fully shifted to labor.

Most of the empirical studies on tax incidence are country-specific studies relying on micro simulation models and computable general equilibrium models. The general conclusion reached in this literature is that the redistributive effects of taxes are weak, especially so for developing countries (Engel et al., 1999; Harberger, 2006; Martinez-Vazquez, 2008; Bird and Zolt, 2014). However, some of these papers have found significant effects for large changes in tax structure. For example, for the United States, Li and Sarte (2004) find that the progressivity change associated with the Tax Reform Act (TRA) of 1986 had a significant effect on income inequality decreasing the Gini coefficient four-percentage points.[3]

[3]Instead, Engel et al. (1999) show that the scope for direct income redistribution through progressivity

There has been less empirical work on the impact of the tax structure on the distribution of income across countries. Weller (2007) uses cross-country data from 1981 to 2002 and finds positive effects of progressive taxation on income distribution. More recently, Duncan and Sabirianova Peter (2012) use a sophisticated measure of progressivity to examine whether inequality in the distribution of income is affected by their measure of structural progressivity of national income tax systems. Their main finding is that while progressivity reduces observed inequality in reported gross and net income, as measured by the Gini coefficients based on those data, it has a significantly smaller impact on "true inequality", which they argue is approximated by consumption-based measures of the Gini coefficient.[4]

2.3 Joint impact of taxation on both growth and inequality

More closely related to our analysis, Muinelo-Gallo and Roca-Sagalés (2011, 2013) examine the joint impact of aggregated direct taxes and indirect taxes on both growth and income distribution, by using 43 upper-middle and high income countries and 21 OECD countries respectively. They find significant evidence in support of the growth-inequality tradeoff for aggregated direct taxes but not for aggregated indirect taxes. However, their analysis differs from ours in several ways. Among them, it is a larger country sample in our case, which includes both high-income countries and low-income countries; a more comprehensive measurement of tax structure, which includes not only disaggregated tax levels but also tax rates for individual tax category, overall tax mix and progressivity; and an account for the potential endogeneity problem of the tax variables.

of the tax system is rather limited in Chile.

[4]Due to the presence of tax evasion, Duncan and Sabirianova Peter (2012) argue that under some conditions tax progressivity may induce increased inequality in the distribution of actual income (as measured by consumption) as opposed to observed income.

3 Trends in Taxation: A look at the Raw Data

Over the last several decades there have been significant changes in the rates and other elements of the structure of tax systems in both developed and developing countries. Naturally, all these changes in tax policy have had consequences, among other things, on both economic growth and income distribution. In this section, we provide as background information an overview of the trends in tax structure at the international level. For our worldwide sample of 150 countries the average annual tax structure as a share of GDP in Figure 1 shows the rapid rise of the general consumption tax (GTGS), generally the VAT, to become one of the most important source of revenue from the early 1990s, coming to represent on average 7 percent of GDP in most recent years. Because this tax is generally thought to be regressive, this move would not have helped reduce inequality in income distribution, but as long it has substituted for other direct taxes which are generally thought to be more distortionary, the rise in the GTGS should have had a positive impact on growth. Figure 1 also shows the large importance in the average tax system of payroll and social security taxes (SSCPAY) during the entire sample period. Because labor taxes are distortionary, they should have contributed to slower economic growth while their impact on income inequality is ambiguous, being regressive when capped at relatively low levels of wage income. Personal income taxes (PIT) have remained on average stable over the entire period, at about 4.5 percent of GDP and the same can be said for corporate income taxes (CIT) at 3 percent, though in more recent years we can observe a fast rise in PIT and a significant drop in the CIT, respectively.[5] Both types of income taxes are expected to cause slower economic growth but being generally progressive, lead to reductions in income inequality.[6] Also notable are the downward trends in excise taxes (EXC) and customs taxes (CUST), especially since the early 1990s, and with a more significant drop in CUST, the result of widespread trade

[5]Sample sizes for years 2007, 2008 and 2009 are reduced significantly, so the trend in these three years may not be comparable to the previous years.

[6]As discussed in more detail in subsection 4.2, the distributional effect of corporate income tax is somehow less clear.

reforms. Since generally these other forms of indirect taxation are thought to be regressive, these trends should have helped improve income distribution, but would have also slowed economic growth in the case of EXC since these taxes are also perceived as less distortionary than other taxes, with the opposite holding true in terms of growth for CUST, which are generally thought to be highly distortionary. Property taxes (PROP) have taken up the lowest share in GDP and it has been quite stable at a value around 1 percent of GDP over the period; although there is still controversy on the true nature of the property tax, we would expect little effects on aggregate growth and inequality.

However, the average figures in Figure 1 hide a considerable amount of heterogeneity across countries, and even groups of countries. To explore that heterogeneity, in Figure 2 we show the average annual tax structure as a share of GDP for OECD and non-OECD countries. We see in Figure 2 (a) that PIT and SSCPAY are by far the two most important tax instruments in OECD countries, with the latter surpassing the former since the early 2000s and each representing about 10 percent of GDP at the end of the sample period.[7] The GTGS is a third performer, steadily increasing in performance since the early 1980s and now representing 6 percent of GDP. The CIT has increased in importance in OECD countries, except for the most recent years, but still it represents no more than 4 percent of GDP on average.[8] The PROP has remained stable at a value just below 2 percent of GDP, while EXC has fluctuated just below 4 percent and CUST has steadily declined to just less than one percentage points of GDP.

For non-OECD countries, as shown in Figure 2 (b) the general trends in the separate taxes are quite different. Most significant is the emergence of the GTGS from the middle 1980s on as the single most important tax instrument representing at the end of the sample

[7]The lackluster performance of the personal income tax is explained by a trend towards flatter personal income tax schedules and a reduction in the top statutory income tax rates (see Figure 5).

[8]A substantial effort has been dedicated in the empirical tax literature toward explaining the apparent paradox of decreases in tax rates and increased revenue performance. The explanations range include base broadening (Devereux et al., 2002; Simmons, 2006; Sørensen, 2007; Piotrowska and Vanborren, 2008), the shifting from personal to corporate tax bases to take advantage of rates differentials (Devereux and Sørensen, 2005; de Mooij and Nicodème, 2008), and increases of general corporate profitability (Devereux and Sørensen, 2005; Auerbach, 2006; Simmons, 2006; Clausing, 2007).

period on average about 8 percent of GDP. At the other extreme is the dramatic fall in importance of CUST from 3 percent of GDP at the beginning of the sample period to just a bit over 1 percent at the end.[9] The SSCPAY has fluctuated over the sample period but with an upward trend and representing toward the end of the sample period between 3 and 5.5 percent of GDP. The PIT and EXC have taken up a value around 2 percent of GDP, and have had a declining trend; for the CIT the story is similar although it is a slightly more important revenue producer than PIT and EXC. PROP is a less significant source for revenue with a value less than 1 percent of GDP, even thought in more recent years we can observe a fast rise in its importance.

A different, more synthetic, way to examine tax trends for their potential effect on economic growth and income distribution is to just focus on the direct to indirect taxes ratio. As direct taxes we define it as all income taxes, including PIT, CIT, SSCPAY, and PROP.[10] As a group these taxes all have some negative impact on growth but because of their varying progressivity tend to have a positive impact in reducing income inequality. On the other hand, indirect taxes, fundamentally comprising GTGS, EXC, and CUST, are markedly friendlier toward economic growth but because of their regressivity tend to increase income inequality. Of course, the behavior or trend of the ratio is determined by that of its components in the numerator and denominator, which were just examined above.

As shown in Figure 3, over the last four decades the average ratio of direct to indirect taxes for our sample of countries oscillated around 1.5, with only a significant increase above that in the last years since the current world financial crisis. When the ratio is defined with PROP as part of indirect taxes (Tax Mix 2), the ratio is smaller but parallels closely the alternate definition (Tax Mix 1). In Figure 4 we show the direct to indirect tax ratio for OECD and non-OECD countries. Both ratios oscillate over time but remain relatively

[9] Keen (2008) and Baunsgaard and Keen (2010) discuss why it has been difficult for developing countries to replace the loss of customs taxes with increased revenues from other sources, in particular the VAT. The policy thrust has been also the subject of theoretical criticism as not being welfare enhancing (Emran and Stiglitz, 2005; Martinez-Vazquez, 2008; Kreickemeier and Raimondos-Moller, 2008).

[10] Alternatively, property taxes can be considered as part of the indirect taxes. The data description below considers both possibilities.

flat over the sample period. The big difference between the two groups of countries is that the direct to indirect ratio for OECD countries oscillates between 2.5 and 3 (or around 2 with the alternate definition) while for non-OECD countries oscillates around a value of 1 for the entire period. In short the ratio for OECD countries is loaded as more antigrowth but favoring income equality and for non-OECD countries as more pro-growth but favoring income inequality.

4 Empirical Methodology and Data

Our main empirical strategy is to provide an assessment of the impact of tax structure on both economic growth and income inequality and, on the way, shed some light on the various growth-inequality tradeoffs in the design and overall structure of tax systems. To achieve these goals, we estimate a simultaneous equations model based on the canonical specifications for economic growth and inequality in the previous literature, and we introduce a set of tax structure indicators into panel regressions, using a fairly large panel dataset built with information from 150 countries over the period 1970 to 2009.

4.1 Specification and Estimation Issues

Specification. While the empirical literature on economic growth is vast and ever growing, the literature to date has reached relatively little consensus on the determinants of income inequality. The benchmark structural specification we employ here follows Lundberg and Squire (2003), which is among the first to examine the joint determination of growth and inequality by a series of other variables.[11] As is also now standard in the literature, the specification is estimated by transforming the yearly data into five-year intervals, in order to control for the influence of business cycle fluctuations and the measurement error. More specifically, we estimate the following structural model for growth and inequality,

[11] This specification, in turn, is drawn on "standard" growth and inequality models available in the literature.

$$\begin{cases} Growth_{it} = \gamma Gini_{it} + \alpha T_{it} + \mathbf{X}_{it}\beta + u_{it} \\ Gini_{it} = \vartheta Growth_{it} + \theta T_{it} + \mathbf{Z}_{it}\delta + \varepsilon_{it} \end{cases} \tag{1}$$

where i indicates country and t denotes five-year intervals (i.e., 1970-1974, 1975-1979,..., 2000-2004, and 2005-2009); $Growth_{it}$ represents the average annual growth rate of GDP per capita (real); $Gini_{it}$ represents the Gini coefficient that we use as our measure of income inequality; T_{it} is a set of variables of interest including a number of tax structure indicators; $\mathbf{X}_{it}$ and $\mathbf{Z}_{it}$ are vectors of control variables for the growth and inequality equations respectively, as defined in Lundberg and Squire (2003).

The vector of "growth" variables $\mathbf{X}_{it}$, which is in turn based on Barro (1991) and Easterly et al. (1993), captures the best established factors of significance in determining economic growth, including the initial income level, education level, government consumption, financial development, trade openness, inflation, and the overall tax burden. The initial income level, measured as real GDP per capita at the beginning of each five-year period, is included to capture a catching-up effect in countries with lower initial income. Education is generally viewed as one of the main engines for economic growth, and it is measured by the average years of schooling. The share of government consumption to GDP is expected to be negatively associated with per capita GDP growth, as government consumption has no direct effect on private productivity but lowers saving and growth through the distorting effects from taxation. Financial development as measured by the ratio of M2 to GDP captures the link between financial depth and economic growth—a relationship that is still a subject of great disagreement and controversy among researchers. Trade openness, measured by the ratio of total trade (imports plus exports) to GDP, aims to capture the exposure of a country to globalization. An increase in inflation, measured by the annual percentage change in the consumer price index, may reduce the level of business investment and the overall efficiency with which productive factors are put to use. Finally, we include the overall tax burden, measured as the share of total tax revenue in GDP, as an additional variable for controlling

the total tax level in the economy and it helps to control for revenue neutrality when we analyze the effect of any given tax instrument.

The vector of "inequality" variables $\mathbf{Z}_{it}$, which originally come from Li et al. (1998), includes education level, a measure of civil liberties, financial development, and a measure of the distribution of land. Given that educational attainment is related to income and that low education is highly correlated with poverty, it is expected to find less inequality in societies with higher levels of education. In addition, a higher level of education also means that the share of labor income in the total tends to be higher and that labor income tends to be more equally distributed than capital income. From a political economy perspective, civil liberties can be expected to constrain the ability of the rich to influence policy in their favor, and so a higher level of civil liberties may contribute to a lower level of inequality in society. Financial development and distribution of land, measured by the ratio of M2 to GDP and the Gini coefficient of land distribution respectively, are included to capture the poor's access to the financial market. A deeper development of the financial sector and a more equal land distribution are expected to ease the access of the poor to credit and so contribute to a lower level of inequality in the society. In addition, we include two dummy variables to control for the differences in the definition and measurement units of the Gini coefficient. The first dummy variable equals one if the Gini coefficient is based on net income or expenditures (and equals zero if the Gini coefficient is based on gross income); the second dummy variable equals one if the Gini coefficient is based on individual data (and equals zero if the Gini coefficient is based on household data).

Finally, u_{it} and ε_{it} are error terms. Following Easterly et al. (1993) and Lundberg and Squire (2003), we assume that there is no correlation in growth rates and in inequality across periods, while we do allow for country fixed effects in the growth equation so that $u_{it} = \eta_i + e_{it}$. However, as in Muinelo-Gallo and Roca-Sagalés (2013), we do not include country fixed effects in the inequality equation. This is due to the fact that inequality varies much more across countries than over time, and so this characteristic of the variance of inequality cannot

be examined by techniques that eliminate cross-country effects and focus exclusively on the within-country relationship (Lundberg and Squire, 2003). In addition, taking out fixed effects in the estimation of inequality is also likely to exacerbate the measurements error (Banerjee and Duflo, 2003).

Endogeneity. An important potential problem concerns the endogeneity of the tax variables in estimating the structural model. In theory, tax policy decisions not only affect growth and income distribution but both economic growth and trends in income inequality can clearly affect the types of tax policy decisions that are taken. Although most empirical studies in both literatures (on growth and inequality) ignore the potential endogeneity of the tax variables[12]—probably in large part due to the difficulty in finding suitable instruments for the tax variables—we see this as an essential estimation issue which needs to be addressed to avoid biased estimates. Again, a country's tax structure design is very likely to be affected by the economic business cycle and the social and political conditions that are related to the country's overall standing vis-à-vis economic growth and income distribution. In the most common case, countries with slow growth or in a recession are more likely to adopt reductions in tax rates as a way to boost the economy through more investment and increased consumer demand. Countries with high and increasing income inequality may adopt reforms that rely more heavily on direct taxes. In addition, endogeneity may also arise automatically because tax collections increase (decrease) with income in an expanding (shrinking) economy if the tax systems are income elastic. From a political point of view, as income inequality increases, the ratio of median income to mean income falls, which in turn could push the median voter coalition to vote for higher tax rates and greater redistribution of income (Meltzer and Richard, 1981).

In order to circumvent the endogeneity issue, we use an instrumental variable approach. We pay special attention to reducing the weak identification issue of the instruments by choosing a combination of several instruments, which include a dummy indicating the type

[12]There are some notable exceptions, including Lee and Gordon (2005); Duncan and Sabirianova Peter (2012).

of political system (presidential versus parliamentary), an index of checks and balances of the executive authority, the rate of urbanization, and the weighted average of tax variables from neighboring countries (weighed by the inverse of distance between the two countries). In line with the literature, the first three instruments are employed to capture institutional and structural characteristics of a country that is likely to correlated with tax variables but orthogonal to both growth and inequality (e.g., Fatas and Mihov, 2001; Debrun and Kapoor, 2010; Attinasi et al., 2011). The last instrument is originally proposed and used by Lee and Gordon (2005). The validity of this instrument is justified by the conventional tax competition and tax mimicking literature arguing that the design of the tax structure in a country will be correlated with the design of tax structure in the neighboring countries, due to the fact that countries compete or mimic their tax policies for attracting mobile tax bases. Meanwhile, economic growth and/or income distribution in a country should not virtually have any significant impact on the design of the tax system of the neighboring countries. It is this favorable feature that makes the weighted average tax variables in neighboring countries otherwise a good instrument for the tax variables in the home country.

Estimation approach. Estimation of the system equations (1) requires an effective methodology to tackle several econometric issues simultaneously. First, appearance of the growth variable on the RHS of the inequality equation and vise versa creates the usual endogeneity problem in the estimation of simultaneous equations, which renders OLS estimators biased. Thus, we use instrumental variable (IV) approach to correct this. Since we have only three explanatory variables in common for the baseline growth and inequality models—education level, financial development, and overall tax burden, the implicit assumption is that the other explanatory variables in the growth equation do not affect inequality and so can serve as instruments for the endogenous growth variable in the inequality equation, and similarly, the other explanatory variables in the inequality equation do not influence growth and so can serve as instruments for the endogenous inequality variable in the growth equation. Second, the potential endogeneity issue of the tax structure variables as just discussed above.

We therefore employ the set of variables we laid out before as additional exogenous instruments for the tax structure variables. Finally, the possible omitted variables would affect both equations, leading to inefficiency caused by the possible correlation of the error terms u_{it} and ε_{it} in the system. Thus, we incorporate the seemingly unrelated regression model (SURE) to extend the 2SLS to a 3SLS model in order to improve estimation efficiency.

Lastly, as benchmark for the analysis, we also estimate the system equations by simply using the SURE model, in which we assume growth and distribution are orthogonal (i.e. absence of growth in the Gini equation and the Gini index in the growth equation) and tax variables are strictly exogenous.

4.2 Measurement of Tax Structure

Our variables of interest involve the measurement of the structure of tax systems in as much detail as possible and over as long a period as possible. To do so, we construct a series of tax structure indicators that capture various dimensions of the tax systems. These include individual tax categories measured in levels (covering PIT, CIT, SSCAPY, PROP, GTGS, EXC, and CUST), top statutory tax rates for personal income tax (PITRate) and corporate income tax (CITRate),[13] an index evaluating the overall direct to indirect taxes mix (Tax Mix 1 and Tax Mix 2), and an index reflecting the overall PIT tax progressivity.

In general, the economic impacts of tax structure can be distinguished between direct and indirect taxes. As direct taxes, personal income taxes, corporate income taxes, and social security and payroll taxes are thought to reduce growth due to the fact that they introduce distortions in the allocation of resources and reduce economic incentives for work effort and investment, all resulting in lower rates of economic growth. On the other hand, with the exception of the personal income taxes, which are generally accepted to be progressive and should reduce income inequality, it is theoretically less clear how the corporate income taxes

[13]Due to data availability, we are only able to obtain statutory tax rates for personal and corporate income taxes for a larger sample of countries. Indeed, these are the two variables used by Lee and Gordon (2005) in measuring the growth effects of tax structure.

and social security and payroll taxes would affect income inequality. For the corporate income tax, the general incidence assumption is that it falls on all capital owners and therefore it tends to be progressive; however, more recently, with more open economies and high mobility of capital, it is evidenced that a significant part of this tax is shifted backward to workers in the form of lower wages, which tend to make this tax regressive. For social security and payroll taxes, they are typically assumed to be fully shifted to workers, regardless of who is legally liable to pay the tax—at least a portion of this tax is typically imposed on the employers. In the presence of a cap on income for contributions—a frequent feature of this tax—its incidence is regressive. However, in developing countries where only workers in the formal sector pay this tax, its final incidence may be less regressive. Similarly, property tax incidence is typically also controversial. Some studies assume no shifting with the tax paid by the owners of the property or shifted to all owners of capital, in which case the tax is progressive. Others assume the forward shifting of property taxes to renters or users of the property, in which case it can be regressive.[14]

In theory, the growth effect of indirect taxes, including general taxes on goods and services, excise taxes and custom duties, can be mixed. While distorting consumption versus savings decisions, higher reliance on taxes on goods and services—as opposed to income taxes—would reduce the typical workers' and savers-investors' marginal tax rates, increasing their incentive to work and save and invest, and potentially increasing economic growth. As indirect taxes are ultimately paid by consumers, and lower income groups spend a higher share of their incomes, relatively higher reliance on general sales taxes, excises and/or customs duties is generally expected to result in higher real income inequality. However, the most important source of indirect taxes, the general consumption tax or value-added tax (VAT) can be designed with some features (exemption of basic commodities, lower rates, and so on) that can significantly mitigate the regressivity of this tax. To allow for differences on the impact of the VAT and other indirect taxes on inequality we introduce each

[14]See for example Martinez-Vasquez and Sjoquist (1988) and Bahl et al. (2010).

of these taxes separately in the regressions. We must note also that among excise taxes, there are some that can be highly regressive (e.g., a tax on kerosene fuel, used mostly by poor households in developing countries) or quite progressive (e.g., surtaxes on some luxury items mostly consumed by high income households). Unfortunately the data we have does not allow us to differentiate among the different excises.

Regarding the overall choice of direct versus indirect taxes, this issue is fundamental to the optimal design of tax structures since those different forms of taxation, as we elaborated above, may affect efficiency and equity quite differently. The strongest evidence yet is that direct versus indirect tax choices matter in the context of dynamic endogenous growth settings; this evidence points to the fact that switching the tax mix toward consumption taxation and away from income taxation has significant growth effects or dynamic efficiency gains (Kim, 1998; Li and Sarte, 2004).[15] Although there is a fairly large applied literature on tax incidence, allocating tax burdens among different income groups according to a conventional set of assumptions about tax shifting,[16] there has been less empirical work on the impact of the tax structure, in particular the direct to indirect taxes mix on the distribution of income. Nevertheless, since direct taxes, especially for income taxes, are more likely to be progressive than indirect taxes, switching from indirect taxes to direct taxes is generally believed to have a positive effect on reducing income inequality.

Finally, a larger consensus has been reached on the effect of tax progressivity on economic growth and income inequality. Since taxation has distortive effects on labor and investment decisions of economic agents, and these effects are generally intensified with rising tax progressivity, recent studies consistently find a negative effect of tax progressivity on economic growth (e.g., Wildman, 2001; Padovano and Galli, 2001, 2002; Li and Sarte, 2004). In contrast, a positive effect of tax progressivity on reducing income inequality is also detected as

[15]For a dissenting view see Mendoza et al. (1997) who provide evidence in support of Harberger (1964)'s claim that, although theory may predict that the mix of direct and indirect taxes is an important determinant of long-run growth and investment rates, in practice plausible changes in tax rates are unlikely to affect growth, even if they can alter moderately the investment rate.

[16]See, for example, Martinez-Vazquez (2008).

it imposes large tax burdens on high income people (e.g., Li and Sarte, 2004; Weller, 2007; Duncan and Sabirianova Peter, 2012). In this paper we use the measurement of personal income tax progressivity developed by Klara Sabirianova Peter and Duncan (2010).

4.3 Data

The data panel we use is unbalanced and variables are derived from various sources. Our measure of income inequality, Gini coefficient, is obtained from the UNU-WDIER World Income Inequality Database. Tax variables in levels are taken from the Government Finance Statistics of the International Monetary Fund (GFS-IMF). Top statutory income tax rates and measures of tax progressivity are derived from the World Tax Indicators from the International Center for Public Policy at Georgia State University, which compiled the data from a combination of multiple sources. The average year of schooling as our measure of education level is obtained from Barro and Lee (2001). Civil liberties are taken from Freedom House, while land Gini values are provided by the FAO database. All the other economic variables are derived from the World Development Indicator database. The data definitions are presented in Table A1 in the Appendix and the summary statistics are reported in Table 1.

5 Empirical Results

This section discusses the estimation results. The first subsection documents the growth and distributional effects of tax structure measured by levels, while the next subsection presents results from the estimations of tax structure measured by rates. The last subsection provides further examination on the impacts of overall tax mix and progressivity of the system. For robustness check, we present results from both SURE and 3SLS estimations, though the 3SLS estimation should be deemed as a more appropriate approach, as it takes into account the potential reverse causality between growth and inequality and the endo-

geneity of the tax variables. As shown below, the results from both estimations are quite similar regarding the signs of the tax variables, while generally some of the tax variables are statistically more significant for the case of 3SLS estimation. The F-statistics for first stage regression models are reported at the bottom of each table with the 3SLS estimation results, indicating the validity of the instruments used for the endogenous tax variables.

5.1 The Impacts of Tax Levels

Tables 2 and 3 report the estimation results for the structural models using the SURE and 3SLS approaches, respectively. Focusing on the tax variables, these results suggest several main findings.

First, there exists clear evidence of a tradeoff between growth and inequality facing governments in the design of their tax structures. In both tables, column (1) shows a negative coefficient for the personal income taxes in both growth and inequality equations, indicating that an increased reliance on personal income taxes that is balanced by a decreased reliance on other taxes tends to cut economic growth but also reduce income inequality at the same time. Using the 3SLS results, a one percentage-point increase in the share of personal income taxes in GDP, on average, reduces the growth rate by 2.09 percentage points while it lowers the Gini index by 0.36 points.[17] In contrast, column (5) shows a positive effect for the greater reliance on the general tax on goods and services on both growth and inequality, suggesting a shift in the opposite direction to rely more on indirect taxes—the general tax on goods and services—would tend to promote economic growth while worsen income inequality. Quantitatively, a one percentage-point increase in the share of general tax on goods and services in GDP, on average, increases the growth rate by 0.47 percentage points while it increases the Gini index by 0.40 points. The opposite effects of these two tax instruments are in line with the theories in characterizing the properties of personal income taxes as being as direct taxes and general tax on goods and services as being

[17]Note that the Gini index ranges from 0 to 100.

indirect taxes. However, increased reliance on custom duties, also defined as indirect taxes, as shown in column (7), appears to reduce economic growth but contribute to a lower level of income inequality, though this result is only statistically significant in the case of 3SLS estimation. But this result is to be expected as custom duties are distortionary to trade, which in turn adversely affects a country's economic growth. Meanwhile, the distributional effect of custom duties is a priori ambiguous, as it depends on which income groups end up consuming the imported taxed goods.

Second, it would appear that the tradeoff between growth and inequality may be somewhat avoided in the design of other tax instruments. Column (3) shows that social security and payroll taxes have the expected sign (i.e. negative) in affecting both growth and inequality, but it is only statistically significant in the inequality equation under the 3SLS estimation. This suggests that an increased reliance on social security and payroll taxes reduces income inequality without significantly harming economic growth. Even so, its magnitude effect seems to be relatively small—a one percentage-point increase in the share of this tax in GDP, on average, reduces the Gini index by 0.21 points.[18] In line with the theoretical predictions for excise taxes as a special consumption tax, a revenue-neutral tax shift to excise taxes would increase economic growth, while due largely to the fact that it may be generally higher income people who pay excise taxes, it lessens income inequality at the same time (as shown in column (6)). In addition, this appealing outcome appears to be relatively large in magnitude, as a one percentage-point increase in the share of excise taxes in GDP, on average, increases the growth rate by 1.91 percentage points while reduces the Gini index by 1.38 points.

Third, corporate income taxes and property taxes turn out to have no significant effects on either growth or inequality.[19] Although, as we discussed in subsection 4.2, the distributional effects of both corporate income taxes and property taxes are theoretically less clear,

[18]Part of the reason may be that in some countries, social security and payroll taxes are capped up to a certain level of income with the effect of making its distribution with respect to income regressive.

[19]As we see immediately below the story for the corporate income taxes is quite different when measured in rates.

as the incidences of both taxes depend on the assumptions regarding the shifting directions of tax burden, it is surprising to find an insignificant growth effect for these two tax instruments, especially for corporate income taxes when it is measured in levels. Nevertheless, it is important to bear in mind that all taxes we discussed here are measured in levels with respect to GDP, it is thus possible that with more revenues collected from corporate income taxes, higher levels of productive expenditure, which improves capital productivity and fosters economic growth, may also be provided as a substitute to maintain capital investment and so economic growth.[20] In this regard, it may be not entirely counterintuitive to observe an insignificant growth effect of corporate income taxes measured in levels.[21] As a further way to explore the impacts of corporate income taxes, we will analyze how the use of top statutory corporate income tax rate, which may better capture the marginal effects on economic behavior, may make a difference in the next subsection. As for the insignificant growth effect of property tax, it may simply reflect the fact that this tax instrument plays a little role in the overall tax system of most countries.

Concerning the control variables, the results are mostly consistent with those obtained in the previous literature. For the growth equation, the coefficient for initial GDP per capita is negative and significant, which is consistent with the assumption of the conditional convergence of economic growth reported in previous studies (Barro, 1991; Mankiw et al., 1992); the coefficient for education level is positively related to economic growth, confirming the predictions of growth theory and consistent with the findings in many previous studies (Barro, 1991; Mankiw et al., 1992; Arnold et al., 2011); government consumption is negatively associated with economic growth, as it lowers saving and so growth through the distorting effects from taxation; in spite of an unclear theoretical effect, our estimates reveal a negative relationship between financial development and economic growth; trade openness and inflation,

[20]Indeed, it has become an active subject on investigating how corporate income taxes and productive expenditure can be utilized as tools for competing capital investment.

[21]In support of our findings, Bustos et al. (2004) conclude that higher corporate income taxes do not necessarily reduce the desired capital stock—an essential factor for promoting economic growth, since a tax increase reduces marginal returns but also increases depreciation and interest payment allowances.

though having the expected signs, are not always statistically significant; lastly, the overall level of taxes is positively related to economic growth—a result, however, on which no consensus has been reached in the literature (Arnold et al., 2011). For the inequality equation, the net income/expenditure dummy variable and household/individual dummy variable for the measurement of the Gini index are negative and statistically significant, a result that coincides with that in Barro (2000). The estimated coefficient for overall level of tax burden shows that it is inequality reducing. As for the rest of the control variables, the results are broadly consistent with those in Li et al. (1998) and Lundberg and Squire (2003)—the impacts of education level and financial development on inequality are consistently negative and significant, while the impacts of the land Gini index and civil liberties are positively related to inequality.[22]

An additional result derived from the 3SLS model is the potential reverse causality between growth and inequality. Our results indicate that income inequality has a negative impact on economic growth; however, this impact is not always statistically significant across different specifications (especially for the specifications in the subsequent analysis).[23] On the other hand, economic growth turns out to be consistently negative and significant associated with income inequality across all specifications, indicating that an effective pathway to alleviate income inequality is through the promotion of economic growth.

5.2 The Impacts of Tax Rates

In this subsection, we explore the impact of tax structure when it is measured by tax rates. Given data availability, we only look at the top statutory tax rates for the personal income tax (PITRate) and the corporate income tax (CITRate), which by far are the two tax rates that have been analyzed most often in the literature. These two rates also have

[22]Note that the index of civil liberties is defined from 1 to 7, with 1 assigned to countries with the largest degree of civil liberties. So higher values of the index refer to lower civil liberties.

[23]The impact of income inequality on growth is far from being a settled issue. A number of studies have found a negative impact of inequality on growth, but with the results varying in significance and sign depending on income levels, democratic institutions and so on (e.g., Alesina and Rodrik, 1994; Easterly, 2007; Woo, 2011).

been observed to drop considerably over the past decades (see Figure 5).

Table 4 reports the results from the SURE and 3SLS estimations. Consistently, columns (1) and (3) reveal that an increase in the top statutory rate for personal income tax leads to lower rates of economic growth with a lower level of income inequality, even though these effects are smaller in magnitude relative to the corresponding case in levels. More precisely, based on the 3SLS estimation, a one percentage-point increase in top statutory tax rate for personal income tax is correlated with a 0.06 percentage points decrease in economic growth rate and a 0.10 percentage points decrease in the Gini index. In contrast to what we found in the previous subsection for the measurement in levels, columns (2) and (4) show that when corporate income tax is measured by top statutory tax rate it has the expected negative and significant effect on both growth and inequality. This effect is about two to three times stronger than that of the personal income tax rate. That is, a one percentage-point increase in the corporate tax rate is associated with 0.14 percentage points decrease in growth rate and 0.33 percentage points decrease in the Gini index. Unlike the case when the corporate income tax measured in levels, for which its economic impacts may be mixed by the accompanying productive expenditure in the country, top statutory tax rate mostly reflects the extent of progressivity of corporate income tax and captures the incentive effects of this tax instrument at the margin; it is thus this feature that drives corporate income tax rate to exert a significant effect on both growth and inequality. These results are consistent with those obtained by Lee and Gordon (2005) for economic growth.

The remaining control variables in both the growth and inequality equations are generally unchanged, with the exception that the impact of the Gini index on economic growth is now entirely insignificant and the effect of civil liberties also becomes insignificant in some specifications.

5.3 The Impacts of Tax Mix and Tax Progressivity

Turning to the overall design of tax structure, we focus on two additional indicators—tax mix and structural tax progressivity. The tax mix is measured by the ratio of direct taxes to indirect taxes, with property tax being considered alternatively as either a direct tax or an indirect tax (Tax Mix 1 and Tax Mix 2). Structural tax progressivity is based on simulations of the countries' personal income tax system, including information on statutory tax rates, tax brackets, country-specific tax legislation, basic allowances, standard deductions, tax credits, national surcharges, and local taxes. For the estimations we use both average rate progression (ARP) and marginal rate progression (MRP) constructed by Klara Sabirianova Peter and Duncan (2010), which characterize the structural progressivity of national tax schedules with respect to the changes in average rates and marginal rates along the income distribution.[24] However, as in Duncan and Sabirianova Peter (2012), we focus on ARP and use MRP for comparative purpose only, since the concept of tax progressivity generally applies to average taxes.

Table 5 presents the estimation results. As shown, although the estimates for the tax variables are statistically insignificant in the SURE estimation, they turn to be statistically significant and have the expected signs in general when we control for endogeneity of the tax variables in the 3SLS estimations. The results generally validate the conjectures that have long stood in the theoretical tax literature. That is, given overall tax revenues constant, a shift from indirect taxes to direct taxes lowers economic growth but reduces income inequality (columns (5) and (6)), while an increase in the extent of overall tax progressivity leads to a lower level of economic growth but a more equal distribution of income (column (7)). Quantitatively, however, the overall impact of the shift from indirect taxes to direct taxes is

[24]For example, for ARP, Klara Sabirianova Peter and Duncan (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.

small. A full one ratio point (equivalent to 100 percentage points) increases in the ratio of direct to indirect tax is correlated with only a 1.49 percentage points decrease in growth rate with only 0.71 points decrease in the Gini index (based on column (5)). This small effect in turn is due largely to the offsetting of the varied impacts of individual tax instruments we found in subsection 5.1. On the other hand, a one point increase in the ARP index contributes to a 0.76 points decrease in the growth rate and to 0.48 points decrease in the Gini index. Despite having an expected sign, it should be noted that the estimate for MRP as a measure of tax progressivity in Column (8) is not statistically significant in the inequality equation. However, this is not surprising given the fact that, as noted above, the MRP is a less accurate measure of tax progressivity. Lastly, similar to the preceding results, the remaining explanatory variables in both growth and inequality equations do not change their impacts.

6 Growth versus Inequality Tradeoff: Policy Simulations

From a policy perspective, our results above document the existence of the much discussed classic trade-off between growth and inequality involved in the design of major tax policy reforms, including income taxes and general consumption taxes. In order to visualize the magnitude of the real impact of choices in tax systems around the world, we estimate the tradeoff as a combination of the estimated marginal effects of each tax instrument and the actual policy change in the use of that tax instrument. Thus, even though a particular instrument may be relatively ineffective—having a relatively small marginal impact—this may be more than offset by a large change in the use of that instrument, and vice versa. Table 6 summarizes the final effects for each tax instrument having statistically significant coefficients (based on 3SLS estimations) and allowing a change in the usage of the instruments that is equal to the overall change between 1981 and 2005.[25] The results are clearly general

[25]The selection of the focus on this period is because we have a larger sample of countries in this period, which makes our calculation over the period more comparable.

averages for a large number of countries and for a long period of time. However, we believe they represent good summary indicators of the overall effects of tax policies on both the trends of economic growth and income distribution worldwide over a quarter century.

In summary, the worldwide change in tax structure in recent times has been in the direction of favoring economic growth, even though both the growth and distributional impacts of this change in reality, on average, have not been very large. While the economic significance (marginal effects) of personal income tax, excise tax, and custom tax seemed to be offset by the relatively small changes in their usage, the reverse was true for social security/payroll taxes. The general tax on goods and services increase in size by 2.59 percentage points led to an increase of 1.24 percentage points in economic growth accompanied by a 1.02 percentage points increase in income inequality. Overall, the net effect of changes in tax structure worldwide over the period 1981-2005 resulted in an increase in economic growth for only 1.85 percentage points and an increase in income inequality for only 1.38 percentage points.

Looking at the effect of changes in the top statutory tax rate for income taxes, the relative small marginal effects have been augmented by a large drop in their usage, leading to a modest impact on both growth and inequality. In particular, the top statutory corporate (personal) income tax rate decreases in size by 12.41 (19.58) percentage points led to a 1.74 (1.17) percentage points increase in economic growth accompanied by a 4.1 (1.96) percentage points increase in income inequality.

Lastly, despite the fact that the direct to indirect taxes ratio has experienced a reduction of about 0.4 ratio points (equivalent to 40 percentage points), it only led to very minor increase in both economic growth and income inequality (less than 1.1 and 0.4 percentage points, respectively). This is mostly due to the relatively small marginal effects. Personal income tax progressivity tends to have a larger effect on economic growth than on income distribution, and so a modest decrease in the level of tax progressivity (about 0.85 percentage point) resulted in a 0.65 percentage point increase in economic growth accompanied by a 0.41 percentage point increase in income inequality.

7 Conclusion

In this paper we have examined the potential tradeoff between economic growth and inequality in income distribution in the design of tax structures by using a large panel data set of 150 developed and developing countries for approximately the last four decades. While the literature on optimal taxation does not provide exact guidelines for the design of tax systems, it is generally understood that optimal tax design requires the use of both direct and indirect taxes, leaving quite open what the optimal tax mix should actually be. The recent empirical studies based on endogenous growth models have shown that heavy reliance on different forms of direct taxation has significant negative effects on the rate of economic growth. On the other hand, a less plentiful but nevertheless robust literature on the effects of taxation on income distribution shows that heavier reliance on progressive direct taxes can have an equalizing effect on income distribution.

Over the last four decades we have seen significant changes in tax structures, with for example significant increases in social security taxes in developed countries, fairly large decreases in the relative importance of customs taxes in developing countries, and increases in domestic consumption taxes across the board.

In this paper we find evidence of an explicit tradeoff between growth and inequality for an overall choice of direct versus indirect taxes, level of tax progressivity, and some major tax categories including income taxes and general consumption taxes. Our empirical results also highlight the importance of differentiating the measurement of the corporate income taxes (i.e. tax level or tax rate) when exploring its economic impact. Nevertheless, given the various potential tradeoffs detected, another important finding in this paper is that overall, from a policy perspective, the impact of the changes in tax structure in reality on economic growth and income inequality has not been very large—between 1981 and 2005 the average tax structure change made by countries in our sample implied 1.85 percentage points higher economic growth but also 1.38 percentage points higher inequality in income distribution measured by the Gini coefficient.

Also from a policy perspective it is necessary to keep in mind that tax structure choices can also significantly affect other important economic policy goals for governments. In particular, the heavier use of direct forms of taxation with significant progressivity also can contribute to macroeconomic stability via the work of automatic tax stabilizers. Thus from this perspective, the tradeoff is not only between growth and inequality but also macroeconomic stability. Other economic goals worth pursuing, especially for developing countries, may include the attraction of foreign direct investment, which may respond positively to lower relative use of direct taxation, in particular corporate income taxes. Therefore, lower relative usage of direct taxes may not only lead to faster economic growth but also reinforce it through the attraction of foreign direct investment. In reality, different countries make different choices on tax design in large part reflecting the relative importance they give to different economic goals at their individual stage of development. Thus, it is interesting to observe that developing countries on average are making considerably heavier use of indirect over direct taxes; this reveals a higher weight being given in their social preferences to economic growth over income inequality.

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Table 1: Summary Statistics, Five-Years Intervals.

Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Growth	1052	1.979	4.089	-42.884	33.137
Gini coefficient	650	38.706	10.583	18.77	73.9
Initial income	1039	6.139	8.92	0.087	61.375
Education	1016	5.863	3.084	0.195	13.19
Government consumption	1076	10.297	5.967	0.75	39.003
M2/GDP	982	50.376	45.914	1.23	633.389
Openness	1034	77.588	47.115	0.67	423.63
Inflation	944	0.542	4.172	-0.271	86.033
Dummy: net income or expenditure	1200	0.875	0.331	0	1
Dummy: individual vs. household	1200	0.071	0.257	0	1
Land Gini	818	62.854	16.949	23	94
Civil liberties	1063	3.615	1.833	1	7
Overall tax burden	923	23.396	11.223	0.431	65.345
PIT	767	4.226	4.567	0.078	25.869
CIT	800	2.84	2.728	0.04	27.079
SSCPAY	718	5.069	4.795	0.009	20.9
PROP	721	0.956	1.049	0.01	13.94
GTGS	779	4.436	3.015	0.006	15.387
EXC	816	2.338	1.445	0.014	8.7
CUST	824	2.128	1.834	0.001	9.167
PITRate	725	37.287	17.294	0	90
CITRate	777	34.301	11.121	0	66.6
Tax Mix 1	679	1.499	1.28	0.087	7.776
Tax Mix 2	679	1.211	0.962	0.075	7.564
ARP	635	3.901	3.299	-1.56E-09	13.484
MRP	635	5.269	3.854	-3.41E-07	17.982

Table 2: Effects of Tax Structure Measured by Levels: SURE Estimations

	(1) PIT	(2) CIT	(3) SSCPAY	(4) PROP	(5) GTGS	(6) EXC	(7) CUST
Growth Equation							
Initial income	-0.25***	-0.24***	-0.23***	-0.20***	-0.23***	-0.25***	-0.25***
	(-5.23)	(-4.86)	(-4.52)	(-4.23)	(-4.73)	(-5.32)	(-4.69)
Education	0.39***	0.32**	0.40***	0.08	0.19	0.36***	0.49***
	(2.81)	(2.31)	(2.75)	(0.56)	(1.31)	(2.76)	(3.48)
Government	-0.35***	-0.27***	-0.36***	-0.30***	-0.32***	-0.29***	-0.29***
	(-4.76)	(-3.68)	(-4.21)	(-4.15)	(-4.70)	(-4.30)	(-4.09)
M2/GDP	-0.02***	-0.02**	-0.02**	-0.02***	-0.02**	-0.01*	-0.01
	(-2.72)	(-2.04)	(-2.43)	(-2.73)	(-2.11)	(-1.92)	(-1.52)
Openness	0.01	0.01	0.00	0.02**	0.01	0.01	0.00
	(1.56)	(0.94)	(0.48)	(2.22)	(0.83)	(1.10)	(0.41)
Inflation	-0.10*	-0.09	-0.10*	-0.11*	-0.06	-0.10*	-0.10*
	(-1.73)	(-1.43)	(-1.69)	(-1.90)	(-1.10)	(-1.73)	(-1.65)
Overall tax burden	0.10***	0.06*	0.09**	0.06**	0.04	0.06**	0.06*
	(3.17)	(1.78)	(2.53)	(2.06)	(1.35)	(2.23)	(1.84)
Tax instrument[a]	-0.33***	0.05	-0.19*	0.33	0.25***	-0.12	0.23
	(-3.12)	(0.60)	(-1.82)	(1.05)	(2.78)	(-0.93)	(1.61)
R-squared	0.472	0.445	0.428	0.454	0.472	0.473	0.479
Gini Equation							
Dummy: net income	-5.93***	-6.14***	-4.98***	-5.36***	-5.77***	-4.89***	-5.11***
vs. expenditure	(-5.27)	(-5.49)	(-4.88)	(-4.82)	(-5.16)	(-4.50)	(-4.55)
Dummy: individual	-7.59***	-8.42***	-8.05***	-7.56***	-8.04***	-7.29***	-7.96***
vs. household	(-4.39)	(-4.74)	(-5.25)	(-4.44)	(-4.75)	(-4.37)	(-4.58)
Education	-0.73***	-0.85***	-0.77***	-0.63***	-0.83***	-0.85***	-0.74***
	(-3.63)	(-4.39)	(-4.04)	(-3.10)	(-3.99)	(-4.39)	(-3.49)
M2/GDP	-0.02***	-0.02**	-0.01*	-0.01*	-0.02**	-0.02***	-0.04***
	(-2.71)	(-2.53)	(-1.73)	(-1.91)	(-2.57)	(-2.89)	(-3.56)
Land Gini	0.16***	0.20***	0.19***	0.19***	0.20***	0.18***	0.20***
	(6.08)	(8.17)	(8.41)	(7.75)	(8.24)	(7.72)	(7.97)
Civil liberties	0.69*	0.80**	0.74**	0.73**	0.73**	0.29	0.71*
	(1.81)	(2.16)	(2.06)	(2.00)	(1.98)	(0.77)	(1.89)
Overall tax burden	-0.15***	-0.18***	-0.26***	-0.26***	-0.27***	-0.20***	-0.21***
	(-2.65)	(-3.80)	(-5.13)	(-5.49)	(-5.20)	(-4.36)	(-4.25)
Tax instrument[a]	-0.24*	-0.02	-0.23**	-0.24	0.32*	-1.18***	-0.44
	(-1.89)	(-0.10)	(-2.37)	(-0.50)	(1.84)	(-3.78)	(-1.54)
R-squared	0.516	0.519	0.632	0.530	0.527	0.527	0.475
Observations	345	358	329	340	367	375	348

Notes: t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

[a]: Tax instrument represents the corresponding tax indicator noted on the top of each column.

Table 3: Effects of Tax Structure Measured by Levels: 3SLS Estimations

	(1) PIT	(2) CIT	(3) SSCPAY	(4) PROP	(5) GTGS	(6) EXC	(7) CUST
Growth Equation							
Gini index	0.12	-0.22**	-0.49***	-0.13	-0.07	-0.26**	-0.25**
	(0.74)	(-2.55)	(-3.56)	(-1.35)	(-0.91)	(-2.21)	(-2.58)
Initial income	-0.27***	-0.23***	-0.18***	-0.19***	-0.18***	-0.15*	-0.24***
	(-4.31)	(-3.72)	(-2.64)	(-3.96)	(-3.56)	(-1.95)	(-4.08)
Education	0.73***	0.20	0.23	-0.04	-0.02	0.51**	0.03
	(2.73)	(1.32)	(0.91)	(-0.23)	(-0.12)	(2.33)	(0.18)
Government	-0.39***	-0.18*	-0.45***	-0.28***	-0.30***	-0.33***	-0.24***
	(-4.07)	(-1.96)	(-3.42)	(-3.94)	(-4.39)	(-3.58)	(-3.18)
M2/GDP	-0.04***	-0.01*	-0.02**	-0.02***	-0.02***	-0.03**	-0.03***
	(-3.03)	(-1.71)	(-2.00)	(-2.89)	(-2.59)	(-2.36)	(-2.79)
Openness	0.02*	0.00	0.01	0.02**	0.01	0.00	0.01
	(1.66)	(0.18)	(0.80)	(2.11)	(0.75)	(0.22)	(0.94)
Inflation	-0.06	-0.08	-0.18**	-0.10	-0.03	-0.19**	-0.14**
	(-0.68)	(-1.23)	(-2.30)	(-1.54)	(-0.51)	(-2.21)	(-2.11)
Overall tax burden	0.23***	-0.03	0.09	0.02	-0.01	-0.01	0.09**
	(2.88)	(-0.54)	(1.01)	(0.56)	(-0.15)	(-0.25)	(2.18)
Tax Instrument[a,b]	-2.09**	0.40	-0.67	0.88	0.47**	1.91*	-1.23**
	(-2.51)	(1.04)	(-1.04)	(0.95)	(2.41)	(1.74)	(-2.40)
R-squared	0.038	0.194	-0.255	0.344	0.412	-0.120	0.086
Gini Equation							
Growth rate	-1.17***	-1.42***	-0.98***	-1.05***	-1.15***	-1.17***	-1.24***
	(-4.85)	(-5.82)	(-4.16)	(-3.99)	(-4.76)	(-5.05)	(-5.18)
Dummy: net income	-6.11***	-5.91***	-4.93***	-5.63***	-6.29***	-5.02***	-5.42***
vs. expenditure	(-5.33)	(-5.29)	(-4.83)	(-4.99)	(-5.56)	(-4.53)	(-4.79)
Dummy: individual	-8.47***	-7.73***	-7.56***	-7.65***	-8.36***	-8.12***	-8.42***
vs. household	(-4.79)	(-4.45)	(-4.97)	(-4.48)	(-4.93)	(-4.77)	(-4.85)
Education	-0.44**	-0.58***	-0.60***	-0.44**	-0.63***	-0.64***	-0.55**
	(-2.09)	(-2.85)	(-3.06)	(-2.08)	(-2.91)	(-3.15)	(-2.45)
M2/GDP	-0.02***	-0.02**	-0.01*	-0.01*	-0.02**	-0.02***	-0.04***
	(-2.97)	(-2.44)	(-1.87)	(-1.84)	(-2.32)	(-2.75)	(-3.02)
Land Gini	0.13***	0.16***	0.16***	0.16***	0.16***	0.15***	0.17***
	(4.43)	(6.25)	(6.99)	(6.29)	(6.29)	(5.83)	(6.23)
Civil liberties	0.77*	1.09***	0.84**	0.90**	0.93**	0.38	0.97***
	(1.96)	(2.88)	(2.34)	(2.43)	(2.49)	(1.00)	(2.58)
Overall tax burden	-0.15***	-0.23***	-0.28***	-0.28***	-0.31***	-0.23***	-0.23***
	(-2.60)	(-4.51)	(-5.36)	(-5.78)	(-5.75)	(-4.87)	(-4.64)
Tax Instrument[a,b]	-0.36***	0.13	-0.21**	-0.43	0.40**	-1.38***	-0.60*
	(-2.61)	(0.63)	(-1.97)	(-0.79)	(2.08)	(-3.49)	(-1.81)
F-test for 1st stage	106.36	9.09	74.26	35.00	26.08	7.87	14.68
R-squared	0.491	0.479	0.604	0.507	0.505	0.502	0.443
Observations	345	358	329	340	367	375	348

Notes: t-statistics in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. [a]: Tax instrument represents the corresponding tax indicator noted on the top of each column. [b]: Tax instrument is treated as endogenous variable and is instrumented by a dummy indicating the type of political system, an index of checks and balances of the executive authority, the rate of urbanization, and the weighted average of tax variables from neighboring countries.

Table 4: Effects of Tax Structure Measured by Rates

	SURE		3SLS	
	(1)	(2)	(3)	(4)
	PITRate	CITRate	PITRate	CITRate
Growth Equation				
Gini index			-0.09	-0.11
			(-1.02)	(-1.49)
Initial income	-0.34***	-0.28***	-0.31***	-0.22***
	(-5.53)	(-6.00)	(-5.06)	(-4.42)
Education	0.60***	0.57***	0.35	0.18
	(2.95)	(3.64)	(1.29)	(0.64)
Government	-0.31***	-0.30***	-0.29***	-0.22**
	(-3.86)	(-3.91)	(-3.63)	(-2.47)
M2/GDP	-0.02**	-0.01*	-0.02**	-0.02**
	(-2.34)	(-1.90)	(-2.53)	(-2.42)
Openness	-0.00	-0.01	-0.00	-0.01
	(-0.37)	(-1.18)	(-0.36)	(-1.18)
Inflation	-0.09	-0.10*	-0.10	-0.11*
	(-1.60)	(-1.83)	(-1.57)	(-1.71)
Overall tax burden	0.08***	0.05*	0.06*	0.02
	(2.70)	(1.76)	(1.96)	(0.87)
Tax Instrument^{a,b}	-0.04**	-0.05***	-0.06**	-0.14**
	(-2.48)	(-2.65)	(-2.14)	(-2.00)
R-squared	0.538	0.540	0.484	0.419
Gini Equation				
Growth rate			-1.17***	-1.47***
			(-5.27)	(-6.49)
Dummy: net income	-6.77***	-7.21***	-6.88***	-7.57***
vs. expenditure	(-5.79)	(-6.25)	(-5.87)	(-6.56)
Dummy: individual	-9.06***	-7.96***	-9.33***	-8.44***
vs. household	(-4.87)	(-4.34)	(-4.98)	(-4.67)
Education	-0.97***	-1.12***	-0.65***	-0.83***
	(-4.67)	(-5.45)	(-2.97)	(-3.83)
M2/GDP	-0.02**	-0.02***	-0.02**	-0.02***
	(-2.54)	(-3.40)	(-2.32)	(-3.29)
Land Gini	0.20***	0.20***	0.17***	0.15***
	(8.39)	(8.38)	(6.69)	(6.07)
Civil liberties	0.04	0.40	0.40	0.80**
	(0.09)	(1.07)	(1.05)	(2.14)
Overall tax burden	-0.27***	-0.22***	-0.30***	-0.25***
	(-5.32)	(-4.46)	(-5.91)	(-5.03)
Tax Instrument^{a,b}	-0.09***	-0.23***	-0.10***	-0.33***
	(-3.20)	(-5.21)	(-3.57)	(-6.41)
F-test for 1st stage	-	-	23.70	9.06
R-squared	0.578	0.556	0.569	0.537
Observations	321	344	321	344

Notes: Same as in Table 3.

Table 5: Effects of Tax Mix and Tax Progressivity

	SURE				3SLS			
	(1) Tax Mix 1	(2) Tax Mix 2	(3) ARP	(4) MRP	(5) Tax Mix 1	(6) Tax Mix 2	(7) ARP	(8) MRP
Growth Equation								
Gini index					-0.13	-0.10	0.11	0.22**
					(-1.37)	(-1.08)	(1.05)	(1.99)
Initial income	-0.24***	-0.24***	-0.29***	-0.28***	-0.16**	-0.18***	-0.40***	-0.36***
	(-5.00)	(-5.14)	(-4.73)	(-4.87)	(-2.49)	(-3.11)	(-4.80)	(-4.63)
Education	0.23*	0.23	0.57***	0.58***	0.13	0.07	0.37**	0.45**
	(1.67)	(1.62)	(3.62)	(3.64)	(0.87)	(0.42)	(2.00)	(2.29)
Government	-0.33***	-0.34***	-0.34***	-0.34***	-0.41***	-0.50***	-0.33***	-0.28***
	(-4.65)	(-4.70)	(-4.26)	(-4.25)	(-3.57)	(-3.85)	(-3.52)	(-2.83)
M2/GDP	-0.01*	-0.01*	-0.02***	-0.02***	-0.02**	-0.03***	-0.03***	-0.02***
	(-1.82)	(-1.86)	(-2.61)	(-2.61)	(-2.30)	(-2.61)	(-2.99)	(-2.58)
Openness	0.02*	0.02*	0.01	0.01	0.01	0.02	0.02	0.02
	(1.73)	(1.78)	(0.80)	(0.80)	(1.15)	(1.34)	(1.63)	(1.34)
Inflation	-0.11*	-0.11*	-0.08	-0.08	-0.12	-0.11	-0.03	-0.04
	(-1.74)	(-1.74)	(-1.55)	(-1.57)	(-1.61)	(-1.42)	(-0.48)	(-0.55)
Overall tax burden	0.09***	0.09***	0.06**	0.06**	0.11**	0.15***	0.04	0.08**
	(2.96)	(3.02)	(2.14)	(2.17)	(2.25)	(2.78)	(1.12)	(2.08)
Tax Instrument^{a,b}	-0.19	-0.27	-0.02	-0.02	-1.49†	-2.59**	-0.76***	-0.58***
	(-0.89)	(-1.10)	(-0.24)	(-0.36)	(-1.42)	(-2.11)	(-2.87)	(-2.58)
R-squared	0.510	0.511	0.573	0.573	0.377	0.317	0.448	0.398
Gini Equation								
Growth rate					-1.14***	-1.07***	-1.51***	-1.34***
					(-4.53)	(-4.30)	(-6.16)	(-5.46)
Dummy: net income vs. expenditure	-6.32***	-6.16***	-6.45***	-6.08***	-6.71***	-6.49***	-6.74***	-6.75***
	(-5.17)	(-5.13)	(-5.01)	(-4.62)	(-5.45)	(-5.38)	(-5.25)	(-5.10)
Dummy: individual vs. household	-7.07***	-6.97***	-9.76***	-9.88***	-7.09***	-7.11***	-10.23***	-11.16***
	(-3.66)	(-3.61)	(-4.63)	(-4.72)	(-3.71)	(-3.72)	(-4.90)	(-5.33)
Education	-0.72***	-0.76***	-0.75***	-0.76***	-0.49**	-0.55**	-0.23	-0.34
	(-3.41)	(-3.66)	(-3.44)	(-3.55)	(-2.20)	(-2.55)	(-0.99)	(-1.50)
M2/GDP	-0.02**	-0.02**	-0.02***	-0.02***	-0.02**	-0.02**	-0.02**	-0.02**
	(-2.34)	(-2.51)	(-2.59)	(-2.68)	(-2.20)	(-2.44)	(-2.32)	(-2.48)
Land Gini	0.21***	0.21***	0.19***	0.20***	0.17***	0.17***	0.13***	0.16***
	(8.26)	(8.25)	(7.39)	(7.95)	(6.46)	(6.58)	(4.74)	(5.72)
Civil liberties	0.87**	0.88**	-0.15	-0.10	0.97**	0.98**	0.20	0.27
	(2.20)	(2.22)	(-0.37)	(-0.25)	(2.44)	(2.47)	(0.52)	(0.68)
Overall tax burden	-0.17***	-0.16***	-0.33***	-0.36***	-0.20***	-0.18***	-0.33***	-0.38***
	(-3.29)	(-2.98)	(-5.57)	(-6.64)	(-3.82)	(-3.34)	(-5.45)	(-6.91)
Tax Instrument^{a,b}	-0.51	-0.64	-0.08	0.16	-0.71*	-0.88†	-0.48**	-0.08
	(-1.34)	(-1.21)	(-0.45)	(1.16)	(-1.70)	(-1.46)	(-2.19)	(-0.46)
F-test for 1st stage	-	-	-	-	26.70	34.44	28.65	13.23
R-squared	0.517	0.516	0.566	0.567	0.506	0.509	0.567	0.573
Observations	331	331	299	299	331	331	299	299

Notes: Same as in Table 3. † represents significance at the 10% level under one-tail test.

Table 6: Policy Simulation of the Impact of Tax Policies, 1981-2005

Policy Instrument	Estimated Marginal Effects[a]		Changes between	Resulting economic effect	
	Growth	Inequality	1981 and 2005[b]	Growth	Inequality
Individual Tax Instrument					
PIT	-2.09	-0.36	-0.25	0.52	0.09
CIT	-	-	-0.07	-	-
SSCPAY	-	-0.21	1.47	-	-0.31
PROP	-	-	0.30	-	-
GTGS	0.47	0.40	2.59	1.22	1.04
EXC	1.91	-1.38	-0.22	-0.42	0.30
CUST	-1.23	-0.6	-0.43	0.53	0.26
Total effect				1.85	1.38
Top Statutory Tax Rate					
PITRate	-0.06	-0.10	-19.58	1.17	1.96
CITRate	-0.14	-0.33	-12.41	1.74	4.10
Overall Tax System					
Tax Mix1	-1.49	-0.71	-0.40	0.60	0.28
Tax Mix2	-2.59	-0.88	-0.39	1.01	0.34
ARP	-0.76	-0.48	-0.85	0.65	0.41
MRP	-0.58	-	-1.27	0.74	-

Notes: [a]: Estimated marginal effects are based on 3SLS estimations and are only reported for those tax instruments having statistically significant coefficients. [b]: The changes are calculated at the difference between the two extreme years, 1981 and 2005. Excepting changes in Tax Mix 1 and Tax Mix 2, all others are interpreted as changes in percentage points. Changes in Tax Mix 1 and Tax Mix 2 are the difference between the values of two ratios.

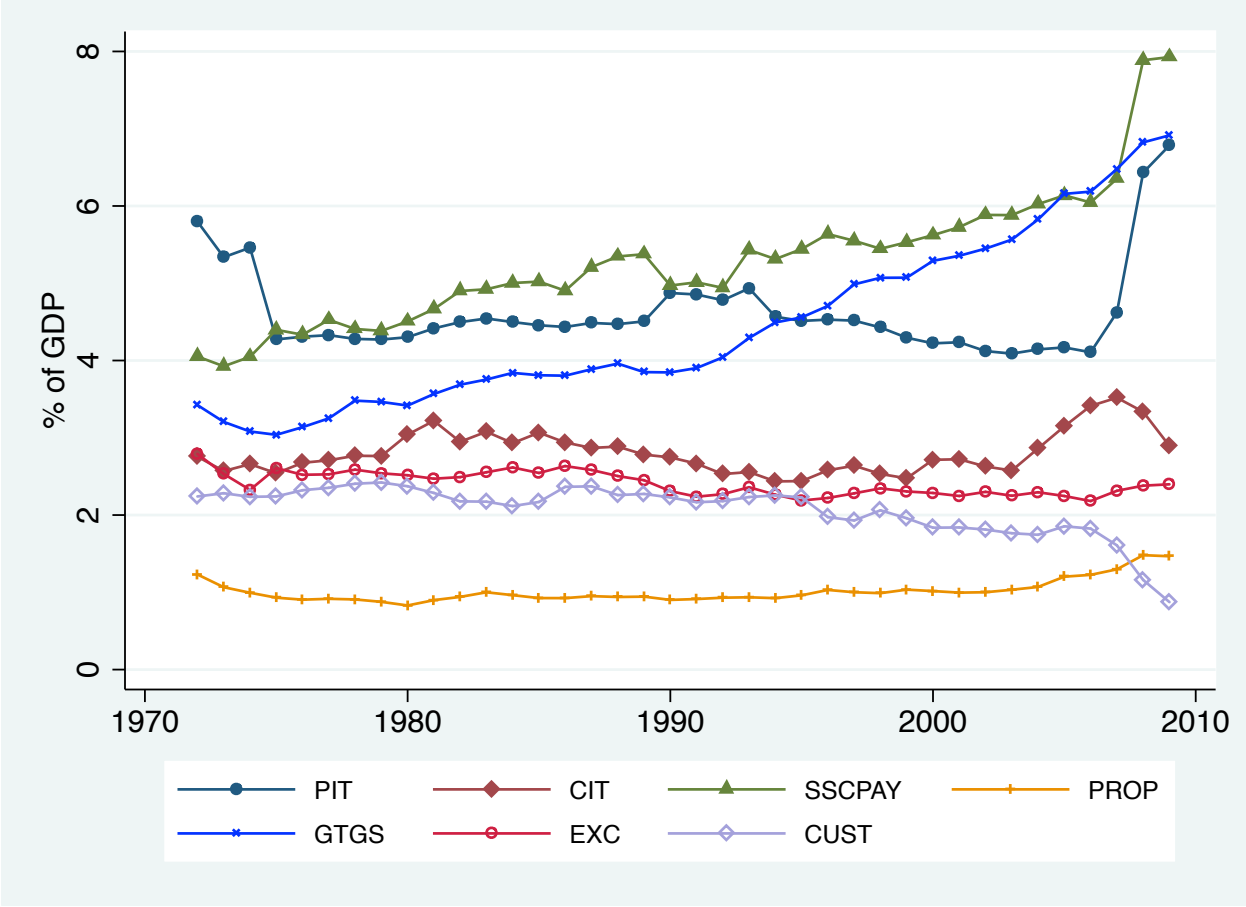

Figure 1: Average Annual Tax Structure as a Share of GDP: 1972-2009
Source: Authors' calculations; IMF GFS Database; OECD Revenue Statistics.
Note: Sample sizes for years 2007, 2008 and 2009 are reduced significantly, so the trend in these three years may not be comparable to the previous years.

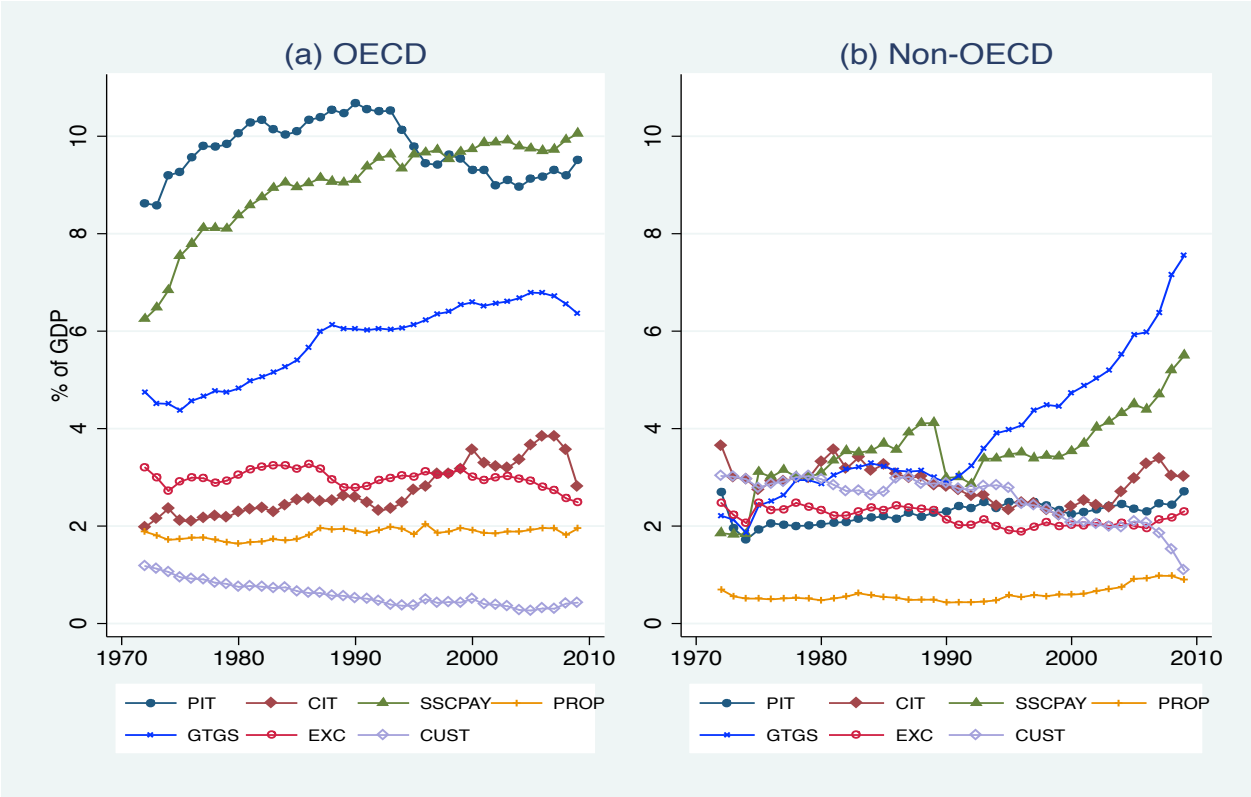

Figure 2: Average Annual Tax Structure as a Share of GDP in OECD and Non-OECD Countries: 1972-2009

Source: Authors' calculations; IMF GFS Database; OECD Revenue Statistics.

Note: Sample sizes for years 2007, 2008 and 2009 are reduced significantly, so the trend in these three years may not be comparable to the previous years.

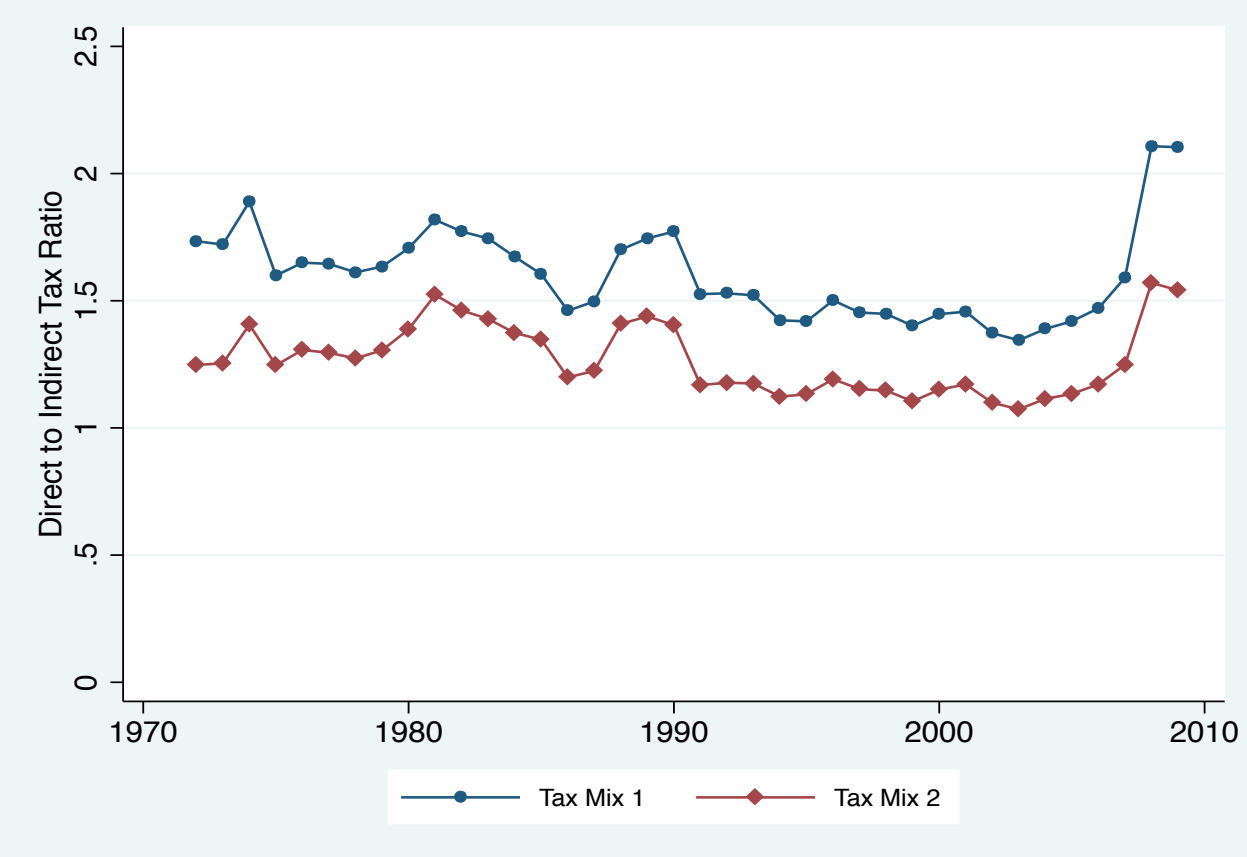

Figure 3: Average Annual Direct to Indirect Taxes Ratio: 1972-2009
Source: Authors' calculations; IMF GFS Database; OECD Revenue Statistics.
Note: In Tax Mix 1, property taxes are taken as direct taxes; while in Tax Mix 2, property taxes are taken as indirect taxes.

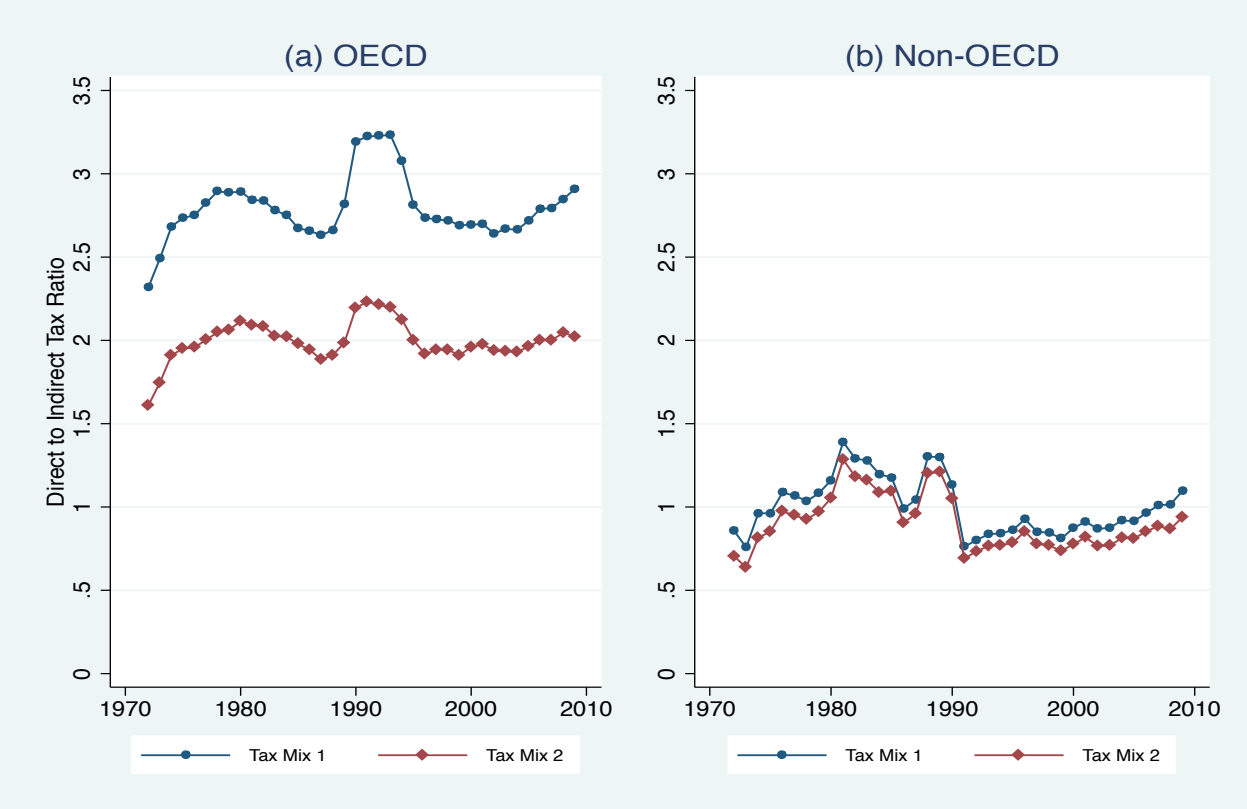

Figure 4: Average Annual Direct to Indirect Taxes Ratio in OECD and Non-OECD Countries: 1972-2009
Source: Authors' calculations; IMF GFS Database; OECD Revenue Statistics.
Note: In Tax Mix 1, property taxes are taken as direct taxes; while in Tax Mix 2, property taxes are taken as indirect taxes.

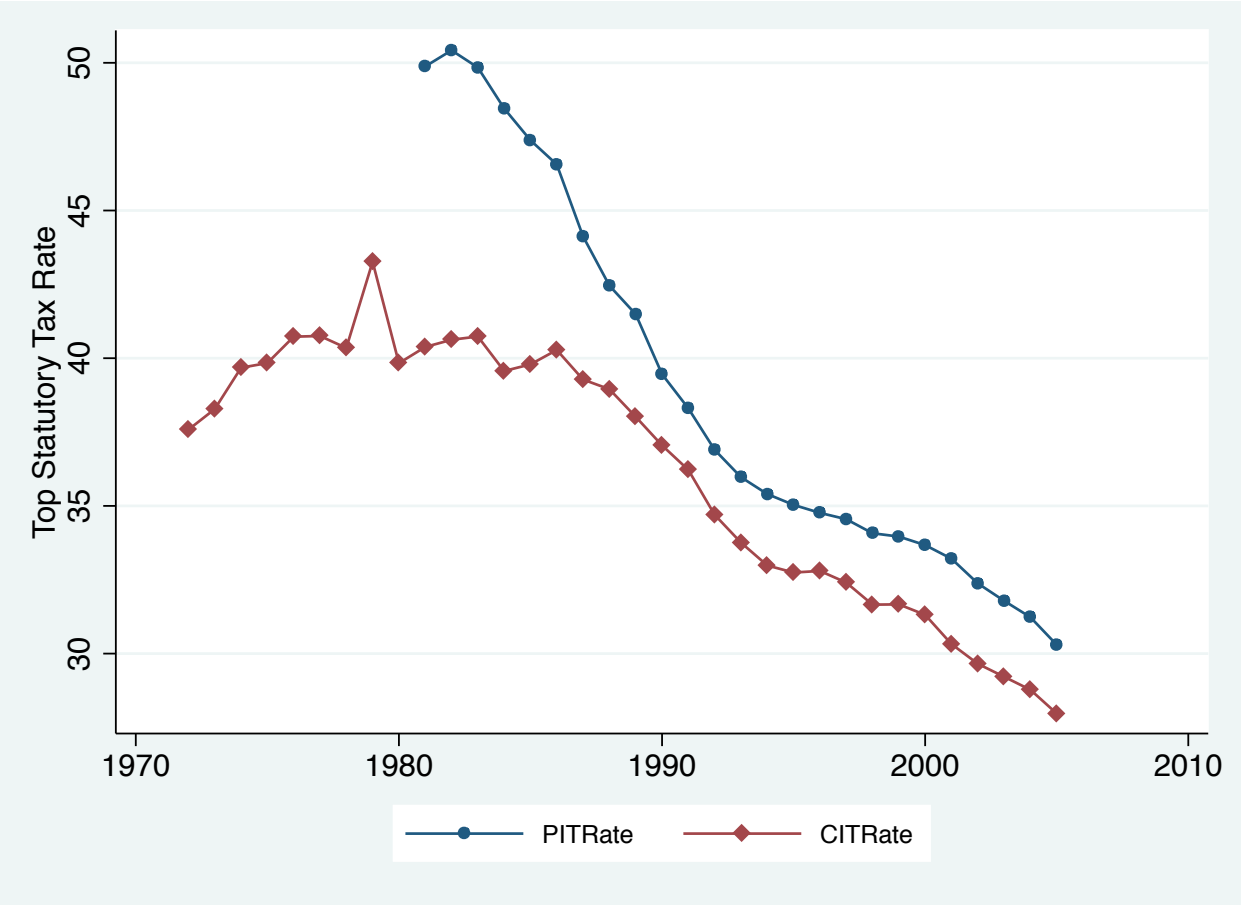

Figure 5: Top Statutory PIT and CIT Rates, 1970-2005
Source: World Tax Indicators

Appendix

Table A1: Description of Variables and Sources

Variable	Description	Source
Growth	Growth rate of real GDP per capita, %	World Development Indicators (WDI)
Gini coefficient	Gini coefficient, %	World Income Inequality Database (WIID)
Initial income	Initial GDP per capita, 1,000$	WDI
Education	Average years of schooling for population aged 25 or order	Barro and Lee (2010)
Government consumption	Government consumption, % of GDP	Penn World Tables
M2/GDP	M2/GDP, %	WDI
Openness	Import plus export, % of GDP	WDI
Inflation	Annual percent change in consumer prices, 1/10,000	WDI
Dummy: net income or expenditure	=1if Gini coefficient is based on net income or expenditures, 0 otherwise	WIID
Dummy: individual vs. household	=1 if Gini coefficient is based on individual data, 0 otherwise	WIID
Land Gini	Land Gini coefficient, %	FAO database
Civil liberties	Index on a scale of 1 to 7, with 1 representing the higher level and 7 representing the lower level of civil liberties.	Freedom house
Overall tax burden	Total tax revenues, % of GDP	Government Finance Statistics (GFS), OECD Revenue Statistics
PIT	Personal income tax, % of GDP	GFS, OECD Revenue Statistics
CIT	Corporate income tax, % of GDP	GFS, OECD Revenue Statistics
SSCPAY	Social security and payroll taxes, % of GDP	GFS, OECD Revenue Statistics
PROP	Property tax, % of GDP	GFS, OECD Revenue Statistics
GTGS	General tax on goods and services, % of GDP	GFS, OECD Revenue Statistics
EXC	Excises tax, % of GDP	GFS, OECD Revenue Statistics
CUST	Customs duty, % of GDP	GFS, OECD Revenue Statistics
PITRate	Top statutory tax rate of personal income tax, %	World Tax Indicators (WTI)
CITRate	Top statutory tax rate of corporate income tax, %	WTI
Tax Mix 1	Direct (personal and corporate income tax, payroll tax, social security contributions, property tax) to indirect (tax on goods and services, excise tax, custom duty) taxes ratio	GFS, OECD Revenue Statistics
Tax Mix 2	Direct (personal and corporate income tax, payroll tax, social security contributions) to indirect (property tax, general tax on goods and services, excise tax, custom duty) taxes ratio	GFS, OECD Revenue Statistics
ARP	Average rate progression up to an income level equivalent to four times countries' per capita GDP in local currency	WTI
MRP	Marginal rate progression up to an income level equivalent to four times countries' per capita GDP in local currency	WTI