INTERNATIONAL STUDIES PROGRAM

International Studies Program
Working Paper 09-11 (updated)
November 2009

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Direct versus Indirect Taxation: Trends, Theory and Economic Significance [1]

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I. Introduction and Some Definitions

One of the oldest questions in the theory and practice of taxation is that of the appropriate mix of direct and indirect taxes. The choice between direct and indirect taxes has contributed to a long animated debate, in political and academic circles, regarding the virtues and defects of those two forms of taxation. In this paper we provide an overview of the evolution of the ratio of direct taxes to indirect taxes across countries over the past three decades, the theorizing that has gone behind the alleged superiority of one form of taxation or the other, the determinants that appear to be behind the intensity with which both forms of taxation are used, and the economic relevance of the choice of tax structure in terms of economic growth, macroeconomic stability, the distribution of income, and the flow of foreign direct investment (FDI).

To get started it is helpful to have a working definition of direct and indirect taxes. Following Atkinson, (1977) we will define as direct taxes those that may be adjusted to the

[1] Paper presented at a Conference: Tax Systems: Whence and Whither. (Recent evolution, current problems and future challenges) A Conference Sponsored by the Savings Banks Foundation of Spain, FUNCAS (a non-profit organization), and UNICAJA, Malaga, Spain September 9-11, 2009. We are thankful to Jenny Ligthart, Klara Sabirianova Peterm and Jesus Ruiz-Huerta for helpful comments.

individual characteristics of the taxpayer and as indirect taxes those that are levied on transactions irrespective of the circumstances of buyer or seller. Thus, conventional income taxes can be classified as direct taxes and the same can said for most taxes on assets and wealth as long as there are potential adjustments for the characteristics of owners. For example, property taxes on owner-occupied housing may be adjusted for the personal characteristics of owners but that is not always the case. Property taxes on commercial buildings, motor vehicles, and the like are hardly ever adjusted for personal or household characteristics and therefore those can be considered indirect taxes. In this category of indirect taxes easily fall most taxes on transactions with differentiated rates (sales, value added tax (VAT), excises, customs tariff, etc.). But as indicated by Atkinson, there are what may called "transitional" taxes between the two categories; in particular, a uniform general sales tax can be easily transformed into a general consumption or expenditure tax, which can be adapted to personal or household characteristics.[2]

Over the last three decades the average ratio of direct to indirect taxes for a sample of 116 countries has been on the increase and these changes have been more pronounced for developed countries than for developing countries. As we will see in detail in the next section of this paper, in the case of developed countries it has been the numerator of the ratio that has moved the most, with the main driver being increases in the relative importance of social security contributions, while smaller relative increases in corporate income taxes have been offset by also smaller relative decreases in personal income taxes; this has been accompanied by a relatively flat performance of domestic consumption taxes. In the case of developing countries, it has been changes in the denominator of the ratio that has had the largest impact. Fairly large decreases in the relative importance of customs taxes have been only partially offset by increases in the relative importance of domestic consumption taxes, while at the same time a small decrease in income taxes has been more than offset by an increase in the relative importance of social security contributions.

In the economics literature a theoretical debate has accompanied over the years the choice between direct and indirect forms of taxation. The choice of direct versus indirect taxes is fundamental to the optimal design of tax structures since those forms of taxation may affect

[2] Other definitions of direct and indirect taxes could be used that would likely produce similar classification results. For example, Poterba et al. (1986) define direct taxes as taxes on individuals, including income taxes and employee contributions for social insurance, and indirect taxes are defined as those collected from firms, including sales and value-added taxes, employer contributions for social insurance, and various excise taxes. For empirical estimation purposes in this paper, given the data available, we will allow for several groupings of direct and indirect taxes.

differently the goals of efficiency and equity. While some early contributions drove to demonstrate the superiority of direct over indirect taxes under specific conditions (Hicks, 1939),[3] most of the focus early on in the optimal tax literature was on separate forms of taxation (e.g., Ramsey, 1927; Diamond and Mirrlees, 1971). A key development in the optimal tax literature from the perspective of the optimal tax mix was Atkinson and Stiglitz's (1976) seminal paper. These authors, who for the first time considered the interaction of direct and indirect taxes in the attainment of efficiency and equity goals, reached a powerful result. The Atkinson and Stiglitz theorem states that, in an economy where individuals differ only in their earning abilities, government can impose a general income tax, and where the utility function is separable between labor and all commodities, then in the optimum tax design there is no need to employ indirect taxation. This important result was followed, as we will see in the overview of the theoretical literature below, by a significant number of other theoretical contributions showing how important aspects of the economy (e.g., the scope of tax evasion) and heterogeneity among taxpayers would justify the existence side by side of direct and indirect forms of taxation. This is comforting since basically all economies employ together broad forms of direct and indirect taxation even though we are far from fully understanding what the main determinants of the direct to indirect tax mix are (Kenny and Winer, 2006).

With the coexistence of direct and indirect forms of taxation explained in the theoretical optimal tax literature, the big question that has remained largely unanswered is that of the economic consequences of different mixes of direct and indirect taxes. For example, from the perspective of economic growth, in a neoclassical framework, the tax structure, and in particular the tax mix, have no permanent effects on the growth rate, although changes in tax policy can have transitory effects.[4] But in the context of endogenous growth models even stable tax structures can impact the growth rate due to the externality effects on the accumulation of human and physical capital. As we review below, an increasing number of studies find important effects of the tax mix on the rate of economic growth.

The choice of the direct-indirect tax mix also is likely to have, as we review below, important consequences in other dimensions of the economy including macroeconomic stability, disparities in income distribution, and foreign direct investment flows. All those, including

[3] Essentially Hicks (1939) assumed identical individuals with perfectly inelastic labor supply (Atkinson, 1977).
[4] See, for example, the discussion in Lee and Gordon (2005).

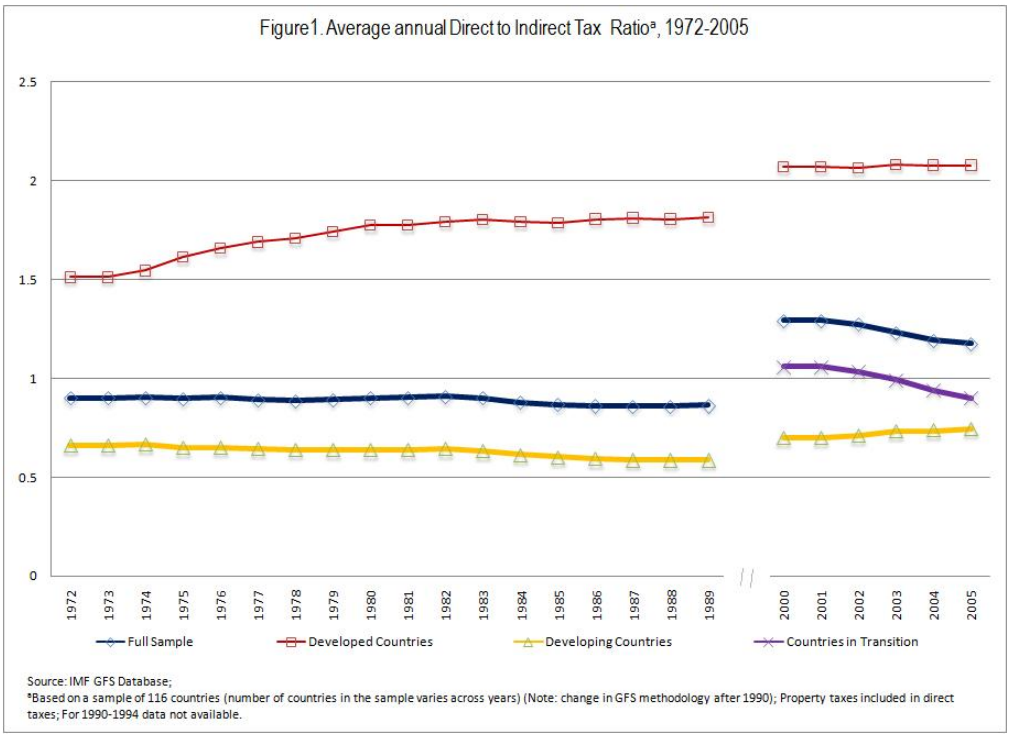
economic growth, will be revisited in this paper. There are several other potential effects of the choice of tax mix, including the impact on risk taking and entrepreneurship or taxpayers' moral and voluntary tax compliance. As Atkinson (1977) points out, supposedly taxpayers may show preference for indirect taxation on the grounds that it offers them choice and some politicians may have similar preferences because indirect taxes may be perceived by the public as being less visible.[5] None of these other possible effects will be explored further in this paper.

The rest of the paper is organized as follows. In section 2 we provide an overview of the international trends in the use of direct versus indirect forms of taxation over the last three decades. In section 3 we review the theoretical literature on optimal tax design and the more recent empirical literature on the economic consequences of the choice of tax structure. In section 4 we revisit the issue of the determinants of tax structure with international panel data from the perspective of the direct to indirect tax ratio. In section 5, using the same international panel data set, we explore the effects of the direct to indirect tax mix on economic growth, macroeconomic stability, income distribution, and foreign direct investment flows. In section 6 we conclude.

II. Trends in Direct versus Indirect forms of Taxation

In this section we provide as background information an overview of the evolution of the average direct to indirect tax ratio over the period 1972-2005 for a sample of 116 developed and developing countries. Figure 1 shows the trend when property taxes are classified as direct taxes, but the trends are maintained when property taxes are classified as indirect taxes, with tax ratio having a lower value.[6] This graph omits observations for the period 1990-1999 because a change of classification in the GFS statistics from the IMF led to irregular country reporting over the period which distorts the average figures.[7]

[5] However, Watrin and Ullman (2008) using an experimental approach find that participants are less compliant with consumption taxes than with income taxes.
[6] Trends in Figures 1 – 5 are based on 5-year moving averages.
[7] See Tables A.3 in the Appendix for an accounting of the number of observations for each period and a discussion of the changes in definitions and reporting in the GFS dataset (Box A.1).



Several significant trends are observed. For developed countries the ratio has steadily increased over the period by over 50 percent while for developing countries has roughly stayed the same, with an average ratio that is about one-third of its value for the average of developed countries. For both developed and developing countries there tends to be somewhat of a jump in the direct to indirect ratio in the 2000s but without a clear trend. Some of this increased in the tax ratio is no doubt due to the changes in the definition of GFS statistics, which most substantially represented a more explicit separate accounting for social security taxes, which before 1990 had been classified as non-tax revenues and also partially as income taxes. For the full sample, there is correspondingly also an increase of the tax ratio from roughly a value of 0.75 during the 1970s and 1980s to just about a value of 1.0 in the most recent years.

To understand better what is driving the behavior of the direct to indirect tax ratio, we show the historical evolutions of the share of each of the main taxes as a ratio of total taxes over the 1972-2005 period for the full sample, and for developed, developing and transition countries in Figures 2, 3, 4, and 5, respectively. We should note that GFS reporting is fairly aggregate in some cases and so, for example, we are not able to distinguish, for a number of countries, between personal and corporate income taxes or in the case of domestic consumption taxes, between VAT and excises. Although one should not pay much attention to fluctuations over

short periods of time, which can be due to, among other things, sample composition, these graphs are useful to identify some trends. In terms of indirect taxes, for the full sample we observe an increase in consumption taxes, supposedly driven by increases in VAT collections. This increase in the relative importance of consumption taxes is apparent in the groups of developing and transition countries; for the case of developed countries their importance remains fairly flat.

Another noticeable trend is the drop in the relative importance of customs taxes, especially in developing countries. For many decades now a standard policy recommendation for developing countries, from the IMF, the World Bank and many other sources, has been to promote trade liberalization by implementing a revenue-neutral reform reducing the customs tariff and increasing domestic consumption taxes, mostly the VAT. However, this policy thrust has been shown only partially successful in actual implementation in a number of recent empirical studies.[8] Keen (2008) provides reasons why it is difficult for developing countries to replace the loss of trade taxes with increased VAT revenues, and Baunsgaard and Keen (2005) find that the degree of revenue recovery through domestic taxes is significantly less in lower income versus middle- and high-income countries. While for high- and middle-income countries, this revenue recovery effect is generally effective, for low-income countries, however, this effect is weak, that is, less than 30 percent of the trade tax loss could be offset by the increase of the domestic consumption tax. And there is no evidence supporting that the presence of a VAT will bring a significant difference to the degree of recovery in low-income countries.

In terms of direct taxes, the big mover and shaker is social security contributions, which experienced a significant increase over the last two decades, especially in developed countries and less of an increase in developing and transitional countries. Income taxes have decreased in relative importance in developing and transition countries, but remained rather flat in the case of developed countries. Using OECD data for developed countries shows that for this group, while personal income taxes have decreased, corporate income taxes have increased.[9] The increases in corporate income taxes have taken place despite the fact that statutory corporate tax rates have

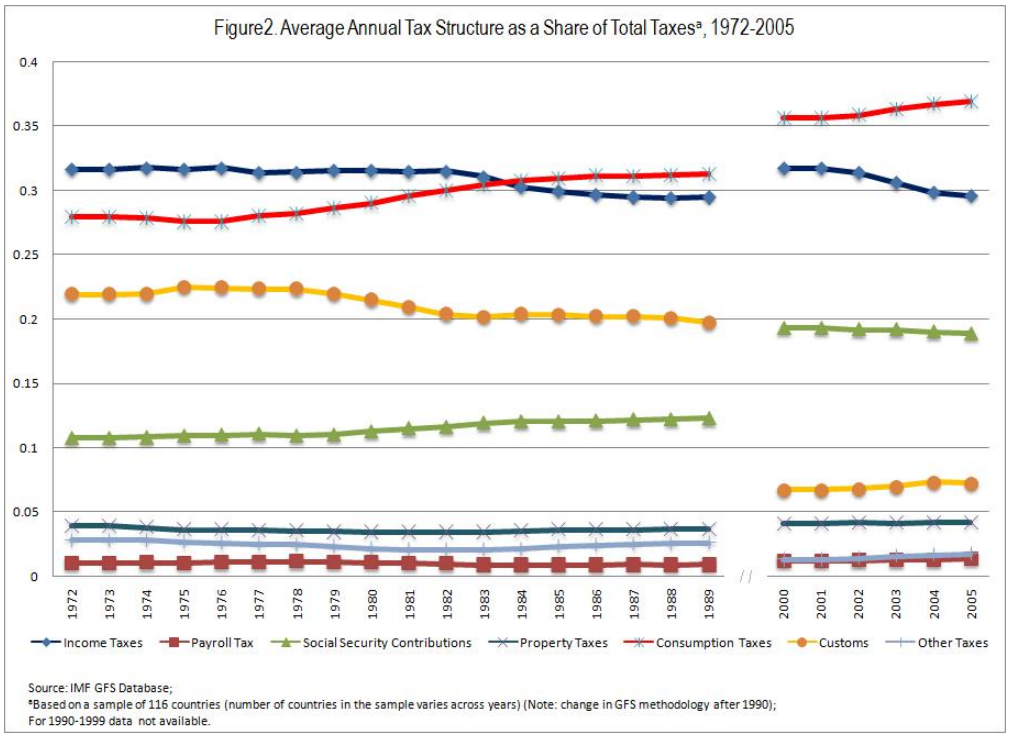
[8] The policy thrust has been also the subject of theoretical criticism. For example, Emran and Stiglitz (2005) have argued that a revenue-neutral shifting from tariff to VAT is welfare worsening because of the existence of a large informal sector in developing countries; Munk (2008) has argued along similar lines because the allocation benefits from domestic taxes may be outweighed by increasing administrative costs. See also Kreickemeier and Raimondos-Møller (2008) on the negative effect on market access and questionable welfare effects.

[9] See also Johansson et al. (2008). Part of the reduction in the share of personal income taxes can be explained by a change towards flatter personal income tax schedules and a reduction in the top statutory income tax rates.

declined internationally as a response to the increasing mobility of capital and firms in the last two decades in an attempt of many governments to remain attractive to international capital.

A substantial body of research has put forward explanations for this apparent paradox. First, the broadening of the corporate tax base by changes in the laws has played an important role in offsetting the reduction of statutory tax rates (Devereux, Griffith and Klemm, 2002; Simmons, 2006; Sørensen, 2006; Piotrowska and Vanborren, 2008). Second, income shifting from personal to corporate tax bases, or from non-corporate to the corporate sector due to the incentive effect of the low tax rate in the corporate sector has been suggested as another explanation for the paradox (Devereux and Sørensen, 2005, De Mooij and Nicodème, 2008). Third, an increase of corporate profitability and the size of the corporate sector may have increased the effective tax rate and, therefore, tax revenues (Devereux, Griffith and Klemm, 2004; Devereux and Sørensen, 2005; Auerbach, 2006; Simmons, 2006; Clausing, 2007).

The relative shares of property taxes and other taxes (environmental levies, etc.) have been fairly constant over time.



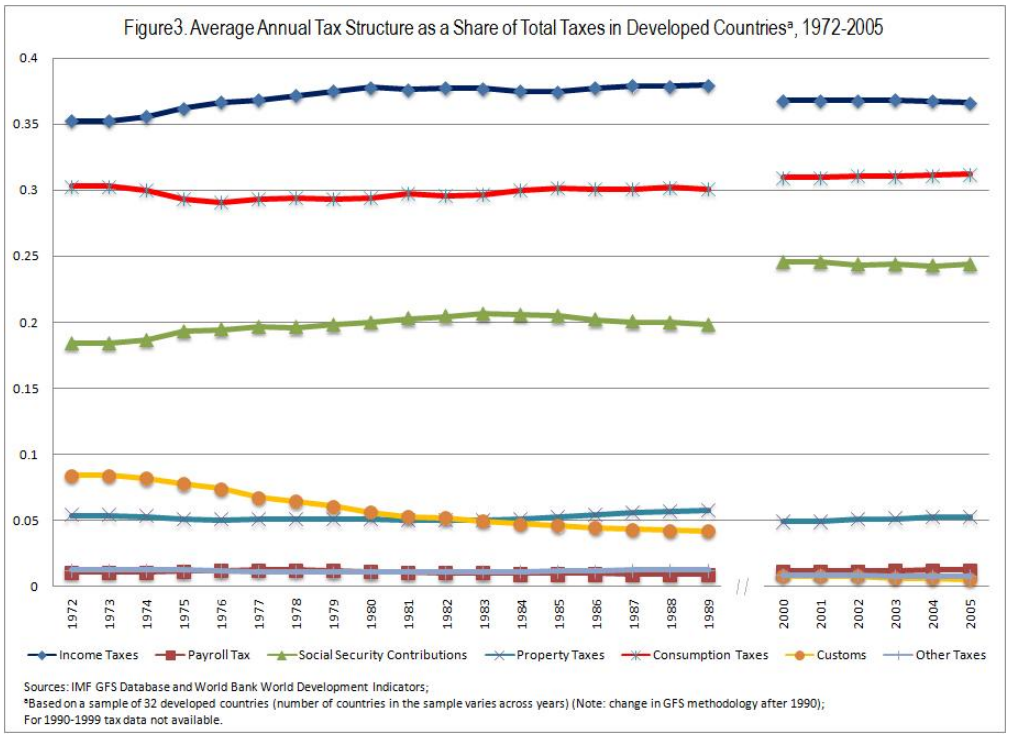


Figure3. Average Annual Tax Structure as a Share of Total Taxes in Developed Countries[a], 1972-2005
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 2000 2001 2002 2003 2004 2005
Income Taxes
Payroll Tax
Social Security Contributions
Property Taxes
Consumption Taxes
Customs
Other Taxes
Sources: IMF GFS Database and World Bank World Development Indicators;
[a]Based on a sample of 32 developed countries (number of countries in the sample varies across years) (Note: change in GFS methodology after 1990);
For 1990-1999 tax data not available.

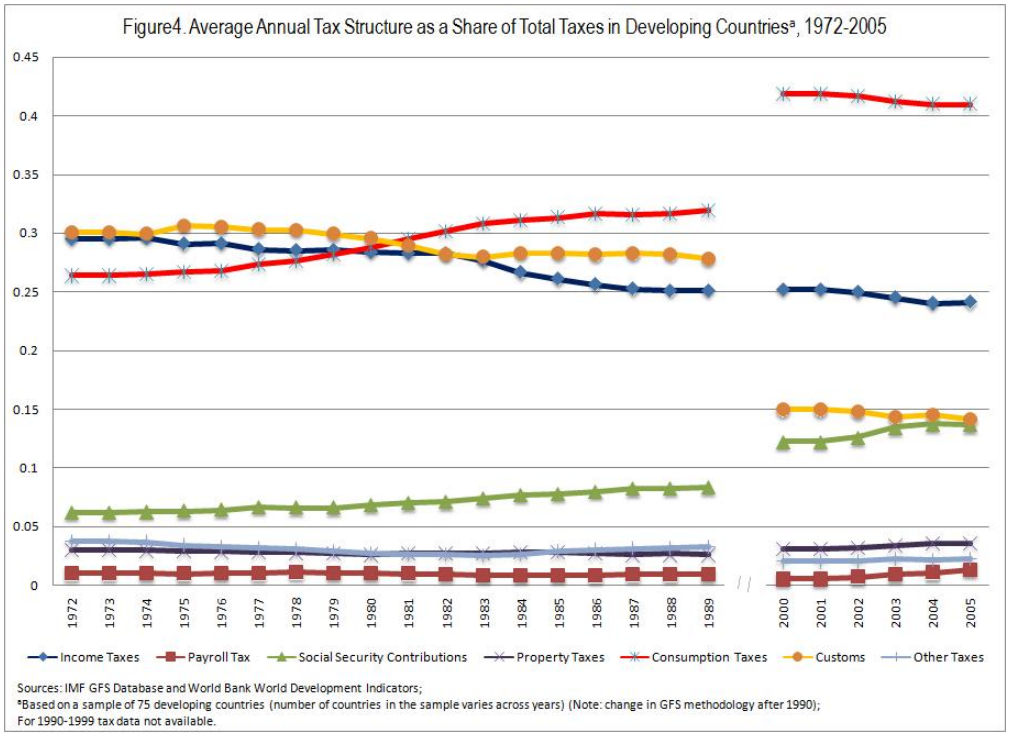
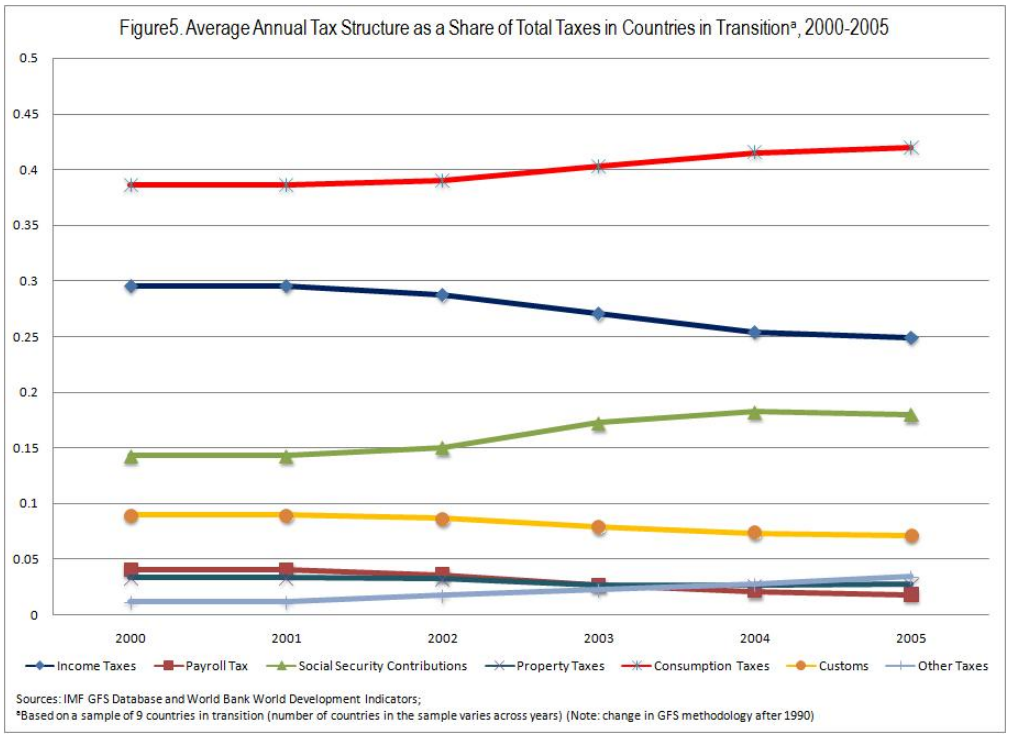


Figure4. Average Annual Tax Structure as a Share of Total Taxes in Developing Countries[a], 1972-2005
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 2000 2001 2002 2003 2004 2005
Income Taxes
Payroll Tax
Social Security Contributions
Property Taxes
Consumption Taxes
Customs
Other Taxes
Sources: IMF GFS Database and World Bank World Development Indicators;
[a]Based on a sample of 75 developing countries (number of countries in the sample varies across years) (Note: change in GFS methodology after 1990);
For 1990-1999 tax data not available.



III. The Choice of Direct versus Indirect taxation: An Overview of the Theory and Empirical Findings

A voluminous literature has developed over the last decades on the optimal design of tax systems and more in particular on the choice of direct versus indirect forms of taxation. In this section we give an overview of the main developments in these literatures and where the debate stands today.

Optimal tax theory: What role for indirect taxes?

The Atkinson-Stiglitz theorem: The starting point in the optimal tax literature is the well-known Atkinson-Stiglitz (1976) theorem which states that when the government may choose a general income tax function, individuals differ only on wage earning ability, and the utility functions are separable between labor and all commodities, then no indirect taxes need be employed. This theorem implied, as Atkinson-Stiglitz (1976) noted, that the extent to which indirect taxes are employed may depend on the (more complex) form of consumer preferences and possibly on restrictions on the type of income taxation that can be employed; for example,

horizontal equity considerations can introduce constraints on the structure of income taxes. The costs of tax administration are not recognized either; allowing for cost differences for separate taxes could also affect the optimal tax structure.

The Atkinson-Stiglitz theorem shaped the research agenda on optimal tax structures for many years to come. But, it is important to note that Atkinson-Stiglitz (1976) saw their analysis as being more useful in shaping the structure of the argument regarding the choice of optimal tax structure than in providing policy advice. What followed Atkinson-Stiglitz's work has been a series of important papers showing how indirect taxes may be justified in an optimal tax structure if some of the explicit and also implicit assumptions in their work are relaxed.

Role of tax evasion and avoidance: It turns out that considering the administration of taxes, in particular enforcement and evasion issues have important consequences for the optimal tax mix of direct and indirect taxes. Boadway, Marchand and Pestieau (1994) show that if different taxes have different evasion characteristics, some optimal tax structure with a meaningful role for indirect taxes emerges naturally. Assuming that only income tax can be evaded (or can be evaded more easily)[10] the authors analyze the case for supplementing optimal (non-linear) income taxation with commodity taxation and develop conditions under which commodity taxation should not be at the same rate. [11]

Role of uncertainty: Cremer and Gahvari (1995) show that in the presence of uncertainty, where otherwise identical individuals are uncertain about the wage they would earn, differential commodity taxation is a necessary component of an optimal tax structure.

Role of the production side: Naito (1999) shows that, even when the government is using a Pareto-efficient non-linear income tax system under weak separability of workers' utility functions, imposing a non-uniform commodity tax can improve welfare, once the assumption of constant marginal cost of production is abandoned and the production side of the economy is explicitly introduced in the analysis.

Role of heterogeneity: Cremer, Pestieau and Rochet (2001) show that when individuals differ in several unobservable characteristics (productivity and endowments), differential

[10] Alternatively, their model can be interpreted as one of tax avoidance with different compliance costs. Some other authors have questioned the premise that direct taxes may be more difficult to evade than indirect taxes. See, for example, Kesselman (1993).

[11] Without evasion, there is equivalence between a uniform commodity and an income tax. However, with tax evasion, that equivalence is gone. Dahlby (2003) argues that both forms of consumption taxation, direct consumption tax in the form of expenditure tax and indirect consumption tax in the form of a sales tax, are needed because both types of taxes are subject to somewhat different forms of tax avoidance and tax evasion behavior.

commodity taxes do have a role to play as instruments of optimal tax policy - an optimal (general) income tax will not suffice, while the optimal commodity tax rates follow traditional Ramsey rules. Papers by Saez (2002) and Balestrino, Cigno, and Pettini (2003) make contributions along similar lines.

Role of endogenous human capital accumulation: Naito (2004) finds that using a commodity tax can increase social welfare in the presence of a nonlinear income tax system when human capital accumulation is endogenous. In particular, assuming that individuals with greater ability have comparative advantage in accumulating skilled human capital, Naito shows that indirect redistribution such as imposing a tariff on unskilled human capital intensive goods can increase the efficiency of, and complement, an income tax system.

Transparency: Dahlby (2003) argues that levying both direct and indirect consumption taxes could improve the transparency of the tax system, especially when there are several tiers of government with autonomous taxing powers.

Impact on economic activity: Does the selection of direct to indirect tax ratio matter?

Alongside the theoretical modeling on optimal tax structure an empirical literature has developed over the past several decades examining the impact of the direct to indirect tax ratio on economic activity. The empirical findings are varied and not always consistent. While older studies tend to find less significant economic effects of taxes, more recent studies tend to find significant effects of the direct versus indirect tax mix on various outcomes. These differences in results have to do with the sample period of the studies but also with the methodology employed.

Impact on labor supply, prices and output: An earlier paper in this literature is by Atkinson and Stern (1980), who use an extended linear expenditure system with United Kingdom Family Expenditure Survey data to examine the impact of a reduction in income taxes and an increase in the VAT on labor supply and welfare. For labor supply they find a net increase in labor supply by those with the highest wage rates, with the income tax cut increasing hours and the VAT change reducing them. The analysis of welfare changes shows that the benefits of a switch from income tax to VAT would flow to those with higher wages. A second paper by Poterba, Rotemberg, and Summers (1986) use quarterly data from United KIngdom and the United States to investigate how shifts in the direct versus indirect mix affect wages, prices, and output. The period studied for the United Kingdom was 1963:3 to 1983:4, while for the

United States it was 1948:1 to 1984:3. For the United Kingdom the results suggest that shifts from direct to indirect taxation in the short-run leads to an increase in prices and after-tax wage and reduces real output, but that in the long run the shift from direct to indirect taxes seems to have no significant effects. The **r**esults obtained for the United States are very similar to those for the UK. Madsen and Damania (1996) augment Poterba's et al. (1986) work to explore the impact of switches from direct to indirect taxes on both wages and output levels for 22 OECD countries over the period 1960 to 1990. They conclude that for the majority of countries in the sample a revenue-neutral switch from direct to indirect taxes has no impact on the level of long-run economic activity. However, they also find that in some economies those tax changes have resulted in increases in output levels and lower nominal wages in the long run.

More recent studies have found quite different results. A study by the European Commission (2006) simulates the macroeconomic effects of a revenue-neutral shift in taxation from direct to indirect taxes, using the QUEST model and show that the shift in taxes might indeed strengthen economic growth and increase employment. In a more recent paper, Johanssonet al. (2008) analyze the effects of changes in tax structure on GDP per capita for 21 OECD countries over the period 1970 to 2005. These authors find that consumption and property taxes have a significant less adverse effect on GDP per capita than taxing income and that corporate income taxes appear to have a particularly negative impact on GDP per capita.

Impact on economic growth : The strongest evidence yet that direct versus indirect tax choices matter is 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 very significant growth effects or dynamic efficiency gains (Kim, 1998; Dahlby, 2003; Li and Sarte, 2004).[12] In the paragraphs below we survey some of this empirical work, which has been mainly carried out with data from OECD countries.

Kneller, Bleaney and Gemmell (1999), using 5-year average data for 22 OECD countries for the period 1970-95, find that while income taxes reduce growth, consumption taxes do not. Widmalm (2001), using panel data for 23 OECD countries between 1965 and 1990, finds that that the proportion of tax revenue raised by taxing personal income is robustly, negatively

[12] For a dissenting view see Mendoza, Milesi-Ferretti and Asea (1997) who provide evidence in support of Harberger's (1964) 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.

correlated with economic growth. Wildman also finds evidence that tax progressivity, measured in terms of the long-run income elasticity of tax revenue, tends to reduce economic growth and that progressivity affects growth, not so much via physical capital accumulation, as through the accumulation of human capital. Padovano and Galli (2001), also using panel data for 23 OECD covering the 1950s to the 1980s decades, find robust results that high marginal income rates and progressivity are negatively correlated with economic growth. The same conclusions are reached in Padovano and Galli (2002) with an updated panel of 25 industrialized countries covering 1970 to 1998. Li and Sarte (2004) find evidence that the decrease in progressivity associated with the Tax Reform Act of 1986 (TRA-86) in the U.S. lead to small but non-negligible increases in U.S. long-run growth (from 0.12 to 0.34 percentage points.) Finally, Lee and Gordon (2005), using panel data for 70 countries covering the period 1970–1997, find in cross-sectional regressions and fixed-effects regressions that higher corporate tax rates are associated with lower growth rates.

Impact on income distribution: The interest in the impact of tax structure on income distribution dates back to Meltzer and Richard's (1981) work on the majority rule and the median voter model, predicting that when the mean income rises relative to the median income (that of the decisive voter), taxes rise, and vice versa. However, their model does not unbundle the different taxes, although the presumption would likely be that the rise in taxes should take more the form of direct taxes mostly paid by higher income groups) as opposed to indirect taxes (more evenly distributed across all taxpayers).[13] 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,[14] there has been less empirical work on the impact of the tax structure, in particular the direct to indirect tax mix on the distribution of income.

Li and Sarte (2004) find that the progressivity change associated with the Tax Reform Act (TRA) of 1986 in the United States had a significant effect on income inequality, resulting in a 20- to 24- percent increase in the Gini coefficient of income. More recently, Weller (2007) uses cross-country data from 1981 to 2002 and finds positive effects of progressive taxation on

[13] Borge and Rattso's (2004) work for Norwegian local governments in 1996 supports the Meltzer–Richard hypothesis.
[14] See, for example, Martinez-Vazquez (2008).

income distribution. An important handicap explaining the few studies available is the difficulty of putting together compatible panel data on income distribution.

Duncan and Peter (2008) examine whether income inequality is affected by the structural progressivity of national income tax systems and find that while progressivity reduces observed inequality in reported gross and net income, it has a significantly smaller impact on true inequality, approximated by consumption-based measures of Gini.

Impact on macroeconomic stability: Even though the built-in stabilizing properties of tax structures have been a noted issue since Musgrave (1959), little empirical work has been conducted to estimate the impact of different tax structures and in particular the role of the direct to indirect tax mix in increasing macroeconomic stability, the presumption being that tax systems that rely more heavily on direct taxation will contribute more effectively to macroeconomic stability.[15] Auerbach and Feenberg (2000) examined the tax system's potential to stabilize income fluctuations in the U.S. economy since the early 1960s and find that that automatic stabilization of aggregate demand probably offsets as much as 8 percent of the initial shocks to GDP. In addition, they find that there has been relatively little net change in the role of the tax system as an automatic stabilizer; the U.S. tax system effectiveness in stabilizing aggregate demand in 1995 was roughly the same as in the early 1960s, but lower than at its estimated peak in 1981.[16] In a more recent study, Weller (2007), using cross-country data for 1981 to 2002, finds the relationship between progressive taxes and growth volatility to be ambiguous.

In section 5 of this paper we revisit the questions of the potential economic impact of the direct to indirect tax mix on economic growth, macro stability, and income distribution using a unified international panel data set. But before doing that we examine in the next section the determinants of the tax mix ratio.

[15] Nevertheless, Mino and Nakamoto (2008) warn that in the presence of heterogeneous agents with different preferences, the stabilizing power of progressive income taxation demonstrated in representative-agent models may not be always effective.

[16] Dolls, Fuest, and Peichl (2009) extend Auerbach and Freenberg's (2000) study with 19 EU countries and find that the amount of automatic stabilization depends strongly on the type of income shock. In the case of a proportional income shock, approximately 38 percent of the shock would be absorbed by automatic stabilizers in the EU, and about 32 percent in the US. Within the EU, there is considerable heterogeneity, and results suggest that in general, the automatic stabilizers in Eastern and Southern European countries are considerably lower than in Continental and Northern European countries

IV. The Determinants of the Direct to Indirect Tax Ratio

In this section we examine the determinants of the direct to indirect tax ratio building on recent work by Kenny and Winer (2006), and Hines and Summers (2009) on the determinants of the different components of tax structures. Our central question is: in practice, what are the main determinants of the proportion in which direct and indirect taxes are used? This is a broad question and we are interested in the different aspects of the economy and societal institutions that may bear on this issue. In the first part of the section we discuss a number of methodological issues and in the second part we present the panel data set and the estimation results.

Empirical approach:

We estimate the following model using a two-stage least squares (2SLS) methodology with panel corrected standard errors[17], including country-dummies to account for any potential individual fixed effects:

$$TaxRatio_{it} = X_{it}\beta + \upsilon_i + \varepsilon_{it}; \;\; i = 1,.,n, \; t = 1,...,T, \tag{1.1}$$

where i indexes country and t indexes year, and υ_i represents the country-specific fixed effects. The *Tax Ratio* is measured as the ratio of direct taxes (personal and corporate income tax, payroll tax, social security contributions, and property tax) and indirect taxes (taxes on goods and services, taxes on international trade, and other taxes). The tax data represent consolidated general government data and are drawn from the IMF GFS Database. Given that certain types of property taxes can be treated as direct and some as indirect taxes, and because we are not able to distinguish among different types within the data we have, we will alternatively estimate the model using a dependent variable where the property tax is included as an indirect tax in the denominator.

Alternative definitions of the dependent variable, the direct to indirect tax ratio are possible. For example, Poterba et al. (1986) use in their analysis of how tax systems may affect wages, prices and output a direct to indirect tax mix variable defined as the difference between the direct and the indirect tax rates computed as $(\tau - \theta)/(1+\theta)$ where τ is the direct tax rate and

[17] Clustered by country

θ the indirect tax rate, and these tax rates computed, respectively, as total direct and indirect taxes divided by nominal GDP. This alternative definition is highly correlated with our measure of *Tax Ratio*, the simple correlation coefficient for the two measures in our panel data set being 0.841. [18]

The set of observable characteristics X_{it} that we hypothesize to affect the tax ratio is selected following the work in Kenny and Winer (2006) and Hines and Summers (2009).[19] The first paper by Kenny and Winer (2006) examines the determinants of the structure of tax systems using a sample of 100 democratic and nondemocratic countries over the period 1975-1992. For estimation purposes, Kenny and Winer (2006) use a SUR (seemingly unrelated regression) approach to test for whether and how the set of explanatory variables matters for each of the tax instruments in a country's tax system. Since our variable of interest is the ratio of direct to indirect taxes rather than individual taxes per se, we should not expect to find the same relationships (signs and significance) between the respective explanatory variables and our dependent variable based on Kenny and Winer's (2006) results. Nevertheless, their study provides a very useful guide on the channels through which particular determinants may be expected to influence the direct to indirect tax ratio.

The second study by Hines and Summers (2009) examines the effect of globalization on tax design using cross country data over the period 1972 to 2006. In cross-sectional regressions for 1973, 1985, and 1999 they find that the reliance on income taxes (personal income taxes and corporate income taxes) on total taxes is higher the larger the country (log population) and the wealthier the country (log per capita income) with this reliance increasing over time.[20] For expenditure taxes (taxes on goods and services and international trade taxes), the cross-sectional regressions for 1973, 1985, and 1999 suggest that country size and per capita income are consistently associated with smaller ratios of expenditure taxes to total tax revenues. The panel evidence is quite consistent with the cross sectional evidence. Growing income levels are

[18] See Table A.4. in the Appendix for the results obtained using this definition of the dependent variable.
[19] A few other papers have examined the composition of tax structures. Aizenman and Jinjarak (2006) evaluate the impact of globalization throughout the 1980s – 1990s on the vector of taxes collected by countries at varying stages of development. At the sub-national level, Geys and Revelli (2009) investigate the economic and political determinants of the local tax mix in the Flemish region of Belgium.
[20] Hines and Summers (2009) also use the interaction of the natural logarithm (ln) of income and ln population as an additional explanatory variable; all variables are normalized by dividing them by their annual means.

associated with reduced reliance on expenditure taxes (44.2 percent), and population growth is likewise associated with less use of expenditure taxes.

The determinants of the tax mix ratio may be categorized into "demand" factors and "supply" factors. By demand factors we mean those that pull the level of certain taxes or the overall level of taxation up because of preferences or the overall budget constraint of the public sector; if more public goods and services are desired, more taxes on private income will need to be raised. Supply factors represent those that facilitate the collection of certain taxes or all taxes in general, such as the availability of tax bases or "tax handles," and institutional and structural features that facilitate tax administration and enforcement.

Among the demand factors, we identify first several forms of "scale effects." The size of total revenue to GDP measures how much overall government a particular society wishes to have. As the size of government gets larger, it is likely that most or all revenue categories (measured as a share of GDP) will need to rise, but there is no clear reason why direct or indirect taxes would have to rise faster. There are also additional scale effects arising from the size of the country measured by population and from the degree of decentralization in a country. A larger population and thus more congestion may lead to higher tax levels, and with decentralization the consolidated government sector is also likely to be larger; both of these factors are likely to lead to a more intense use of different tax sources but without a clear decantation a priori for higher use of either direct or indirect taxes. Another demand factor is that of "political preferences." For example, repressive regimes may turn away from sources requiring higher degrees of citizen cooperation or voluntary compliance, such as income taxes; for the opposite reasons, more democratic regimes may turn toward those types of taxes. Thus, we may expect that higher degrees of democratic liberties may lead to higher direct to indirect tax ratios. But the political color of democratic regimes may also have an impact on the direct to indirect ratio. Kenny and Winer (2006) find that socialist governments substituted toward corporate taxes and taxes on goods and services, which does not lead to a clear prediction in terms of direct versus indirect taxes. Another important political factor may be collective preferences for redistribution and overall more equitable societies. We may assume that "redistribution" is a normal or even superior good with income elasticity positive or greater than one; if so, the variable per capita income may capture this effect.

Moving on to the "supply factors," we need to identify features that make it easier (more difficult) to raise tax revenues from different sources. In the list are those that Kenny and Wines call "tax base effects," meaning that countries will be attracted to use taxes for which there are relatively larger tax bases available. For example, major oil-producing countries may have larger nontax revenues shares and have also easy access to additional revenues via the corporate income tax due to the profits from the exploitation of oil reserves. In this case we would expect the significance of oil production in a country to be associated with higher direct to indirect tax ratios. Similarly, a higher direct to indirect ratio may come from relatively larger tax bases for personal income tax (measured by real GDP per worker), and payroll taxes (proxied by the labor force participation). On the other hand, taxes on domestic goods and services have larger bases in the formal sector in countries in which more people live in urban areas. This may lead to a lower direct to indirect tax ratio. Similarly, countries with more open economies would tend to rely more on trade and other indirect taxes given the easier collection of VAT and excises at the ports of entry. An additional set of supply factors, not entirely distinguishable from the previous one, is that of "administration costs," including among other things the ability to provide taxpayer services and conduct tax enforcement activities. Urbanization may capture the effect of administration costs on tax structure. Because of the higher population density in urban areas, monitoring of tax compliance may become less expensive implying overall higher tax compliance. However, the impact of urbanization on tax compliance may be more complicated than that (Kau & Rubin, 1981). Because people live close to their neighbors in urban settings, informal transactions become more feasible which in turn will tend to reduce tax collections of both indirect and direct taxes.

Summarizing, the set of observable characteristics X_{it} we include as explanatory variables in our analysis of the tax mix is as follows:

i) demand factors:
   - total revenue (including tax and non tax revenue) to GDP ratio;
   - log population, normalized by dividing it by the annual mean of this variable;
   - dummy for country's formal federal structure;
   - expenditure decentralization, calculated as the ratio of state and local expenditures to total expenditures;
   - democracy index;

- dummy for socialist government;
- log GDP per capita, normalized by dividing it by the annual mean of this variable

ii) supply factors:

- domestic crude petrol per capita production;
- labor force participation;
- trade openness, measured as the ratio of imports plus exports to GDP;
- share of agriculture in GDP[21]
- globalization index;
- percent of urban population. [22]

To be sure, there are several departures in our approach from that used by Kenny and Winer (2006). Besides the different dependent variables, we employ a slightly larger sample of 116 developed, developing and transitional countries and observe a longer time period, between 1972 and 2005. Furthermore, we utilize a bit different regression specification based on some theoretical assumptions on the determinants of the tax mix and use annual data rather than creating subsample averages. [23] Our analysis covers the full sample of countries but we also run separate regressions for developed and developing countries to check for potentially separate effects due to differences in economic structure.

Like Kenny and Winer, we allow for the endogeneity of certain right-hand variables. But, in addition, we correct for autocorrelation. Let's first address the possible presence of endogeneity among some of the explanatory variables. Kenny and Winer (2006) account for the possible endogeneity of government size (proxied by the ratio of total revenue to GDP) although with or without correction for endogeneity, the inclusion of this variable in the regression has

[21] We reestimate the model using percentage of shadow economy as an alternative variable for agriculture. However, due to the quite small number of observations on this variable, the sample size reduces significantly, causing some of the coefficients to lose the statistical significance. The simple correlation between agriculture and shadow economy is 0.5.

[22] The list of variables and data sources and descriptive statistics are presented in the Appendix, Tables A.1 and A.2, respectively.

[23] The exact replication of methodology and specification of Kenny and Winer (2006) but using the direct to indirect tax ratio as the dependent variable and 5-year subsample periods rather that annual data produced similar but generally weaker results. We would expect that the effect of some of the explanatory variables on individual tax categories may be neutralized when the dependent variable; is the tax mix ratio.

very little impact on their results.[24] Given that our dependent variable is the ratio between direct and indirect taxes rather than individual tax instruments, the reverse causality between the direct to indirect tax ratio and total revenue to GDP variable is less likely to be present. We test for endogeneity in total revenue to GDP using the same instruments as Kenny and Winer (2006), absolute latitude of the country's largest city, scaled to take values between 0 and 1, and voter turnout rate, but fail to detect it. [25]

A second issue is the need correct for autocorrelation.[26] Since we detect the existence of the first-order panel-specific autocorrelation in our model, we estimate the model with Panel Corrected Standard Errors (PCSE), as suggested by Beck and Katz (1995).[27][28]

Estimation results:

Table1 presents the estimated effects obtained by using the annual data and applying panel corrected standard errors to the full sample to correct for panel specific autocorrelation. [29] The highly significant and positive estimated effect of total revenue to GDP ratio suggests that countries with larger government size tend to rely more on direct taxes (10 percentage points

[24] The intuition behind potential endogeneity in size of government is that more efficient tax structures will lead to the growing size of the government sector. To correct for potential endogeneity in government size, Kenny and Winer use two instrumental variables, absolute latitude of the country's largest city and voter turnout. Latitude is used because temperate zones have climate that is more agriculturally productive and less severe, enabling countries located in these zones to develop their economies faster (Landes (1998), La Porta et al. (1999)). Beck et al. (2004) as well apply this same intuition to the case of financial development. The North Temperate Zone extends from the Tropic of Cancer (at about 23.5 degrees north latitude) to the Arctic Circle (at approximately 66.6 degrees north latitude). The South Temperate Zone extends from the Tropic of Capricorn (at approximately 23.5 degrees south latitude,) to the Antarctic (at approximately 66.6 degrees south latitude.)The intuition behind using voter turnout is from Mueller and Stratmann (2003) who find that countries with higher voter turnout rates have more equal income distribution and larger government size (measured by expenditures and transfers to GDP).

[25] Note that for the voter turnout instrument we had to adapt the variable to our annual observations by interpolating the annual data between the election dates.

[26] We also test for but find no heteroskedasticity in our model.

[27] See Beck and Katz (1995) who show that the Ordinary Least Squares (OLS) with the PCSE is the most proper approach for data sets with relatively many cross-sectional units (N) and relatively short time period (T). This approach is compatible with unbalanced panel estimation. The panel corrected standard errors are robust in the style of Huber-White standard errors. However, using Huber-White rather than PCSE formula to calculate standard errors would be wrong because it ignores the fact that we assume there is a common variance structure within a cross-section unit and that the correlation across units follows a very specific pattern - equal covariance between any two units for any particular time.

[28] The Hausman (1978) test for fixed/random effects fails to reject the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator, allowing us to apply the fixed effects procedure. However, since the Hausman test may be misleading due to the presence of autocorrelation, we include a set of individual country dummies in our regression model to control for individual unobservable fixed effects.

[29] Property taxes are included in the direct taxes. Results obtained using the alternative definition of tax ratio which includes property taxes in indirect taxes are available from the authors upon request.

increase in total revenue to GDP leads to an increase in the direct to indirect tax ratio by between 1.4 and 2.2 percentage points).

For population size, recent evidence suggests that countries with smaller populations have relatively mobile tax bases and as a result they rely relatively less on corporate and personal income taxes than other countries (Hines and Summers, 2009). These countries instead rely more on expenditure type taxes, tax on goods and services and import tariffs. Our results strongly support those previous findings.

The significant results for the federal structure dummy variable suggest that federal countries tend to rely relatively more on direct taxation. Furthermore, the degree of expenditure decentralization seems to be on average not significant in deciding the tax mix, but when we observe developed and developing countries separately, we find the expenditure decentralization to be significant in both subsamples, although the effect has the opposite signs in the subsamples, negative for developed countries and positive for developed countries; but note that the economic effect is quite small in both cases.[30]

For factors representing political preferences, we find that on average more democracy implies higher direct to indirect tax ratios; however, for the subsamples, the coefficient for developed countries takes an unexpected negative sign but is statistically insignificant.[31] We find no evidence that transitional countries from socialism tend to show a marked reliance on either direct or indirect taxes. [32] The estimated coefficients for GDP per capita are not statistically significant, except for developing countries which takes a negative sign.

[30] We reestimate the model by using the alternative definition of tax ratio where property taxes are included in indirect taxes but obtain very similar results.

[31] We reestimated the model by using political rights and civil liberties separately, rather than combined in the democracy index and find no significant change in the results.

[32] This is in line with some of the previous literature claiming that political factors are not important in determining the actual shape of tax mix (Volkerink and de Haan, 1999; Geys and Revelli, 2009).

Table1. Determinants of Tax Mix: 1972-2005, Fixed Effects, annual data
Dependent Variable: Direct to Indirect Tax Ratio

	(1)	(2)	(3)	(4)	(5)	(6)
	Full	Developed	Developing	Full	Developed	Developing
Demand Factors						
Scale Effect						
Revenue to GDP	2.20***	1.45***	2.15**	1.59***	1.70***	0.76
	(0.50)	(0.42)	(1.03)	(0.42)	(0.48)	(0.70)
Log(Population)	29.39***	6.68	67.08***	19.67***	-4.37	39.39***
	(9.86)	(14.80)	(24.23)	(7.36)	(9.53)	(13.09)
Federal	-3.59***	1.85	-18.63***	-13.36*	22.76*	-36.76***
	(1.24)	(3.83)	(6.46)	(7.96)	(12.08)	(13.85)
Decentralization	-0.01*	-0.03***	0.01*	-0.01**	-0.02***	0.00
	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Political Preferences						
Democracy	0.38*	-0.42	0.72**	0.02	-0.18	0.04
	(0.22)	(0.55)	(0.33)	(0.14)	(0.48)	(0.14)
Socialist	-0.36	0.00	-0.25	-0.16	0.00	-0.24
	(0.34)	(0.00)	(0.41)	(0.31)	(0.00)	(0.37)
Log(GDP pc)	-2.26	-2.92	-1.45	-2.41*	-6.56***	-0.71
	(2.20)	(3.88)	(3.05)	(1.44)	(2.41)	(1.74)
Supply Factors						
Tax Base Effect						
Crude Petrol	0.01	0.00	0.06			
	(0.01)	(0.01)	(0.10)			
LFP	0.01	0.03**	-0.01	0.01	0.02**	0.02
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Openness	0.33**	0.30	0.35**	0.13	-0.39**	0.13
	(0.14)	(0.22)	(0.16)	(0.12)	(0.20)	(0.14)
Agriculture	0.62	-12.50***	0.27	-0.29	-7.81***	-0.60
	(1.48)	(3.54)	(1.69)	(1.02)	(2.08)	(0.95)
Globalization	-2.77***	-1.52	-2.09**	-1.37***	0.01	-2.03***
	(0.70)	(1.12)	(0.82)	(0.53)	(0.71)	(0.64)
Administration Costs						
Urbanization	-7.14***	-11.41***	-9.47***	-6.14***	-10.61***	-6.60***
	(1.76)	(2.73)	(2.83)	(1.61)	(1.70)	(1.90)
Constant	-19.56**	6.71	-45.44**	0.00	0.00	0.00
	(9.21)	(17.30)	(17.77)	(0.00)	(0.00)	(0.00)
Observations	437	227	210	635	328	307
Number of id	41	17	24	63	24	39
R-squared	0.91	0.97	0.81	0.93	0.96	0.83

Panel corrected standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

On the supply side, the effect of globalization on the tax ratio appears to be statistically significant and negative, which is consistent with the widely accepted conjecture that with increasing globalization all countries are becoming small open economies being forced to lower their reliance on direct taxes vis-à-vis indirect taxes. [33] Furthermore, in line with the expectations, taxes on domestic goods and services are more important in countries in which more people live in urban areas.

Our results suggest a very significant negative and robust effect of urbanization, our proxy for domestic indirect tax base, on the direct to indirect tax mix. [34] Finally, a more educated population can facilitate the implementation of taxes, such as the personal income tax, that require more ability to fill out sophisticated tax forms. Our results indicate that increased education leads to greater reliance on direct taxes. This result is quite robust to alternative specifications.

V. Relevance of the Direct- to-Indirect Tax Ratio in the Real Economy

In this section of the paper we use a fairly large panel data set of developing and developed countries to explore the empirical significance of the direct to indirect tax choices countries make for their tax systems on four important dimensions of macroeconomic performance: economic growth, macro stability, income distribution, and foreign direct investment.

a. On economic growth

With little doubt the most commonly thought effect, but nevertheless controversial, of high reliance of tax systems on direct taxes versus indirect taxes is its negative impact on economic growth. In the review of the literature above we have seen that a number of recent studies provide empirical evidence, albeit not always consistent, of the negative long-term growth effects of direct taxes, particularly corporate income taxes and progressive personal

[33] However, Messere (1993) finds no evidence that increasing economic integration would affect the tax mix in OECD countries a lot.

[34] See Kau and Rubin (1981) for an elaboration on the argument that urbanization positively affects taxes on goods and services because of the potential less monitoring costs on tax compliance in urban areas.

income taxes. Our goal here is to explore more specifically the potential role of the direct to indirect tax ratio on economic growth. To extrapolate from the most recent empirical literature we should anticipate that higher direct tax to indirect tax ratios should lead to lower rates of economic growth all other things being equal. The empirical literature on economic growth is vast and ever growing. [35]Our analysis in this section builds on a fairly recent study by Lee and Gordon (2005) analyzing the potential role of corporate taxes on economic growth and based on a panel data set for 70 countries over the period 1980-1997.

In this section, besides adding the direct to indirect tax ratio variable, we introduce several other modifications to Lee and Gordon's (2005) approach.[36] First, we extend the sample period by eight years to 1972-2005, while we proceed to divide it into seven subsample periods: one 3-year period (1972-74), five 5-year periods (1975-79, 1980-84, 1985-89, 1990-94, 1995-99), and one 6-year period (2000-05); following Lee and Gordon we regress the average subsample GDP (real) per capita growth rate on the tax variable and the other control variables. Second, we expand the sample size from 70 to 116 countries. We proceed to estimate the following equation:

$$GDPg_{it} = \alpha TaxRatio_{it} + X_{it}\beta + \upsilon_i + \varepsilon_{it}, \quad i = 1,...,n, \; t = 1,...,T \tag{2.1}$$

where i indicates country and t denotes subsample period, *GDPg* represents average subsample GDP (real) per capita growth rate, *Tax Ratio* is the average subsample direct to indirect tax ratio, X_{it} represents a set of control variables affecting GDP growth, including: GDP per capita in the initial subsample year in US$ 10,000, the initial subsample year top marginal corporate tax rate, the initial subsample year of the primary school enrollment, average subsample openness (measured as sum of import and export to GDP), the average subsample International Country Risk Guide (ICRG) index, the average subsample population growth rate, and average subsample inflation rate.

[35] Since the pioneering contributions by Solow (1956), Swan (1956), Barro (1990), Barro and Sala-i-Martin (1992, 1995), King and Rebelo (1990) and Lucas (1990), empirical research on economic growth has been extended in various fiscal dimensions, including public expenditure and taxation (Jones et al.,1993; Mendoza et al.,1997; Kim,1998; Dahlby,2003; and Lee and Gordon, 2005).

[36] In turn, Lee and Gordon (2005) estimating equation, except for the tax variables, is based on the specification used in Mankiew et al. (1992), and Barro (1992).

Before we proceed, we need to address several issues concerning the estimation strategy. First, there is the possibility that the direct to indirect tax ratio variable is endogenous; for example, countries with faster growth may increasingly rely on direct taxes for equity or economic stability reasons. In order to address this issue, we use an instrumental variable for the tax ratio variable that is calculated in a similar way to the instrumental variable for the corporate tax rate used by Lee and Gordon's (2005). In particular, we first instrument each direct to indirect tax ratio observation with the weighted average of the tax ratios for all other countries in the corresponding year, where the weights are the inverse of the distance (as described below) between the two countries. The value of the tax ratio instrumental variable for country i in year *t*, $TaxRatioIV_{it}$ is, therefore, calculated as

$$TaxRatioIV_{it} = \frac{1}{\sum_{j=1}^{n} \frac{1}{d_j}} \sum_{j=1}^{n} \frac{1}{d_j} TaxRatio_{jt}; i \neq j \qquad (2.2)$$

where d_j is the distance between the largest cities in country i and country j, and $TaxRatio_{jt}$ is the tax ratio in country *j* in year *t*. The underlying intuition for using this particular instrument is that economic growth in a country relative to others generally should not have an effect on the design of the tax mix of those other countries, so the dependent variable should not be correlated with the instrument. On the other hand, the design of the tax mix in a country should be affected by the design of the tax mix in the neighboring countries, this effect being especially strong in the case of small countries. [37] Because we use the corporate tax rate in our regressions, which is the tax variable of interest for Lee and Gordon (2005), we also reproduce their steps regarding the instrumentation of the corporate tax rate variable.

Second, before applying the instrumental variable methodology, we perform a Hausman test for endogeneity concerning the direct to indirect tax ratio variable and the corporate tax rate. The Hausman tests reject the null hypothesis that OLS is a consistent estimator, providing support for

[37] The smaller the size of country i, the relatively shorter the distance between its largest city and largest cities in neighboring countries, implying relatively stronger effect of their tax ratios on the tax ratio in country i. The source for the distance measure between two countries is CEPII (Centre D'Etudes Prospectives Et D'Informations Internationales, http://www.cepii.fr/). Geodesic distances are calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations in terms of population.

using instrumental variables methodology. The overidentification test has a P-value of 0.9, suggesting that we fail to reject the hypothesis that all excluded instruments are exogenous.

Third, following Lee and Gordon (2005) we use a battery of estimation approaches: first, we employ ordinary least squares regression, robust regression and median regression to check for the robustness to the outliers; second, we use panel estimation including fixed effects[38] regression and the instrumental variable regression with country dummies.

The estimation results are shown in Table2 for the case when our main independent variable of interest, the direct to indirect tax ratio, includes property taxes as direct taxes. [39] The most relevant finding from our perspective is that higher direct to indirect tax ratios appear to have a significant and negative impact on economic growth. From the robust regression and median regressions in Table2 we can see that the estimated coefficient for the tax ratio is quite robust to outliers. After controlling for individual country effects, the impact of the tax ratio variable on economic growth remains negative and significant and this overall result is also maintained after we control for the potential endogeneity of the tax ratio and corporate tax rate variables.

However, when we divide the full sample into subsamples for developed and developing countries some of the results change. In the case of developed countries, the direct to indirect tax ratio continues to have a negative and highly significant effect on economic growth. In the case of developing countries, even though the coefficient is negative, it is not statically significant.

For the rest of the control variables, we obtain comparable results to those in the previous literature including Lee and Gordon (2005). The coefficient on initial subsample GDP per capita is negative and significant, which is consistent with the assumption of the conditional convergence of growth rates reported in previous studies (Barro, 1991; Mankiw, Romer and Weil, 1992; Kneller, Bleaney and Gemmell, 1999). Inflation affects economic growth rate negatively, supporting the hypothesis that, among other things, inflation increases investment uncertainty and, therefore, reduces economic agents' incentives to invest (Padovano and Gall, 2001 and 2002; Romero-Ávila and Strauch, 2008). Trade openness has a positive and significant effect on the growth rate, which is consistent with previous findings (Dollar, 1992; Edward, 1998; Frankel and Romer, 1999; and Dollar and Kraay, 2003). The results for institutional

[38] We used a Hausman test to check for the appropriateness of fixed effects estimation approach.
[39] Practically identical results are obtained when property taxes are included as indirect taxes; these results are available from the authors.

factors (measured by the ICRG index) are not robust to changes in estimation methodology; there is also less consensus in the empirical literature concerning the role of these factors.[40] Lastly, note that the results for the rest of the control variables are overall of lower statistical significance for the subsample of developing countries. Because of the very high standard errors and high R- squared of the regression we may suspect the presence of multicollinearity. [41]

[40] For example, Acemoglu and Verdier (1998) argue that corruption facilitates economic growth because it helps government officials become more efficient in approving the project process. On the other hand, Mauro (1995) and Knack and Keefer (1995) claim that corruption increases uncertainty in decision making and in the costs of conducting business, and, therefore, that it reduces economic growth.

[41] To investigate the presence of multicollinearity, we calculate the Tolerance and Variance Inflation Factor (VIF) for each explanatory variable and find that almost all variables have tolerance higher than 0.4 and a low VIF value, suggesting a low degree of multicollinearity, if any. We also perform a sample estimation of the correlations between the independent variables. Only three correlation coefficients satisfy the "conservative" requirement of 0.5 or larger, involving the corporate tax rate. When the corporate tax rates is excluded from the regression, the R-squared for the subsample of developing countries drops substantially (from 0.87 to 0.66), but the coefficients for school enrollment, openness and inflation now become statistically significant. In case of developed countries, the exclusion of the corporate rate does not cause any significant changes.

Table2. Direct-Indirect Tax Ratio and Economic Growth Regressions for subsample periods, 1972-2005
Dependent variable: GDP per capital growth rate for subsample periods

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	Robust	Median	Fixed Effect	Country Dummies + IV					
					Full	Developed	Developing	Full	Developed	Developing
Tax Ratio[1]	-0.248	-0.323**	-0.338*	-0.872***	-3.910**	-5.575**	-2.429	20.107	-4.293	0.272
	(0.179)	(0.147)	(0.178)	(0.284)	(1.575)	(2.774)	(2.791)	(20.683)	(3.321)	(4.058)
Corp tax rate[a]	-0.028*	-0.034**	-0.031*	-0.052***	-0.092***	-0.055*	0.057			
	(0.015)	(0.014)	(0.017)	(0.019)	(0.033)	(0.032)	(0.099)			
GDP per cap[a]	-0.891***	-0.775***	-0.929***	-1.924***	-1.654***	-2.401***	-11.247*	-3.805	-1.733***	-12.399***
	(0.243)	(0.246)	(0.319)	(0.549)	(0.559)	(0.705)	(6.304)	(2.382)	(0.557)	(3.565)
Primary enroll[a]	0.026	0.016	0.041**	-0.035	-0.089**	-0.141**	-0.076	0.070	-0.145*	-0.076**
	(0.017)	(0.016)	(0.020)	(0.030)	(0.045)	(0.070)	(0.052)	(0.125)	(0.081)	(0.038)
Av. openness	0.672**	0.641**	0.569	3.825***	4.475***	2.282	3.880	-2.373	3.279***	2.179
	(0.332)	(0.285)	(0.375)	(1.156)	(1.327)	(1.527)	(4.101)	(5.287)	(0.981)	(1.743)
Av. ICGR Index	0.316	0.319*	0.499**	0.417	0.826*	-0.791	1.018	-3.081	-0.489	-0.153
	(0.195)	(0.170)	(0.221)	(0.393)	(0.449)	(0.713)	(0.887)	(2.942)	(0.629)	(1.220)
Pop. gr. rate	-1.211***	-1.107***	-1.057***	-1.084**	-1.461***	-0.838	-4.337***	0.620	-0.544	-2.077***
	(0.227)	(0.177)	(0.231)	(0.425)	(0.518)	(0.759)	(1.585)	(1.527)	(0.956)	(0.770)
Av. inflation	-0.007***	-0.006***	-0.006***	-0.003**	-0.002**	-0.280***	-0.002	-0.008**	-0.137**	-0.006**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.091)	(0.002)	(0.003)	(0.055)	(0.002)
Constant	2.337	3.325*	0.302	8.288**	14.446***	27.024**	17.142*	-9.339	29.040**	19.791***
	(1.924)	(1.722)	(2.230)	(3.471)	(5.395)	(11.832)	(9.300)	(18.071)	(13.760)	(5.755)
Observations	197	197	197	197	197	120	77	275	135	140
R-squared	0.37	0.34		0.28	0.73	0.57	0.87	0.60	0.54	0.66

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
[a] These variables take values at the initial subsample year
[1] Property taxes treated as direct taxes

b. On macroeconomic stability

One of the well-known benefits of direct taxes is that they can act as automatic stabilizers.[42] Progressive personal income taxes tend to withdraw proportionally more private income during economic expansions and less so during contractions of the economy. Similarly, corporate income taxes yield higher revenues when profits are high in the expansion phase of the business cycle but they drop considerably in the contraction phase. On the other hand, indirect taxes, such as the VAT or excises, lack these stabilizing features. To explore the role of tax structure in terms of the direct to indirect tax composition on macroeconomic stability, we employ a simple regression model in which we regress the volatility of economic growth, measured by the standard deviation of GDP growth rate within each subsample period, on the direct to indirect tax ratio and a set of other explanatory variables. For the basic specification of the regression equation we follow the work of Easterly, Islam and Stiglitz (2000) and Beck, Lundberg and Majnoni (2001). These other control variables include the "volatility of inflation" (measured by the standard deviation of the inflation rate within the subsample period), "average openness," and "average GDP per capita." The direct to indirect tax ratio captures the effect of automatic stabilizers on economic stability while average openness and the volatility of inflation are included as proxies for the degrees to which the economy is exposed to real and monetary shocks; average GDP per capita is intended to capture any possible relationship between wealth and economic volatility.

For estimation purposes we use the sample of 116 developed, developing and transitional countries, over the period 1972-2005 and as in other sections we divide the sample in seven subsample periods (one 3-year period (1972-74), five 5-year periods (1975-79, 1980-84, 1985-89, 1990-94, 1995, 1999), and one 6-year period (2000-05). For the independent variable of interest, the direct to indirect tax ratio we use two alternative measures, one treating property tax as a direct tax ("tax ratio 1") and the other treating it as an indirect tax ("tax ratio 2"); below we only report the results for "tax ratio 1" since the results obtained using "tax ratio 2" are fundamentally the same.

We proceed to estimate the following equation:

[42]The literature on this issue is large, going back to Musgrave and Miller (1948), Brown (1955), Musgrave (1959), and Pearse (1962).

$$SD\_GDPg_{it} = \alpha_1 TaxRatio_{it} + \alpha_2 TaxRatio_{it}^2 + \alpha_3 TotalTax_{it} + \alpha_4 TaxRatio_{it} * TotalTax_{it} + \\ + X_{it}\beta + \varepsilon_{it}; \quad i = 1,...,n, t = 1,...T \qquad (3.1)$$

where i indicates country and t denotes subsample period. The dependent variable, *SD_GDPg,* is measured as the subsample standard deviation of annual GDP (real) per capita growth rate. *Tax Ratio* is the average subsample direct to indirect tax ratio, and *Total Tax* is the average subsample total tax to GDP. Finally, X_{it} represents a set of control variables affecting GDP growth volatility, including: the subsample standard deviation of M1 annual growth rate[43], the average subsample openness (measured as sum of import and export to GDP), and the average subsample GDP per capita.

For the choice of the correct panel data estimation procedure, we perform a Hausman test for selecting between the fixed and random effects approaches and fail to reject the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator, allowing us to use the random effects procedure.[44]

We may suspect the potential endogeneity of the trade variable. For example, countries with more stable output growth may be more inclined to liberalize trade barriers. Even though the Hausman test fails to reject the hypothesis of no endogeneity for trade openness, we perform both random effects estimations, without and with an instrumental variable for trade openness. The results obtained using random effects are reported in Table3a, while Table3b presents the results obtained by applying the fixed effects estimation methodology. We instrument trade openness with the weighted average of the trade openness for all other countries in the corresponding subsample period, where the weights are the inverse of the distance (as described below) between the two countries. The value of the trade instrumental variable for country i in year t is, therefore, calculated as

[43] Money is the sum of currency outside banks and demand deposits other than those of central government. This series, frequently referred to as M1 is a narrower definition of money than M2. Data are in current local currency. For more information, see Table s: WDI 4.15.

[44] Since we are allowed to use random effects rather than fixed effects, we further consider whether there are any unobserved effects at all. If this were the case, we could use pooled OLS, which would offer two important advantages: it would provide a gain in efficiency because we would not have to allow for within-group correlations, and we could use its finite sample properties rather than relying on asymptotic properties of random effects. However, the Breusch-Pagan Lagrange Multiplier test rejects the null hypothesis that OLS is consistent, so we stay with the random effects procedure.

$$TradeIV_{it} = \frac{1}{\sum_{j=1}^{n} \frac{1}{d_j}} \sum_{j=1}^{n} \frac{1}{d_j} Trade_{jt}; i \neq j \quad (3.2)$$

where d_j is the distance between the largest cities in country i and country j, and $Trade_{jt}$ is the trade openness of country j in year t.

In the regressions we allow for a nonlinear relationship between the tax ratio variable and economic stability by including a squared term. In addition, the different specifications are estimated using separate subsamples for developed and developing countries to allow for potentially different responses due to different fundamental economic structures.

Overall, the results provide strong evidence that the direct to indirect tax ratio has a significant negative effect on economic volatility. There is only weak evidence that this relationship between the direct to indirect tax ratio and economic volatility may be quadratic.[45] When the quadratic term is significant, the implied threshold for the tax ratio starting to have a positive effect on economic instability has an improbable value as high as 6.5 times greater reliance on direct taxes relative to indirect taxes. [46] Furthermore, within the subsample of developed countries, the direct to indirect tax ratio has more automatic stabilizing power in countries with higher total tax to GDP ratios.

[45] Even though the squared terms are frequently not individually statistically significant, the level and the square term are often jointly significant at the 10 percent level.

[46] However, not including the square term may bias the estimates of the level term upwards. The correlation within each pair (dependent variable versus included variable, dependent variable versus omitted variable, and omitted variable versus included variable) is positive, implying that the estimate is upward biased.

Table3a. Tax Ratio and Economic Stability, subsample periods, 1972-2005, Random Effects Estimation
Dependent variable: Standard deviation of annual GDP growth rate

	(1)	(2)	(3)	(4)	(5)	(6)
	Random Effects			Random Effects IV		
	Full	Developed	Developing	Full	Developed	Developing
Tax Ratio	-0.934	-1.043	-1.186**	-1.556*	-0.896	-3.383**
	(0.663)	(2.092)	(0.543)	(0.841)	(2.118)	(1.651)
Tax Ratio squared	0.246**	0.631*	0.004	0.240*	0.640*	0.201
	(0.110)	(0.351)	(0.095)	(0.130)	(0.353)	(0.210)
Total Tax	1.445	18.693	-1.076	-4.449	21.537	-19.281
	(3.693)	(13.715)	(2.977)	(5.245)	(14.712)	(12.496)
Tax Ratio * Total Tax	-0.028	-0.104*	0.033	0.006	-0.111*	0.091
	(0.021)	(0.057)	(0.020)	(0.028)	(0.059)	(0.055)
SD M1	1.909	-36.364	-3.915	5.428	137.684	16.403
	(11.644)	(710.348)	(9.405)	(12.329)	(780.403)	(19.007)
Average Openness	1.061**	-0.970	0.091	3.902***	-2.009	8.664*
	(0.422)	(1.539)	(0.369)	(1.331)	(2.440)	(4.887)
Average GDP per capita	0.042***	0.025***	0.080***	0.039***	0.023***	0.025
	(0.003)	(0.008)	(0.005)	(0.004)	(0.008)	(0.031)
Constant	60.346	237.137	36.391	-50.070	237.816	-131.435
	(71.999)	(349.230)	(53.486)	(106.041)	(350.788)	(151.119)
Observations	256	59	197	256	59	197
Number of id	89	17	72	89	17	72
R-squared	0.69	0.76	0.82	0.57	0.75	0.31

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

For the other control variables, it appears that the volatility of M1 has no significant effect on economic stability. On the other hand, trade openness is shown to be positively correlated with economic volatility in the cases of the full sample and the subsample of developing countries; this suggests that the more exposed the economy is to outside real shocks, the more prone the economy is to volatility, as previously found in Easterly, Islam and Stiglitz (2000) and Beck, Lundberg and Majnoni (2001). Last, average GDP per capita has a positive effect on economic volatility, and this effect is more pronounced among the subsample of developed countries.

Table3b. Tax Ratio and Economic Stability, subsample periods, 1972-2005, Fixed Effects Estimation
Dependent variable: Standard deviation of annual GDP growth rate

	(1)	(2)	(3)	(4)	(5)	(6)
	Fixed Effects			Fixed Effects IV		
	Full	Developed	Developing	Full	Developed	Developing
Tax Ratio	-0.400	3.457	-0.237	-1.037	1.485	-4.546
	(1.338)	(6.810)	(1.274)	(1.517)	(8.445)	(5.028)
Tax Ratio squared	0.205	1.075	0.295	0.248	1.088	0.719
	(0.192)	(0.718)	(0.194)	(0.204)	(0.723)	(0.564)
Total Tax	12.991	41.611	22.941**	12.643	25.674	6.059
	(10.722)	(42.974)	(10.654)	(11.136)	(58.855)	(26.234)
Tax Ratio * Total Tax	-0.028	-0.183	-0.093	-0.017	-0.125	-0.043
	(0.044)	(0.169)	(0.058)	(0.047)	(0.223)	(0.120)
SD M1	3.684	-562.606	6.444	7.572	-544.237	15.437
	(13.601)	(850.147)	(11.689)	(14.603)	(855.686)	(23.429)
Average Openness	0.294	3.243	1.213	4.922	0.390	24.257
	(1.313)	(4.790)	(1.373)	(4.642)	(8.625)	(23.924)
Average GDP per capita	0.015	0.001	-0.038	0.002	0.010	-0.295
	(0.012)	(0.022)	(0.035)	(0.018)	(0.032)	(0.273)
Constant	-30.318	-953.487	-98.247	-243.824	-423.950	-671.252
	(222.338)	(1,370.936)	(197.361)	(308.514)	(1,913.955)	(694.173)
Observations	256	59	197	256	59	197
Number of id	89	17	72	89	17	72
R-squared	0.04	0.24	0.06	0.04	0.23	0.20

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

c. On income inequality

Our interest here is to investigate the importance of the direct to indirect tax ratio as a determinant of income inequality in a country. The general presumption is that greater vertical equity and more equal income distributions require a more progressive tax system, which means that direct taxes (generally expected to be progressive) would need to be relatively more important than indirect taxes (typically expected to be regressive or less progressive) in tax systems. The evidence in the empirical literature on this issue is mixed,[47] and our own empirical findings in this section do not offer any strong support to the conjecture that the direct versus indirect composition of taxes plays an important role on observed inequality in distribution of income. However, this conclusion is subject to the important caveat of the difficulties involved in measuring inequality in income distribution across countries and over time.

[47] The evidence on redistributive effects of taxes is especially weak for developing countries (Bird and Zolt, 2005; Martinez-Vazquez, 2007; and Harberger, 2008).

In investigating the importance of the direct-indirect tax balance on income inequality and redistribution we focus on the evolution of the Gini coefficient for income distribution. The Gini coefficient is computed on the basis of income distributions using different concepts of income, including gross income, net income and consumption. This presents some measurement and comparability issues that we can only partially address below. We are interested in finding out how the direct-indirect tax mix and a set of other explanatory variables has affected the Gini coefficient over time in our sample of countries.

The empirical model we estimate is

$$Gini_{it} = \alpha_1 TaxRatio_{it} + \alpha_2 TotalTax_{it} + \alpha_3 TaxRatio_{it} * TotalTax_{it} + \\ + X_{it}\beta + GiniConcept_{it} + \varepsilon_{it}; \quad i = 1,...,n, t = 1,...,T \tag{4.1}$$

where i indicates country and t denotes years. *Gini* is the Gini coefficient as a measure of income inequality[48] over time and across countries; X_{it} is the set of observable characteristics that affect income inequality, including: the initial Gini coefficient, the direct-indirect tax ratio, total tax collection to GDP, GDP per capita growth rate, private credit as a percentage of GDP, labor force participation, openness (measured by the ratio of import plus export to GDP) dependency ratio, and dummy for EU15. The set of explanatory variables, except for the direct-indirect tax ratio, represents a consensus specification in the empirical literature on aggregate income distribution.

In the estimation we employ annual data for a sample of 116 developed, developing, and transitional countries, over the period 1972 to 2005. For the estimation we apply a 2SLS procedure to control for the potential reverse causality between income inequality and the financial system (measured by the share of private credit in GDP) and between income inequality and the direct to indirect tax mix. As suggested by Beck et al. (2004), the reverse causality between income inequality and private credit might take the form that reductions in inequality may lead to higher demand for more efficient financial systems. Following La Porta et al. (1999) and Beck et al. (2004), we use as instrumental variables for the financial system, latitude (the scaled absolute value of) as well as legal origin (English, French, and German). We have already

[48] To control for the fact that income distributions across countries are based on different measurements of income, including gross income, net income and consumption, we include in our empirical model a set of dummies for net income and consumption definitions, and use gross income as the base category

discussed in the previous section the rationale for using these variables as instruments for GDP per capita growth; a similar intuition applies to the case of financial development and so it will not be repeated here. Furthermore, the potential endogeneity between income inequality and the tax mix may arise from the fact that countries with higher income inequality may tend to rely more on direct taxes in order to reduce it. In order to test and correct for endogeneity in the tax mix ratio, we instrument the direct-indirect tax ratio with the weighted average of the tax ratio for all other countries in the corresponding year, where the weights are the inverse of the distance (as described below) between the two countries. The value of the tax mix instrumental variable for country i in year *t* is, therefore, calculated as

$$TaxRatioIV_{it} = \frac{1}{\sum_{j=1}^{n} \frac{1}{d_j}} \sum_{j=1}^{n} \frac{1}{d_j} TaxRatio_{jt}; i \neq j \tag{4.2}$$

where d_j is the distance between the largest cities in country i and country j, and $TaxRatio_{jt}$ is the direct-indirect tax mix of country j in year *t*.

The Hausman test for endogeneity rejects the null hypothesis that OLS is a consistent estimator for both private credit and the tax ratio, providing support for using the 2SLS procedure. For the instrumental variables 2SLS procedure we estimate first stage equations as below with latitude, and legal origin as instruments in the private credit equation and the weighted tax ratio for all other countries as the instrument in the tax mix equation:[49]

$$Credit_{it} = Z_{it}\delta + \alpha_i + u_{it}; \;\; i = 1,...,n, \;\; t = 1,...,T \tag{4.3}$$

$$TaxRatio_{it} = Z_{it}\gamma + \alpha_i + \nu_{it}; \;\; i = 1,...,n, \;\; t = 1,...,T \tag{4.4}$$

where Z_{it} includes all exogenous variables from equation (4.1) plus the instruments, and $E(Z_{it}^{'} u_{it}) = E(Z_{it}^{'} \nu_{it}) = 0$.

To carry out the panel estimation we perform a Hausman test for selecting between fixed and random effects estimation on the basis of the second-stage equation, which fails to reject the null hypothesis that the coefficients estimated by the efficient random effects estimator are the

[49] The over-identification test has a P-value of 0.9, suggesting that we fail to reject the null hypothesis that the instrumental variable for the tax ratio is exogenous.

same as the ones estimated by the consistent fixed effects estimator, allowing us to use the random effects procedure.

The estimation results are presented in Table4. Our main interest is in the relationship between income inequality and the direct to indirect tax structure. The expectation, based on the past literature, is that of a negative relationship, albeit possibly weak between the direct to indirect tax mix and income distribution. The results in Table 4, overall, provide at best weak support for the conjecture. Our results suggest that the effect of the tax ratio on income inequality depends on the size of the taxation system: in countries with relatively smaller tax systems, the tax ratio tends to have a positive effect on income inequality, whereas its negative (equalizing) effect increases with enlarged tax systems. For the full sample, the tax ratio mix has negative effect on the Gini coefficient (reducing income inequality) in countries with shares of total taxes in GDP larger than 0.29. This threshold is larger in developed countries (0.34); for the subsample of developing countries there is no statistically significant effect. This latter pattern seems to fit the conventional wisdom on the low impact of tax systems on the distribution of income for developing countries (Bird and Zolt, 2005, Harberger, 2006). But we must note that once we control for unobserved individual country effects by adding the individual country dummies, the importance of direct to indirect tax ratio in terms of income inequality seems to practically vanish in all equations.

For the other control variables, the results largely follow those in the previous empirical literature on the determinants of aggregate income distribution.[50] Following Beck et al. (2004), we include the initial level of the Gini coefficient at the beginning of the observation period as one of the explanatory variables to capture the country's initial conditions. The initial level of inequality has a strong positive effect, especially for developing countries, on observed inequality. The coefficient for the level of financial development takes a negative and significant sign, as expected, but only for the full sample.

[50] Sala-i-Martin (1997) finds that larger government size, measured by social transfers, reduces income inequality, while Landau (1985), Peden and Bradley (1989), Fölster and Herekson (2001) find that resources are allocated less efficiently within larger governments, with government size having no or a negative effect on income inequality.

Table4. Direct to Indirect Tax Ratio and Income Inequality, 1972-2005, 2SLS estimations
Dependent variable: Gini Coefficient (%)

	Random Effects			Fixed Effects		
	(1)	(2)	(3)	(4)	(5)	(6)
	Full Sample	Developed Countries	Developing Countries	Full Sample	Developed Countries	Developing Countries
Initial Gini	0.74***	0.30**	0.65***	0.00	0.00	0.00
	(0.09)	(0.13)	(0.13)	(0.00)	(0.00)	(0.00)
Tax Ratio	10.04*	15.05**	1.17	-2.81	-4.70*	-0.32
	(5.95)	(6.68)	(6.67)	(2.23)	(2.48)	(0.40)
Total Taxes	60.28*	95.02***	8.74	0.00	0.00	1.84
	(33.84)	(36.77)	(25.84)	(0.00)	(0.00)	(8.43)
Tax Ratio * Total Taxes	-35.21*	-44.31**	-5.95	2.91	7.51**	0.00
	(19.58)	(18.86)	(24.48)	(6.30)	(3.81)	(0.00)
Private Credit	-4.73*	3.51	0.60	38.33	21.19*	1.40
	(2.53)	(3.20)	(4.69)	(54.70)	(10.91)	(5.35)
GDP pc growth	-0.02	0.10	-0.04	0.37	0.17	-0.01
	(0.11)	(0.16)	(0.12)	(0.63)	(0.25)	(0.12)
LFP	0.06	-0.07	-0.11	-0.45	-0.16	-0.21**
	(0.08)	(0.13)	(0.09)	(0.45)	(0.26)	(0.11)
Dependency Ratio	3.55	22.29*	-9.66	55.77	55.99**	-11.66
	(6.29)	(11.79)	(8.20)	(80.11)	(25.26)	(10.31)
EU15	-3.48**	-0.19	0.00	0.00	0.00	0.00
	(1.48)	(1.89)	(0.00)	(0.00)	(0.00)	(0.00)
Openness	2.04**	0.35	0.57	-9.34	-5.85	-0.83
	(0.80)	(1.43)	(1.74)	(16.74)	(5.96)	(1.86)
Net Income Gini Concept	-2.11***	-1.55	0.10	-0.79	-2.22	0.32
	(0.77)	(1.12)	(0.77)	(1.77)	(1.85)	(0.81)
Consumption Gini Concept	-3.69***	-2.53**	-2.82***	-3.27	-3.07	-2.51***
	(0.88)	(1.20)	(0.71)	(2.68)	(2.00)	(0.72)
Constant	-7.18	-19.66	29.49**	19.62	5.84	63.04***
	(17.42)	(24.30)	(12.58)	(41.47)	(24.46)	(12.67)
Observations	447	274	173	447	274	173
Number of id	62	25	37	62	25	37
R-squared	0.64	0.31	0.65	0.02	0.13	0.20

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

There is a broad literature emphasizing the role of education as one of the major factors affecting the degree of income inequality. Even though policymakers usually justify higher educational spending as an effective tool for reducing income inequality, the theoretical

predictions about this relationship are ambiguous and the empirical findings are not consistent.[51] Years of schooling in the total population as a measure of education has a positive and significant effect on income inequality but only for developing countries. We include also a dummy for the 15 old European Union member states to control for the generally higher social welfare expenditures in those countries; however, this variable is not statistically significant. The dependency ratio variable appears to have a highly positive and significant effect on inequality in developed countries.

The evidence in the literature on the effect of trade openness on income inequality is inconclusive. Barro (2000) finds a positive relationship between trade openness and income inequality, while Calderon and Chong (2001) and Dollar and Kray (2002) do not find any significant relationship. Our results provide some evidence of a positive effect of trade openness on income inequality, but this effect vanishes in the subsamples. Finally, we control for variations in the conceptual measurement of the Gini coefficient, and as expected, we find that measured income inequality is significantly smaller when net income or consumption are used vis-à-vis gross income.

d. On Foreign Direct Investment

Because of globalization and the increasing international mobility of the factors of production, especially of capital, there has been a lot of interest in the literature studying FDI (foreign direct investment) flows and how corporate income taxes and other direct taxes may affect these flows.[52] Thus the choice of tax structure and in particular the direct to indirect tax ratio can be anticipated to have potentially significant effects on FDI flows. That is the question researched in this section.

In this section, again, our strategy in analyzing the potential role of the direct to indirect tax ratio in FDI flows consists of including the tax ratio with a set of other control variables in a general specification that has been commonly used in the empirical literature on the determinants of FDI.

[51] As education expands, income distribution may become more unequal, which is particularly important in countries with very low levels of education. However, as more people receive education, the return to education will generally decline, reducing income inequality (Schultz, 1960; Becker, 1964; Mincer, 1974; Knight and Sabot, 1983; and Gregorio and Lee, 2002)

[52] See, for example, Devereux and Griffith (1998, 2002), Buttner (2002), De Mooij and Ederveen (2003, 2005), Bénassy-Quéré et al. (2005), Razin and Sadka (2006), and Bénassy-Quéré et al. (2007).

Because data availability is more of a problem with respect to FDI, we are limited to using an annual panel data set for 53 developed and developing countries over the period 1984-2005. We use two alternative measures of FDI: global net FDI inflows to GDP ratio from UNCTAD,[53] and the ratio of net FDI inflow from the United States to GDP from the Bureau of Economic Analysis (BEA). As we have done in all the previous sections, we employ two alternative definitions of the direct to indirect tax ratio, depending on whether property taxes are categorized as direct or indirect taxes. In addition, the analysis will be performed for the full sample of countries and for the two subsamples of developed and developing countries.

The empirical model we estimate is

$$FDI_{it} = X_{it}\beta + \upsilon_i + \varepsilon_{it}; \;\; i = 1,...,n, \;\; t = 1,...,T \tag{5.1}$$

where i is an index for country and *t* one for year, and *FDI* is the net foreign direct investments inflow (total or from the US) to GDP over time and across countries; X_{it} is the set of observable characteristics that affect FDI inflow, including: the direct to indirect tax ratio, GDP per capita, average effective tax rate, infrastructure (proxied by the number of telephone lines), education, and political and institutional variables (democracy, corruption, and bureaucracy). The set of explanatory variables, except for the direct to indirect tax ratio, represents a consensus specification in the empirical literature on foreign direct investments. Finally, υ_i represents time-invariant individual country effect.

In terms of estimation issues, the Hausman test for fixed versus random effects rejects the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator, indicating the need to apply the fixed effects procedure. In order to account for individual country effects, we include a set of country dummies in our estimation model. Next, we test for the presence of a nonlinear relationship between the tax mix and FDI but fail to detect it. Finally, we detect the existence of panel specific autocorrelation so we use throughout the Panel Corrected Standard Errors (PCSE) to correct for autocorrelation (Beck and Katz, 1995).

[53] According to the UNCTAD definition, FDI flows consist of the net sales of shares and loans (including non-cash acquisitions made against equipment, manufacturing rights, etc.) to the parent company plus the parent firm´s share of the affiliate´s reinvested earnings plus total net intra-company loans (short- and long-term) provided by the parent company. For branches, FDI flows consist of the increase in reinvested earnings plus the net increase in funds received from the foreign direct investor. FDI flows with a negative sign (reverse flows) indicate that at least one of the components in the above definition is negative and not offset by positive amounts of the remaining components.

Table5 presents the results obtained when property taxes are classified as direct taxes in the numerator of the tax ratio variable.[54] Our results show that that the direct to indirect tax ratio, our variable of interest, as expected, affects both total and FDI from the United States inflows negatively with the coefficients being statistically significant for the full sample and the developed country subsample. However, the coefficients are statistically insignificant for developing countries.

For the other control variables, the results reported in Table 5 are fairly standard in the FDI empirical literature. The coefficient for GDP per capita takes a positive sign whenever significant in the case of full sample and developed countries, suggesting that high income countries tend to attract more investments from the United States, whereas the results for developing countries suggest the opposite, lower income countries tend to attract more foreign direct investments from the United States. Positive and statistically significant results hold for telephone lines, suggesting that foreign investors are more attracted to a better infrastructure. However, the coefficients for the labor cost variable are mostly insignificant, except for FDI from the United States for developed countries where cheaper labor attracts more FDI.

For the average effective tax rate (computed from the Bureau of Economic Analysis data for U.S. firms), we find a statistically significant and robust nonlinear relationship. Foreign investors are discouraged by higher average effective rates but this is so at a decreasing rate. In the regressions we also control for the effect of political and institutional variables (democracy, corruption, and bureaucracy). Corruption, measured by an index from 0 to 6, with 6 denoting least corruption, takes the expected positive sign, but it is mostly statistically insignificant. Bureaucracy, also measured by an index from 0 to 6, with 6 denoting the highest quality, has the expected positive sign whenever significant. Finally, we estimate very consistent negative and in some cases significant effects for democracy, suggesting that less democratic countries may be able to attract more foreign direct investment.[55] This is in accord with some results in the previous literature. [56]

[54] The corresponding results with the alternative definition of the tax ratio are fairly similar and therefore not reported but available from the authors upon request.

[55] The democracy variable measures the existence of civil rights and liberties and is calculated as (14 – civil liberties – political rights) / 12, where both "civil liberties" and "political rights" are scaled from 1 (most free) to 7 (least free).

[56] See Adam and Filippaios (2007) for a review of the literature on this issue.

Table5. Tax Ratio and Foreign Direct Investments: 1984-2005
Dependent Variables: Total FDI net flow and Net flow from the US

	(1)	(2)	(3)	(4)	(5)	(6)
	Full Sample		Developed Countries		Developing Countries	
	Total FDI	FDI from US	Total FDI	FDI from US	Total FDI	FDI from US
Tax Ratio	-0.057*	-0.033**	-0.157**	-0.063**	0.002	-0.014
	(0.034)	(0.014)	(0.073)	(0.027)	(0.002)	(0.012)
GDP per cap	-0.010	0.013*	-0.015	0.015*	0.003	-0.020**
	(0.016)	(0.008)	(0.018)	(0.008)	(0.003)	(0.009)
Labor Cost	0.002	-0.007	0.004	-0.009*	0.001	-0.001
	(0.010)	(0.004)	(0.012)	(0.005)	(0.000)	(0.001)
AETR	-0.845**	-0.294**	-1.148*	-0.441**	0.016	-0.275
	(0.406)	(0.125)	(0.600)	(0.181)	(0.040)	(0.193)
AETR sq	0.780**	0.302**	0.957*	0.406**	-0.024	0.269
	(0.374)	(0.122)	(0.539)	(0.172)	(0.038)	(0.186)
Tell. lines	0.165*	0.068**	0.197**	0.072**	0.004	0.079***
	(0.095)	(0.027)	(0.090)	(0.030)	(0.007)	(0.021)
Secondary	-0.001	-0.001	-0.001	-0.001	0.000*	-0.001
	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Democracy	-0.040	-0.113*	-0.292	-0.173	0.012	-0.100
	(0.073)	(0.062)	(0.353)	(0.145)	(0.021)	(0.067)
Corruption	0.007	0.008	0.032	0.005	-0.000	0.014
	(0.021)	(0.007)	(0.031)	(0.009)	(0.003)	(0.009)
Bureaucracy	0.124**	-0.032	0.295**	-0.075	-0.001	0.019***
	(0.062)	(0.029)	(0.121)	(0.047)	(0.003)	(0.006)
Constant	-0.200	0.295***	0.000	0.000	-0.048**	0.117
	(0.231)	(0.107)	(0.000)	(0.000)	(0.020)	(0.073)
Observations	379	374	257	253	122	121
Number of id	42	42	25	25	17	17
R-squared	0.30	0.48	0.33	0.57	0.58	0.07

Panel corrected standard errors in parentheses
significant at 10%; ** significant at 5%; *** significant at 1%

VI. Conclusion

In this paper we have examined the evolution and economic consequences over the last three decades of the direct to indirect tax ratio in the tax systems of a large number of developed and developing countries. Over this time period the average ratio of direct to indirect taxes for a sample of 116 countries has been on the increase and this movement has been more pronounced for developed countries than for developing countries. The underlying reasons for these trends have differed between the two groups of countries, with increases in social security contributions being the main driver in the case of developed countries and a fairly large decrease in the relative importance of customs taxes that has been only partially offset by an increase in domestic consumption taxes in the case of developing countries.

While the optimal tax literature never provided quick or exact recipes to be followed in the design of tax structures, it has been understood that optimal tax design requires the use of both direct and indirect taxes leaving open what the optimal tax mix should be. The more recent empirical evidence based on endogenous growth models tells a robust story on the negative effects on the rate of economic growth of heavy reliance on different forms of direct taxation. But as we saw in several sections of this paper the choice between direct and indirect forms of taxation may not be so clear. While lowering the direct to indirect tax ratio, it seems, would bring advantages in terms of economic growth and an enhanced competitive stand regarding FDI, it would also dampen the ability to rely on automatic stabilizers for the macro economy and possibly reduce the scope or ability for income redistribution policies.

In terms of those potential tradeoffs, it is interesting to note that developing countries, by choosing on average a much lower direct to indirect tax ratio than developed countries, seem to be giving a much heavier weight to economic growth and FDI flows than to the potential distributional and macroeconomic control issues. But, of course, the choice of tax mix by developing countries is also significantly based on administration and capacity issues. Our empirical findings provide a first order approximation for quantifying the types of tradeoffs policymakers would face in making choices on the overall tax mix. From our estimates and provided that the tax mix ratio is within some expected bounds, a 10 percentage point increase in the direct to indirect tax ratio on average would reduce economic growth and FDI inflows by 0.39 percent and 0.57 percent respectively, but at the same time it would also reduce economic volatility by 0.15 percent and income inequality by about 1 percent. However, we need to recall that the equalizing effect of higher direct to indirect tax ratios on the income distribution is partially dependant on the size of tax system; the larger the ratio of taxes to GDP, the larger the equalizing effect of the tax mix ratio. We find a tax to GDP ratio threshold of 0.29 for the tax mix ratio to have equalizing effects on income distribution; this pattern seems to fit the conventional wisdom on the low impact of tax systems on income inequality, especially in the case of developing countries because of their generally smaller tax systems.

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APPENDIX

Table A.1. Variables Description and Sources

Variable	Description	Source
Agriculture	Share of agriculture in GDP	World Development Indicators (WDI)
Average Effective Tax Rate	Average effective tax rate = foreign income taxes/(foreign income tax + net incomes) of all affiliates for US firms operating abroad in each country	Bureau of Economic Analysis (BEA)
Bureaucracy Index	Bureaucratic quality index, ranging from 0-6, with 6 denoting the highest quality	International Country Risk Guide (ICRG) 2009
Corporate Tax Rate	Top marginal statutory corporate income tax rate in the initial year of the corresponding period	Office of Tax Policy Research (OTPR)
Corruption Index	Corruption index, ranging from 0-6, with 6 denoting least corruptive	International Country Risk Guide (ICRG) 2008
Crude Petrol	Per capital crude petroleum production (in thousands of metric tons)	UN Energy Statistics Database
Democracy Index	(14-political rights-civil liberties)/12	Freedom House: Authors' calculations
Political Rights	Scale from 1 (most free) to 7 (least free)	Freedom House
Civil Liberties	Scale from 1 (most free) to 7 (least free)	Freedom House
Dependency Ratio	Age dependency ratio (dependents to working-age population)	World Development Indicators (WDI)
Education	Average years of schooling in the adult population 25+ years old	Barro and Lee (2000)
Expenditure Decentralization	State and Local Expenditure to Total (Central, State, Local) Expenditure	IMF GFS: Authors' calculations
FDI from US to GDP (net)	Foreign direct investment flows from US firms divided by GDP	Bureau of Economic Analysis (BEA)
Total FDI to GDP (net)	Total foreign direct investment flows divided by GDP	UNCTAD
Federal	= 1 if country has formal federal structure	Handbook of Federal Countries, 2005

GDP per capita (current prices)	GDP per capita in current local prices	World Development Indicators (WDI)
GDP per capita (real)	GDP per capita in 2000 US$	World Development Indicators (WDI)
GDP per capita growth rate	Real per capita GDP growth rate	World Development Indicators (WDI)
Gini	Gini coefficient	UNU-WIDER World Income Inequality Database, May 2008
Globalization	KOF index of globalization	ETH Zürich KOF Konjunkturforschungsstelle
Inflation, Consumer Prices	Inflation, Consumer Prices (annual %)	World Development Indicators (WDI)
Labor Cost	Wages of employees working in US companies' foreign affiliates (000 $US/ year)	Bureau of Economic Analysis (BEA)
Labor Force Participation	Labor force participation rate, total (share of total population ages 15-64)	World Development Indicators (WDI)
Labor Force Participation Female	Labor force participation rate, female (share of female population ages 15-64)	World Development Indicators (WDI)
Latitude	The absolute value of the latitude of the country, scaled to take values between 0 and 1	La Porta et al. (1999)
Legal Origin	The legal origin of the Company Law or Commercial Code of each country: English, French, or German Commercial Code	La Porta et al. (1999)
M1 growth rate	The annual growth of the sum of currency outside banks and demand deposits other than those of central government.	World Development Indicators (WDI)
Population	Population size	World Development Indicators (WDI)
Population Growth Rate	Population growth rate	World Development Indicators (WDI)
Private Credit	Private Credit by Deposit Money Banks and Other Financial Institutions to GDP	Beck, Demirgüç-Kunt and Levine (2000, 2008)
School Enrollment Primary	Primary enrollment rate (%) (gross)	UNESCo Institute of Statistics
School Enrollment Secondary	Secondary enrollment rate (%) (gross)	UNESCo Institute of Statistics
Socialist	Countries having either a socialist economic system or a mixed socialist economic system and a socialist or communist political	Gastil (various years), Kornai (1992)

Tax Ratio 1	Direct (income tax, payroll tax, social security contributions, property tax) to Indirect (taxes on goods and services, taxes on int'l trade, other taxes) Tax Ratio	IMF GFS: Authors' calculations
Tax Ratio 2	Direct (income tax, payroll tax, social security contributions) to Indirect (taxes on goods and services, taxes on int'l trade, other taxes, property tax) Tax Ratio	IMF GFS: Authors' calculations
Telephone Landlines	Telephone landlines (per 1000 people)	World Development Indicators (WDI)
Total Tax to GDP	Share of total (tax and non tax) revenue in GDP in current prices	IMF GFS, WDI: Authors' calculations
Trade Openness	(Imports + Exports) / GDP	World Development Indicators (WDI)
Urbanization	Urban population (share of total)	World Development Indicators (WDI)

Table A.2. Variables Descriptive Statistics

Variable	Obs	Mean	St. Dev.	Min	Max
Agriculture to GDP	3205	0.17	0.15	0.00	0.94
Average Effective Tax Rate	1152	0.33	0.20	-0.28	0.98
Bureaucracy Index	1114	2.84	1.08	0.00	4.00
Corporate Tax Rate (%) (subsample initial year)	453	35.14	11.79	0.00	60.00
Corporate Tax Rate IV (subsample initial year)	454	35.36	3.87	25.62	43.54
Corruption Index	1912	3.37	1.45	0.00	6.00
Crude Petrol per capita (000 of metric tons)	1798	2.61	10.38	0.00	196.24
Democracy Index	3394	0.60	0.33	0.00	1.00
Political Rights	3396	3.35	2.16	1.00	7.00
Civil Liberties	3394	3.14	1.86	1.00	7.00
Dependency Ratio	3831	0.68	0.19	0.31	1.17
EU15	3944	0.13	0.34	0.00	1.00
Expenditure Decentralization	1487	25.22	17.31	0.56	87.00
Federal	3944	0.16	0.36	0.00	1.00
GDP (real) per capita ($)	3501	6995.34	8770.67	56.45	51673.98
GDP (real) per capita growth rate (%)	3295	1.86	3.70	-9.54	9.26
Gini coefficient (%)	1302	35.85	10.22	16.60	73.90
Net Income Gini Concept	1302	0.52	0.50	0.00	1.00
Gross Income Gini Concept	1302	0.31	0.46	0.00	1.00
Consumption Gini Concept	1302	0.17	0.38	0.00	1.00
Globalization	3429	0.52	0.18	0.09	0.93
Inflation, Consumer Prices (%)	3192	10.65	13.45	-21.68	99.88
Labor Cost (000 $US)	1154	25.80	17.80	2.59	89.96

Labor Force Participation	2938	0.69	0.09	0.46	0.93
Latitude	3944	0.32	0.20	0.01	0.72
Legal Origin English	3944	0.29	0.46	0.00	1.00
Legal Origin French	3944	0.46	0.50	0.00	1.00
Legal Origin German	3944	0.04	0.20	0.00	1.00
M1 growth rate	2964	0.29	1.75	-0.42	67.25
Net FDI from the US to GDP	1114	0.11	0.29	-0.01	2.92
Net FDI to GDP	1166	0.04	0.22	-0.16	4.97
Openness	2974	0.77	0.54	0.07	4.32
Population	3933	26900000	84500000	40130	1100000000
Population Growth Rate	3830	0.01	0.01	-0.04	0.04
Private credit to GDP	3040	0.45	0.38	0.01	3.45
School Enrollment Primary	1107	85.55	18.12	9.48	104.57
School Enrollment Secondary	639	84.92	24.86	19.00	161.66
Socialist	3944	0.12	0.32	0.00	1.00
Tax Ratio 1	3944	3.32	1.97	0.02	4.87
Tax Ratio 1 (Poterba et al. 1986)	1773	0.02	0.10	-0.25	0.44
Tax Ratio 1 IV	3944	1.52	0.45	0.22	5.17
Tax Ratio 2	3944	3.21	2.03	0.00	4.50
Tax Ratio 2 (Poterba et al. 1986)	1773	-0.03	0.06	-0.26	0.39
Tax Ratio 2 IV	3944	1.28	0.37	0.20	3.10
Telephone Landlines (per 000 people)	1166	2.81	2.15	0.02	7.97
Total Revenue to GDP	1715	0.28	0.13	0.03	0.64
Urbanization	3944	0.54	0.24	0.03	1.00

Box A.1. Number of countries per year for which the government finance data is available in the sample: Issues with Internationally Monetary Fund's (IMF), Government Finance Statistics (GFS) data

Data on taxes are downloaded from the International Monetary Fund's (IMF) Government Finance Statistics (GFS) Database, which provides data with consistent definitions across countries and years. However, a change in methodology from GFS1986 to GFS2001 in 2001, with the data from 1990 onward being reclassified from the old to the new methodology, has made historical data (1972-1989) not comparable with new data (1990 onwards). Another issue is that coverage for particular regions and individual years may be limited. Given that data collection is through a questionnaire filled out each year by local ministries in member countries, data availability in the GFS Database primarily depends on filer responsiveness. The table below documents the data availability for each year in the sample.

The classifications of revenue are substantially different in the two manuals. Revenue in the *1986 GFS Manual* is classified as tax, nontax, or capital revenue. Grants form a separate, nonrevenue category of receipts. In the revised *GFS Manual*, revenue is subdivided into taxes, social insurance contributions, grants, and other revenue. In more detail:

• Taxes exclude social security contributions in the revised *GFS Manual,* but include them in the *1986 GFS Manual.*

• Social insurance contributions in the revised *GFS Manual* include social security contributions, which are classified as taxes in the *1986 GFS Manual,* and contributions to social insurance schemes operated for the benefit of government employees, which are classified as nontax revenue in the *1986 GFS Manual*."

(Source: 2001 GFS Manual: p. 158)

Table A.3. Number of countries in the sample

Year	Full Sample	Developed Countries	Developing Countries	Countries in Transition	Year	Full Sample	Developed Countries	Developing Countries	Countries in Transition
1972	52	21	31	0	1989	77	26	51	0
1973	67	25	42	0	1990	4	0	4	0
1974	69	26	43	0	1991	4	0	4	0
1975	74	26	48	0	1992	4	0	4	0
1976	78	26	52	0	1993	4	0	4	0
1977	76	26	50	0	1994	5	0	4	0
1978	77	26	51	0	1995	16	9	6	0
1979	77	25	52	0	1996	17	9	7	0
1980	81	27	54	0	1997	18	10	7	0
1981	78	27	51	0	1998	26	17	8	0
1982	76	27	49	0	1999	32	20	11	0
1983	78	27	51	0	2000	41	26	12	3
1984	80	27	53	0	2001	47	28	15	4
1985	83	27	56	0	2002	59	29	24	6
1986	83	27	56	0	2003	65	28	28	9
1987	77	27	50	0	2004	62	27	26	9
1988	80	27	53	0	2005	50	21	21	8

Source: *Government Finance Statistics Manual 2001* (*GFSM 2001*), IMF Statistics Department, 2001

Table A.4. Determinants of Tax Mix: 1972-2005, Fixed Effects, annual data
Dependent Variable: Tax Ratio[1]

	(1)	(2)	(3)	(4)	(5)	(6)
	Full	Developed	Developing	Full	Developed	Developing
Demand Factors						
Scale Effect						
Revenue to GDP	0.3410***	0.3802***	0.1240**	0.2803***	0.4120***	0.0162
	(0.0427)	(0.0365)	(0.0570)	(0.0368)	(0.0422)	(0.0411)
Log(Population)	-0.0379	-0.9733	3.5780***	-0.1186	-0.1269	1.6323*
	(0.7455)	(1.3251)	(1.3630)	(0.6610)	(0.8749)	(0.8352)
Federal	0.3055	0.1462	-0.9824***	-0.0423	0.2423***	0.3030***
	(0.8275)	(0.1016)	(0.3706)	(0.1772)	(0.0889)	(0.0778)
Decentralization	0.0002	-0.0009*	0.0010**	-0.0000	-0.0007**	0.0003
	(0.0003)	(0.0005)	(0.0005)	(0.0002)	(0.0003)	(0.0003)
Political Preferences						
Democracy	0.0200	-0.0302	0.0558***	-0.0048	-0.0239	0.0082
	(0.0162)	(0.0410)	(0.0171)	(0.0113)	(0.0293)	(0.0085)
Socialist	-0.0057	0.0000	0.0100	-0.0034	0.0000	0.0148
	(0.0214)	(0.0000)	(0.0280)	(0.0203)	(0.0000)	(0.0253)
Log(GDP pc)	0.0338	-0.3018	0.0758	-0.0666	-0.0824	0.0706
	(0.1281)	(0.3292)	(0.1431)	(0.1098)	(0.1681)	(0.1057)
Supply Factors						
Tax Base Effect						
Crude Petrol	-0.0014	-0.0014**	0.0022			
	(0.0009)	(0.0006)	(0.0050)			
LFP	0.0010	0.0001	-0.0002	0.0014**	0.0011	0.0012*
	(0.0007)	(0.0011)	(0.0008)	(0.0006)	(0.0009)	(0.0006)
Openness	0.0380***	-0.0407**	0.0397***	0.0187**	-0.0261***	0.0275***
	(0.0099)	(0.0207)	(0.0101)	(0.0081)	(0.0094)	(0.0086)
Agriculture	0.1667	-0.7812***	-0.0319	0.0272	-0.1493	-0.0499
	(0.1066)	(0.2980)	(0.1102)	(0.0670)	(0.1382)	(0.0561)
Globalization	-0.145***	0.0384	-0.1850***	-0.0730**	0.0941	-0.1726***
	(0.0487)	(0.1019)	(0.0575)	(0.0349)	(0.0574)	(0.0393)
Administration Costs						
Urbanization	-0.515***	-0.3224	-0.4416***	-0.434***	-0.5364***	-0.3398***
	(0.1262)	(0.2161)	(0.1174)	(0.1057)	(0.1284)	(0.0950)
Constant	0.0000	1.4358	-2.7267**	0.4681	0.3053	-1.9395*
	(0.0000)	(1.5138)	(1.1227)	(0.8042)	(0.9675)	(0.9989)
Observations	437	227	210	635	328	307
Number of id	41	17	24	63	24	39
R-squared	0.91	0.94	0.87	0.91	0.93	0.90

Panel corrected standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
[1]Depenent variable calculated as $(\tau - \theta)/(1 + \theta)$ where τ is the direct tax rate and θ the indirect tax rate, and these tax rates computed, respectively, as total direct and direct taxes divided by nominal GDP, as in Poterba et al. (1986)