January 2006

Globalization and Developing Countries - a Shrinking Tax Base ?

Joshua Aizenman and Yothin Jinjarak

UCSC and the NBER; NTU

Abstract*

This paper evaluates the impact of globalization on the tax bases of countries at varying stages of development. We see globalization as a process that induces countries to embrace greater trade and financial integration, and macro stabilization. This in turn should shift their tax base from "easy to collect" taxes [tariff, seigniorage, etc.] towards "hard to collect" taxes [VAT, income tax, etc.]. We confirm this prediction – the revenue/GDP ratio of the "easy to collect" taxes declined by about 20% in developing countries between the early 1980s and the late 1990s, while the revenue/GDP of the "hard to collect" taxes increased by 9%. The relatively small initial base of "hard to collect" taxes in developing countries implied a net 7% *drop* in total tax revenue/GDP. Applying panel regressions and controlling for structural factors, we find that trade openness and financial integration have a positive relationship with "hard to collect" taxes, and negative relationship with the "easy to collect" taxes. The effects of globalization in our panel regressions are even larger than the effects of the institutional and political variables combined. Fiscal revenue from financial repression has also decreased, further reinforcing these results. The high income and the middle income countries managed to more than compensate for the revenue decline of the "easy to collect" taxes, increasing the total tax/GDP. In contrast, the upper and low income developing countries experienced sizeable drop in the tax/GDP. We also identify fiscal convergence: the coefficient of variation of tax revenue/GDP measures across countries declined substantially during 1980s - 1990s. The cross country variation declined by about 50% for seigniorage, about 30% for tariff, and about 15% for the "hard to collect" taxes. These results are consistent with the notion that improving the performance of the "hard to collect" taxes is more challenging than reducing the use of "easy to collect" sources of revenue.

Joshua Aizenman
UCSC and the NBER
Economics department, E2
UCSC, Santa Cruz
CA 95060, USA
jaizen@ucsc.edu

Yothin Jinjarak
NTU
School of Humanities and Social Sciences
S3-B2A-38 Nanyang Avenue
Singapore 637698
yjinjarak@ntu.edu.sg

Keywords: Globalization, tax base, fiscal convergence, VAT, financial repression, tariff
JEL No. F15, H21

* We would like to thank Jake Kendall for excellent research assistance. The views expressed herein are those of the authors and do not necessarily reflect the views of the NBER

1. Introduction and overview

A salient feature of the last twenty years has been the phenomenal increase in trade and financial integration of developing countries alongside dropping inflation rates. The greater openness has been reflected both in de-facto and de-jure measures of trade and financial integration. These trends are consistent with developing countries recognizing that, in the era of globalization, the opportunity costs of inward orientation have increased to a level justifying outward oriented reforms. These reforms include trade liberalization (reducing tariffs, quotas, and other non-tariff trade barriers); financial liberalization (reducing capital controls, and financial repression); and macroeconomic stabilizations (reducing inflation, reducing thereby the financial spread and the cost of borrowing). All of these reforms have a common fiscal denominator – they erode the revenue from what we call "easy to collect" taxes. These are the traditional sources of revenue used by developing countries including tariffs, inflation tax, and financial repression.[1] In this sense, globalization entails a negative fiscal shock to developing countries, shrinking the traditional tax base. Short of matching the drop in these taxes by a corresponding cut in fiscal expenditure, affected countries need to increase revenue. To do this, they must rely on alternative "hard to collect" sources such as Value Added Taxes [VAT], income taxes, sales taxes, etc.

The purpose of this paper is to evaluate empirically the impact of globalization throughout the 1980s – 1990s on the vector of taxes collected by countries at varying stages of development. We view the greater trade and financial integration as the outcome of deeper processes often dubbed "globalization." Taking the globalization process as exogenous for the purpose of the present investigation, we trace its impact on the tax base.[2] Specifically, we

---

[1] Developing countries' reliance on "easy to collect" taxes has been explained by their limited institutional capacities, political instability, and polarization. Studies explaining the reliance on easy to collect taxes in developing countries include Phelps (1973), Vegh (1989), Cukierman, Edwards and Tabellini (1992), Giovannini and De Melo. (1993), Aizenman and Guidotti (1994), Emran and Stiglitz (2005), and Gordon and Li (2005). See the Appendix for a detailed model explaining the reliance on "easy taxes." The impact of globalization on the pattern of taxation in the OECD countries has been the focus of Rodrik (1997a, b). See also Tanzi and Zee (2000); and Ebrill, Keen, Bodin, and Summers (2002).

[2] The factors explaining globalization include faster, more reliable, and cheaper delivery of goods and services across borders, and advances in information technology that allow cheaper fragmentation of production via FDI and outsourcing, etc.

quantify and explain the degree to which globalization has contributed to the diminishing fiscal base of developing countries, and the degree to which these countries managed to switch from the traditional "easy to collect" taxes to new, "hard to collect" taxes. We trace factors explaining the heterogeneity of the negative fiscal shock induced by globalization and thus explaining the depth of the fiscal adjustment accomplished already by countries at varying levels of development.

Figure 1.a compares trade openness and financial integration between 1980s and the 1990s for developing countries segregated into five regions.[3] The comparison confirms that the globalization trend is indeed global – openness increased remarkably in all regions. Figures 1.b and 1.c report the decline in the tariff and inflation rates during that period. On balance, the average tariff and inflation rates declined more in regions where the rates were above the average during the 1980s, indicating convergence of rates to a lower common denominator. Further insight about these developments is gained by comparing the revenue/GDP during the first 5 years of 1980s to that during the last 5 years of 1990s.[4] Figure 1.d indicates a major drop in the revenue from "easy to collect" taxes [seigniorage + tariff], and a sizable increase - though at a smaller rate - in the revenue from "hard to collect" taxes [VAT + income].[5] While the drop in "easy to collect" effective tax rates is more pronounced for high income countries, the greater initial base of "hard to collect" taxes in these countries relative to developing countries implies a net increase in total taxes of 5% in the first group, and a drop of 7% in the second. The position of the 4 South Asian countries is in between the high income and the developing countries: the

---

[3] The Data Appendix provides the list of countries in our study, and definitions of the various regions. The choice of these countries is dictated by data availability over the period 1980-1999.

[4] We compare a 5-year average separated by ten years due to two reasons. First, a 5-year average should smooth variations associated with business cycles. Second, the cumulative effects associated with globalization should be more visible by comparing two sub-periods separated by longer time. The country coverage in the figures is dictated by data availability.

[5] Limited data availability about tax revenue from financial repression prevents us from adding this implicit tax to the figures dealing with "easy to collect" taxes. Hence, these figures tend to understate the shrinking of "easy to collect" taxes. In section 2 we conduct a regression analysis for the subset of countries where we managed to collect data about tax revenue from financial repression.

large increase in the revenue from hard to collect taxes more than offset the drop in the revenue from the "easy to collect" taxes, increasing total tax revenue by 3%. These figures mask significant heterogeneity of the adjustment across countries, an issue that will be investigated in this paper using regression analyses.

Figure 2.a reports total tax/GDP rates in 24 developing countries in the early 1980s (measured horizontally) and in the late 1990s (measured vertically). The further away is a country from the 45-degree ray, the greater is the change over time in that country. Figures 2.b and 2.c report the GDP share of revenue colleted by "easy taxes" and by "hard taxes". For most developing countries, the share of "easy taxes" declined, whereas the share of "hard taxes" increased. The average tax revenue/GDP declined from 0.200 to 0.175. The average revenue/GDP of "easy to collect" taxes declined during the period from 0.058 to 0.042 [see Figure 2.b]; whereas average tax revenue/GDP of "hard to collect" taxes remained rather stable at about 0.1 [see Figure 2.c]. Interestingly, the overall cross country patterns are non-linear, characterized by a U-shape curve [see the quadratic regression lines in 2.b and 2.c]. In both figures, the left arch of the fitted U curve is close to the 45-degree ray for countries below the sample mean, with increasing divergence from the 45-degree ray for countries above the sample mean. The concavity of the cross-country patterns is more pronounced in figure 2.b suggesting that countries that had previously relied heavily on the "easy to collect" taxes confronted greater losses. Figure 2.c suggests that countries above the mean of revenue from "hard taxes" in the early 1980s ended up reducing the revenue in the late 1990s. Both figures are consistent with the notion that globalization entails fiscal convergence. Figure 2.d compares the total government expenditure/GDP between the early 1980s and the late 1990 and shows that the average drops from 0.275 to 0.226.

Further insight is gained from cross-country regressions as well as a detailed panel study explaining the patterns of taxes over time. Both are described in the next section. Figure 3 summarizes the panel study, reporting the economic impact of globalization and structural factors on the changes in revenue/GDP collected by VAT, seigniorage, and tariff. Globalization has large and robust effects: a one standard deviation increase in financial integration is associated with a decline of the seigniorage revenue/GDP by 0.8%, half of which is compensated

by an increase in the VAT revenue/GDP of 0.4 %.[6] A one standard deviation increase in trade openness leads to a drop tariff revenue/GDP by 0.2%. Among the structural factors, a one standard deviation increase in urbanization increases the VAT revenue/GDP by 0.7, the seigniorage revenue/GDP by 2.7%, and reduces the tariff revenue by 0.8%.

To gain perspectives about the net adjustment, Figure 4.a reports the various sources of tax revenue as a percentage of GDP in the early 1980s. Interestingly, most of the variation across the four income groups was in the revenue from "hard to collect taxes", which was about 7% of GDP for the low income, progressing upward and reaching 15% of GDP in the high income countries. In contrast, there was little variation in the revenue from "easy to collect taxes" across the various groups: it was 5% of GDP for the low income, reaching 7% of GDP for the high income countries. The total tax/GDP in the four groups mimics the patterns of the "hard to collect" taxes: it was about 14% of GDP for the low income group, progressing upward with GDP/Capita and reaching 27% of GDP for the high income group. Figure 4.b reports the changes in total taxes/GDP, and in "easy to collect" and "hard to collect" taxes/GDP between the early 1980s with the late 1990s across four income groups. Overall, the record is mixed. Interestingly, the drop in the revenue from "easy taxes" was larger for the higher income groups [in fact the revenue from easy taxes went up for the low income by 5%]. Both the high income and the middle income managed to increase the revenue from the "hard taxes" significantly [10% and 37%, respectively] and increasing the total tax/GDP by 5% and 8%, respectively. The increase in revenue from the "hard taxes" was rather timid for the upper and the low income countries [4% and 6%, respectively], less than what was needed to compensate for the drop in the revenue from "easy taxes." This induced a drop in the total tax revenue of 9% for the upper income countries and 15% for the low income developing countries. Seemingly countries exhibit complex non-linear patterns of adjustment, where the middle-income developing countries adjust more easily

[6] See Ebrill, Keen, Bodin, and Summers (2001, 2002) for comprehensive studies of the growing importance of VAT, and Aizenman and Jinjarak (2005) for empirical evaluation of VAT's collection efficiency. Baunsgaard and Keen (2005) found that for middle-income countries, revenue recovery following trade liberalization has been about 50 cents for each dollar of lost trade tax revenue, and the revenue recovery has been even weaker in low-income countries.

than the upper and the lower income developing countries.[7]

We conclude the empirical section with a cross-country study, accounting for the changes in revenue contribution of various taxes between the late 1980s and the late 1990s. We find that better institutional quality is associated with a greater drop in seigniorage revenue during that time. Countries with higher degree of financial integration or countries that went through deeper economic liberalization, increased the VAT revenue and reduced the seigniorage revenue by larger extent. This also suggests that globalization, being a common shock, may induce fiscal convergence across countries. Figure 5 confirms this conjecture. It shows a gradual decline in the coefficient of variation of tax revenue/GDP measures during 1980s – 1990s. This effect differs across taxes: the coefficient of variation of seigniorage revenue/GDP during 1980s - 1990s declined by about 50% as opposed to about 30% for tariff, and only about 15% for the "hard to collect" taxes. Apparently, improving the performance of the "hard to collect" taxes is more challenging then reducing the use of "easy to collect" sources of revenue.

The next section summarizes the panel and the cross-country regressions. Section 3 closes the paper with concluding remarks. The Appendix outlines a model explaining the factors determining the use of "easy to collect" versus "hard to collect" taxes.

2. Estimation

The Data Appendix provides the list of 86 countries in our study. The choice of these countries is dictated by data availability over the period 1980-1999. About a quarter of these countries have observations consistently across the 1980s and the 1990s for both panel and cross-country regression analysis. Our dependent variables are the annual revenue collection via VAT, seigniorage, and tariff revenues divided by GDP. We conduct the Seemingly Unrelated Regression (SUR) analysis that projects these dependent variables on a vector of explanatory variables, including structural and political variables suggested in the literature, plus our globalization factors. The vector of explanatory variables comprises [see Appendix A for a model explaining the impact of these variables on the tax base]:

[7] These divergent patterns may be explained by noting that the overall tax revenue/GDP in the early 1980s was similar for the high and upper income countries (about 26%), yet the high income managed to increase the revenue from the "hard taxes" by more than double the increase achieved by upper income countries [10% and 4%, respectively].

(a) Globalization: We expect the globalization factors, measured by trade openness and financial integration, to increase VAT collection, and reduce seigniorage and tariff revenue.

(b) Composition of GDP: "easy to collect" taxes should be applied more heavily in a country with larger agricultural share in GDP.

(c) Urbanization: We expect that it is more difficult to administer and collect "hard to collect" taxes in less urbanized and more rural countries. However, it is also possible that urbanization is associated with underground economy, inducing the use of seigniorage to tax such informal sector.

(d) Institutional quality and political durability: We expect a country with better institutional quality and more stable politics to collect more from "hard to collect" taxes, and less from "easy to collect" taxes.

(e) Level of economic development: We expect that higher level of development and income, which we measure by per capita GDP, should be associated with higher collection for "hard to collect" taxes and lower for "easy to collect" taxes.

Throughout the paper we take the globalization process, measured by trade openness and financial integration, as exogenous factors, inducing fiscal adjustment in the next periods.[8] We take care of the possible reverse causality from fiscal adjustment to globalization by lagging 'institutional quality,' 'political durability', 'trade openness,' and 'financial integration' one period (a year).[9] Some of these explanatory variables, however, are also likely to be subjective. We will therefore use several alternative measures of institutional and political quality, and globalization factors in our robustness check. Since the determining processes of VAT, seigniorage, and tariff are likely to be interrelated, the SUR on the panel data of countries is our

[8] The exogenous factors explaining globalization include faster, more reliable, and cheaper delivery of goods and services across borders, and advances in information technology that allow cheaper fragmentation of production via FDI and outsourcing, etc.

[9] Note that globalization may have mixed results on tariff revenue/GDP and seigniorage revenue/GDP ratios: lower tariff rates tend to increase imports, with ambiguous effects on the total revenue from trade taxes. Similarly, macroeconomic stabilization may increase economic growth, with ambiguous effects on seigniorage. Yet, if most countries operate on the "proper" part of Laffer's tax curve, one expects that globalization would reduce the tariff and the seigniorage revenue/GDP ratios.

benchmark estimation methodology. Nevertheless, we will also use other panel data techniques and cross-country regression to confirm our findings. The Data Appendix provides definitions, sources, and descriptive statistics of the data used in our study.

2.1 **Benchmark Panel Estimation**

In this section we ask what are the determinants of VAT, seigniorage, and tariff, and whether the determining processes of these taxes are interrelated.[10] Table 1 reports the benchmark SUR estimates using developing-countries data. The non-developing countries are those defined by the World Bank's income classification as high income, excluding South Korea. In total, we have 313 observations of unbalanced panel for 31 developing countries.

Our benchmark panel estimation accounts for 11 – 20 percent of the variation in the data. Theory suggests that developing countries with worse institutional quality and political conditions are expected to make more use of taxes with low collection and enforcement costs, the "easy to collect" sources. Indeed, this is supported by our empirical findings. According to our coefficient estimates in Table 1, better institutional quality is associated with lower seigniorage. Similarly, political durability reduces tariff revenue as a fraction of GDP. On average, developing countries with better institutional quality and political durability make more use of VAT.

On the impact of globalization on fiscal adjustment, we find that trade openness and financial integration have a positive relationship with "hard to collect" taxes, and negative relationship with the "easy to collect" taxes. Trade openness (exports plus imports divided by GDP) led to a reduction in tariff revenue, which is consistent with empirical findings in previous studies on the relationship between trade liberalization and tariff revenue (see for example Baunsgaard and Keen, 2005). Financial integration via the reduction in capital account restrictions (imputed Quinn index, Edwards (2005)) is negatively associated with the use of seigniorage and at the same time increases VAT collection. These estimates support our view that globalization has reduced the effective collection rate of "easy to collect" taxes, forcing developing countries to switch to the "hard to collect" revenue sources.

[10] Statistical correlations of VAT are –0.16 with seigniorage, –0.12 with tariff, and +0.65 with total tax revenue.

Most coefficient estimates of other explanatory variables have their expected sign. VAT collection is positively associated with urbanization. Note that the urbanization variable appears to be negative on tariff, and positive on and seigniorage. As pointed out by Cukierman, et al. (1992), urbanization of population may in effect encourage the use of seigniorage to tax underground/informal economy. It may also represent greater political fractiousness and polarization (often magnified in more urbanized societies), which tend to increase the use of seigniorage. We also find that high agricultural share in GDP is positively associated with both VAT and tariff collections. This result seems to contradict our initial presumption and may merit further investigation. Finally, higher per capita GDP is found to reduce both seigniorage and tariff.

For each of the explanatory variables, Figure 3 summarizes their economic significance by estimating the impact of a one standard deviation [henceforth, +1s.d.] change. We calculate the economic significance based on the estimates reported in Table 1 as the following. Standard deviation of the urbanization variable for developing countries is 20.24. Using the coefficient estimate of urbanization on VAT from Table 1, which is 0.035 and statistically significant, the effect of +1s.d. change of urbanization is to increase VAT by 20.24*0.035 ≈ 0.7% of the GDP (a +1s.d. change of urbanization in 1999 is equivalent to increasing the urbanization level of Mexico, 74% → Netherlands, 89%). Note that this is a sizable effect of urbanization, further underscoring the notion that the "hard taxes" such as VAT carry significant collection and enforcement costs.

Our main variables, the globalization factors, have been associated with significant fiscal adjustment in developing countries. Firstly, it is useful to note that a +1s.d. change of trade openness is about 22% (in 1999: +1s.d. change in trade openness: Ecuador, 56% → Israel, 79%), and that of financial integration is 21 score out of 100 (in 1999: +1s.d. change in financial openness: Indonesia, 63 → Portugal, 88). We find that the combined effects of trade and financial integration is approximately +1.1% on VAT, increasing on average this "hard to collect" tax from 3.8% to 4.9% of the GDP. At the same time, the globalization factors reduce the "easy to collect" taxes all together by 1.0%, lowering seigniorage from 2.2% to 1.4%, and tariff from 2.7% to 2.5% of the GDP.

When we do a comparison of economic significance from all of the explanatory variables thought to influence fiscal adjustment in our benchmark panel regression, the effects of

globalization are even larger than the effects of the institutional and political variables combined. Together, the measures of institutional quality and political durability have contributed to an increase in VAT by 0.7% and a decrease in "easy taxes" by 0.6% of the GDP, both of which are smaller than the effects from trade and financial integration. We also find that structure and composition of the economy matter: +1s.d. change of per capita GDP reduces the "easy to collect" seigniorage and tariff revenues as the fraction GDP by 1.1% and 0.4%, respectively.

2.2 **Robustness Check**

– Adding Financial Repression Revenue

Our first robustness check is to add government revenue from financial repression into the vector of dependent variables. Government can impose controls on international capital flows and domestic financial intermediaries as a form of taxation. The resultant wedge between effective external and domestic interest rates of public debt is the financial repression tax, which is essentially a subsidy on interest payments on government liabilities. As discussed in Giovannini and De Melo (1993), there are also potential complementarities between financial repression revenue and seigniorage because (i) inflation implies low real interest rates facing savers, and thus interest savings on government liabilities, and (ii) negative real interest rates on savings increase money demand, that is, the inflation tax base. Financial repression revenue is calculated by multiplying the stock of outstanding domestic debt by the financial repression tax rate, which is the interest rate differential in local currency between the effective external and domestic interest rates.[11] Evidently, there is a high positive correlation between seigniorage and government revenue from financial repression (about 0.50).

In Table 2, the financial repression revenue is added to the set of dependent variables. A drawback with the addition of the financial repression variable into the regression is that the sample size drops substantially from 313 observations (31 countries) to 106 observations (16

[11] Financial repression revenue may be negative (i.e. the effective foreign interest rate is smaller than the effective domestic interest rate), reflecting a lower cost of foreign borrowing relative to domestic borrowing facing a government. In our sample, the highest financial repression revenue was 245% in Peru 1990 when its currency depreciated from the previous year level by more than 4,000%. The lowest recorded was –15% in Mexico 1988 when its currency appreciated by 7%. See Giovannini and De Melo (1993) for reports of the financial repression revenue in the 1970s and early 1980s.

countries). Nevertheless, with the financial repression revenue added, our regressions can account for 24 – 49 percent of the variation in the data when we conduct the SUR analysis on VAT, seigniorage, tariff, and financial repression revenue with the same set of explanatory variables we use in the benchmark specification. Taking financial repression into consideration, our estimation suggests that financial integration is one of the most important factors affecting fiscal adjustment. The effect of financial integration on VAT is positive and statistically significant. Its estimates are negative for both seigniorage and financial repression revenue. Most of the explanatory variables continue to have their expected sign.

– Sensitivity to Explanatory Variables

Among the explanatory variables included, institutional and political variables are most likely to be subjective. In addition, the results might also depend on what we use as a measure of globalization. Table 3 investigates this sensitivity by altering these explanatory variables.

First, we replace the institutional quality with bureaucratic quality (their statistical correlation is 0.38). Most estimates continue to have their expected sign. Higher political durability and financial integration are still associated with higher VAT and lower seigniorage. Next, we replace political durability with the measure of government stability (their statistical correlation is 0.04). Financial integration continues to affect both VAT and seigniorage. Better institutional quality is associated with higher VAT and lower seigniorage. Countries with higher GDP per capita tend to rely less on seigniorage and tariff.

So far, we measure globalization factors using the degree of trade openness and financial integration. Wacziarg and Welch (2003) compile an indicator of openness, extending Sachs and Warner (1995). The 0/1 variable indicates the year of a country's economic liberalization, taking into account the level of trade barriers, black market exchange rate, and economic system. When we replace our benchmark trade openness and financial integration with this dummy variable of economic liberalization, we find that higher institutional quality and political durability increase VAT and lower seigniorage and tariff revenues. Economic liberalization, as a measure of 'globalization,' is associated with higher VAT and lower "easy to collect" revenues.

– Sensitivity to Econometric Specifications

We next investigate whether our findings are sensitive to alternative econometric specifications. This is reported in Table 4. Note that the Breusch-Pagan tests of independence across equations for regressions reported in Tables 1-3 suggest that VAT, seigniorage, and tariff are jointly determined. We also conduct fixed-effects, random-effects, and pooled averages estimation for VAT, seigniorage, and tariff separately. The estimates are consistent with those obtained from the benchmark SUR estimation. In particular, better institutional quality, higher political durability, and economic integration have positive effects on VAT, and adversely affect seigniorage and tariff. Thus, our findings seem robust to econometric specifications.[12]

– The Late 80s versus Late 90s Cross-Country Regressions

Another important question is whether the effects of globalization on the fiscal adjustment continue to hold in the cross-country regression context. In order to further investigate the robustness of our results, we reports in Table 5 the cross-country regressions. All of the dependent and explanatory variables are now measured as their change between the last 5 years of the 1980s and the last 5 years of the 1990s (henceforth denoted in front of each variable by Δ). Ideally we wanted to use the change between the first 5 years of the 1980s and the last five year of the 1990s like we do throughout with the graphical analysis, but the cross-country estimations is constrained by data availability between such periods.

For the comparison between late 80s and late 90s, we have information for 20 countries. We proceed with the SUR estimation on these 20 observations, exploring also the alternative measures of the explanatory variables similar to what we do in the robustness check for panel regressions. Our cross-country regressions account for 27 – 98 percent of the variation in the data. Most coefficient estimates from the cross-country regressions are consistent with those from the panel estimation. We find that better institutional quality is associated with a greater reduction in seigniorage. Political durability and government stability increase VAT, but reduce

[12] We tend to rely on SUR as it utilizes the correlation of the disturbances across equations, taking into account the interdependence of tax collection from various sources.

revenue collection from seigniorage and tariff. Countries with a higher degree of financial integration or countries that went through economic liberalization tend to rely more on VAT, but less on seigniorage. Overall, these findings are supportive to the panel regressions.

3. Concluding remarks

Our study found that globalization has imposed new fiscal challenges on developing countries, forcing them to scale down traditional "easy to collect" revenue sources. A good share of developing counties managed the adjustment by shifting the tax base to the "hard to collect" taxes. Yet, countries with low level of institutional quality have found the adjustment more challenging, frequently ending with a drop in the net tax revenue/GDP. Our study has focused only on half of the adjustment, as we do not include government expenditure as a potential determinant of the tax base. It is possible that part of the adjustment of "hard to collect" and "easy to collect" tax to globalization is accomplished by opening a larger fiscal gap, or by scaling down government spending. At this point, we do not have sufficient data that will allow us to do more rigorous analysis beyond a simple period comparison reported in Figure 2.d. Another possible limitation is that the presence of informal economy may overstate the effective tax rates used throughout the paper. Subject to data availability, there is no easy way to fix this measurement error as we do not have consistent panel information about the changing scope of the informal sector.[13]

[13] See Schneider and Enste (2000) and Friedman, et al. (2000) for various measures of informal economy in the early 1990s. Garcia-Penalosa and Turnovsky (2005) consider optimal capital-labor income tax structure in the presence of informal economy. See also Dessy and Pallage (2003) and Fortin, et al. (1997). See Fisman and Wei (2004) and Aizenman (2004) for fiscal implications of trade misinvoicing.

References

Aizenman, Joshua, and Pablo E. Guidotti. "Capital Controls, Collection Costs, and Domestic Public Debt." *Journal of International Money and Finance* 13, no. 1 (1994): 41-54.

Aizenman, Joshua. "Financial Opening and Development: Evidence and Policy Controversies", *American Economic Review* 92, no. 2(2004): 65-70.

Aizenman, Joshua, and Yothin Jinjarak. "The Collection Efficiency of the Value Added Tax: Theory and International Evidence." NBER Working Papers, no. 11539 (2005).

Baunsgaard, Thomas, and Michael Keen. "Tax Revenue and (Or?) Trade Liberalization." International Monetary Fund Working Papers, no. 05/112 (2005).

Cukierman, Alex, Sebastian Edwards, and Guido Tabellini. "Seigniorage and Political Instability." *American Economic Review* 82, no. 3 (1992): 537-55.

Dessy, Sylvain, and Stephane Pallage. "Taxes, Inequality and the Size of the Informal Sector." *Journal of Public Economics* 70, no. 1 (2003): 225-33.

Ebrill, Liam, Michael Keen, Jean-Paul Bodin, and Victoria Summers. "The Allure of the Value-Added Tax." *Finance and Development* 39, no. 2 (2002).

———. *The Modern VAT*. Washington: International Monetary Fund, 2001.

Edwards, Sebastian. "Capital Controls, Sudden Stops and Current Account Reversals," (2005) NBER Working Paper # 11170.

Emran, Shehe M., and Joseph E. Stiglitz. "On Selective of Indirect Tax Reform in Developing Countries." *Journal of Public Economics* 89, no. 4 (2005): 599-623.

Fisman, Raymond and Shang-Jin Wei. "Tax Rates and Tax Evasion: Evidence from 'Missing Imports' in China," *Journal of Political Economy* 112, no. 2 (2004): 471-500.

Fortin, Bernard, Nicolas Marceau, and Luc Savard. "Taxation, Wage Controls and the Informal Sector." *Journal of Public Economics* 66, no. 2 (1997): 293-312.

Friedman, Eric, Simon Johnson, Daniel Kaufmann, and Pablo Zoido-Lobaton. "Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries." *Journal of Public Economics* 76, no. 3 (2000): 459-93.

Garcia-Penalosa, Cecilia, and Stephen J. Turnovsky. "Second-Best Optimal Taxation of Capital and Labor in Developing Economy." *Journal of Public Economics* 89, no. 5-6 (2005): 1045-74.

Giovannini, Alberto, and Martha De Melo. "Government Revenue from Financial Repression." *American Economic Review* 83, no. 4 (1993): 953-63.

Gordon, Roger, and Wei Li. "Puzzling Tax Structures in Developing Countries: A Comparison of Two Alternative Explanations." NBER Working Papers, no. 11661 (2005).

Jinjarak, Yothin. "Adios Government Revenue from Financial Repression: More on the Consequences of Financial and Trade Opening." NTU (2005).

Phelps S. Edmund "Inflation in the Theory of Public Finance," *Swedish Journal of Economics*, 75, no. 1 (1973): 67-82.

Rodrik, Dani. "Trade, Social Insurance, and the Limits to Globalization," NBER Working Papers, no. 5905 (1997a).

Rodrik, Dani. *Has Globalization Gone Too Far*, (1997b) Institute for International Economics, Washington DC.

Sachs, Jeffrey D., and Andrew Warner. "Economic Reform and the Process of Global Integration." *Brookings Papers on Economic Activity* 1995, no. 1 (1995): 1-118.

Schneider, Friedrich, and Dominik H. Enste. "Shadow Economies: Size, Causes, and Consequences." *Journal of Economic Literature* 38, no. 1 (2000): 77-114.

Tanzi, Vito, and Howell Zee. "Tax Policy for Emerging Markets: Developing Countries." *National Tax Journal* 53, no. 2 (2000): 299-322.

Vegh, Carlos, "Government Spending and Inflationary Finance: A Public Finance Approach'" *IMF Staff Papers*, 36 (1989): 657-77.

Wacziarg, Romain, and Karen Horn Welch. "Trade Liberalization and Growth: New Evidence." NBER Working Papers, no. 10152 (2003).

Appendix A

Our benchmark model is adopted from Cukierman, et al. (1992), which explains the obstacles to tax reforms in polarized countries, characterized by political instability. They focused on the case where fiscal revenue can be raised by taxes associated with collection costs [income taxes], and implicit taxes where the collection cost is zero [inflation tax]. They assumed implementation lags – the present policy maker determines the efficiency of the tax system next period. This implies that the choice of the tax system efficiency may be strategic – the current policy maker may choose an inefficient future tax system in order to constrain the fiscal revenue available to future policy makers. This prevents future policy makers from spending in ways that are viewed as inferior from the vantage point of the present policy maker.

We extend Cukierman et. al. model by adding endogenous tax evasion, and modeling the optimal enforcement of the "hard to collect" taxes. The economy at time t is described by two representative budget constraints: the government, (A1) and the private sector, (A2):

$$g_t + f_t + \theta_t \le \tau_t^a + s_t \qquad \text{(A1)}$$

$$c_t = 1 - \tau_t^a - s_t - \delta(\tilde{\tau}_t) - \gamma(s_t). \qquad \text{(A2)}$$

Each individual is endowed with one unit of output in each period. The variables g_t; f_t represent two different public goods [say guns and butter] in per capita terms, and c_t is per-capita private consumption. The term θ_t is the fiscal investment in tax capacity, the impact of which is discussed below. The government collects from each individual an amount s_t, in the form of easy to collect taxes [seigniorage, tariff, etc.] and an amount τ_t^a of actual hard to collect taxes [like, income, VAT, etc]. The statutory tax rate is $\tilde{\tau}_t$. Easy to collect taxes carries no administrative costs, whereas the hard to collect taxes are associated with costly enforcement, described below. Both type of taxes impose convex deadweight losses on the private sector, equal to $\delta(\tilde{\tau}_t); \gamma(s_t)$, satisfying $\delta' > 0, \quad \delta'' > 0, \gamma' > 0, \quad \gamma'' > 0$. Underpaying taxes is costly: with probability p_t, the agent is audited. If she is found paying τ_t below the statutory rate, she would be penalized, paying $\tilde{\tau}_t + 0.5\phi_t[\tilde{\tau}_t - \tau_t]^2$. Hence, underpaying is associated with a quadratic penalty of $0.5\phi_t[\tilde{\tau}_t - \tau_t]^2$, paid with probability p_t. The period t utility from the private consumption is $U(c_t)$. The representative agent would submit tax payment τ_t^s, maximizing her expected utility:

$$\underset{\tau_t}{MAX} \left[p_t U \begin{pmatrix} 1 - \{\tilde{\tau}_t + 0.5\phi_t[\tilde{\tau}_t - \tau_t]^2\} - \\ s_t - \delta(\tilde{\tau}_t) - \gamma(s_t) \end{pmatrix} + (1 - p_t) U\left(1 - \tau_t - s_t - \delta(\tilde{\tau}_t) - \gamma(s_t)\right) \right] \qquad \text{(A3)}$$

Optimizing (A3), the optimal submitted tax, denoted by τ_t^s, is: $\tau_t^s = \widetilde{\tau}_t - \frac{1-p_t}{p_t\phi_t}(1-\lambda)$ where λ is the risk premium adjustment, $\lambda = \frac{U'(c_{t,a}) - U'(c_{t,n})}{U'(c_{t,a})} \geq 0$, and $U'(c_t)$ is the marginal utility associated with consumption c_t. The risk term, λ, is the percentage gap of the marginal utilities between the audit and no-audit cases. The resultant expected tax payment is $E[\tau_t] = \widetilde{\tau}_t - 0.5\frac{(1-p_t)^2}{p_t\phi_t}(1-\lambda^2)$. In practice, the risk adjustment term, λ, is of second order magnitude in circumstances where the tax gap between the increases in tax payment associated with audit, is small relative to total consumption. Thus, for simplicity, we henceforth ignore this risk adjustment term, assuming $\lambda \cong 0$ [It is easy to verify that $\lambda \cong \frac{c_{t,n} - c_{t,a}}{c_{t,a}} \frac{-U''(c_{t,a})}{U'(c_{t,a})}$, hence, λ is negligible when $\frac{c_{t,n} - c_{t,a}}{c_{t,a}}$ is small]. The economy is populated with a large number of atomistic agents. Hence, from the point of view of the authorities, the idiosyncratic risk associated with tax evasion is diversified away – in the macro budget constraints (A1) - (A2), the actual tax revenue τ_t^a is the expected tax payment of the atomistic agent,

$$\tau_t^a = \widetilde{\tau}_t - 0.5\frac{(1-p_t)^2}{p_t\phi_t}(1-\lambda^2) \cong \widetilde{\tau}_t - 0.5\frac{(1-p_t)^2}{p_t\phi_t}. \qquad \text{(A4)}$$

The policy maker problem

There are two possible policymaker types, L and R, who randomly alternate in office. The policy maker of type i, i = L, R maximizes welfare:

$$w_i^t = E_t\left\{\sum_{k=0}^{\infty}\beta^k\begin{bmatrix}U(c_{t+k}) + \\ H^i(g_{t+k}, f_{t+k})\end{bmatrix}\right\}; \quad H^i(g,f) = \begin{cases}\dfrac{\min[\alpha g,\ (1-\alpha)f]}{\alpha(1-\alpha)} & i = L \\ \\ \dfrac{\min[\alpha g,\ (1-\alpha)f]}{\alpha(1-\alpha)} & i = R\end{cases}. \qquad \text{(A5)}$$

where E_t denotes the expectation operator, U is a concave utility function, $H^i(g,f)$ corresponds to the utility associated with the public good, as evaluated by policy maker type i, $1 > \beta > 0$, $1 > \alpha > 0$. The political system is described as a Markov process with transition probabilities π and $1 - \pi$: the government in office at time t has a fixed probability $1 - \pi$ of being reappointed next period. With probability π, it is thrown out of office and the other policymaker type is appointed.

Let $x \equiv g + f$ denote the total amount of government spending. For concreteness, we assume $\alpha > 0.5$. While the private agent views the probability of an audit, and the penalty rate at time t, as exogenous, these variables are pre-determined by the policy maker at time t -1. The efficiency of the tax system is determined by the probability of an audit, and by the penalty associated with tax evasion, *p* and ϕ, respectively. We assume that both *p* and ϕ are determined by the investment in tax capacity, θ. To capture the greater inertia in reforming the tax system than in changing fiscal policy, assume that the investment in tax efficiency, θ, along with *p* and ϕ, but not the other policy variables ($\tilde{\tau}_t$; s_t ; g_t; f_t), must be chosen one period in advance. Thus, θ_{t-1} was chosen at time t-1, but exerts an influence on the efficiency of the tax system only at time t:

$$\begin{aligned} p_t &= p_t(\theta_{t-1}; ST); \quad p' > 0; \quad p'' < 0; \\ \phi_t &= \phi_t(\theta_{t-1}; ST); \quad \phi' > 0; \quad \phi'' < 0; \end{aligned} \qquad \text{(A6)}$$

where *ST* is the vector of structural factors impacting the cost of tax collection. Specifically, high urbanization rate, lower share of agriculture and higher trade openness may reduce the effective cost of monitoring and collecting information, implying greater efficiency of the collection system. As these structural factors are changing slowly, we view them beyond the control of the policy maker, and focus on the determination of optimal investment in tax capacity, θ_t. As in proposition 1 in Cukierman, et al. (1992), optimal choices of consumption, aggregate public good, easy and hard taxes are a function of the efficiency of the tax system:

$$c^* = C(\theta); x^* = X(\theta); s^* = S(\theta); (\tau^a)^* = T(\theta); \qquad \text{(A7)}$$

satisfying $C'(\theta) < 0; X'(\theta) > 0; S'(\theta) < 0; T'(\theta) > 0$, where *z** denotes the optimal value of *z*. The equilibrium value of the tax rate chosen, θ, satisfies the first order condition:

$$\beta U'(C(\theta))C'(\theta) + \left[1 - \pi + \pi \frac{1-\alpha}{\alpha}\right] X'(\theta) = 1 \qquad \text{(A8)}$$

The main results of the model are summarized by the following proposition:

I. If the current government is certain of being reappointed, or if there is no polarization ($\pi = 0$ or $\alpha = 0.5$), then it brings about the most efficient tax system.

II. The lower the probability that the current government will remain in office and the greater the polarization, the more inefficient is the tax system left as a legacy to the future administration. This inefficiency is manifested by lower investment in tax capacity, inducing a lower probability of auditing, and a lower penalty on tax evasion, reducing thereby the tax collection associated with a given statutory tax rate. Structural factors that increase the ease of tax evasion reduce the equilibrium tax collection, and increase the share of the "easy to collect" taxes.

Appendix B

Data Sources and Definitions

Main sources of data are *International Financial Statistics* (IFS), *World Development Indicators* (WDI), POLITY IV database from the University of Maryland, *Penn World Tables 6.1* (PENN), *International Country Risk Guide* (ICRG) from the PRS Group, and *World Tax Database* (WTD) from the Office of Tax Policy Research (OTPR), University of Michigan Business School.

GDP ≡ annual gross domestic product [*Source*: IFS]

Rate of Tariff ≡ weighted-average rate of tariff; in % [*Source*: World Bank]

Capita GDP ≡ real GDP per capita; in US$1,000 [*Source*: PENN]

Agricultural Share of GDP ≡ share of GDP produced in the agricultural sector; in % of GDP [*Source*: WDI]

Urbanization ≡ the share of the total population living in areas defined as urban in each country; in % of total population [*Source*: WDI]

Tax revenues:

Seigniorage ≡ increase in reserve money divided by GDP; in % of GDP [*Source*: IFS]

Financial Repression Revenue ≡ foreign interest rate differential*stock of domestic debt divided by GDP; in % of GDP [*Source*: Jinjarak (2005)]

VAT ≡ revenue from value added tax divided by GDP; in % of GDP [*Sources*: WTD, IFS]

Income Tax ≡ revenue from income tax divided by GDP; in % of GDP [*Sources*: WTD, IFS]

Total Tax ≡ total tax revenue divided by GDP; in % of GDP [*Sources*: WTD, IFS]

Tariff ≡ revenue from tariff divided by GDP; in % of GDP [*Sources*: WTD, IFS]

Expenditure ≡ expenditure divided by GDP; in % of GDP [*Sources*: IFS]

Globalization factors:

Trade Openness ≡ a de facto measurement of trade opening, calculated as imports plus exports divided by GDP; in % of GDP [*Source*: PENN]

Financial Integration ≡ index of capital-account restrictions (imputed Quinn) [*Source*: Edwards (2005)]

Economic Liberalization ≡ a dummy variable for openness, equals to 1 if a country has (1) average tariff rates of 40% or more, (2) non-tariff barriers covering 40% or more of trade, (3) a black market exchange rate that is depreciated by 20% or more relative to the official exchange rate (4) a state monopoly on major exports, (5) a socialist economic system. [*Sources*: Wacziarg and Welch (2003)]

Institutional Quality and Political variables:

Institutional Quality ≡ ranges from 0 to 100, measuring the composite political, financial, and economic risk. A higher score indicates lower risk. [*Source*: ICRG]

Government Stability ≡ ranges from 0 to 12, measuring the government's ability to carry out its declared programs, and its ability to stay in office. A higher score means higher stability. [*Source*: ICRG]

Bureaucracy Quality ≡ ranges from 0 to 4. The institutional strength and quality of the bureaucracy is a shock absorber that tends to minimize revisions of policy when governments change. High points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. [*Source*: ICRG]

Political Durability ≡ the first year during which a new (post-change) polity is established is coded as the baseline "year zero" (value = 0) and each subsequent year adds one to the value of the variable consecutively until a new regime change or transition period occurs [*Source*: POLITY]

List of Developing and High-Income Countries in the Sample

Developing Countries (53)

code	country	code	country
AFR	Sub-Saharan Africa (10)	LAC	Latin America & Caribbean (17)
CMR	Cameroon	ARG	Argentina
cog	Congo, Republic of	brb	Barbados
GAB	Gabon	BOL	Bolivia
lso	Lesotho	BRA	Brazil
mus	Mauritius	CHL	Chile
NAM	Namibia	COL	Colombia
sen	Senegal	CRI	Costa Rica
syc	Seychelles	hti	Haiti
ZAF	South Africa	hnd	Honduras
ZWE	Zimbabwe	JAM	Jamaica
		MEX	Mexico
EAP	East Asia & Pacific (5)	NIC	Nicaragua
IDN	Indonesia	PRY	Paraguay
KOR	Korea, Republic of	PER	Peru
mys	Malaysia	TTO	Trinidad and Tobago
mmr	Myanmar	URY	Uruguay
THA	Thailand	VEN	Venezuela
ECA	Europe & Central Asia (14)	MNA	Middle East & North Africa (3)
BLR	Belarus	IRN	Iran
bgr	Bulgaria	MAR	Morocco
hrv	Croatia	TUN	Tunisia
cze	Czech Republic		
est	Estonia	SAR	South Asia
geo	Georgia	IND	India
HUN	Hungary	npl	Nepal
kaz	Kazakhstan	PAK	Pakistan
lva	Latvia	lka	Sri Lanka
ltu	Lithuania		
POL	Poland		
rom	Romania		
svk	Slovak Republic		
TUR	Turkey		

High-Income Countries (14)

code	country
AUS	Australia
CAN	Canada
cyp	Cyprus
dnk	Denmark
isl	Iceland
isr	Israel
JPN	Japan
mlt	Malta
NOR	Norway
sgp	Singapore
svn	Slovenia
swe	Sweden
che	Switzerland
gbr	United Kingdom

*Note: World Bank's classification. These countries have data on VAT, seigniorage, and tariff. Those with data for regression analysis are codified with capitalized letters.

Descriptive Statistics for Developing Countries

Summary

Variable	Obs	Mean	S.D.	Min	Max
VAT/GDP	313	3.77	2.25	0.01	8.88
Seigniorage/GDP	313	2.19	2.30	0.00	16.05
Tariff/GDP	313	2.67	2.07	0.37	14.56
Repression/GDP	106	6.10	24.54	-15.88	245.03
Total Tax/GDP	312	17.33	7.61	5.54	49.24
Institutional Quality	313	60.39	10.70	29.13	83.54
Bureaucratic Quality	313	2.12	0.97	0.00	4.00
Political Durability	313	17.40	19.75	0.00	81.00
Government Stability	313	6.51	1.81	2.00	11.08
Trade Openness	313	48.54	22.68	10.39	137.71
Financial Integration	313	49.80	21.00	12.5	100
Economic Liberalization	313	0.61	0.49	0.00	1.00
Urbanization	313	56.01	20.26	17.87	91.64
Agriculture Share in GDP	313	15.25	8.13	2.22	43.55
Per Capita GDP	313	5.28	2.60	1.37	14.79

Correlations: Taxes

	VAT	Seign.	Tariff	Repress
Seigniorage/GDP	-0.16			
Tariff/GDP	-0.12	-0.11		
Repression/GDP	-0.09	0.50	-0.08	
Total Tax/GDP	0.65	-0.08	0.30	-0.10

Correlations: Conditioning Variables

	Inst.	Bure.	Poli.	Gove.	Trad.	Fina.	Econ.	Urba.	Agri
Bureaucratic Quality	0.38								
Political Durability	0.09	0.23							
Government Stability	0.58	0.16	0.04						
Trade Openness	0.31	0.06	-0.02	0.23					
Financial Integration	0.38	-0.22	-0.09	0.15	0.10				
Economic Liberalization	0.40	-0.09	-0.10	0.22	0.14	0.39			
Urbanization	0.26	-0.17	-0.13	0.08	-0.15	0.47	0.29		
Agriculture Share in GDP	-0.46	-0.18	0.07	-0.14	-0.14	-0.42	-0.35	-0.58	
Per Capita GDP	0.59	0.26	-0.05	0.25	0.13	0.41	0.28	0.67	-0.75

Table 1. Benchmark Results

	VAT	Seigniorage	Tariff
Institutional Quality	0.028 (0.008)**	-0.040 (0.017)*	0.010 (0.009)
Political Durability	0.021 (0.005)**	-0.016 (0.010)	-0.011 (0.005)*
Trade Openness	0.007 (0.005)	0.010 (0.011)	-0.011 (0.006)+
Financial Integration	0.021 (0.004)**	-0.038 (0.008)**	0.003 (0.004)
Urbanization	0.031 (0.017)+	0.129 (0.036)**	-0.041 (0.019)*
Agriculture Share	0.049 (0.017)**	-0.009 (0.035)	0.059 (0.018)**
Per Capita GDP	-0.022 (0.075)	-0.396 (0.159)*	-0.143 (0.083)+
R2	0.197	0.137	0.114
Countries/Observations		31/313	
Breusch-Pagan test of independence's $\chi 2(3)$		24.447**	

Note: Annual observations from 1980-1999. Dependent variables are tax revenues divided by GDP. Institutional Quality, Political Durability, Trade Openness, and Financial Integration are lagged by one period. Unbalanced panel data estimated by Seemingly Unrelated Regression (SUR), accounting for country-specific and time-invariant error components. Intercept terms included, but not reported. Standard errors in parentheses. Symbol +[*,**] denotes statistical significance at the 90%[95%,99%] confident level. Breusch-Pagan χ^2 statistic is under the null hypothesis that the equations are not related.

Table 2. Adding Revenue from Financial Repression

	VAT	Seigniorage	Tariff	Financial Repression
Institutional Quality	0.014 (0.014)	0.022 (0.030)	-0.021 (0.012)+	-0.669 (0.502)
Political Durability	-0.034 (0.012)**	-0.006 (0.028)	-0.032 (0.011)**	0.593 (0.456)
Trade Openness	0.016 (0.010)+	-0.023 (0.021)	0.043 (0.008)**	-0.036 (0.353)
Financial Integration	0.029 (0.005)**	-0.046 (0.011)**	0.005 (0.004)	-0.804 (0.180)**
Urbanization	-0.086 (0.024)**	0.161 (0.053)**	-0.007 (0.021)	1.900 (0.874)*
Agriculture Share	0.032 (0.034)	0.090 (0.074)	0.061 (0.029)*	0.331 (1.233)
Per Capita GDP	0.489 (0.155)**	-1.150 (0.343)**	-0.366 (0.135)**	-2.911 (5.671)
R2	0.441	0.253	0.489	0.241
Countries/Observations			16/106	
Breusch-Pagan test of independence's $\chi 2(3)$			45.279**	

Note: Annual observations from 1980-1999. Dependent variables are tax revenues divided by GDP. Institutional Quality, Political Durability, Trade Openness, and Financial Integration are lagged by one period. Unbalanced panel data estimated by Seemingly Unrelated Regression (SUR), accounting for country-specific and time-invariant error components. Intercept terms included, but not reported. Standard errors in parentheses. Symbol +[*,**] denotes statistical significance at the 90%[95%,99%] confident level. Breusch-Pagan χ^2 statistic is under the null hypothesis that the equations are not related.

Table 3. Sensitivity to Explanatory Variables

	Institutional Quality			Government Stability			Economic Integration		
	VAT	Seigniorage	Tariff	VAT	Seigniorage	Tariff	VAT	Seigniorage	Tariff
Institutional Quality				0.04 (0.01)**	-0.04 (0.02)*	0.01 (0.01)	0.03 (0.01)**	-0.04 (0.02)*	0.01 (0.01)
Bureaucratic Quality	0.03 (0.04)	0.02 (0.09)	0.06 (0.05)						
Political Durability	0.02 (0.00)**	-0.02 (0.01)+	-0.01 (0.01)*				0.02 (0.00)**	-0.02 (0.01)+	-0.01 (0.01)+
Government Stability				-0.04 (0.03)	-0.01 (0.06)	0.01 (0.03)			
Trade Openness	0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)+	0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)+			
Financial Integration	0.02 (0.00)**	-0.04 (0.01)**	0.00 (0.00)	0.02 (0.00)**	-0.04 (0.01)**	0.00 (0.00)			
Economic Liberalization							0.22 (0.10)*	-0.70 (0.19)**	0.01 (0.10)
Urbanization	0.04 (0.02)*	0.12 (0.04)**	-0.04 (0.02)*	0.01 (0.02)	0.14 (0.04)**	-0.03 (0.02)	0.05 (0.02)**	0.07 (0.04)+	-0.03 (0.02)+
Agriculture Share	0.04 (0.02)**	-0.00 (0.04)	0.06 (0.02)**	0.04 (0.02)*	-0.00 (0.04)	0.06 (0.02)**	0.02 (0.02)	0.03 (0.03)	0.06 (0.02)**
Per Capita GDP	0.05 (0.07)	-0.51 (0.15)**	-0.12 (0.08)	0.04 (0.08)	-0.44 (0.16)**	-0.17 (0.08)*	-0.05 (0.08)	-0.35 (0.16)*	-0.15 (0.08)+
R2	0.17	0.12	0.11	0.15	0.13	0.10	0.12	0.11	0.10
Countries/Observations		31/313			31/313			31/313	
Breusch-Pagan test of independence's $\chi 2(3)$		25.87**			29.12**			29.47**	

Note: Annual observations from 1980-1999. Dependent variables are tax revenues divided by GDP. Institutional Quality, Political Durability, Trade Openness, and Financial Integration are lagged by one period. Unbalanced panel data estimated by Seemingly Unrelated Regression (SUR), accounting for country-specific and time-invariant error components. Intercept terms included, but not reported. Standard errors in parentheses. Symbol +[*,**] denotes statistical significance at the 90%[95%,99%] confident level. Breusch-Pagan χ^2 statistic is under the null hypothesis that the equations are not related.

Table 4. Sensitivity to Econometric Specifications

	Fixed Effects						Random Effects						Pooled Averages					
	VAT		Seigniorage		Tariff		VAT		Seigniorage		Tariff		VAT		Seigniorage		Tariff	
Institutional Quality	0.02	(0.01)*	-0.05	(0.02)**	0.01	(0.01)	0.03	(0.01)**	-0.05	(0.01)**	-0.00	(0.01)	0.03	(0.01)**	-0.05	(0.01)**	-0.00	(0.01)
Political Durability	0.02	(0.00)**	-0.01	(0.01)	-0.01	(0.01)+	0.02	(0.00)**	-0.01	(0.01)	-0.01	(0.01)*	0.02	(0.01)**	-0.01	(0.01)+	-0.01	(0.01)+
Trade Openness	0.00	(0.01)	0.01	(0.01)	-0.02	(0.01)*	0.01	(0.01)+	-0.00	(0.01)	-0.01	(0.01)	0.01	(0.01)+	-0.00	(0.01)	-0.01	(0.01)
Financial Integration	0.02	(0.00)**	-0.04	(0.01)**	0.00	(0.00)	0.02	(0.00)**	-0.03	(0.01)**	-0.00	(0.00)	0.02	(0.00)**	-0.03	(0.01)**	-0.00	(0.00)
Urbanization	0.11	(0.03)**	0.11	(0.06)+	-0.06	(0.03)+	0.04	(0.02)**	0.07	(0.02)**	-0.04	(0.02)*	0.04	(0.02)*	0.08	(0.02)**	-0.04	(0.02)*
Agriculture Share	0.04	(0.02)*	0.00	(0.04)	0.05	(0.02)**	0.03	(0.02)*	-0.01	(0.03)	0.04	(0.02)*	0.03	(0.02)	-0.01	(0.03)	0.04	(0.02)+
Per Capita GDP	0.08	(0.08)	-0.40	(0.18)*	-0.17	(0.09)+	0.05	(0.08)	-0.23	(0.12)+	-0.10	(0.08)	0.05	(0.08)	-0.26	(0.12)*	-0.10	(0.09)
R2	0.17		0.11		0.07		0.20		0.13		0.09							
Countries/Observations	31/313		31/313		31/313		31/313		31/313		31/313		31/313		31/313		31/313	

Note: Annual observations from 1980-1999. Dependent variables are tax revenues divided by GDP. Institutional Quality, Political Durability, Trade Openness, and Financial Integration are lagged by one period. Unbalanced panel data estimated accounting for country-specific and time-invariant error components. Intercept terms included, but not reported. Standard errors in parentheses. Symbol +[*,**] denotes statistical significance at the 90%[95%,99%] confident level.

Table 5. Late 80s versus Late 90s: Cross-Country Estimation

	benchmark specification			alternative measures		
	ΔVAT	ΔSeigniorage	ΔTariff	ΔVAT	ΔSeigniorage	ΔTariff
ΔInstitutional Quality	0.00 (0.03)	-0.04 (0.07)	0.05 (0.03)			
ΔBureaucratic Quality				0.36 (0.48)	-0.22 (1.07)	0.95 (0.50)+
ΔPolitical Durability	0.02 (0.01)+	-0.01 (0.03)	-0.00 (0.02)			
ΔGovernment Stability				0.34 (0.18)+	-0.52 (0.39)	-0.13 (0.18)
ΔTrade Openness	0.00 (0.02)	0.10 (0.05)*	-0.02 (0.02)			
ΔFinancial Integration	0.05 (0.01)**	-0.09 (0.03)**	0.00 (0.01)			
ΔEconomic Liberalization				1.23 (0.58)*	-3.55 (1.29)**	-0.27 (0.61)
ΔUrbanization	0.15 (0.10)	0.25 (0.25)	0.02 (0.13)	-0.03 (0.13)	0.38 (0.29)	-0.04 (0.13)
ΔAgriculture Share	0.07 (0.04)+	-0.04 (0.10)	0.06 (0.05)	0.00 (0.06)	0.06 (0.14)	0.14 (0.06)*
ΔPer Capita GDP	0.28 (0.23)	-1.10 (0.58)+	-0.20 (0.31)	-0.17 (0.28)	-0.54 (0.62)	-0.14 (0.29)
Informal Economy						
Income Inequality						
R2	0.61	0.59	0.27	0.37	0.48	0.28
Countries		20			20	
Breusch-Pagan test of independence's $\chi 2(3)$		5.42			6.76+	

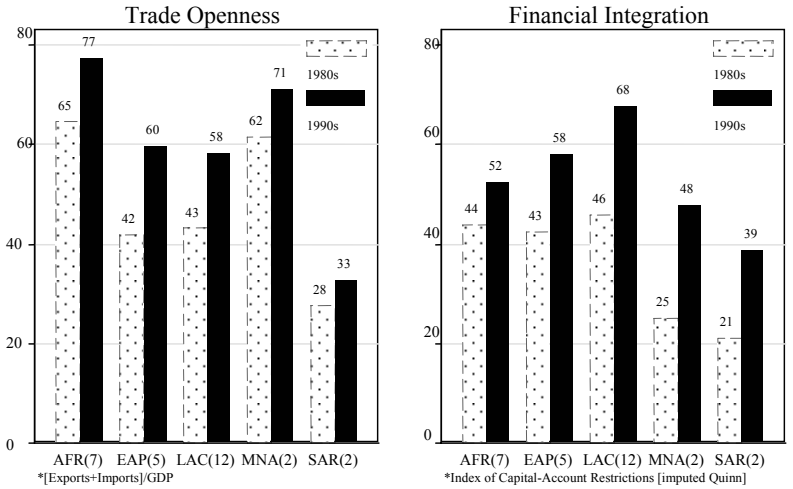
Note: Except informal economy and income equality which are in levels, the variables are the differences between their averages of late 1980s (5 years) and of late 1990s (5 years). Dependent variables are tax revenues divided by GDP. Estimated by Seemingly Unrelated Regression (SUR). Intercept terms included, but not reported. Standard errors in parentheses. Symbol +[*,**] denotes statistical significance at the 90%[95%,99%] confident level. Breusch-Pagan χ^2 statistic is under the null hypothesis that the equations are not related.

Table 6. Late 80s versus Late 90s: Cross-Country Estimation

	Δtotal tax	Δtotal tax	Δtotal tax
ΔInstitutional Quality	0.212 (0.114)+	0.224 (0.106)*	0.235 (0.103)*
ΔTrade Openness	-0.044 (0.086)	-0.033 (0.079)	
ΔFinancial Integration	0.018 (0.049)		
R2	0.248	0.241	0.233
Countries	20	20	20

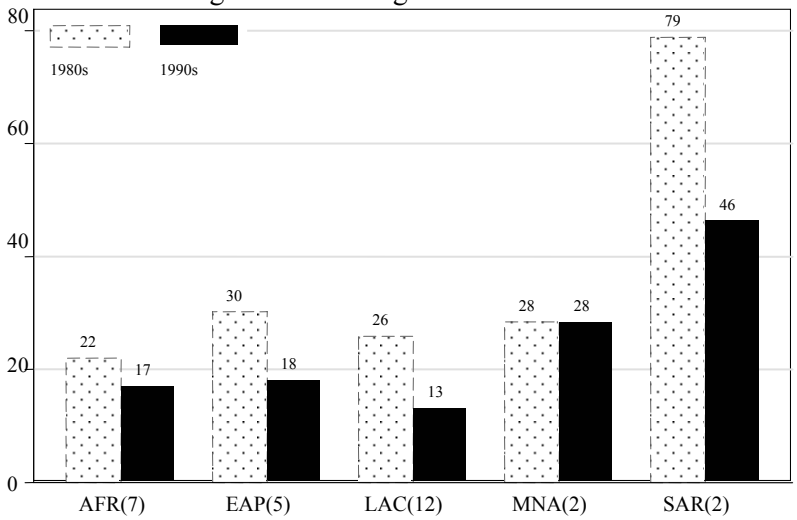
Note: The variables are the differences between their averages of late 1980s (5 years) and of late 1990s (5 years). Dependent variables are total tax revenues divided by GDP. Estimated by OLS. Intercept terms included, but not reported. Standard errors in parentheses. Symbol +[*,**] denotes statistical significance at the 90%[95%,99%] confident level.

Figure 1.a: Globalization of Developing Countries by Region



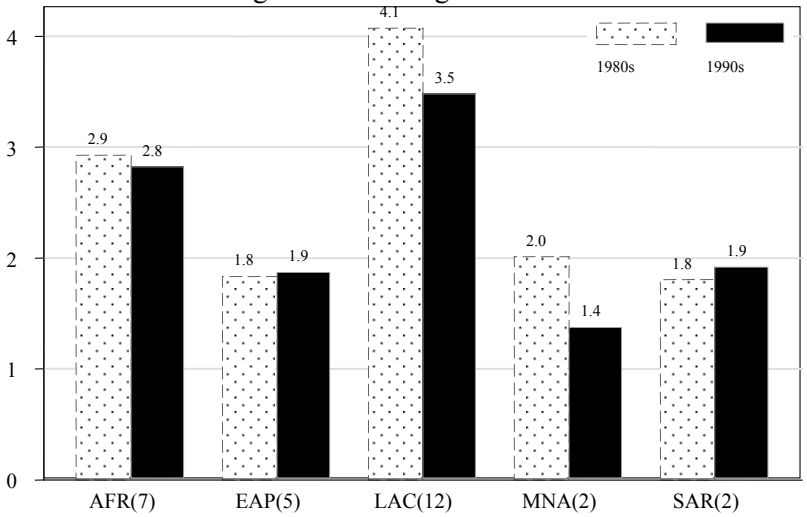
Note: Numbers of country for each region are in parentheses.

Figure 1.b: Average Rate of Tariff



*Note: Weighted-average rate of tariff. Numbers of country for each group are in parentheses

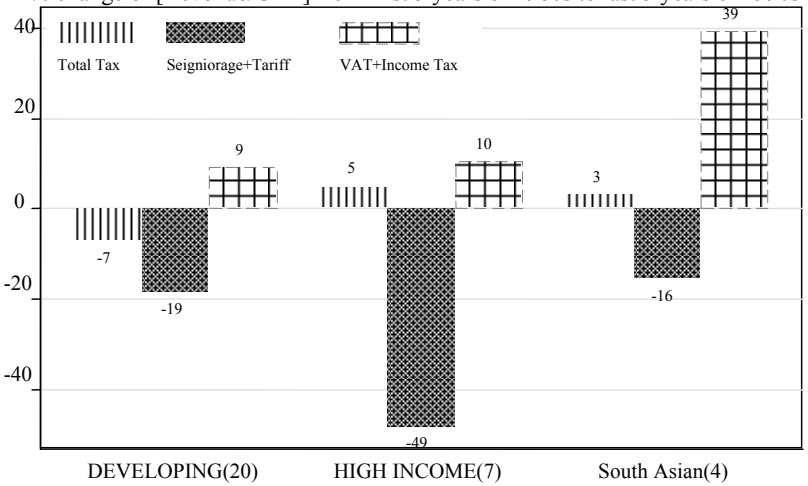
Figure 1.c: Average Inflation



*Note: Annual inflation in logarithm. Numbers of country for each group are in parentheses

Figure 1.d: Average Effective Tax Rate

% change of [Revenue/GDP] from first 5 years of 1980s to last 5 years of 1990s



Note: Numbers of country for each group are in parentheses. High-income countries include Australia, Canada, Iceland, Israel, Norway, Sweden, and Switzerland.

Figure 2.a: [Total Tax]/GDP

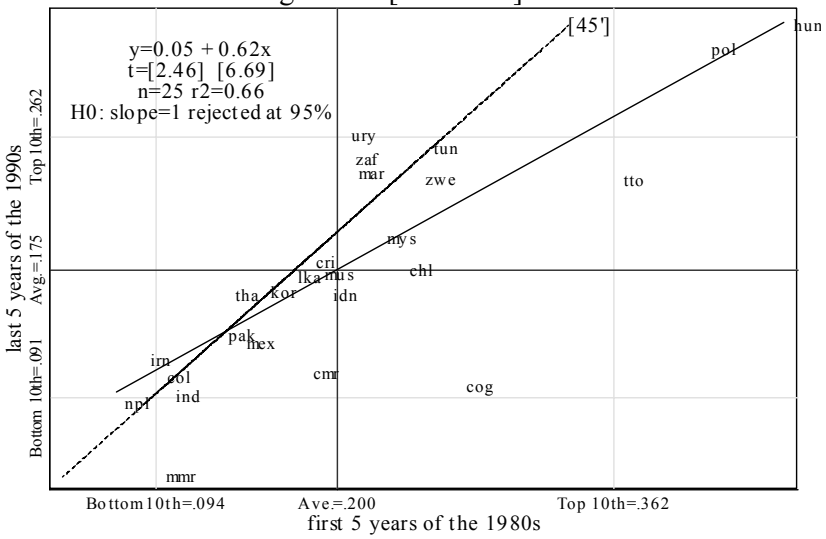


Figure 2.b: [Seigniorage+Tariff]/GDP

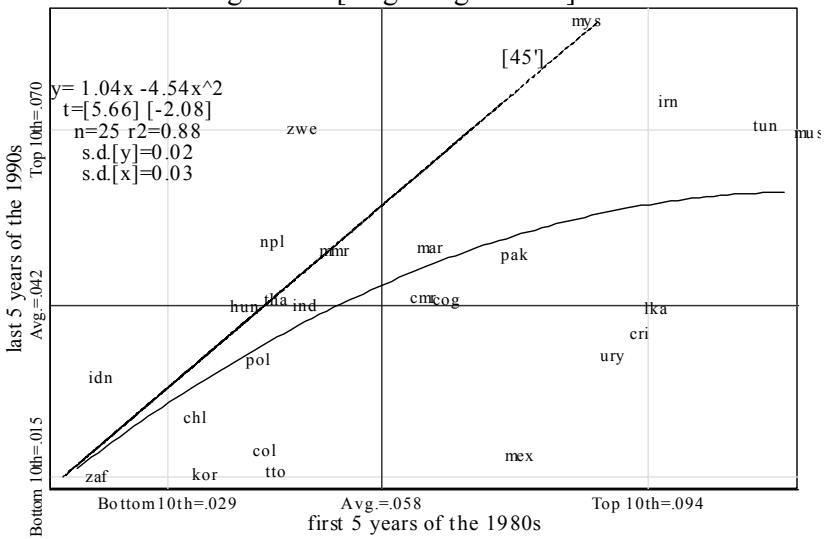


Figure 2.c: [VAT+Income Tax]/GDP

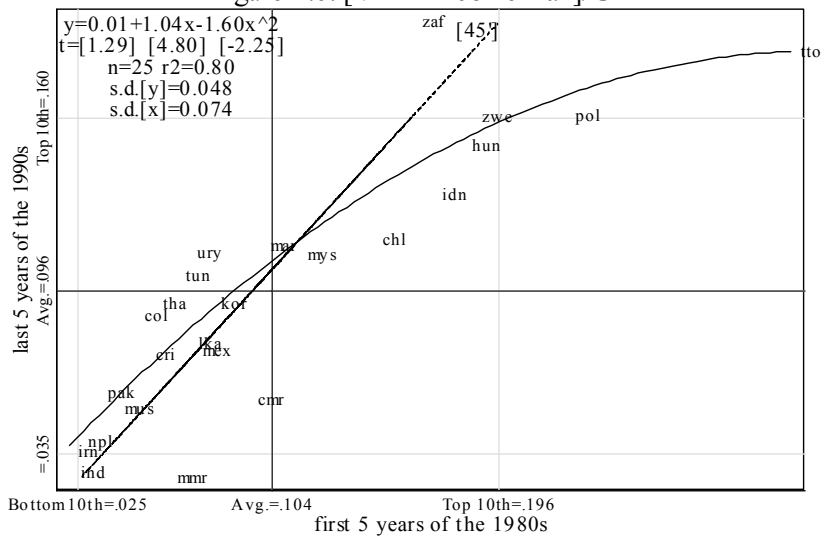


Figure 2.d: [Total Expenditure]/GDP

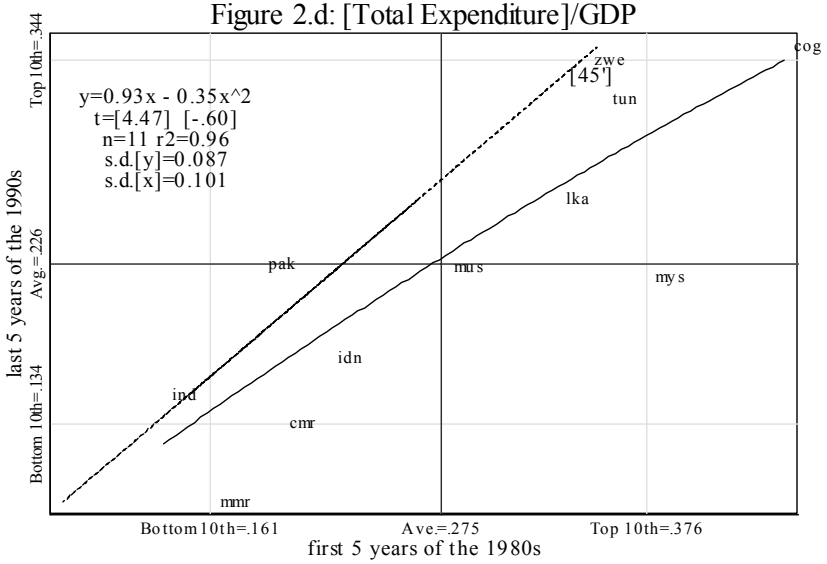
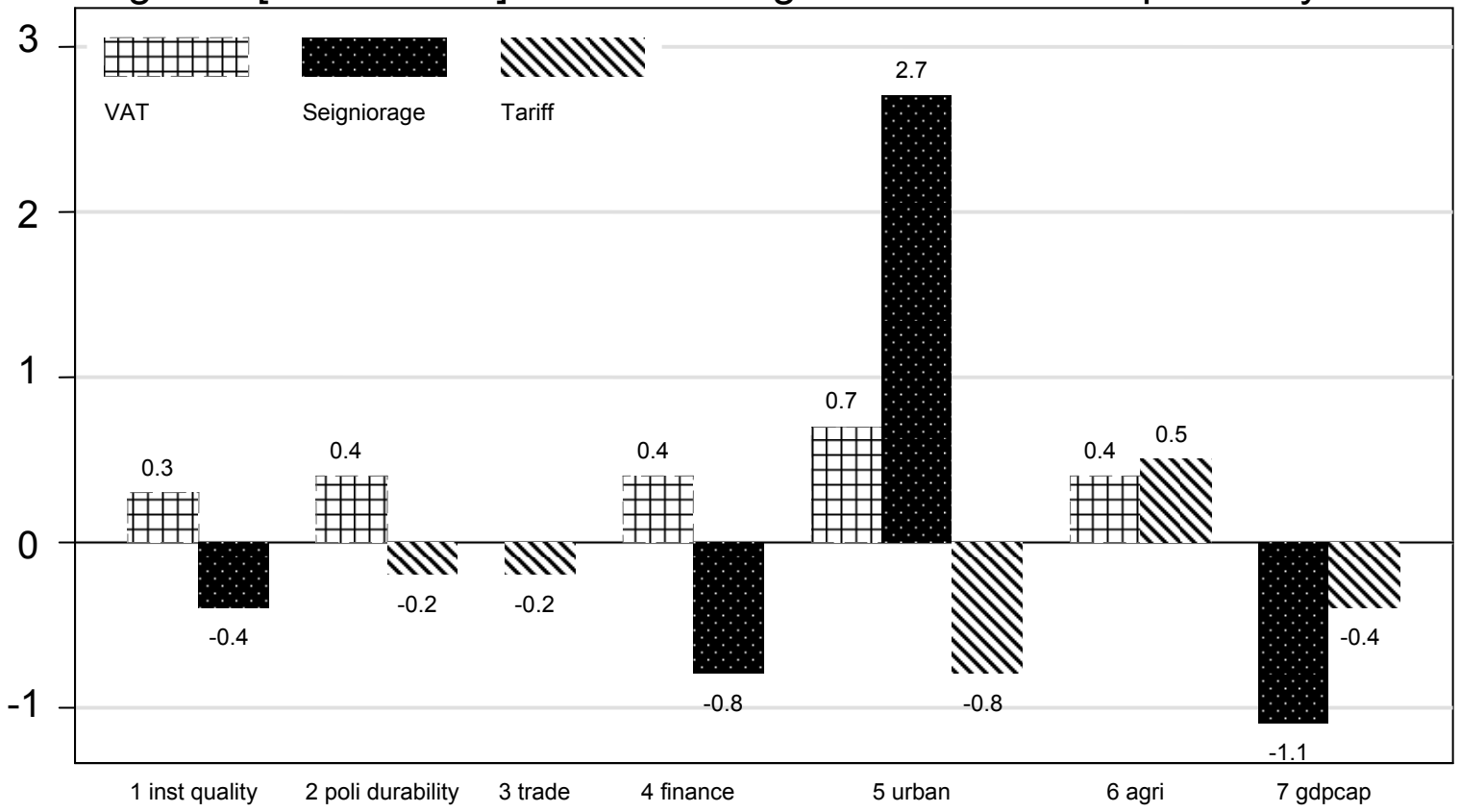


Figure 3: Economic Significance

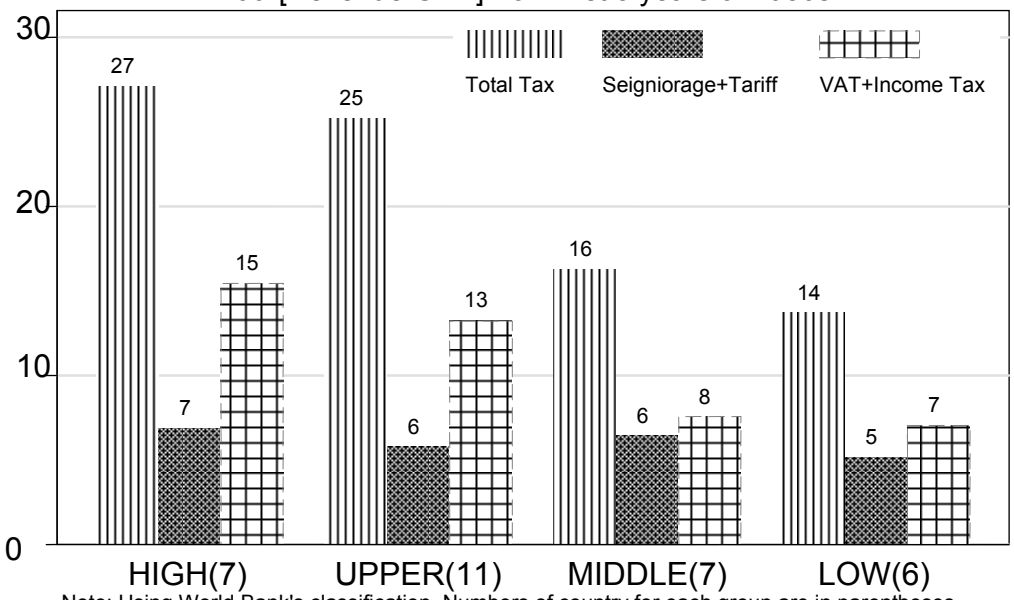
Changes in [tax revenue]/GDP following +1s.d. of each explanatory variable



Note: For example, the coefficient estimate of urbanization on VAT in Table 1 is 0.035
standard deviation of urbanization for developing countries is 20.24.
The economic significance of urbanization +1s.d. change is 20.24*0.035 ~ 0.7%.
All the missing bars are statistically insignificant at 90% confident interval.

Figure 4a: Average Tax/GDP (%) across Income Groups

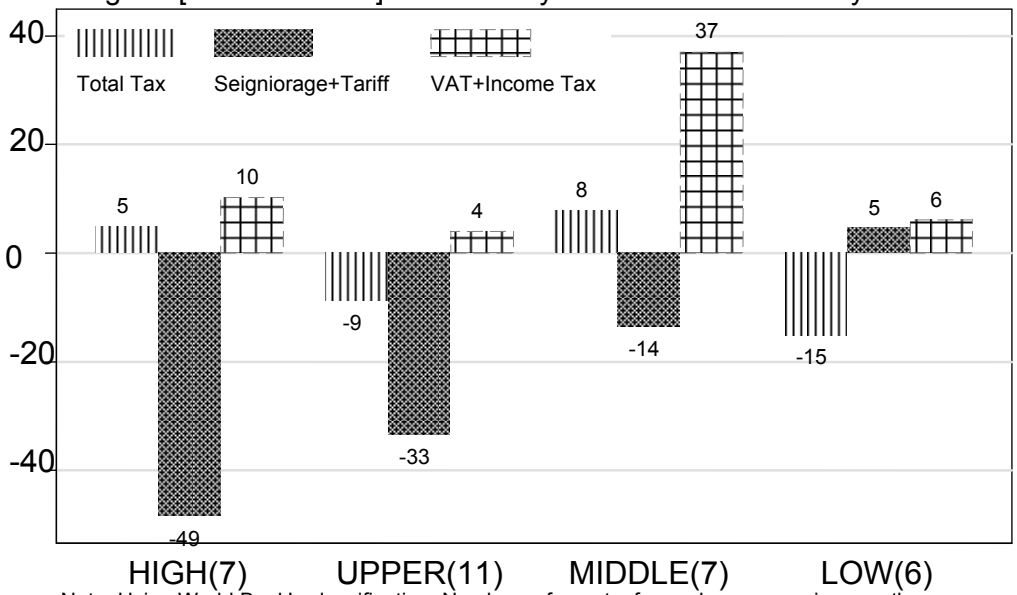
100*[Revenue/GDP] from first 5 years of 1980s



Note: Using World Bank's classification. Numbers of country for each group are in parentheses.
Sample includes the same 24 developing countries as in Figure 1's.

Figure 4b: Average Adjustment across Income Groups

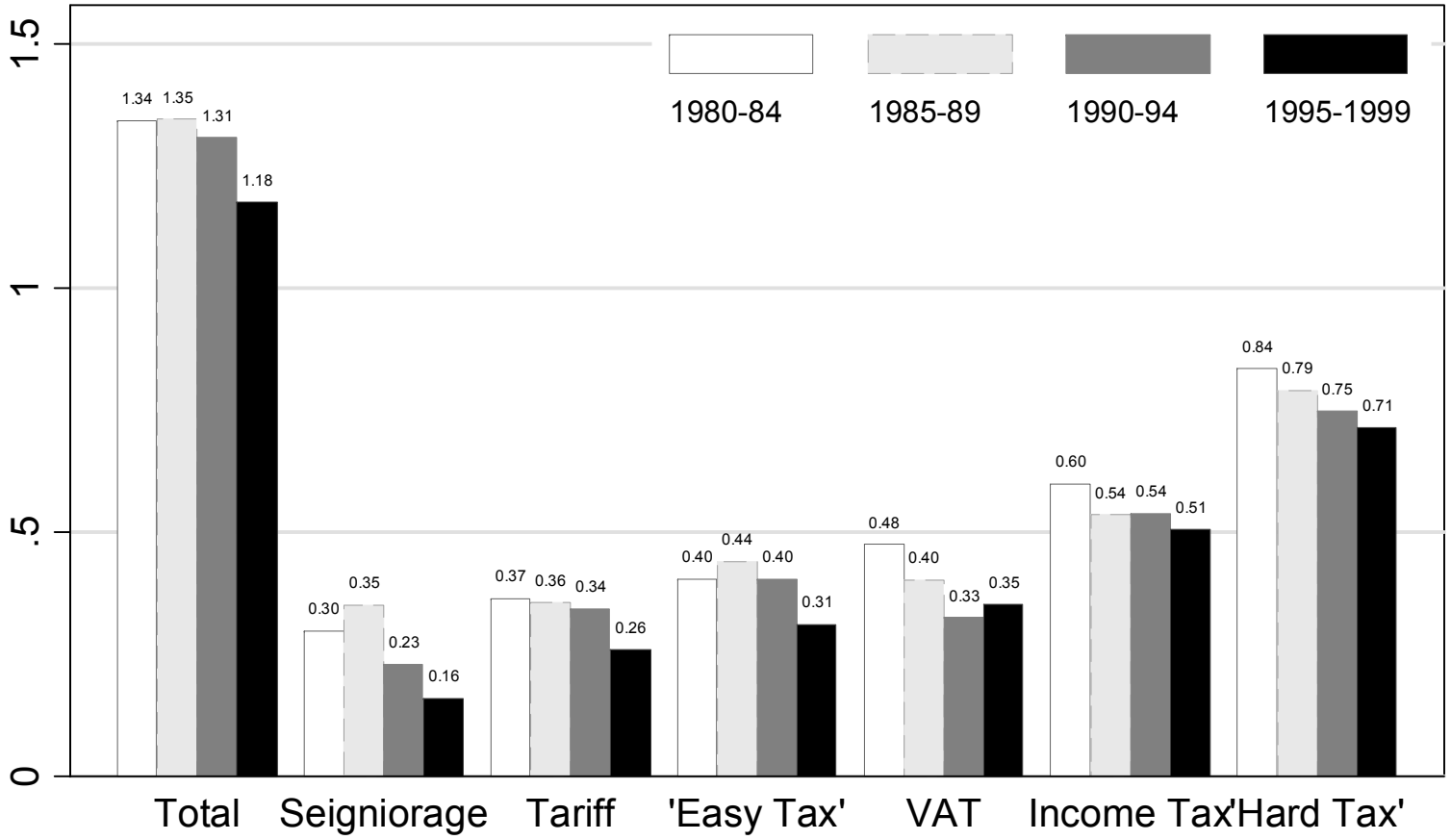
% change of [Revenue/GDP] from first 5 years of 1980s to last 5 years of 1990s



Note: Using World Bank's classification. Numbers of country for each group are in parentheses.
Sample includes the same 24 developing countries as in Figure 1's.

Figure 5: Fiscal Convergence across Time

Coefficient of variation over each 5 years from 1980 to 1999



Note: Sample includes developing countries in Figure 4.a,
minus Trinidad and Tobago which does not have data across all sub-periods.