

Financial Sector Quality and Tax Revenue: Panel Evidence

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Abstract

Many countries encounter major difficulties in collecting tax revenue. This paper proposes a new solution to this collection problem by looking at the ways in which improving the financial sector leads to more revenue. I use a panel of data from 72 countries and from 14 years to test the relationship between financial sector quality and different types of tax revenue. I construct a financial indicator that encompasses measures from five areas of the financial system and show that an increase in the quality of financial intermediaries increases total tax revenue and income tax revenue as shares of GDP. My findings suggest that the quality of the financial sector does not affect the revenue collected from sales, property or gift taxes.

1 Introduction

Countries differ in the tax policies they adopt and also in amount of tax revenue/GDP they collect from taxpayers. However, there are countries with similar tax policies that collect strikingly different tax revenues/GDP. This

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paper examines the role of financial sector quality on the amount of tax revenue the government collects from its taxpayers. The study also shows that revenues coming from income, sales, property and gift taxes are affected in different ways by changes in financial sector quality.

The central intuition behind this analysis is that fiscal policy and tax laws have little effect on the actual revenue if the level of underground economy is high. When taxpayers are difficult to monitor and firms are not formally organized, then the task of collecting tax becomes extremely difficult. When a country has financial institutions that are efficient, transparent and not corrupt, more taxpayers are given incentives to use the financial institutions in their transactions. Then, the government can obtain valuable information about taxpayers from financial institutions. So, one possible determinant of the level of tax revenue can be the quality and level of development of the financial sector.

Figure 1 shows the average tax revenue collected by governments in countries with different financial sector quality¹. Countries in the bottom quartile of financial quality collect only 14.85% of GDP in taxes, while countries in the top quartile collect 4.25% points more in taxes. This figure seems to suggest a positive correlation between financial sector quality and taxes/GDP.

A similar conclusion can be drawn by looking at the development of the financial sectors of two similar countries. In 1992, Peru had poor quality financial sector quality and collected only 11.97% of GDP in taxes. In the following years, the Peruvian financial sector underwent important changes. Peru passed a number of laws that regulated monetary policy, banks and capital markets. In 1992, a new organic law was approved that regulated the Central Bank and its role. Next, commercial banks were allowed to be more active in the capital markets. In 1996, Law 26702 set standards for the financial and insurance markets compatible to the Basel agreement. As a result, in 1996, the quality of the financial sector was much higher than 4 years ago. The same year, Peru collected more tax revenue, 13.79% of GDP, almost 2% points more than 4 years before. Figure 2 shows the data for financial sector quality² and tax revenue in Peru. By contrast, Peru's neighbor, Venezuela didn't improve the quality of the financial sector during

¹Financial sector quality is measured on a scale from 0 to 10, where 0 represents poor quality and 10 represents excellent quality. The details regarding the calculation of this measure of financial quality are explained in Section 3.

²The financial sector quality in Figure 2 is measured on the same 0 to 10 scale mentioned before.

those years. Its financial quality scores were 1.90 in 1992 and 1.41 in 1996. Venezuela collected almost the same amount of tax revenue in 1992 and in 1996. Figure 2 shows the data for Venezuela. Thus, the data seem to suggest that countries that increase the quality of their financial sectors also collect more tax revenue/GDP.

In order to calculate the effect of financial sector quality on tax revenue, this study uses a panel of data from 72 countries and 14 years and constructs a financial sector indicator, F . F contains measurements of the banking sector, the stock market, other financial institutions, the monetary policy and the quality of institutions.

The study shows that an increase in the financial sector quality determines an increase in total tax revenue/GDP and in income tax revenue/GDP. However, sales, property and gift taxes don't seem to be affected by the quality in the financial sector.

The paper is organized as follows. Section 2 reviews some previous studies that analyze tax revenue and financial sector development. Section 3 describes the data and the way the variables were constructed, Section 4 presents the econometric model, Section 5 shows the results of the paper and Section 6 presents robustness checks. Section 7 concludes.

2 Previous Studies of Tax Revenues and Financial Sectors

Numerous studies investigate tax revenues in different countries, but the one that is the most relevant to this paper is Gordon and Li (2005). The authors develop a model for the choice of tax structure under the assumption that firms can avoid tax payments by shifting to cash transactions and not using the financial sector. They find that in countries with weak financial sectors, tax revenue as a share of GDP is low, the tax base is narrow and optimal tax structure puts more weight on capital taxes. They also conclude that policies that improve the quality of the financial sector will give more incentives to local companies to use the financial sector, increasing in this way, tax revenue as a share of GDP. I use their model and tests empirically their hypothesis regarding the effect of the financial sector quality on the tax revenue.

Berkowitz and Li (2000) examine the effects of tax rights on the economic development of transition countries. They compare the fiscal institutions of

China and Russia and find that in China, where tax rights are more clearly defined, tax collections and public good provisions are higher than in Russia where tax rights are less clearly defined. Also they find that burdensome taxation increases tax evasion in Russia. I also use measures of institutions, law and order and corruption and find that countries with better institutions collect more revenue than the ones with poor institutions.

Treisman (1999) tries to explain the sharp fall in Russian tax revenues in recent years. He concludes that tax rates reductions and general macroeconomic problems common to transitional economies play an important role in the declining tax revenue. This paper also considers macroeconomic indicators like GDP/capita and inflation in the analysis of tax revenue. I also control for tax rates and find that a decline tax rates determines a decline in tax revenue.

Beck et al. (2004) investigate the relationship between financial intermediary and economic growth, total factor productivity growth, physical capital accumulation and private saving rates. They use private credit/GDP as a proxy for financial development. In this paper, I also use private credit/GDP as one of the measurements of financial quality, but I use other measurements as well in order to capture other aspects of the financial sector.

In their IMF study, Creane et al. (2004) estimate the financial development for countries in the Middle East and North Africa. They use indicators from six areas: development of the monetary sector and monetary policy, banking sector development, non-bank financial development, regulation and supervision, financial openness, and institutional quality. However, they don't use the actual values of the indicators; they scale each indicator from 0 (worst) to 2 (best) and calculate their weighted average. I use a similar method to construct a financial indicator, but our financial indicator captures more information than Crane's because I use continuous values of each variable rather than discrete values.

3 Data Description and Construction of the Financial Sector Indicator

This study uses a panel of data from 72 countries and from 14 years (1990-2003). Table 1 and Table 2 provide short descriptions of the independent

and dependent variables. Data in this paper can be broken into three main categories: financial sector data, macroeconomic controls and tax data.

First, the financial data is used to assess the quality of the financial sector. The paper uses interest rate spread, domestic credit to the private sector provided by the banking sector as a share of GDP and bank liquid reserves to bank assets ratio to measure the quality of the banking sector. Interest rate spread is the interest rate charged by banks on loans to prime customers minus the interest rate paid by commercial banks for savings deposits. The interest rate spread is a measure of bank competition and a larger interest rate spread is correlated with less competitive banking sectors where interest rates are set administratively or collusively. Banks operating in competitive environments are more efficient and they attract more customers that would otherwise use hard to detect cash transactions or operate in the informal economy.

Domestic credit to the private sector provided by the banks includes all bank credit to private sector and measures the ease of the private sector access to bank credit. The ratio of bank liquid reserves to bank assets is the ratio of domestic currency holdings and deposits with the monetary authorities to claims on other governments, non-financial public enterprises, the private sector, and other banking institutions. When the domestic credit is large and the ratio is small, more companies and individuals use bank loans, making easier for the government to gather financial information on taxpayers.

Next, I use turnover ratio and market capitalization as a share of the GDP and to measure the stock market development. Turnover ratio is the total value of shares traded during the period divided by the average market capitalization for the period. Market capitalization as a share of the GDP is the value of the listed shares divided by the GDP. Turnover ratio and market capitalization indicate the trading volume of stock market relative to the economy's size. High turnover ratios are usually associated with liquid stock markets that provide good incentive for long-term investments and efficient resource allocation. Also, a higher trading volume of the stock market creates the opportunity for the government to monitor these financial activities more easily and decreases the costs of acquiring information on the financial status of individuals and corporations.

Banking and stock market are not the only sectors of the financial system that are important to this analysis. The existence of housing finance, pension funds, mutual funds and insurance companies are important to the development of the financial sector. Unfortunately, I don't have enough data on

each of these financial instruments to run a regression analysis. I use instead insurance and financial services net exports as share of GDP as a measure for these non-banking financial markets. If net exports of insurance and financial services represent a large share of GDP, then more financial transactions take place. Assuming that financial exports and imports are equally easy to monitor by the government than the domestic financial transactions, then a large volume of net exports of financial services corresponds to a more developed financial sector and to more financial transparency in the economy

The development of the monetary sector and monetary policy affects the overall quality of the financial sector. The only measure I use to quantify the monetary sector is exchange rate stability. Exchange rate stability is the annual percentage change of the exchange rate. Exchange rate stability is very important for the good functioning of the financial sector. Highly volatile exchange rates increase risk in the financial transactions, increase the costs of conducting transactions and decrease the overall quality of the financial sector services. Also, high money to GDP ratios are associated to high liquidity services in the financial sector, thus associated to harder to monitor transactions.

Finally, the institutional environment plays an important role in the overall quality of the financial sector, so I also consider measures of law and order and corruption in this analysis. An inefficient legal system and corrupt government officials can limit the range of financial services offered on the market and decrease their quality. Also, tax collection is directly affected by these variables. Tax enforcement is weak in countries with inefficient legal systems and tax revenue is lower in environments with high corruption. Law and order is an index that ranges from 0 to 6, where higher values indicate a better legal system. Corruption is measured on a scale from 0 to 6 and 6 indicates a low level of corruption.

I use all of the above variables to create a comprehensive financial quality indicator. I create z scores for each variable, then I fit a maximum-likelihood factor model on the 9 z scores, then I estimate the first factor f_{ij} , and finally I rescale f_{ij} such that its lowest value to be 0 and its highest 10. The financial quality indicator is

$$F_{ij} = 10 \frac{f_{ij} - \min f_{ij}}{\max f_{ij} - \min f_{ij}}. \quad (1)$$

The mean of the financial indicator for the countries in the sample is 3.11.

The financial sector quality indicator takes the value 10 in Switzerland in 2000 and the value 0 in Peru in year 1992. In general, more developed countries tend to have higher financial sector quality. Mean F for Switzerland is 8.59 and for United Kingdom is 6.26. Less developed countries have lower financial sector quality indicator. Mean F for Bangladesh is 1.32 and for Colombia is 1.25. F can increase over years due to financial reforms like banking sector restructuring, strengthening banking supervision and developing capital market infrastructure. F can decrease due to political changes that affect the institutions in a negative way, due to bad monetary policies that make the exchange rate more volatile. F varies less over time for more developed countries. These variations come usually from changes in market capitalization and domestic credit. Figure 3 presents the variation in F over time for Chile, Thailand, Sri Lanka, Peru, Mexico and Bangladesh.

Other variables used in the analysis are shadow economy, inflation, measured as annual percentage change in the consumer price index and GDP/capita measured in 2000 US dollars. The shadow economy measures the legal production of goods and services concealed from the government. The estimates come from Friedrich Schneider's dataset and have been calculated using the DYMIMIC approach. Table 1 and Table 2 describe these variables and their sources in more detail. The mean shadow economy per capita is \$10,907.70, the mean inflation is 9.60% and the mean income per capita is \$8,248.05.

In the analysis, I use total tax revenue and income tax revenue as shares of GDP and as shares of the overall economy (GDP and shadow economy). The mean tax revenue/GDP is 16.67% and the mean tax revenue/GDP and shadow economy is 13.16%. The paper also analyzes the revenues from sales, gift and property tax as a share of GDP. I use the highest marginal tax rates for individual income and for corporate income as controls. Individual rates range from 0% to 68% and corporate rates range from 0% to 55%. Table 8 in the Data Appendix presents average financial indicator, average tax revenue/GDP, average tax revenue/overall economy and average tax rates for each country in the data set.

4 Econometric Model

This paper estimates the effects of the financial sector quality on the total tax, income tax, sales tax, gift tax and property tax revenues. It also includes

shadow economy in the model and measures the effects of F on revenues as shares of overall economy, GDP and shadow economy. Tax revenue increases when the financial sector quality improves because more people choose to use financial institutions instead of cash transactions. When more people use financial institutions, the government can acquire information about them because they leave a paper trail. Ultimately, the government can collect more revenue from the taxpayers for whom they have more financial information.

For the first estimation, I use tax revenue as a share of GDP as dependent variable and measures of financial quality as independent variables. I also control for tax rates and GDP/capita. Equation (2) summarizes this approach

$$\begin{aligned} tax_k/gdp_{it} = & \beta_0 + \beta_1 F_{it} + \beta_2 GDP/cap_{it} + \beta_3 inflation_{it} + \\ & \beta_4 individual\ rate_{it} + \beta_5 corporate\ rate_{it} + \\ & \Sigma_i \beta_i c_i + \Sigma_t \beta_t \tau_t + \epsilon_{it}, \end{aligned} \quad (2)$$

where i is country i , t is year t , c_i is the country dummy and τ_t is the time dummy. tax_k is total tax revenue, income tax revenue and $t = 1990, 1991, \dots, 2003$. F_{it} is the financial quality indicator for country i in year t .

I expect an increase in F to lead to an increase in tax revenue/GDP. I control for GDP/capita because an increase in GDP leads to more economy activity and to more tax revenue. I also control for inflation. The effect of inflation could be positive or negative. When inflation is high, using cash transactions can lead to serious loses, so firms and individuals have an incentive to switch to financial institutions. In this way, they leave a paper trail and the government can obtain financial information more easily, leading to eventually more revenue. So, in this case, an increase in inflation leads to an increase in revenue. However, an increase in inflation leads to a decrease in the real values of taxes and of GDP. If the real value of GDP declines more, then an increase in inflation leads to a decrease in tax revenue/GDP. I also include tax rates in the analysis because the higher the rate, higher the collected tax revenue.

The problem with (2) is that it doesn't take into consideration the shadow economy. Due to tax evasion, total tax doesn't represent all the revenue that can be collected at the given rates and GDP doesn't represent all the economic activity. If I scale the tax revenue by the overall economy, then I

have a better measure of share of taxes collected. Equation (3) summarizes this approach.

$$\begin{aligned} tax_k/overall\ gdp_{it} = & \beta_0 + \beta_1 F_{it} + \beta_2 GDP/cap_{it} + \beta_3 shadow/gdp_{it} + \\ & \beta_4 inflation_{it} + \beta_5 individual\ rate_{it} + \\ & \beta_6 corporate\ rate_{it} + \Sigma_i \beta_i c_i + \Sigma_t \beta_t \tau_t + \epsilon_{it}, \end{aligned} \quad (3)$$

where i is country i , t is year t , c_i is the country dummy and τ_j is the time dummy. tax_k is total tax revenue, income tax revenue and $t = 1990, 1991, \dots, 2003$. F_{it} is the financial quality indicator for country i in year t . $overall\ gdp_{it}$ is the sum of GDP and shadow economy for country i and year t .

In (3), I control for both GDP/capita and shadow/capita. Both variables measure economic activities and income that have an effect on tax revenue; GDP/capita has a positive effect and shadow/capita has a negative effect.

Finally, I also look at the effect of F on revenue coming from sales, gift and property taxes. These taxes are levied on activities and assets that are easily observable even in absence of a good financial sector. The government doesn't need a good financial sector and paper trails in order to determine for example, that an individual owns two houses. So I don't expect financial quality to have any effect on these types of revenues. I would like to test this hypothesis using equation (4)

$$\begin{aligned} tax_k/gdp_{it} = & \beta_0 + \beta_1 F_{it} + \beta_2 GDP/cap_{it} + \beta_3 inflation_{it} + \Sigma_i \beta_i c_i + \\ & \Sigma_t \beta_t \tau_t + \epsilon_{it}, \end{aligned} \quad (4)$$

where i is country i , t is year t , c_i is the country dummy and t_j is the time dummy. tax_k is sales tax revenue, gift tax revenue, property tax revenue and $t = 1990, 1991, \dots, 2003$. F_{it} is the financial quality indicator for country i in year t

I don't control for tax rates in (4) because there is few data on sales tax rates, gift tax rates and property tax rates.

5 Empirical Results

First, the study estimates the effects of financial sector quality on total tax revenue. Table 3 presents the results of this analysis. The first specification, in column (1), has total tax/GDP as dependent variable and financial quality, individual rate, corporate rate, GDP/capita, inflation, time and country dummies as independent variables. The results show that an increase of 1 point in F leads to an increase of 1.22% in total tax/GDP. Countries can increase F by as much as 3 points when they adopt policies that affect the financial sector. So it is likely a financial sector reform will increase total tax/GDP by almost 3%.

Results show that increases in marginal tax rates increase the total revenue/GDP, but the coefficients are not statistically significant. Other tax rates affect tax revenue, so I might have a positive OVB on the financial quality coefficient. However, OVB is probably very small. In most countries, income tax brings the most revenue to the treasury, so other taxes account only for a small part of total tax revenue. So, tax rates that affect the other tax revenues have a small impact on total tax revenue and OVB is small.

The second specification, in column (2), has total tax/overall economy as a dependent variable and has an additional independent variable, shadow economy/capita. Again, when F increases, total tax/overall economy also increases, but by a smaller extent. Individual and corporate rates have again a positive and insignificant effect. As expected, shadow economy/cap affects the revenue in a negative way. An increase of \$100 in the shadow economy/cap decreases total tax/overall economy by .2%. Inflation is not significant in either (1) or (2) probably because the two opposite effects cancel out.

Next, I investigate the effect of F on tax revenues collected from different taxes. Table 4 looks at income tax revenue and Table 5 at sales tax, gift tax and property tax revenues. F seems to affect income tax revenue more strongly than any other revenues. An increase of 1 point in F increases income tax/GDP by 1.80%. This result is consistent with our theory. A country with a better financial sector uses the financial sector for more transactions. In this way, economic assets and activities become more transparent and thus, more easily taxable. When financial intermediaries are used, the government receives the more additional information on income than on any other assets or activities. So the effect of F is larger on income tax revenue than on other tax revenues.

Similarly to the total tax case, the effect of F is smaller when the income tax is scaled by overall economy. An increase of 1 point in F increases income tax/overall economy only by 1.37%. The highest individual marginal rate is not significant in this specification probably because this rate is not representative for the mean taxpayer. The tax rate corresponding to the median income would make a better instrument, but unfortunately, I don't have median income data for all the countries in the sample.

Finally, Table 5 shows the effects of financial sector quality on sales tax revenue, gift tax revenue and property tax revenue. As expected, the revenues coming from relatively transparent activities are not affected by the quality of the financial intermediaries. I don't control for tax rates in these specifications, so I might have an OVB on the coefficient of F . If the property tax rate and F are positively correlated, then I have a positive bias on the coefficient of F , which makes a positive and significant effect of F on revenues even more unlikely. This conclusion is consistent to my theory.

6 Robustness Checks

In this section, I perform a series of robustness checks on the total revenue and income tax revenue results. Table 6 presents results of effects of financial sector quality on total tax revenue/GDP. In column (1), I control for all nine variables that compose F . Of the nine variables, only 3 are significant. Law and order has a positive effect on total tax revenue: an increase of 1 points in law and order (change equivalent to moving from having Croatian law and order to having Danish law and order) increases total revenue/GDP by .62%. Market capitalization/GDP also has a positive effect on revenue: an increase of 1% in this variable leads to an increase of .01% in total tax revenue/GDP. Domestic credit/GDP also affects total tax revenue: an increase of 1% leads to an increase of .02% in tax revenue. The marginal tax rates have a positive effect on the total revenue as before, but this time the corporate rate is also statistically significant.

In column (2), I control for F and F^2 because I believe that an increase in financial sector quality has a bigger effect when financial sector improves from very poor quality to better quality (when the change involves switching from cash economy to non-cash economy) than when it improves from sophisticated financial sector to an even more sophisticated financial sector

(one that might make hiding transactions easier). As predicted, the sign of F^2 is negative, but it is not significant.

In column (3), I introduce another measure of personal rate because I believe the maximum marginal tax rate for personal income is not representative for most taxpayers. I run a regression using the rate corresponding to the mean GDP/capita of the countries in the same quintile as the country analyzed for the highest individual marginal tax rate. For example, in year 1993, Nigeria has a GDP/capita of \$217.25, which places Nigeria in the lowest quintile. The average GDP/capita for all the countries in that quintile is \$1,084.93, or NGN49,105.19. The individual marginal tax rate for a Nigerian income of NGN49,105.19 is 25%. I use this individual tax rate of 25% for Nigeria in 1993. However, the individual rate remains insignificant. It is likely GDP/capita is not a good measure of median taxable income, either.

Finally, in column (4) I control for the minimum between the highest marginal tax rate for personal income and the highest marginal tax rate for corporate income. I believe this variable might have a better explanatory value than the two highest rates alone because people tend to switch between the two types of income depending on which rate is lower. The coefficient is positive and statistically significant. An increase in 10% in this minimum marginal rate leads to an increase of .6% in total revenue/GDP.

Table 7 presents the same types of robustness checks as in the previous table, but performed on the income tax revenue results. Column (1) controls for the components of F . Law and order is again positive and significant, but the effect is twice as large as in the analysis of the total revenue. Law and order probably affects the monitoring and detecting income much more than monitoring and detecting other types of taxable activities. Contrary to the initial prediction, liquid reserves have a negative and significant sign. It is possible that high liquid reserves mean less loans to private firms and individuals and thus less observable (and easily taxable) transactions. Corporate rate is again positive and significant.

Column (2) controls for F and F^2 . As predicted, F^2 has a negative and significant effect suggesting that effects are larger for countries that improve poor financial sectors rather for countries that improve good financial sectors. For example, an increase of 1 point for a country like Peru with an average $F = 1.43$ leads to an increase of 2.74% in income tax revenue/GDP, while the same increase of 1 point for a country like Switzerland with an average $F = 8.59$ leads to a much smaller increase of 1.45%. The effect is almost twice as large in the country with poor financial sector than in the one with very

good one. It is important to notice that the effect of F is never negative, not even for countries like Switzerland. So the negative effects of having more sophisticated tools to hide income are smaller than the positive effects of using better financial intermediaries.

Column (3) controls for tax rate at average GDP/cap for all countries in the same quintile and again the results are not statistically significant. Column (4) controls for minimum between the two marginal tax rates. The rate has a positive but insignificant effect on the income tax revenue.

7 Conclusions

This paper examines the effects of financial sector quality on the tax revenue collected by the government. The study also investigates whether the quality of financial sector affects the revenue collected from different taxes in different ways. The paper uses a variable F to measure the goodness of the financial sector. F is constructed from nine variables that measure the quality of the banking sector, stock market, insurance and other financial markets, monetary policy and institutions.

The study reaches three main conclusions. First, an increase of 1 point in financial sector quality increases total tax revenue/GDP by 1.22%. The result also holds when I take into consideration the existence of shadow economy. Tax revenue as a share of overall economy increases by 1.02% when financial quality increases by 1 point.

Second, financial sector quality also affects income tax revenue. Of all tax revenues, income tax/GDP increases the most when financial quality improves. An increase of 1 point in F leads to an increase of 1.80% in income tax/GDP and 1.37% in income tax/overall economy.

Third, revenues coming from taxes levied on assets or activities that are easily observable are not affected by changes in financial sector quality. Such tax revenues are sales tax revenue, gift tax revenue and property tax revenue.

Despite the encouraging results, the study has a number of problems. First, the analysis is performed on a small number of observations. The approach requires many financial sector variables that are missing for most developing countries. Tax data is available, but is inconsistent across different sources. So this study uses tax data from only one source at a time. Also, it would be helpful to control for the different tax rates when analyzing the relative importance of each tax. Unfortunately, data on various tax rates is

very scarce.

Second, some institutional variables change from year to year, but it is very likely I capture a lot of noise in the analysis. For this reason, it would be better to run the analysis on a cross-section of countries, but unfortunately, the sample is too small to do an econometric analysis with cross-country data.

Third, it is likely I didn't capture all the aspects of financial sector quality that might affect tax revenue. F should include more measures of banking regulation and supervision, of the development, profitability, privatization and concentration in the banking sector.

Finally, it is important to mention the policy implications of this paper. The results indicate that reforms of certain areas of the financial sector may lead to an increase in tax revenue, thus some reforms may be paying for themselves. There are various policies that a government can adopt in order to develop its financial sector. The government can restructure public financial institutions and develop capital market infrastructure. But these policies can be expensive. The government can also implement legal and supervisory framework across the banking, insurance and stock markets. These policies are cheaper and according to our results, the government can hope to recoup some of the costs later from higher tax revenues.

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Appendix 1

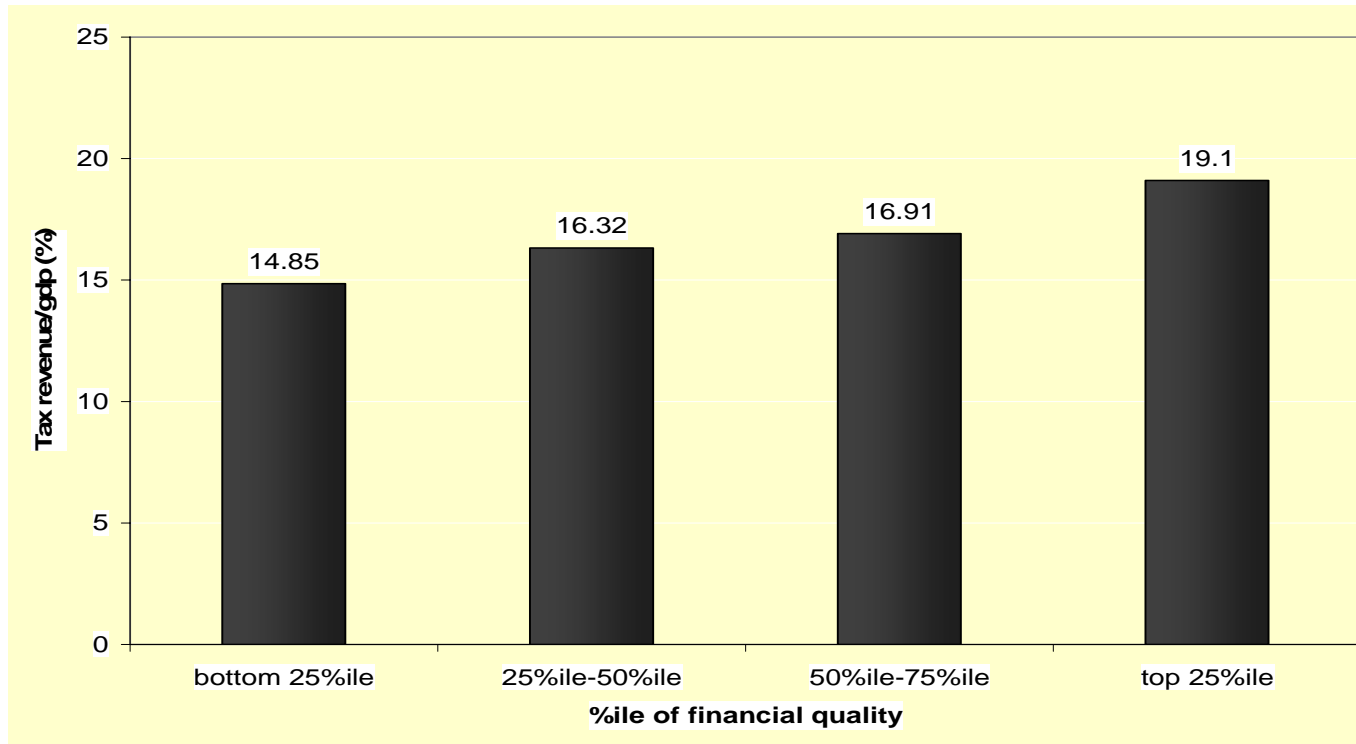


Figure 1. This figure shows the average total tax revenue as a share of GDP for countries with different financial sector quality. The first bar represents tax revenues collected by countries with low financial sector quality (countries with financial sector indicators in the bottom 25%ile of the sample). The second, third and fourth bars represent tax revenues of countries with financial sectors in the 2nd, 3rd and top quartile, respectively.

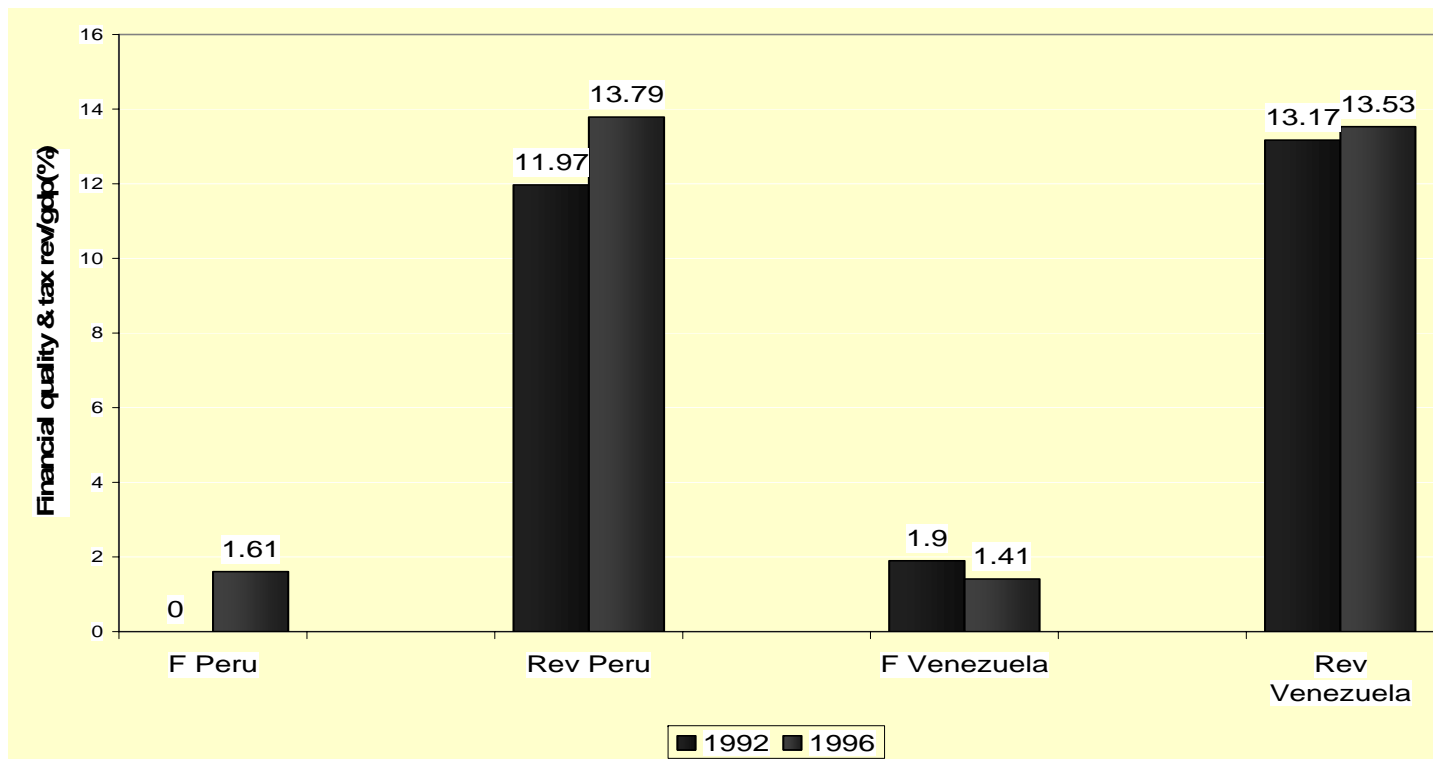


Figure 2. This figure shows the financial sector quality and total tax revenue/GDP for Peru and Venezuela in 1992 and 1998. The blue bars represent data from 1992 and the red bars data from 1996. The first two bars show the financial sector quality in Peru, the third and fourth show the total tax revenue/GDP in Peru, the fifth and sixth the financial sector quality in Venezuela and the last two bars show the total tax revenue/GDP in Venezuela.

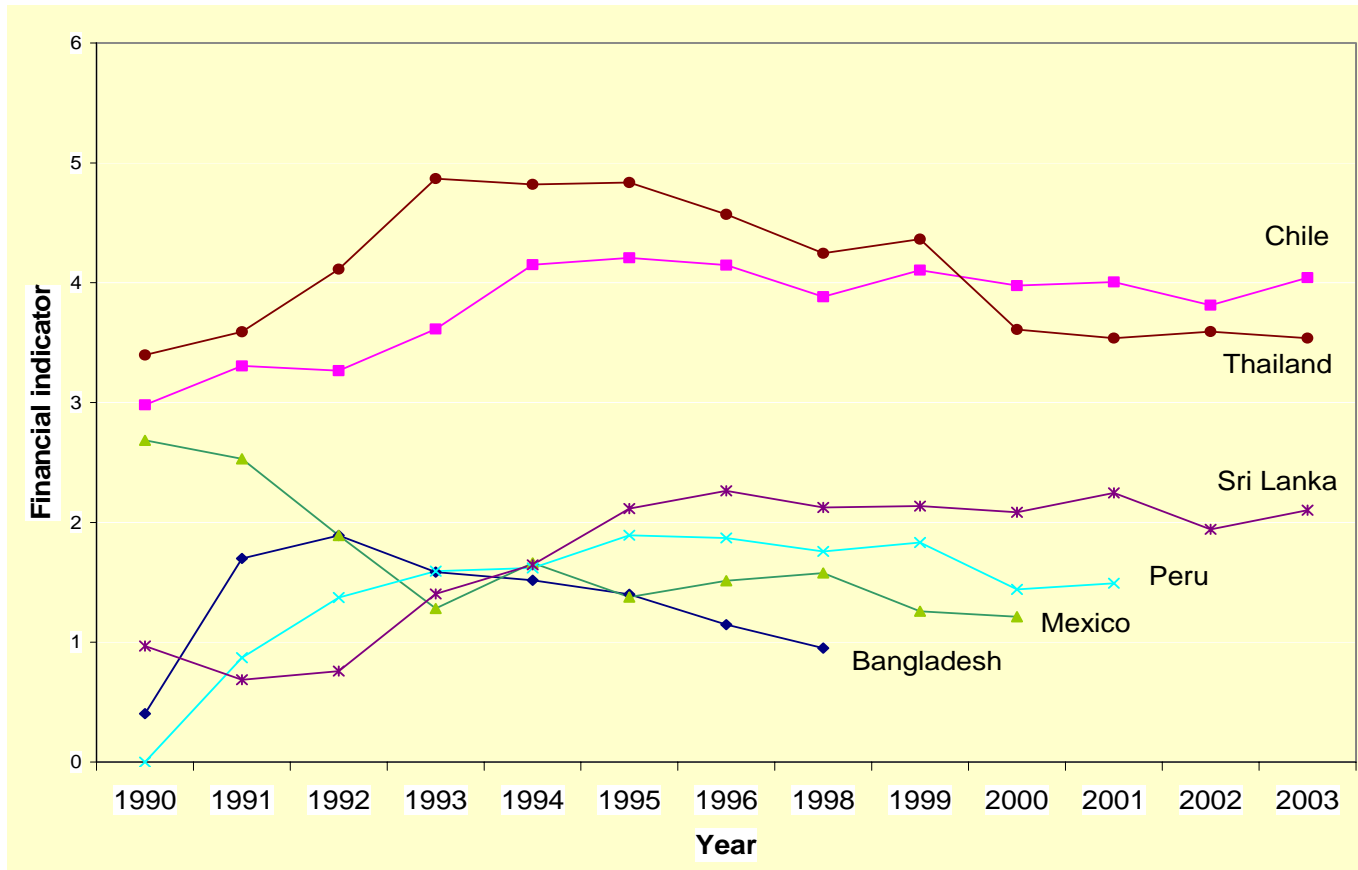


Figure 3. This figure shows the changes of the financial quality indicator over time for six countries in the dataset

Variable	Definition and sources
Financial sector variables	
Interest rate spread	It measures the lending rate minus the deposit rates charged by banks. Source: <i>World Development Indicators</i> .
Domestic credit by banking sector/GDP	Domestic credit provided by the banking sector as a share of GDP measures all credit to various sectors on a gross basis, with the exception of credit to the central government over GDP. Measured in percentage points. Source: <i>World Development Indicators</i> .
Bank liquid reserves/bank assets	It measures the ratio of domestic currency holdings and deposits with the monetary authorities to claims on other governments, non-financial public enterprises, the private sector, and other banking institutions. Source: <i>World Development Indicators</i> .
Turnover ratio	Turnover ratio is ratio of the total value of shares traded in one period to the average market capitalization for the period. Measured in percentage points. Source: <i>World Development Indicators</i> .
Market cap/GDP	Market capitalization as a share of GDP measures the share price times the number of shares outstanding over GDP. It is measured in percentage points. Source: <i>World Development Indicators</i> .
Net export of insurance & financial services/GDP	It measures net exports of freight insurance on goods and other direct insurance such as life insurance; of financial intermediation services such as commissions, of foreign exchange transactions, and brokerage services; and of auxiliary services such as financial market operational and regulatory services as a percentage of GDP. Measured in percentage points. Source: Author's calculation and <i>World Development Indicators</i> .
Exchange rate stability	It measures the annual percentage change in the exchange rate of the national currency against the

Law and Order	US dollar (against the euro in the case of the USA). Source: <i>International Country Risk Guide</i> . A measure of law (assesses the strength and impartiality of the legal system) and of the order (measures the observance of the law in the country). Each sub-component equals half of the total. The best score is 6 and the worst is 0. Source: <i>International Country Risk Guide</i> .
Corruption	A measure of corruption within the political system. The least corrupt system has a score of 6 and the most corrupt has a score of 0. Source: <i>International Country Risk Guide</i> .

Macroeconomic variables

Shadow economy /GDP	It measures all market-based legal production of goods and services that are deliberately concealed from public authorities as a share of GDP. Measured in percentage points. Note: The shadow economy data from the original dataset was calculated in form of averages over two years. In this paper, we used the average value for both years in order to increase the number of observations, i.e. in the original dataset mean shadow economy/GDP for Austria for 1990/1991 was 5.47%. In this paper, shadow economy/GDP is 5.47% in 1990 and 1991 for Austria. Source: Author's calculations, Chaudhuri and al. (2006), Schneider (2000), Schneider (2003), Schneider (2005a), Schneider (2005b), Schneider and Savasan (2005), <i>World Development Indicators</i> .
Shadow economy/capita	It measures the shadow economy divided by midyear population. Measured in constant US dollars. Source: Author's calculations, Chaudhuri and al. (2006), Schneider (2000), Schneider (2003), Schneider (2005a), Schneider (2005b), Schneider and Savasan (2005), <i>World Development Indicators</i> .
Inflation	Measures the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services from year to year. Measured

GDP/capita	<p>in percentage points. Source: <i>World Development Indicators</i>.</p> <p>It measures GDP per capita is gross domestic product divided by midyear population. Measured in constant U.S. dollars (US dollar in year 2000). Source: <i>World Development Indicators</i>.</p>
Tax variables	
Total tax/GDP	<p>It measures all the revenue that comes from taxes as a percentage of GDP. Measured in percentage points. Source: Author's calculations and <i>World Development Indicators</i>.</p>
Total tax/overall economy	<p>It measures all the revenue that comes from taxes as a percentage of GDP and shadow economy. Source: Author's calculations, Chaudhuri and al. (2006), Schneider (2000), Schneider (2003), Schneider (2005a), Schneider (2005b), Schneider and Savasan (2005) and <i>World Development Indicators</i>.</p>
Income tax/GDP	<p>It measures the taxes on income, profits, and capital gains are levied on individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets as a share of GDP. Measured in percentage points. Source: Authors' calculations and <i>World Development Indicators</i>.</p>
Income tax/overall economy	<p>It measures the taxes on income, profits, and capital gains are levied on individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets as a share of GDP and shadow economy. Measured in percentage points. Source: Authors' calculations, Chaudhuri and al. (2006), Schneider (2000), Schneider (2003), Schneider (2005a), Schneider (2005b), Schneider and Savasan (2005) and <i>World Development Indicators</i>.</p>
Sales tax/GDP	<p>It measures the revenue from sales taxes as a share of GDP. Measured in percentage points. Source: Authors' calculations and <i>the OECD Tax Revenue as percent of GDP</i></p>

Gift taxes/GDP	It measures the revenue from taxes on gifts as a share of GDP. Measured in percentage points. Source: Authors' calculations and <i>the OECD Tax Revenue as percent of GDP</i> .
Property tax/GDP	It measures the revenue from taxes on property as a share of GDP. Measured in percentage points. Source: Authors' calculations and <i>World Development Indicators</i> .
Individual rate	It measures the highest rate shown on the schedule of tax rates applied to the taxable income of individuals. Measured in percentage points. Source: <i>Economic Freedom of the World 2005 Annual Report, World Tax Database, World Development Indicator, Individual taxes Worldwide Summaries – various issues</i> .
Corporate rate	It measures the highest rate shown on the schedule of tax rates applied to the taxable income of corporations. Source: <i>World Tax Database, World Development Indicators, Corporate taxes Worldwide Summaries – various issues</i> .

Table 1. This table presents all the variables used in the analysis, their definitions and sources.

Variable	Obs.	Mean	SD	Min	Max
Financial indicators					
Interest rate spread	448	8.06	10.33	-8.85	114.15
Domestic credit by banking sector/GDP	448	56.11	45.58	4.69	203.26
Bank liquid reserves/bank assets	448	9.96	8.70	.18	60.79
Turnover ratio	448	36.09	40.34	0	329.03
Market cap/GDP	448	42.55	53.08	.26	379.17
Net export of insurance & financial services/GDP	448	-.12	.58	-1.51	3.91
Exchange rate stability	448	-8.65	27.71	-328.3	51.10
Law and order	448	4.22	1.46	0	6
Corruption	448	3.35	1.25	.08	6
Financial quality indicator	448	3.11	1.72	0	10
Macroeconomics indicators					
Shadow economy/cap	339	10907.7	12076.24	334.56	48226.54
Inflation	448	9.60	13.44	-3.96	99.87
GDP/capita	448	8248.05	9992.43	262.39	40526.5
Tax variables					
Total tax/GDP	233	16.67	6.25	1.17	31.88
Total tax/overall economy	179	13.16	5.17	1.08	27.49
Income tax/GDP	233	6.23	4.08	.28	19.27
Income tax/overall economy	179	5.12	3.70	.23	17.15
Sales tax/GDP	133	.32	1.06	0	8.4
Gift tax/GDP	137	.008	.03	0	.30
Property tax/GDP	385	9.55	3.89	0	22.09
Individual rate	429	35.02	12.32	0	68
Corporate rate	436	30.90	7.87	0	55

Table 2. This table presents the descriptive statistics of the variables used in the analysis. The second column shows the number of observations, the third shows the mean value of the variable, the fourth shows the standard deviation, the fifth shows the minimum value of the variable in the sample and the sixth shows the maximum value.

	Total tax/GDP	Total tax/overall economy
	(1)	(2)
Financial quality	1.22 (.28)***	1.02 (.28)***
Individual rate	.02 (.02)	.01 (.02)
Corporate rate	.02 (.01)	.02 (.02)
GDP/cap	-.0002 (.0002)	.003 (.001)*
Inflation	.008 (.01)	.005 (.01)
Shadow economy/cap		-.002 (.001)*
Observations	216	167
R ²	97.35%	97.83%
Country dummies	Yes	Yes
Year dummies	Yes	Yes

Table 3. This table presents the results of the analysis with total tax revenue as a dependent variable. (1) shows effects of F on total tax revenue as a share of GDP when we control for highest marginal tax rate for individual income, highest marginal tax rate for corporate income, inflation and GDP/capita. Column (2) shows the effects of F on total tax revenue as a share of overall GDP (GDP and shadow). (2) adds another control variable, the shadow economy per capita. Standard errors are in parentheses. * denotes significant at 10% level, ** denotes significant at 5% level and *** denotes significant at 1% level.

	Income tax/GDP	Income tax/overall economy
	(1)	(2)
Financial quality	1.80 (.27)***	1.37 (.29)***
Individual rate	-.03 (.02)	-.01 (.02)
Corporate rate	.02 (.01)	.01 (.02)
GDP/cap	-.0001 (.0002)	.002 (.001)
Inflation	.01 (.01)	.02 (.01)
Shadow economy/cap		-.002 (.001)*
Observations	216	167
R ²	93.83%	95.34%
Country dummies	Yes	Yes
Year dummies	Yes	Yes

Table 4. This table presents the results of the analysis with income tax revenue as a dependent variable. (1) shows effects of F on income tax revenue as a share of GDP when we control for highest marginal tax rate for individual income, highest marginal tax rate for corporate income, inflation and GDP/capita. Column (2) shows the effects of F on income tax revenue as a share of overall GDP (GDP and shadow). (2) adds another control variable, the shadow economy per capita. Standard errors are in parentheses. * denotes significant at 10% level, ** denotes significant at 5% level and *** denotes significant at 1% level.

	Sales tax/GDP	Gift tax/GDP	Property tax/ GDP
	(1)	(2)	(3)
Financial quality	.02 (.20)	.002 (.003)	-.02 (.21)
GDP/cap	-.0001 (.00009)	.0000002 (.00001)	-.0001 (.0001)*
Inflation	.06 (.01)***	-.00009 (.0002)	-.01 (.007)
Obs.	133	137	385
R ²	61.98%	90.05%	91.42%
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes

Table 5. This table presents the results of the analysis that has inflation, GDP/capita and financial quality as independent variables. The dependent variables are sales tax revenue as share of GDP in column (1), gift tax revenue as a share of GDP in column (2) and property tax revenue as a share of GDP in column (3). Standard errors are in parentheses. * denotes significant at 10% level, ** denotes significant at 5% level and *** denotes significant at 1% level.

	Total tax/GDP			
	(1)	(2)	(3)	(4)
Interest rate spread	-.01 (.01)			
Law and order	.62 (.32)*			
Exchange rate stability	.004 (.009)			
Corruption	-.21 (.23)			
Turnover ratio	.003 (.005)			
Market cap/GDP	.01 (.006)**			
Domestic credit/GDP	.02 (.01)*			
Liquid reserves	.005 (.02)			
Insurance NX/GDP	-.25 (.58)			
Individual rate	.04 (.02)	.03 (.02)	.03 (.03)	
Corporate rate	.03 (.02)*	.03 (.02)*	.03 (.02)	
Personal rate at GDP/cap			.02 (.03)	
Min (personal rate, corporate rate)				.06 (.03)*
Financial indicator		1.65 (.44)***	1.69 (.43)***	1.17 (.28)***
Financial indicator squared		-.06 (.05)		
Inflation	.01 (.02)	.01 (.01)	.02 (.01)	.007 (.01)
GDP/cap	-.0004 (.0002)*	-.0003 (.0002)	-.0004 (.0002)	-.0001 (.0001)
Observations	216	216	140	216
R ²	97.51%	97.38%	97.97%	97.34%
Country dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes

Table 6. This table presents robustness checks for regressions with total revenue as a dependent variable. (1) controls for each component of the financial indicator, (2) controls for financial indicator and for financial indicator squared, (3) adds marginal tax rates paid on a personal income=mean GDP/cap for all countries in the same quintile, and (4) controls for the minimum between the highest personal marginal tax rate and the highest corporate marginal tax rate. Standard errors are in parentheses. * denotes significant at 10% level, ** denotes significant at 5% and *** denotes significant at 1% level.

	Income tax/GDP			
	(1)	(2)	(3)	(4)
Interest rate spread	-.02 (.01)			
Law and order	1.30 (.30)***			
Exchange rate stability	-.001 (.009)			
Corruption	-.07 (.22)			
Turnover ratio	.002 (.005)			
Market cap/GDP	.009 (.006)			
Domestic credit/GDP	.003 (.01)			
Liquid reserves	-.07 (.02)***			
Insurance NX/GDP	-.28 (.55)			
Individual rate	-.01 (.02)	-.01 (.02)	-.04 (.03)	
Corporate rate	.03 (.02)*	.04 (.01)**	.02 (.02)	
Personal rate at GDP/cap			-.005 (.02)	
Min (personal rate, corporate rate)				.009 (.03)
Financial indicator		3.00 (.42)***	1.70 (.36)***	1.73 (.28)***
Financial indicator squared		-.18 (.04)***		
Inflation	.02 (.01)	.02 (.01)**	.01 (.01)	.01 (.01)
GDP/cap	-.0003 (.0002)	-.0002 (.0001)	-.00008 (.0002)	-.0001 (.0001)
Observations	216	216	140	216
R ²	94.47%	94.36%	96.48%	93.71%
Country dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes

Table 7. This table presents robustness checks for regressions with income tax revenue as a dependent variable. (1) controls for each component of the financial indicator, (2) controls for financial indicator and for financial indicator squared, (3) adds marginal tax rates paid on a personal income=mean GDP/cap for all countries in the same quintile, and (4) controls for the minimum between the highest personal marginal tax rate and the highest corporate marginal tax rate. Standard errors are in parentheses. * denotes significant at 10% level, ** denotes significant at 5% and *** denotes significant at 1% level.

Appendix 2
Data Appendix

Country	F	Tax revenue/GDP	Tax revenue/ overall economy	Ind. rate	Corp. rate
Australia	5.03	23.42	20.54	47.11	33.78
Bangladesh	1.32	7.79	5.69	25.00	40.00
Bolivia	2.04	12.95	7.70	13.00	25.00
Bulgaria	1.92	17.88	13.02	31.25	20.88
Canada	5.26	14.73	12.75	31.45	38.00
Chile	3.81	16.21	13.41	46.08	24.23
China	3.84	5.61	5.94	45.00	29.09
Colombia	1.25	12.93	9.10	32.69	32.96
Costa Rica	1.81	12.17	9.40	25.00	30.00
Cote d'Ivoire	1.95	18.44	13.82	8.00	40.00
Croatia	2.66	25.82	19.32	40.60	31.25
Czech Republic	3.13	16.06	13.43	36.38	34.25
Egypt	2.38	17.58	13.33	36.25	40.00
Estonia	2.71	16.11	11.62	26.00	31.40
Germany	5.25	11.06	9.65	53.00	35.00
Guatemala	1.47	9.47	6.59	27.75	29.75
Hungary	3.02	22.27	17.72	41.64	23.64
Israel	3.77	30.50	24.90	50.06	36.13
Italy	3.56	24.39	19.16	49.50	36.50
Jamaica	1.29	25.59	19.15	25.93	33.24
Kenya	1.46	21.92	16.36	33.50	33.19
Kuwait	3.63	1.24	1.09	0.00	18.33
Latvia	2.43	14.41	10.26	25.00	23.20
Lithuania	2.06	15.93	12.12	33.00	19.40
Malaysia	5.00	16.75	12.73	28.60	28.00
Mexico	1.70	10.85	8.49	37.00	34.50
Morocco	3.39	22.51	16.77	44.25	35.13
Namibia	2.83	30.03	22.90	36.60	36.00
New Zealand	4.90	29.95	26.63	37.00	33.00
Norway	4.59	27.53	23.16	32.43	27.98
Oman	2.79	7.12	5.95	0.00	21.33
Paraguay	1.42	10.34	7.82	0.00	30.00

Peru	1.43	12.73	8.00	29.82	29.45
Philippines	2.36	14.71	10.01	33.85	33.85
Poland	2.88	20.18	15.64	41.36	34.64
Portugal	3.83	21.78	17.69	40.00	37.28
Russian Fed.	1.41	13.70	9.29	24.00	35.00
Singapore	6.11	15.36	13.52	27.25	25.31
Slovak Republic	2.90	16.75	13.94	40.40	31.80
Slovenia	2.96	21.76	17.01	47.33	25.00
Spain	4.36	15.64	12.71	53.33	35.00
Sri Lanka	1.73	16.43	11.55	33.57	37.22
Sweden	5.70	21.08	17.67	43.11	29.33
Switzerland	8.59	9.93	9.18	28.57	19.26
Thailand	4.08	15.43	10.06	39.77	30.00
Ukraine	1.41	13.29	8.69	40.00	30.00
UK	6.26	28.41	25.12	40.00	33.00
Uruguay	1.76	17.91	11.58	0.00	30.00
Venezuela, RB	1.48	13.45	10.33	34.77	35.54
Zambia	1.82	18.45	12.39	30.00	35.00
Zimbabwe	2.02	21.26	13.69	57.00	46.00

Table 8. This table presents the mean values of 5 variables. The means are calculated over all the years available for each country. The second column shows the mean financial sector indicator, the third column shows the mean tax revenue/GDP, the fourth column shows the mean tax revenue/overall economy, the fifth column shows the mean value for the highest marginal tax rate for personal income, and the last column shows the mean value for the highest marginal tax rate for corporate income.