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The Literacy Impact on Tax Revenues

Mihai Mutascu and Dan Danuletiu

Abstract

The paper investigates the relationship between tax revenues and literacy level, using a panel-model approach. The dataset covers the period 1996 to 2010 and includes 123 countries. The estimations suggest that the assumed function is nonlinear, with inverted-U and U-shaped curves. More precisely, a very low literacy level is associated with reduced tax revenues. Furthermore, the government inputs increase as the literacy level increases, reaching a maximum point. Beyond this level, the tax revenues decrease even if the literacy has an ascendant tendency, registering a minimum level. Finally, the tax revenues increase in a parallel manner with the literacy index.

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Keywords Literacy; tax revenues; nonlinearity; effects; tax policy

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Introduction

The socio-demographic characteristics represent one of the most important incentives for tax revenues. As the main component of education, the literacy has a strong impact on tax payments and acceptance of taxation level, causing a serious informational asymmetry between taxpayers. The capacity to read and to write is very important for understand the tax laws, tax procedures, and tax burden. International Adult Literacy Survey (IALS) defines literacy as “the ability to understand and employ printed information in daily activities, at home, at work and in the community - to achieve one’s goals, and to develop one’s knowledge and potential.” In similar way, UNESCO considers that “literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts.” Literacy involves a continuum of learning in enabling individuals to achieve his or her goals, develop his or her knowledge and potential and participate fully in community and wider society.

Thus, as the information is asymmetric through the literacy level, the tax payments and the acceptance of taxation level differs from one person to another (the capacity to “understand taxation issues” does not have the same amplitude for all citizens).

Following this idea, the paper investigates the relationship between tax revenues and literacy level, using a panel-model approach. The data-set covers the period 1996-2010, and includes 123 countries. The estimations suggest that assumed function is nonlinear, with inverted-U and U shapes. More precisely, a very low literacy level is associated with reduced tax revenues. Further, the government inputs increase as the literacy level increases, reaching a maximum point. After this level, the tax revenues decrease even if the literacy has an ascendant tendency, registering a minimum level. Finally, the tax revenues increase in parallel manner with the literacy index.

There is an extensive literature regarding the determinants of tax revenues. The first studies trying to show the determinants of tax revenues focussed on structural features, such as: GDP/capita, openness of the economy, the share of agriculture in GDP, mining share, manufacturing share, demography, inflation, public debt, foreign debt, foreign aid, natural resources, deep financial sector, the abundance of natural resources, urbanization. More recent, the importance was given to institutional factors, such as: corruption, governance, inequality,

shadow economy, entry regulations, accountability and voice, democracy. Another strand of literature connects the tax revenue with public spending.

Extended sample of countries, empirical panel analysis and nonlinearity testing are the most important novelty of this paper. The present investigation extends the literature in the field by focusing on the literacy implications in economy and finds new evidences regarding the determinants of tax revenues.

The rest of the paper is structured as follows: Section 2 present the literature, Section 3 contains the methodology and data, while Section 4 reveals the empirical results. Section 5 concludes.

Literature review

The literature regarding “tax revenues-literacy” nexus is relatively poor. Whatever, there are several results in this direction. Some authors suggest that there is a significant connection between tax revenues and literacy level (Riezman and Slemrod, 1987; Ghura (1998); Book, 2003; Kenny and Winner, 2006; Kirchler et al., 2008; Mahdavi, 2008; Aidt and Jensen, 2009; Chaudry and Munir, 2010; Marti et al., 2010; Profeta and Scabrosetti, 2010; Aidt and Eterovic, 2011; and Dioda, 2012), while other researchers do not find any correlation in this way (Sartori, 2000). Other implications of literacy in the economic area cover the economic growth (Hanushek and Kimko, 2000; Coulombe et al., 2004; and Hanushek and Woessmann, 2009), labour market (Coulombe and Tremblay, 2006), returns (Hanushek and Woessmann, 2007; and Hanushek and Zhang, 2009) etc. The contributions which explore the impact of literacy on tax revenues usually follow different variables in order to capture the taxation environment: the volume of tax revenues, the taxes as percentage of total government revenues and the tax revenues as percentage of GDP.

Studies which introduce literacy as determinant of the tax revenues are relatively scarce. Ghura (1998) investigates the variation of the tax revenue/GDP ratio, testing its hypotheses on income, tax base, economic policies, corruption and external environment, for an unbalanced panel of thirty-nine sub-Saharan African countries, over the period 1985-1996. As a proxy for the impact of the government expenditure, the auhtor uses the index of human capital, which is constructed based on four variables (secondary school enrollment ratio, literacy rate, life

expectancy at birth, one thousand minus the infant mortality rate). The results show that tax revenue/GDP ratio grows with the increase in income, greater openness of the economy, a decline in the share of agriculture in GDP, the existence of oil and non-oil mining sectors. Others factors which influence the tax revenues are: inflation (an increase of inflation lowers the tax ratio), structural reforms (raise the ratio), the human capital development (HCI-positive effect), the level of corruption (inverse effect), the external grants (inverse effect). Being part of the HCI, literacy rate has an influence on the tax revenues. Although, the author stresses that when the corruption and HCI are included in the same regression, the magnitude and statistical significance of their impact fall.

Using a modified version of the models employed by Heller (1975), Leuthold (1991) and Ghura (1998), Mahdavi (2008) studies the determinants of the level and composition of tax revenue in developing countries. He uses an unbalanced panel of 43 developing countries, covering data over the period 1973-2002. The results regarding the level of tax revenues show that the tax to GDP ratio is higher where the size of international trade sector, percent of urban population, adult literacy rate, and per capita income are higher and, on the other hand, an increase in aid inflow, percent of “old” population, population density, the degree of monetization, and the rate of inflation are associated with a lower tax to GDP ratio. In the same time, the author find that a higher level of basic education is one of the factors that affects positively the sales and excise taxes, so improving the literacy rate could raise the level of taxation and/or change the tax revenue mix.

The relationship between literacy rate and tax revenue structure mix is evidenced by the studies that underline the importance of the administration costs of taxes. Riezman and Slemrod (1987) use the literacy rate as a proxy for these costs in order to investigate empirically the important role of the tax collection costs on fiscal decisions. They use a panel data with 107 developed and developing countries (of which 84 countries are developing ones), for the year 1977, and run the regression analysis for the entire panel, but also for developing countries panel only. They find that a low literacy imposes countries to rely more on import and export taxes and, on the other hand, an increase in literacy is associated with a decline in the percentage of revenue accounted for by the trade taxes. These results hold for the entire panel, but also for the developing countries only (in this case, the statistical significance of the literacy rate is reduced). In the same idea, Kenny and Winer (2006) investigate about 100 democratic and nondemocratic

countries for three distinct periods of time (1975-1980, 1981-1985, 1986-1992) and use the average years of educational attainment in the adult population as a measure for literacy. Their results are very similar with those of Riezman and Slemrod (1987). According to the study, the rise of the educational attainment is accompanied by a higher importance of taxes that require widespread literacy (i.e. individual income taxes, and domestic goods and sales taxes). At the same time, there are taxes that have less demanding literacy requirements, such as payroll and trade taxes.

Aidt and Jensen (2009) study the effects of the extension of the voting franchise in ten western European countries, for the period 1860-1938 and test the hypotheses that the impact of the franchise extension on the tax structure is conditional on tax collection costs. The researchers use the literacy rate as a proxy for the collection cost of taxes and conclude in the same direction as Riezman and Slemrod (1987) regarding the impact of the literacy on taxation structure. They also find that the transit of a country from a restricted to universal suffrage (with more illiterate people voting) generate an increase in the total spending/GDP, but also a increase (about 2%) in the volume of tax revenues. Aidt and Eterovic (2011) analyse the fiscal effects of voting franchise extension in the case of 18 Latin American countries, where literacy requirements were one of the most used restriction for voting. So, the franchise extension grows the importance of the illiterate voters' participation. The data used cover the period 1920-2000 and the results show that the abolition of the literacy test increases both government spending and tax revenues, measured as a percent of the gross domestic product (GDP).

Another strand of literature that finds links between tax revenues and literacy level highlight the tax compliance problem. Book (2003) suggests that low literacy, with different taxes and languages, is used by the deviant taxpayers to hide their tax evasion. By consequence, an increase of literacy tends to eliminate this kind of evasion. Kirchler et al. (2008) develop an explanatory framework (the "slippery slope" framework) to emphasize the necessary actions of the state to improve the taxpayers' tax compliance. They suggest that a different mix of actions, based on the power and trust in authorities, could be the best incentive for different kinds of taxpayers. The authors think that developing tax educational programmes it's a good direction to improve tax compliance for those taxpayers with a motivational commitment. In the case of taxpayers with motivational capitulation or resistance to the educational programmes, actions that profile the state power in respect to tax compliance are more than welcomed. Chaudry and

Munir (2010) investigate the determinants of low tax revenues in Pakistan and find that an increase of literacy generates a decrease of collected tax revenue. In this case, the tax evasion is the main explanatory determinant. Marti et al. (2010) show that misunderstanding the fiscal law (such as tax rates, tax base and paying dates) is one of most important factors that affects tax compliance in Kenya. Thus, a good improvement in tax collection is to increase the taxpayers' ability to understand the tax laws.

Dioda (2012) identifies the long-term variables - including historical, economic, social and political factors - that significantly influence taxation in Latin America and Caribbean countries. The author performs standard models for 32 Latin American countries over the period 1990-2009 and finds that statistically significant factors of the tax revenue are (+ means positively related with tax revenue, “-“ means negatively related with tax revenue): GDP per capita (+), openness of the economy (+), share of agriculture over GDP (-), the size of the shadow economy (-), the level of education (+), female labor force participation (+), the population density (+), the share of women employed in the formal market (+), the share of people over 65 years old (+), a higher degree of civil liberties (+), by the durability of the political regime (+).

Finally, Profeta and Scabrosetti (2010) develop an analysis on the determinants of tax revenue for 39 developing countries (11 Asian, 19 Latin American and 9 recent members of the EU), over the period 1990–2004. They investigate the significant differences in the regional determinants of tax revenue and tax structure. As result, the authors show that, for the Asian countries, secondary school attainment is not significant, but for Latin American countries the education is positive and significantly related to the tax revenue.

In the opposite way, Sartori (2000) defends idea that there is not any evidence regarding the connection between literacy and collected tax revenues. Even if the author recognizes the importance of education, he mentions that a general level of instruction doesn't determine an increase in the level of specific public information. Thus, the instruction does not have any effect regarding political education, inclusive in the area of tax policy.

Based on these contributions, the main assumed hypothesis of this paper is that the literacy has a significant impact on tax revenues.

Methodology and data

Two variables are selected for investigation of the relationship between tax revenues and population's literacy level: the tax revenues, as a dependent variable, and the literacy level, as independent interest variable. The unbalanced sample covers the period 1996-2010, and includes 123 countries (Table 1, in Appendix).

Tax revenues (τ) reflect the level of tax revenues collected by general government as percentage of GDP. Adult literacy index (λ) is a measure used to determine how many adults can read and write in a certain area or nation as percent in total adult population.

Based on the literature, the main hypothesis of this analysis considers as valid the influence of literacy on the level of collected tax revenues. The function has this shape:

$$\tau = f(\lambda), \quad (1)$$

where τ is the level of tax revenues as percentage of GDP, and λ represents the literacy index.

We entered three categories of control variables: one inspired by classical tax literature, one connected to appropriate macroeconomic policy area and another one represented by robustness variables.

The first group of control variables includes: GDP per capita, the size of industrial sector and the size of agricultural sector (Agbeyegbe at al., 2006). GDP per capita illustrates the main source for tax revenue, with strong positive impact. The second and third control variables are the size of industrial sector and the size of agricultural sector. They measure the value added by industrial and agricultural sector respectively, as percentage of GDP, registering a significant impact on tax revenues. It is expected that the size of agricultural sector to have a negative influence on tax revenues, while the industrial sector a positive one.

The second set of control variables covers the macroeconomic policy area, subsuming: public debt, government consumption expenditure, balance of trade, inflation rate and net foreign direct investments. Public debt describes the level of general government gross debt as percentage of GDP. Several evidences regarding the positive relationship between public debt and tax revenues are shown by Battaglini and Coate (2008). Government consumption

expenditure measures the general government final consumption expenditure as percentage of GDP. This variable is strong positively correlated with tax revenues, as Taha and Loganathan (2008) note. The third control variable inspired by macroeconomic policy area is balance of trade and illustrates the difference between monetary value of exports and imports of output in an economy, as percent of GDP. The positive influence of this variable on tax revenues is evidenced by Agbeyegbe et al. (2006). The inflation rate reveals the percentage rate of change in consumer price level per annum. Relevant contributions regarding the inflation - tax nexus are provided by Olivera (1967) and Tanzi (1977). The variables have the same signs only if the taxes are paid as they accrue, and tax systems are elastic. The last control macroeconomic variable is net foreign direct investments (net FDI) and shows the difference between inward foreign direct investment and outward foreign direct investment as percent of GDP. A lot of studies demonstrate the positive effects of foreign direct investment flows on the level of taxation (e.g. Mintz, 1994; Richter and Wellisch, 1996; Huizinga and Nielsen, 1997, 2002; Wildasin and Wilson, 1998; Wildasin, 2003 or Huizinga and Nicodème, 2006).

The last group of control variables includes variables for robustness, such as: the corruption and political stability. The corruption is represented by freedom from corruption index and measures the corruption intensity. The level 100 illustrates low corruption, while a score of 0 indicates a very corrupt government. There are a lot of researchers who explore and demonstrate the negative impact of corruption on taxation (Ghura, 1998; Friedman et al., 2000; Fjeldstad and Tungodden, 2003; or Imam and Jacobs, 2007).

The second variable for robustness is political stability and expresses the number of years since the most recent regime change or the end of transition period defined by the lack of stable political institutions. The impact of political stability on taxation is revealed by Estrada et al. (2013) and reveals a non-conclusive conclusion.

We also test the function for nonlinearity, considering a cubic form. In this case, the new extended panel-model can be specified as follows:

$$\tau_{it} = \alpha + \alpha_1 \lambda_{it} + \alpha_2 \lambda_{it}^2 + \alpha_3 \lambda_{it}^3 + \sum_{k=1}^n \beta_k X_{k,it} + \mu_i + \nu_t + \varepsilon_{it}, \quad (2)$$

where β_k - coefficient of control independent variable k by n type, X - control variables, μ_i - stands for country fixed effects, v_t - time-specific effect that controls for unaccounted common time-varying factors, i - country, t - time, and ε_{it} - the error term.

The Reset Test is used to test the nonlinearity of considered function, assuming squares and cubes, cubes only, and squares only hypotheses.

In the panel-model approach, the model may present heterogeneity in the data. In our case, using an unbalanced sample, the model is analysed testing this propriety for both fixed and random effects. F-test is performed as support for choice between OLS models and fixed-effects models, while Hausman test decides between fixed and random-effects models. In order to deal with any potential endogeneity issue caused by the interest variable “literacy”, we performed a GMM-system estimation introduced by Blundell and Bond (1998). The Sargan test is used to check the validity of the instrumental considered variables. The instruments are the lags of endogenous variable and also two proxy determinants: the government effectiveness (La Porta et al., 1999) and the index of democratization (UNESCO, 2012). The first variable is taken from World Bank online database and measures the perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (-2.5 shows a weak governance performance, while 2.5 a strong governance performance one). The second instrument is the Polity2 index and captures the level of a country democratization, heaving values from +10 (strongly democratic regime) to -10 (strongly autocratic regime). The variable is offered by Polity™ IV Project Political Regime Characteristics and Transitions, 1800-2010 Dataset (2011).

All variables are treated as elasticities, except the variables already expressed as percentage and the variables with non-strict positive values (i.e. political stability). Table 2 in Appendix shows descriptive statistics of variables, Table 3 presents the sources of data, while Table 4 illustrates variance inflation factor test.

In the next section we illustrate the empirical results of modelling approach, following several econometric scenarios (models 1-8), as Table 5, in Appendix, reveals.

Empirical results

The results of VIF test in Table 4, in Appendix, show that all coefficients are less than 10, arguing that there is not any multicollinearity issue between variables. In the naive OLS scenario presented in Table 5, in Appendix, the explanatory variable is significant and positively correlated with dependent variable. The results of Ramsey's Reset Tests clearly suggest a nonlinear relationship between τ and λ , with cubic shape only. Thus, even if the variable λ is not significant, the model 4 shows that λ^3 is significant and positively correlated with dependent variable - τ . Entering the control variables progressively, the results of model 5 reveal that the interest variables λ and λ^3 are also significant, with negative and positive signs respectively. At the same time, the coefficients of control determinants GDP per capita, size of industrial sector, government consumption, balance of trade and inflation rate are significant, heaving positive signs. The rest of control variables are not significant.

Further, we explore the panel-data model heterogeneity, testing both fixed and random-effects of the model. For the fixed-effects model 6, the values of F-test clearly evidence that the fixed-effects are more appropriate than OLS estimations. Further, the Hausman test for random-effects indicates that the fixed-effects model 6 is preferred to the random-effects model 7. This conclusion is reinforced by the fact that $N > T$. The selected fixed-effects model 6 shows that only the λ^3 is significant and positively correlated with dependent variable, λ remaining not significant. All control determinants are significant, except freedom of corruption and political stability. GDP per capita, size of industrial sector, government consumption, balance of trade, inflation rate and net FDI are positively correlated with ratio of tax revenues. Two determinants have negative signs: size of agricultural sector and government debt.

Finally, the GMM-system predictions of model 8, using 17 instruments, reveal that the interest variables λ is significant, with negative impact on tax revenues, while λ^3 is also significant but positively correlated with dependent variable. The Sargan-test result confirms the null hypothesis that all considered instruments are valid, more precisely that the instruments are not correlated with the errors in the first-differenced equation. Moreover, the output for AR(2) process in first difference does not put in evidence any autocorrelations issues. In the case of GMM-system model 8, both two interest variables are conclusive, λ registering negative sign, while λ^3 positive one. The control variables GDP per capita, size of industrial sector, government

consumption, balance of trade and inflation rate are all significant, have positive signs and confirm the main literature outputs. The rest of control determinants are not conclusive.

As a consequence, the GMM-system model 8 can be considered representative for our final analysis of relationship between literacy and tax revenues. This connection is nonlinear, the estimated cubic function heaving an oscillating trend, with two critical points: the first one maximum ($\tau_{\max.}$) and the second one minimum ($\tau_{\min.}$). Between these two levels there is an inflection point $\tau_{\text{inf.}}$ in which the accelerated decreasing trend becomes slowed.

Summarising, the main findings, in the case of 123 investigated countries, for the period 1996-2010, show that the connection between literacy index and tax revenues is cubic, with inverted-U and U shapes. As the estimations are performed by using a nonlinear approach, our results are really new comparatively with those existing in the literature in the field.

Conclusions

The citizens have different payment behaviours in respect to tax information. The level of literacy fluctuates from one taxpayer to another and from one country to another. As some of information is not obtained through “audio-video” channel, the capacity to read and write is essential in the taxation area.

The main results show that a very low literacy is associated with reduced tax revenues. Further, the government inputs increase as the literacy level increases, reaching a maximum point. After this level, the tax revenues decrease even if the literacy has an ascendant tendency, registering a minimum level. Finally, the tax revenues increase in parallel manner with the literacy index.

Three main zones can be identified. First one is related to the minimal poor states, with very low literacy level and reduced public sectors. In this states, the taxpayers do not have or have poor information about taxation. They also do not understand the main constitutional rights represented by public good and financial transfers. Taxes have reduced level and, in many cases, their government output equivalences do not exist. Even if the taxpayers can be easy manipulated, the potential for new tax resources are very low. The second zone belongs to states which have a medium GDP and not very extended public sector. In these cases, the capacity to understand the taxation environment is minimal. Any literacy increase determines a contraction

of tax revenues as results of taxpayers “resistance”. In this scenario, they realize that any hypothetical augmentation of tax revenues do not improve the quantity and quality of public goods and financial transfers. The last zone includes the very rich states, with strong economies and extended public sectors. The literate taxpayers have the capacity to understand the taxation laws and procedures, accepting high tax revenues, but with properly public good and financial transfers.

Concerning the policy implications, the results are very important for tax adjustments in government’s policy area. If the countries are very rich, with literate taxpayers, an increase of tax revenues can be easy obtained by raising the level of literacy. Unfortunately, this type of adjustments is available for the poor countries only if the increase of literacy is accompanied by coherent economic growth policy in order to sustain the tax base. For the rest of the countries, the main government’s objective should be also focused on growth policy in order to compensate the “tax revenues loss” caused by literacy rise.

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Appendix

Table 1: List of analyzed countries

Countries					
Albania	Central African Rep.	Germany	Lao Peoples Dem.Rep	Niger	Swaziland
Algeria	Chad	Ghana	Latvia	Nigeria	Sweden
Argentina	Chile	Greece	Lebanon	Norway	Switzerland
Armenia	China,P.R.: Mainland	Guatemala	Lesotho	Oman	Tajikistan
Australia	Colombia	Guyana	Libya	Pakistan	Togo
Austria	Costa Rica	Honduras	Lithuania	Panama	Trinidad and Tobago
Azerbaijan, Rep. of	Croatia	Hungary	Macedonia, FYR	Paraguay	Tunisia
Bahrain, Kingdom of	Cyprus	India	Madagascar	Peru	Turkey
Bangladesh	Czech Republic	Indonesia	Malawi	Philippines	Uganda
Belarus	Denmark	Iran, I.R. of	Malaysia	Poland	Ukraine
Belgium	Djibouti	Ireland	Mali	Portugal	United Arab Emirates
Benin	Dominican Republic	Israel	Mauritius	Qatar	United Kingdom
Bolivia	Ecuador	Italy	Mexico	Romania	United States
Botswana	Egypt	Jamaica	Moldova	Russian Federation	Uruguay
Brazil	El Salvador	Japan	Mongolia	Rwanda	Uzbekistan
Bulgaria	Estonia	Jordan	Morocco	Saudi Arabia	Venezuela, Rep. Bol.
Burkina Faso	Ethiopia	Kazakhstan	Mozambique	Senegal	Vietnam
Burundi	Fiji	Kenya	Nepal	Slovak Republic	Zambia
Cambodia	Finland	Korea, Republic of	Netherlands	Slovenia	
Cameroon	France	Kuwait	New Zealand	Spain	
Canada	Georgia	Kyrgyz Republic	Nicaragua	Sudan	

Table 2: Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
Tax revenues (as % of GDP)	0.302642	0.291645	0.71623	0.05921	0.120206	1368
Literacy index	0.867516	0.942617	1	0.080294	0.18492	1368
GDP per capita (US \$)	10227.54	3727.228	93156.84	112.5174	14235.15	1368
Size of industrial sector as % of GDP	0.308159	0.291205	0.785181	0.105153	0.104666	1368
Size of agricultural sector as % of GDP	0.128163	0.07997	0.597204	0.003552	0.123572	1368
General government gross debt as % of GDP	0.527956	0.463115	2.6183	0.0055	0.342954	1368
Government final consumption expenditure as % of GDP	0.157918	0.156505	0.429503	0.026753	0.057099	1368
Balance of trade as % of GDP	-0.04461	-0.02457	0.458385	-1.01735	0.140887	1368
Inflation rate as % per annum	0.063397	0.040453	1.328238	-0.09863	0.082284	1368
Net FDI	0.024666	0.019489	0.465006	-0.2279	0.04587	1368
Freedom of corruption	43.27412	35	100	10	23.49546	1368
Political stability	27.56652	15	200	0	32.7052	1368

Table 3: Sources of data

Variable	Source
Tax revenues as percentage of GDP	International Monetary Fund online database (2011).
Literacy index	United Nations Development Programme online database (2011).
GDP per capita (US dollars)	International Monetary Fund online database (2011).
Size of industrial sector as % of GDP	World Bank online database (2011).
Size of agricultural sector as % of GDP	World Bank online database (2011).
General government gross debt as % of GDP	World Bank online database (2011).
Government final consumption expenditure as % of GDP	World Bank online database (2011).
Balance of trade as % of GDP	International Monetary Fund online database (2011).
Inflation rate as % of GDP	International Monetary Fund online database (2011).
Net FDI	United Nations Development Programme online database (2011).
Freedom of corruption	The Heritage Foundation online database (2012).
Political stability	Polity™ IV Project Political Regime Characteristics and Transitions, 1800-2010 Dataset (2011).

Table 4: Variance inflation factor test results

Variable	VIF	1/VIF
ln GDP per capita	7.28	0.13733
Size of agricultural sector as % of GDP	5.05	0.19810
Ln freedom of corruption	2.99	0.33479
Literacy index	2.15	0.46613
Balance of trade as % of GDP	2.12	0.47278
Size of industrial sector as % of GDP	1.85	0.54153
Political stability	1.59	0.62810
Government final consumption expenditure as % of GDP	1.57	0.63768
Net FDI	1.33	0.74974
General government gross debt as % of GDP	1.22	0.82148
Inflation rate as % of GDP	1.19	0.84378
Mean VIF	2.57	

Table 5: Empirical results of panel regressions

Dependent variable: tax revenues as % of GDP									
Independent variables	Model								Expected sign
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Constant	0.035*** (0.011)	0.235*** (0.027)	0.170*** (0.062)	0.187*** (0.022)	-0.086** (0.035)	0.080 (0.061)	0.090* (0.048)	0.202* (0.109)	+/-
literacy index - λ	0.311*** (0.012)	-0.345*** (0.082)	0.033 (0.333)	-0.065 (0.048)	-0.169*** (0.040)	-0.088 (0.096)	-0.128* (0.073)	-0.739** (0.311)	+/-
literacy index - λ^2		0.470*** (0.058)	-0.162 (0.542)						+/-
literacy index - λ^3			0.320 (0.273)	0.239*** (0.029)	0.124*** (0.024)	0.192*** (0.055)	0.170*** (0.043)	0.351*** (0.126)	+/-
GDP per capita					0.023*** (0.003)	0.015*** (0.003)	0.016*** (0.002)	0.034** (0.014)	+
size of industrial as % of GDP					0.164*** (0.022)	0.166*** (0.028)	0.178*** (0.026)	0.217*** (0.062)	+
size of agricultural as % of GDP					0.040 (0.032)	-0.120*** (0.038)	-0.118*** (0.0363)	-0.091 (0.058)	-
general government gross debt as % of GDP					0.003 (0.005)	-0.018*** (0.005)	-0.017*** (0.005)	0.001 (0.003)	+
government final consumption expenditure as % of GDP					1.266*** (0.038)	0.094** (0.0461)	0.238*** (0.044)	1.325*** (0.425)	+
balance of trade as % of GDP					0.098*** (0.018)	0.036** (0.015)	0.044*** (0.015)	0.075*** (0.012)	+
inflation rate (%) per annum					0.063*** (0.023)	0.034*** (0.012)	0.038*** (0.013)	0.136** (0.056)	-
net FDI					0.030 (0.044)	0.047* (0.024)	0.0601** (0.024)	0.033 (0.022)	+
In freedom of corruption					-0.001 (0.005)	-0.002 (0.003)	-0.002 (0.003)	-0.009 (0.005)	+
political stability					2.02 (6.74)	0.0001 (0.0002)	0.0001 (0.0001)	-0.00002 (0.00003)	+/-

tax revenues as % of GDP (t-1)								-0.111 (0.345)
Estimation	Naive	PLS	PLS	PLS	PLS	FE	RE	GMM system
Model summary								
R-squared	0.258	0.283	0.283	0.283	0.712	0.256	0.247	
RESET-test (squares and cubes)	F = 35.444261, with p-value = P(F(2,1688) > 35.4443) = 8.34e-016							
RESET-test (cube only)	F = 70.078059, with p-value = P(F(1,1689) > 70.0781) = 1.18e-016							
RESET-test (squares only)	F = 67.687016, with p-value = P(F(1,1689) > 67.687) = 3.78e-016							
F-test for fixed effects						F(115, 1234) =53.55, Prob.=(0.0000)		
Hausman-test for random effects						Chi sq.= 211.78, Prob.=(0.0000)		
Ar(1)						z=-0.51 Pr>z=0.608		
Ar(2)						z=-1.03 Pr>z=0.302		
Number of instruments						17		
Sargan probability						0.131		

(a) (...) denotes the standard error;

(b) PSL, FE and RE denote panel least square, fixed-effects and random-effects, respectively;

(c) ***, **, and * denote significance at 1, 5 and 10 % level of significance, respectively.

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