CAN PUBLIC EDUCATION EXPENDITURE
REDUCE THE SHADOW ECONOMY?

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Abstract

This paper empirically examines whether devoting more resources to education can reduce the size of the shadow economy on a cross-section of countries. The findings show a negative relationship between public education expenditure and the size of the shadow economy, which is robust to the inclusion of different proxies for the control variables, a large set of policy variables and regional differences. The findings also suggest that an increase in educational attainment can reduce the size of the shadow economy.

Keywords: education; government expenditure; shadow economy, taxation.
JEL Classification: C13; H26; I20

1. Introduction

Each year there are an enormous number of economic transactions in the market which are not deliberately revealed to the public authorities. This phenomenon is known as *shadow economy*. According to the empirical evidence, the shadow economy has reached remarkable proportions with a weighted average size (as a percentage of GDP) of almost 40 percent in Sub-Saharan African countries, about 35 percent in mostly transition countries and 13.5 percent in high-income OECD countries (Schneider *et al.*, 2010). Policymakers often propose strict enforcement strategies to fight the shadow economy on the basis of the model developed by Allingham and Sandmo (1972). In this model tax evasion is negatively correlated with the probability of detection and the degree of punishment. Despite the strong focus on deterrence in policies fighting the shadow economy activities, the empirical evidence is really limited, because it is very difficulty to get data about who

is engaged in these activities, the frequencies with which these activities are occurring and the magnitude of them. The main results demonstrate that fines and punishment do not exert a negative influence on the shadow economy. However, these results are often weak and causality tests show that the size of the shadow economy can impact deterrence instead of deterrence reducing the shadow economy (Andreoni *et al.*, 1998; Feld*et al.*, 2009).

Differently, there is by now a rich empirical literature that investigates the relationship between the size of the shadow economy and a set of causal variables. Inadequate and slow economic growth rates, high unemployment rates, high marginal tax rates and high level of public consumption have been identified as the main driving forces of the shadow economy (Schneider *et al.*, 2000; Dell'Anno *et al.*, 2003; Marinov, 2008; Bovi *et al.*, 2009; Cicek *et al.*, 2010; Schneider *et al.*, 2010; Torgler *et al.*, 2010). In particular, these studies show a positive correlation between the size of the shadow economy and the government expenditure. The plausible interpretation of this result is that if the government spending does not satisfy the public preferences (for example, in presence of unnecessary or irrational government spending), then the tax payers are disappointed with the government and search for other options, such as engaging in shadow economy activities. Another interpretation of the positive sign of this coefficient gives support to the hypothesis that more State in the market, and subsequently an increase in regulation, incentives to operate in the unofficial economy (Dell'Anno *et al.*, 2003). However, since government must allocate scarce resources among various priorities (defence, education, infrastructure, etc.), it would be important to better understand if this positive relationship is robust to the various components of the public expenditure. More recently, there is a growing empirical evidence on the nexus between education and shadow economy, but these studies demonstrate mixed results. Torgler (2004) find a positive correlation between education and the size of the shadow economy in Switzerland, but they define this result as surprising, because the expected sign was negative. Gërxhani *et al.* (2013) find a negative correlation between shadow economy and education in the urban area of Tirana. Buehn *et al.* (2013) show that higher levels of education have positive effects on the shadow economy in an environment of weak political institutions.

In this context, the aim of this paper is to better ascertain the impact of the public education expenditure on the size of the shadow economy. In more details, the paper contributes to the literature in several ways. Firstly, the paper examines whether devoting more resources to education can negatively

affect the size of the shadow economy using a cross-section of 70 countries. Secondly, the paper identifies what level of education (primary, secondary or higher) implies a decreasing effect on the shadow economy.

The paper is organized as follows. Section 2 discusses the data and presents the empirical model. Section 3 reports the findings and Section 4 concludes.

2. Data and empirical specification

Data on the size of the shadow economy come from the data set developed by Schneider *et al.* (2010), that is the largest existing data set on the size and trends of the shadow economy in 162 countries over the period 1999 to 2006/2007. In Schneider *et al.* (2010) the shadow economy is defined as the production of all market-based legal goods and services that are deliberately concealed from public authorities for any of the following reasons: (i) to avoid payment of income, value added or other taxes; (ii) to avoid payment of social security contributions; (iii) to avoid having to meet certain legal labor market standards, such as minimum wages maximum working hours, safety standards, etc.; (iv) to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms. Schneider *et al.* (2010) use the macroeconomic multiple indicators multiple causes (MIMIC) model to estimate the size of the shadow economy.

The level of public education expenditure has been used to capture the intensity of support for public education in a country. Data on the public education expenditure levels come from the World Bank Database (World Bank, 2012).

In order to study the effect of public education spending on the shadow economy, the ordinary least-square (OLS) regression is carried out. In more details, the empirical specification is constructed as follows. Let SSE denote the size of the shadow economy, measured in percentage of GDP, then I regress SSE upon the log of the public education expenditure level, denoted as $LGEE$:

$$SSE_i = \beta_0 + \beta_1 LGEEi + \epsilon_i \tag{1}$$

where ϵ_i is the stochastic error term.

Furthermore, in order to capture both the quantity and quality effect of education, I regress SSE upon $LGEE$ and a matrix X of education variables

as follows:

$$SSE_i = \alpha + \beta LGEE_i + \gamma X_i + \epsilon_i \tag{2}$$

Matrix X is comprised of a set of three variables that capture the quality of education. These variables are the percentage of primary, secondary and higher education attainment in the adult population (PRI, SEC, HIGH). Data for these variables come from Barro and Lee (2010).

Finally, I regress SSE upon $LGEE$, the matrix X and a matrix Y as follows:

$$SSE_i = \alpha + \beta LGEE_i + \gamma X_i + \delta Y_i + \epsilon_i \tag{3}$$

Matrix Y includes a set of control variables, which are the main determinants of the shadow economy previously identified in literature. This set includes: GDP per capita, taxation and government effectiveness. Data on GDP per capita and taxation come from the World Bank Database (World Bank, 2012), whereas data on government effectiveness come from Kaufmann *et al.* (2010).

Finally, variables capturing macroeconomic conditions, income distribution, political stability and openness have been included for the robustness checks.

The sample consists of 70 observations on the latest year for which the shadow economy and education data are both available, namely 2005. The sample includes 34 countries from high-income group, 29 countries from middle-income group and 7 countries from low-income group. The lack of a larger sample size is caused by a lack of consistent and available data for many countries in the period of investigation. In Appendix, Tables A1 and A2 report more details concerning, respectively, the list of countries and summary statistics.

3. Results

To get a first insight Figure 1 plots the relationship between the size of the shadow economy, corrected for GDP versus public education expenditure (transformed in logarithmic terms). The scatter plot suggests a negative association. Furthermore, as specified in Equation (1), Table 1 shows the results of the bivariate regression (1.1) and confirms that the coefficient upon the log of the public education expenditure is negative.

[Figure 1 about here]

[Table 1 about here]

As it remains unclear as to whether the public expenditure variable is capturing a quantity or quality effect of education, three variables related to education level have been added as specified in Equation (2). The results of the multivariate regression (1.2), reported in Table 1, confirm the negative sign for the coefficient related to the public education expenditure variable, but also they show that an increase in educational attainment significantly reduces the size of the shadow economy. Following the lead of the literature on the impacts of education on crime (Lochner, 2004; Lochner *et al.*, 2004; Machin*et al.*, 2011), a plausible interpretation of these results is that through its positive effect on income returns, education should reduce the incentives to participate in the shadow economy, as taking on an official, well-paid job becomes more rewarding, hence attractive. This may be referred to as the *human capital effect* of education.

Furthermore, a set of three control variables, previously identified as the main driving forces of the shadow economy in literature, have been added as specified in Equation (3). These control variables include: GDP per capita, direct taxation and government effectiveness. The GDP per capita is an indicator of economic development. If on the one side, a downturn in the economic official activities may lead to a loss of jobs and thus drive more individuals into the hidden economy; on the other side, a contraction in the GDP may reduce the demand for underground products and thus offset the first effect. However, empirical evidence gives support to the hypothesis of negative relation between shadow economy and GDP per capita. The most popular determinants of tax evasion and of the shadow economy are tax rates. In literature, the common hypothesis is that an increase of the tax burden is a strong incentive to work in the unofficial economy and, hence, the expected sign is positive. Here, the direct tax burden is measured by means of the total share of direct tax as a percentages of GDP. Government effectiveness reflects the perception 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. The index ranges from -2.5 (weak) to 2.5 (strong) governance performance. The expected sign is negative.

The results of the multivariate regression (1.3) show that the selected control variables exhibit the predicted sign. A larger per capita GDP and

government effectiveness are associated with a smaller shadow economy. The higher the direct tax share on GDP the higher is the incentive to work in the shadow economy. The result of interest, however, pertains to education. The relationship between the size of the shadow economy and public education expenditure remains negative and statistically significant. The coefficients of primary and secondary attainment become positive, but the coefficient of higher attainment remains negative. This means that higher education levels discourages the participation to the shadow economy activities.

4. Robustness checks

This section investigates the robustness of the above findings by three tests.

Firstly, a set of six variables have been added to the specification (1.3), which capture macroeconomic conditions, openness, income distribution and political stability. This set includes: unemployment rate, currency, inflation rate, trade, political stability index and income inequality. Unemployment rate refers to the share of the labor force that is without work but available for and seeking employment. As most shadow economy activities are reflected in an additional use of cash (or currency), the currency outside the banks as a proportion of base money has been used as monetary indicator. The inflation rate is used as a proxy of macroeconomic instability. It is measured by the annual growth rate of the GDP implicit deflator and shows the rate of price change in the economy as a whole. Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product. Political stability reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism; the index ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. The Gini coefficient has been used as measure of income inequality. On the basis of empirical evidence, the expected sign of the impact on the size of the shadow economy is negative for the political stability index and positive for the use of currency and income inequality; the effects of the inflation rate, trade and unemployment rate are ambiguous. Data on government stability come from Kaufmann *et al.* (2010), whereas data on the other variables come from the World Bank Database (World Bank, 2012). The multivariate regression is reported in Table 2. The results show a strikingly consistent pattern of the education and control variables with the specification (1.3). Currency,

political stability and income inequality exhibit the expected sign. Public education expenditure, government effectiveness and income inequality are statistically significant and the F test indicates that the estimated coefficients are jointly significant.

[Table 2 about here]

Since one may be concerned that the findings was driven by the specific set of proxies used in the specification (1.3), table 3 shows the results of the robustness checks including the substitution of the education and control variables by other indicators. In more details, I replace the log of public education expenditure with two variables expenditure per student in secondary and tertiary schooling level (specification 3.1); the educational attainment levels (primary, secondary and higher) with no schooling and the average schooling years (specification 3.2); direct tax as percentage of GDP with log of direct tax revenues per capita (specification 3.3); government effectiveness with the size of the government (specification 3.4). The results are very similar amongst the regressions. Public education expenditure exhibits a negative sign and its order is remarkable stable across regressions. In specification (3.1) the education expenditure per student decreases the size of the shadow economy for the highest schooling level. Substitution of the education attainment levels with the average schooling years confirms the *human capital effect* of education: an increase in average education level reduces the size of the shadow economy. In summary, the findings are robust to the definition of control variables.

Finally, in specification (3.5), the model checks for regional differences using dummies to reduce the omitted variables bias. The results show a positive sign both for middle and low income countries. Although the dummies variables are not significant, we can consider the results as robust, as the F test indicates that the estimated coefficients are jointly significant.

[Table 3 about here]

5. Conclusions

This article provides a first attempt to measure the impact of the public education expenditure on the size of the shadow economy.

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Using a cross-section of 70 countries for the year 2005, the findings show a negative relationship between the size of the shadow economy and the public education expenditure. The empirical results appear to be robust to different proxies of the control variables, a large set of policy variables and regional differences.

The policy implications of this paper are that support for education is beneficial not only for raising the human capital to spur economic growth. In fact, these results emphasize the role of education suggesting that policies designed to increase educational attainment levels can reduce the size of the shadow economy. Intuitively, these results may be interpreted in two ways. First, as education increases wage rates, it increases the opportunity costs of participating to shadow economy activities. Second, education may affect on the social and moral dynamics and, hence, it may increase tax moral in the individuals influencing (positively) their willingness to pay taxes.

In order to provide to policy-makers a better understanding of the nexus between education and shadow economy, future research should focus on different case studies in various geographical regions at the micro level.

APPENDIX

[Table A1 about here]

[Table A2 about here]

References

Allingham, M.G., Sandmo, A. (1972). Income Tax Evasion: A Theoretical Analysis, *Journal of Public Economics*, **1**, 323-338.

Andreoni, J.,Erard, B., Feinstein, J. (1998). Tax Compliance, *Journal of Economic Literature*, **36**, 818-860.

Barro, R.J., Lee, J. (2010). A New Data Set of Educational Attainment in the World, NBER Working Paper No. 15902, the National Bureau of Economic Research, Cambridge, MA.

Beck, T., Al-Hussainy, E., (2008). *A new database on financial development and structure.* The World Bank/DECRG-FI, Washington, D.C..

Bovi, M., Dell'Anno, R. (2009). The changing nature of the OECD shadow economy, *Journal of Evolutionary Economics*, **20**, 19-48.

Buehn, A., Farzanegan, M.R. (2013). Impact of education on the shadow economy: Institutions matter, *Economics Bullettin*, **33**, 2052-2063.

Cicek, D., Elgin, G. (2010). Cyclicality of fiscal policy and the shadow economy, *Empirical Economics*, **41**, 725-737.

Dell'Anno, R., Schneider, F. (2003). The Shadow Economy of Italy and other OECD Countries: What do we know? *Journal of Public Finance and Public Choice*, **31**, 97-120.

Feld, L.P., Larsen, C. (2009). *Undeclared Work in Germany 2001-2007 Impact of Deterrence, Tax Policy, and Social Norms: An Analysis Based on Survey Data*, Springer, Berlin et al.

Gërxhani, K., van de Werfhorst, H. G. (2013). The effect of education on informal sector participation in a post-communist country, *European Sociological Review*, **29**, 464-476.

Kaufmann, D., Kraay, A., Mastruzzi, M. (2010). The Worldwide Governance Indicators : A Summary of Methodology, Data and Analytical Issues, World Bank Policy Research Working Paper No.5430.

Lochner, L. (2004). Education, Work and Crime: A Human Capital Approach, *International Economic Review*, **45**, 811-843.

Lochner, L., Moretti, E. (2004). The effect of education on Crime: Evidence from Prison Innates, Arrests and Self Reports, *American Economic Review*, **94**, 155-180.

Machin, S., Marie, O., Vujic, S. (2011). The crime reducing effect of education, *Economic Journal*, **121**, 463-84.

Marinov, A. (2008). Hidden economy in the rural regions of Bulgaria, *International Review on Public and Nonprofit Marketing*, **5**, 71-80.

Schneider, F., Buchn, A., Montenegro, C.E. (2010). Shadow economies all over the world, World Bank Policy Research Working Paper No.5356, World Bank, Washington, DC.

Schneider, F., Enste, D.H. (2000). Shadow economies: size, causes and consequences, *Journal of Economic Literature*, **38**, 77-114.

Torgler, B. (2004) Cross-culture comparison of tax morale and tax compliance: evidence from Costa Rica and Switzerland, *International Journal of Comparative Sociology*, **45**, 1743.

Torgler, B., Schneider, F., Schaltegger, C.A. (2010). Local autonomy, tax morale, and the shadow economy, *Public Choice*, **144**, 293-321.

World Bank (2012). *World Development Indicators.* World Bank, Washington D.C..

Figure 1. Shadow economy vs. public education expenditure
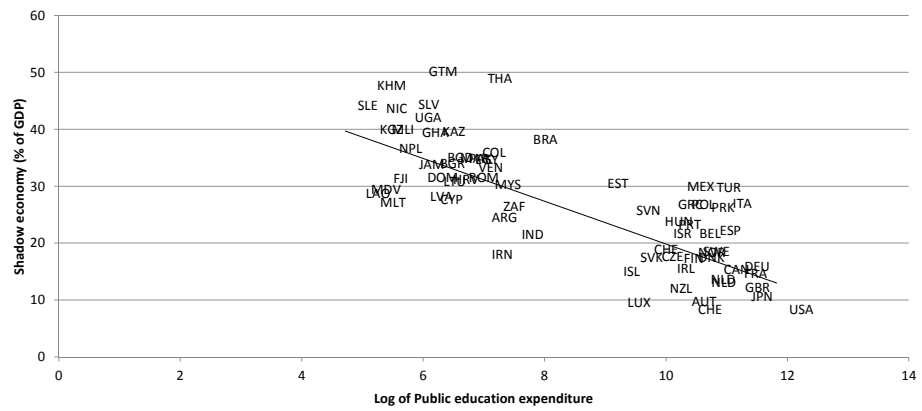
Table 1. Least square regressions, dependent variable: size of the shadow economy (% of GDP).

	(1.1)	(1.2)	(1.3)
Const.	57.419	51.934	52.628
	(18.86)***	(13.67)***	(5.56)***
Log of Public education expenditure	-3.759	-2.249	-1.569
	(10.34)***	(2.76)***	(1.99)**
Primary school attained (% of population aged 25 and over)		-0.049	0.068
		(0.59)	(0.84)
Secondary school attained (% of population aged 25 and over)		-0.079	0.041
		(1.27)	(0.63)
Higher school attained (% of population aged 25 and over)		-0.216	-0.011
		(2.07)***	(0.10)
Log of GDP per capita			-3.436
			(1.16)
Direct tax (% of GDP)			0.064
			(0.32)
Government effectiveness			-4.606
			(2.42)**
N	70	70	70
F	106.98***	29.14***	23.42***
R^2	0.611	0.642	0.726
Adj. R^2	0.605	0.619	0.695

Absolute t-statistics are displayed in parentheses under the coefficient estimates.

* Statistically significant at the 10% level

** Statistically significant at the 5% level

* Statistically significant at the 1% level

Table 2. Least square regressions, dependent variable: size of the shadow economy (% of GDP).

	(2.1)
Const.	40.706
	(3.79)***
Log of Public education expenditure	-1.647
	(1.71)*
Primary school attained (% of population aged 25 and over)	0.066
	(0.79)
Secondary school attained (% of population aged 25 and over)	0.069
	(0.96)
Higher school attained (% of population aged 25 and over)	-0.031
	(0.28)
Log of GDP per capita	-2.139
	(0.64)
Direct tax (% of GDP)	0.063
	(0.31)
Government effectiveness	-4.903
	(1.99)*
Unemployment	-0.247
	(1.29)
Currency	0.004
	(0.82)
Inflation	-0.163
	(0.95)
Openness	0.022
	(1.00)
Political stability	-0.713
	(0.51)
Income inequality	0.212
	(2.01)**
N	70
F	13.38***
R^2	0.756
Adj. R^2	0.699

Absolute t-statistics are displayed in parentheses under the coefficient estimates.

* Statistically significant at the 10% level

** Statistically significant at the 5% level

* Statistically significant at the 1% level

Table 3. Least square regressions, dependent variable: size of the shadow economy (% of GDP).

	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)
Const.	42.767	65.882	58.14	69.827	50.339
	(2.70)***	(5.17)***	(5.20)***	(10.73)***	(3.64)***
Log of Public education expenditure		-1.21	-1.545	-1.867	-1.544
		(1.91)*	(2.06)**	(2.28)**	(1.91)*
Expenditure per student, secondary (% of GDP per capita)	0.053				
	(0.39)				
Expenditure per student, tertiary (% of GDP per capita)	-0.01				
	(0.33)				
Primary school attained (% of population aged 25 and over)	-0.059		0.069	0.063	0.068
	(0.56)		(0.87)	(0.75)	(0.82)
Secondary school attained (% of population aged 25 and over)	-0.07		0.049	0.024	0.045
	(0.89)		(0.76)	(0.35)	(0.51)
Higher school attained (% of population aged 25 and over)	-0.188		-0.016	-0.063	-0.008
	(1.54)		(0.16)	(0.58)	(0.94)
No schooling (% of population aged 25 and over)		-0.148			
		(1.65)			
Average years of total schooling		-0.813			
		(1.35)			
Log of GDP per capita	-1.937	-4.731	-6.449	-7.585	-3.088
	(0.39)	(1.45)	(1.41)	(2.90)***	(0.84)
Direct tax (% of GDP)	0.129	0.058		-0.022	0.066
	(0.54)	(0.31)		(0.11)	-0.32
Log of direct tax revenues per capita			2.406		
			(0.92)		
Government effectiveness	-5.399	-3.787	-4.59		-4.516
	(1.94)*	(1.98)*	(2.46)**		(2.26)**
Government final consumption expenditure omitting education expenditure(% of GDP)				0.03	
				(0.15)	
Middle income dummy (=1 if country is Middle Income, =0 otherwise)					0.936
					(0.30)
Low income dummy (=1 if country is Low Income, =0 otherwise)					1.28
					(0.23)
N	54	70	70	70	70
F	20.90***	28.82***	23.81***	20.64***	17.67***
R^2	0.702	0.7333	0.729	0.699	0.726
Adj. R^2	0.669	0.707	0.698	0.665	0.685

Absolute t-statistics are displayed in parentheses under the coefficient estimates.

* Statistically significant at the 10% level, ** Statistically significant at the 5% level, * Statistically significant at the 1% level

Table A1. List of countries.

High Income		Middle Income		Low income	
AUS	Australia	ARG	Argentina	BGD	Bangladesh
AUT	Austria	BRA	Brazil	KHM	Cambodia
BEL	Belgium	BGR	Bulgaria	KGZ	Kyrgyzstan
CAN	Canada	CHE	Chile	MLI	Mali
HRV	Croatia	COL	Colombia	NPL	Nepal
CYP	Cyprus	DOM	Dominican Rep.	SLE	Sierra Leone
CZE	Czech Republic	EGY	Egypt	UGA	Uganda
DNK	Denmark	SLV	El Salvador		
EST	Estonia	FJI	Fiji		
FIN	Finland	GHA	Ghana		
FRA	France	GTM	Guatemala		
DEU	Germany	IND	India		
GRC	Greece	IRN	Iran (Islamic Republic of)		
HUN	Hungary	JAM	Jamaica		
ISL	Iceland	KAZ	Kazakhstan		
IRL	Ireland	LAO	Lao PDR		
ISR	Israel	LVA	Latvia		
ITA	Italy	LTU	Lithuania		
JPN	Japan	MYS	Malaysia		
PRK	Korea, Rep.	MDV	Maldives		
LUX	Luxembourg	MEX	Mexico		
MLT	Malta	MAR	Morocco		
NLD	Netherlands	NIC	Nicaragua		
NZL	New Zealand	PAK	Pakistan		
NOR	Norway	ROM	Romania		
POL	Poland	ZAF	South Africa		
PRT	Portugal	THA	Thailand		
SVK	Slovak Republic	TUR	Turkey		
SVN	Slovenia	VEN	Venezuela		
ESP	Spain				
SWE	Sweden				
CHE	Switzerland				
GBR	United Kingdom				
USA	United States				

Table A2. Summary statistics

	Mean	Std. Deviation	Minimum	Maximum
Average years of total schooling	8.55	2.96	1.16	13.19
Currency outside the banks as a proportion of base money	33.34	13.30	1.60	80.34
Direct tax (% of GDP)	5.84	4.54	0.42	23.20
Expenditure per student, secondary (% of GDP per capita)	21.97	8.91	2.97	47.74
Expenditure per student, tertiary (% of GDP per capita)	40.76	44.52	5.60	296.52
Government effectiveness	0.56	1.00	-1.36	2.16
Government final consumption expenditure omitting education expenditure(% of GDP)	16.14	5.17	4.07	26.19
Higher school attained (% of population aged 25 and over)	14.33	11.96	0.33	53.05
Income inequality	37.06	9.24	24.00	67.40
Inflation rate	5.40	5.24	-1.74	29.60
Log of direct tax revenues per capita	2.50	0.90	0.50	3.80
Log of GDP per capita	3.85	0.69	2.38	4.91
Log of Public education expenditure	8.08	2.22	4.72	11.82
No schooling (% of population aged 25 and over)	14.33	18.94	0.00	79.83
Openness (Trade as % of GDP)	86.11	45.53	26.53	286.15
Political stability	0.16	0.91	-2.11	1.59
Primary school attained (% of population aged 25 and over)	18.68	12.20	0.19	53.93
Secondary school attained (% of population aged 25 and over)	34.23	22.39	0.77	87.30
Size of the shadow economy (% of GDP)	27.04	10.69	8.50	50.20
Unemployment rate	7.53	4.38	1.30	26.70