Volume 33, Issue 3

Impact of education on the shadow economy: Institutions matter

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Abstract

Using panel data for more than 80 countries from 1999-2007 this paper studies the marginal effect of education on the shadow economy, particularly considering the quality of institutions. The results show that higher levels of education fuel the shadow economy in an environment of weak political institutions.

1. Introduction

International organizations such as the World Bank allocate a significant budget to support education, one of the most important determinants of a country's prosperity.[1] As of April 2012, the World Bank spent an average annual amount of $2.4 billion on education in low- and middle-income countries.[2] The expectations are high: human capital formation is expected to translate into increased direct productivity, more innovation and higher levels of development.

Problems arise when the formal economy is unable to provide employment due to structural problems and weak institutions that distort the labor market and impede fair returns on investments into education. Individuals could then turn to the shadow economy to earn a living. In fact, the average size of the shadow economy in developing countries has grown to one third of official GDP (Buehn and Schneider, 2012), suggesting this to be an all too common scenario.

Surprisingly, there is still a lack of empirical research on the nexus between education, institutions and the shadow economy.[3] A recent study on the shadow economy-education nexus is the work of Gërxhani and van de Werfhorst (2013). They examine the role of education for the size of the informal economy in the urban area of Tirana, in particular the role of human capital and enlightenment in the education-shadow-economy-nexus. The human capital factor refers to the decreasing effect of education on the shadow economy through increasing income and opportunity cost. Enlightenment emphasizes the decreasing effect of education on the shadow economy by formation of attitudes. The authors use survey data and logit regressions to explain participation in the informal economy and find a negative correlation between education and the shadow economy. They provide empirical evidence for the enlightenment factor against ideological refinement: the interaction term between the level of household income and two subjective indicators (tax immorality and pessimism on formal institutions) is not statistically significant.

In our paper, we add to the literature by investigating the shadow economy-education-nexus at the country level, taking into account the moderating role of political institutions. We show that education can only reduce the size of the shadow economy when open and transparent political institutions are in place. Already Renooy (1990) explains two important factors behind the incentives of going underground: structural and opportunity factors. The former refers to institutional constraints, the latter to individual characteristics such as education, skills, living style and non-individual factors such as culture, values and tradition. Stulhofer (1997) for Croatia and Hanousek and Palda (2004) for the Czech Republic show that tax evasion (as a part of informal economy) increases with education. Schneider and Enste (2000) mention that a decline of "civic virtue" and loyalty towards formal institutions increases tax evasion. Torgler (2004) however finds a decreasing effect of education on tax evasion in Costa Rica and Switzerland. These mixed results may suggest that the quality of institutions is important to understand the final effect of education on the shadow economy.

Our paper aims to answer the question whether education and its interplay with a society's institutions are important elements explaining the dynamics of participation in the

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[1] The effects are however not conclusive. Pritchett (2001), for example, does not find any meaningful relationship between rising educational attainment and growth of output per worker, relating it – among other things – to a weak institutional environment in developing countries.

[2] For more details see http://go.worldbank.org/ZPG46KIAK1

[3] Another strand of the literature investigates the negative effects of corruption on genuine wealth per capita, controlling for education and political freedom (see e.g. Aidt, 2009).

shadow economy.[4] 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. At the same time though, education contributes to the formation of values and helps people to understand the importance of paying taxes. Higher morale sentiments should reinforce the reluctance to enter the shadow economy. If institutions are however severely deprived, education may be less effective a mechanism to reduce shadow economy participation. We call this the *normative effect*. Using panel data for more than 80 countries[5] between 1999 and 2007, the empirical analysis presented in this paper tests the relationship between the shadow economy and education, taking into account the impact of institutions and controlling for other important factors such as the tax burden. Our results show that political institutions matter for the total effect of education on the shadow economy.

2. Data and methodology

In order to study the effect of education on the shadow economy and the moderating role of institutions, we estimate the following panel regression:

$$shadow_{it} = cons + \beta_1 edu_{it} + \beta_2 inst_{it} + \beta_3 edu_{it} \times inst_{it} + \gamma X_{it} + \mu_i + \delta_t + \varepsilon_{it}, \qquad (1)$$

where the subscripts denote country i and time period t, μ_i denotes country fixed effects, and δ_t time fixed effects. The dependent variable ($shadow_{it}$) is the shadow economy, measured in % of GDP. The source of the shadow economy data is Buehn and Schneider (2012).

As estimating the size and trend of the shadow economy is a difficult and challenging task different methods have been developed and applied. Buehn and Schneider (2012) use the macroeconomic multiple indicators multiple causes (MIMIC) model to study the determinants of the shadow economy and estimate its size. The MIMIC model is based on the statistical theory of unobserved variables and uses covariance structures to explain the relationship between observable variables and an unobservable phenomenon – here the shadow economy, which is defined as the production of legal goods and services that is concealed from authorities to avoid taxes and social security contributions, compliance with labor market standards or paperwork. The MIMIC model uses several indicator variables for the phenomenon shadow economy – which is not directly quantifiable – at the same time and studies the multiple determinants (causes) driving people off the official economy such as the tax burden, the degree of regulation, or unemployment. Using an exogenous benchmark estimate usually taken from the currency demand approach the MIMIC model estimates are converted into shadow economy estimates in percentage of official GDP. MIMIC model based estimations of the shadow economy are widely used in the literature.[6]

We use two variables as measures of education: first, the secondary school enrollment rate (*edu1*) – which is more appropriate than tertiary education as it has a higher coverage in the population in developing countries – and second, the youth literacy rate in % of people aging 15-24 (*edu2*). The importance of secondary education in the development process is also reflected in the statement of Jean-Louis Sarbib, Senior Vice President of the World Bank's Human Development Network: "Secondary education is the highway between primary schooling, tertiary education, and the labor market. Its ability to connect the different

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[4] We focus on the average size of a country's shadow economy and neglect its regional variations. A recent study analyzing regional differences of shadow economic activities across Germany is Buehn (2012).
[5] The number of countries in the sample reduces to 53 by using youth literacy rate in models 4, 5, and 6.
[6] See, for example, Biswas et al. (2012), Buehn et al. (2013) or Dobson and Dobson (2012).

destinations and to take young people where they want to go in life is crucial"[7]. If the institutions work well, secondary education equips a larger portion of the public with the skills necessary for formal jobs. Secondary education has important implications for the networks of civil engagements and social capital too (Welsh, 2003; Balatti and Falk, 2002 and Schuller et al. 2002). Case studies for the US and the UK show that higher levels of secondary education enrollment increases newspaper readership and free speech. It changes attitudes, increasing participation in politics, elections, and promote active citizenship (Dee, 2004, Milligan et al., 2004). The youth literacy rate refers to the proportion of people in the age group 15 to 24 years who can both read and write with understanding a short simple statement on their everyday life. We believe that this age group is appropriate for the analysis of the shadow economy-education-nexus as previous studies have shown that workers in the informal economy have lower skills and are more willing to take on low-paid jobs that do not carry entitlements for social security contributions. Given the demographics in most countries of the developing world, this part of the population constitutes a significant figure.[8] In addition, the correlation between the youth literacy rate and total adult literacy rate, i.e., (literate people in % of people ageing 15 and above) is 0.96, meaning that both move in the same direction.

To measure the quality of political institutions (*institutions*), we use the *Polity2* index, which runs from -10 (full dictatorship) to 10 (full democracy).[9] Hence, higher values mean a better quality of political institutions. Several time-invariant country characteristics such as culture, geography or religion potentially affect the shadow economy, increasing the risk of omitted variable bias. Allowing for country fixed effects (μ_i) in the regression eliminates the latent heterogeneity between countries and reduces the risk of an omitted variable bias. The time fixed effects (δ_t) capture shocks common to all countries such as a global financial crisis. To reduce the effects of outliers, we transform the shadow economy, political institutions, and education variables logarithmically, also making the interpretation of coefficients a lot easier. Other time-variant determinants (X_{it}) may affect the shadow economy in addition to education and the quality of institutions. We thus control for the most important determinants of the shadow economy such as inflation, corporate income taxes, social security contributions and payroll taxes, and the level of development using the real GDP per capita.[10]

We generalize the idea of Farzanegan (2009), who investigates the role of education on illegal trade in Iran showing that the final effect of education on illegal trade indeed depends on the quality of institutions, for the whole informal sector. As argued above we expect that education affects the shadow economy through the human capital effect and that this effect depends on the quality of institutions (*normative effect*). Weak institutions may entail better-educated people to use their skills and knowledge in rent-seeking and highly profitable activities of the informal sector. As a consequence, the shadow economy rises despite improvements in education. Our main hypothesis is thus as follows:

Hypothesis: *Education may increase the size of shadow economy if the quality of institutions in a society is low.*

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[7] http://go.worldbank.org/22KVDJ7RN0. The World Bank has detailed information on the complex role of secondary education in development process: http://go.worldbank.org/G49E1SQ1M0

[8] Bjorvatn and Farzanegan (2013) elaborate the demographic transition in resource rich countries finding that resource rents besides quality of institutions are responsible for the demographic curse in developing countries.

[9] We re-scaled this variable to run from 0 to 1.

[10] The Hausman test shows that fixed effect estimation (model 2) is preferable to random effect (model 3). The p-value is 0.01.

3. Results

Table 1 shows the empirical results testing whether education affects the shadow economy and if that effect depends on the quality of institutions. We present three different models: a pooled OLS, a fixed-effects OLS, and a random-effects GLS model. The pooled OLS model shows an overall correlation among data without controlling for unobservable country fixed effects and common (time) shocks. The fixed effects model studies the effects of within country changes of education, institutional quality, and their interaction on within country changes of the shadow economy, thus reducing the endogeneity bias that arises because of unobserved cross-country heterogeneity (Arezki and Brückner, 2011). For comparison, we also report the results of the random effects model in table 1. While specifications 1 to 3, 7 and 8 use the secondary school enrollment rate, specifications 4 to 6 employ the youth literacy rate as measure of education.

The estimations of equations (1)-(3), 7 and 8 yield some interesting results. First, the interaction term between education and institutional quality is statistically significant in all models, indicating that the marginal impact of education on the shadow economy indeed depends on the level of institutions. If a country suffers from weak institutions (*institutions* = 0), the marginal impact of education is positive and statistically significant at the 5% level (fixed effects and random effects models). In such an environment, investments in education would fuel the informal sector rather than improving the productivity of the official labor force. However, improving the quality of institutions can limit this negative effect of education. In other words, countries with stronger institutions are better able to channel human capital into the formal, more productive part of the economy.

While the pooled OLS model tends to over-estimate the direct and indirect effects of education on the shadow economy, the fixed effects model presents more conservative point estimates, controlling for potential omitted variable biases. In model 7, we re-estimate model 1 by controlling for regional differences using dummies to reduce the omitted variable bias. The results remain robust. The results of the random effects model results are very similar to those of the fixed effects model. Using the youth literacy rate as a measure for the level of education in specifications 4 to 6, the fixed effects model confirms our main hypothesis: Political institutions of high quality are necessary for education to be prolific for an economy. The interaction term between youth education and political institutions is statistically significant at the 1% level. The marginal impact of a 1% increase of the education level on the shadow economy is for different levels of institutional quality demonstrated in Figures 1 and 2.

Table 1: Education, institutions and the shadow economy, 1999-2007

	(1)	(2)	(3)	(4)	(5)	(6)	(7) Pooled + Dummies	(8) 2SLS
	Pooled	FE	RE	Pooled	FE	RE		
Secondary school enrollment (edu1)	0.511*** (6.11)	0.0345** (2.03)	0.0343** (2.06)				0.221*** (2.90)	0.351*** (2.77)
Youth literacy rate (edu2)				-0.156 (-0.36)	2.022*** (2.78)	0.452 (1.14)		
Institutions	3.215*** (4.09)	0.171* (1.73)	0.184* (1.86)	-1.652 (-0.47)	20.39*** (2.82)	3.371 (1.02)	1.90*** (2.84)	3.04*** (2.62)
*Institutions*edu1*	-0.707*** (-3.92)	-0.0449* (-1.80)	-0.0482* (-1.92)				-0.352** (-2.25)	-0.619** (-2.32)
*Institutions*edu2*				0.540 (0.64)	-4.313*** (-2.71)	-0.645 (-0.84)		
Inflation	-0.000123 (-0.23)	0.000142 (1.13)	0.000142 (1.20)	-0.000217 (-0.40)	-0.00103 (-0.65)	0.000200 (0.43)	-0.000 (-1.30)	-0.001 (-0.63)
GDP per capita	-0.276*** (-14.77)	-0.138*** (-6.64)	-0.152*** (-8.14)	-0.146** (-2.33)	-0.332*** (-3.82)	-0.125*** (-3.19)	-0.257*** (-16.57)	-0.271*** (-12.6)
Corporate income tax (% of GDP)	0.00577 (0.76)	-0.00193 (-1.52)	-0.00171 (-1.33)	0.0153 (0.57)	-0.00688 (-1.23)	-0.00800* (-1.66)	0.018*** (3.68)	0.023*** (4.20)
Social security taxes (% of GDP)	0.000064 (0.02)	0.00107 (0.75)	0.000895 (0.61)	-0.00646 (-0.72)	-0.00591 (-0.66)	-0.00548 (-0.74)	-0.01*** (-4.67)	-0.013*** (-3.63)
Obs.	607	607	607	78	78	78	607	384
R-squared	0.53	0.73	0.51	0.17	0.96	0.19	0.62	
Cragg-Donald Wald F statistic								157.70
Hansen J statistic (p-value)								0.109

Note: The dependent variable is the logarithm of the shadow economy (% of GDP). Pooled, FE and RE refer to the pooled, fixed effects and random effects models, respectively. All models include a constant term (not reported). Standard errors are clustered at the country level and robust t-statistics are reported in parentheses. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively. Data except for the quality of political institutions are taken from the World Bank (2012); the *Polity2* index is explained in Marshall et al. (2011). In models 7 and 8 (2SLS) we also control for East Asia & Pacific, Sub Sahara Africa and North America regional dummies. The used instruments for INST and INST*EDU1 are their 1 to 3 years lags.
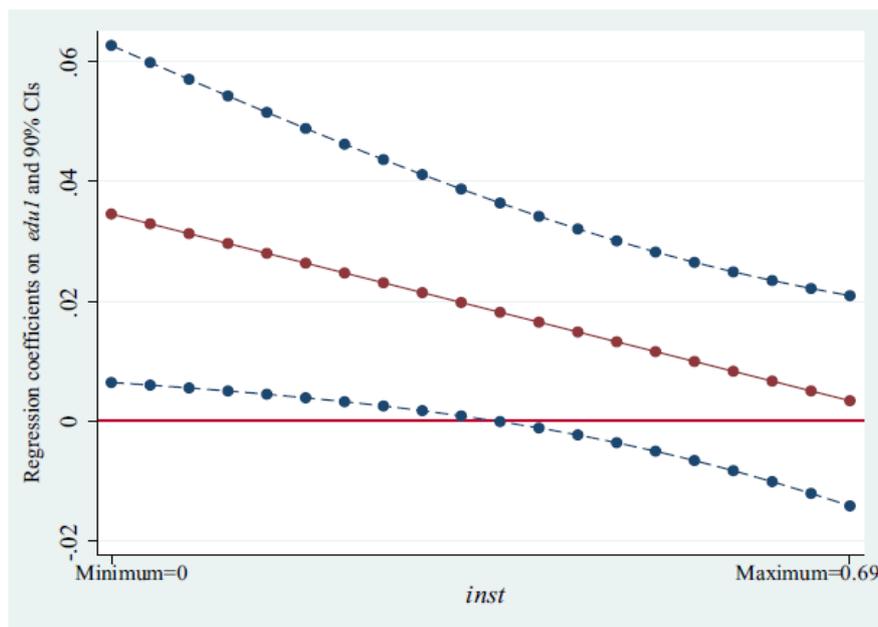
Figure 1. Marginal effect of the secondary school enrollment rate on the shadow economy

Note: The solid line shows the marginal effect, while the dashed lines are the 90% confidence intervals. Calculations are based on specification 2.

As evident from both figures, improving the quality of institutions can help the government to mitigate the adverse outcome of increasing levels of education automatically feeding the shadow economy. Figure 2 also shows that stronger institutions significantly moderate the initially increasing effect of improved youth literacy on shadow economic activities. In other words, the blessing effect of education realizes only at higher levels of institutional quality. Model 8 aims to identify the causal effect of institutions and its interaction with education on the shadow economy. There may exist a reverse feedback from the shadow economy to institutions: the more workers operate in the shadow economy or evade taxes, the higher are attitudes towards less transparent institutions.[11]

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[11] We thank an anonymous referee for drawing our attention to this point.
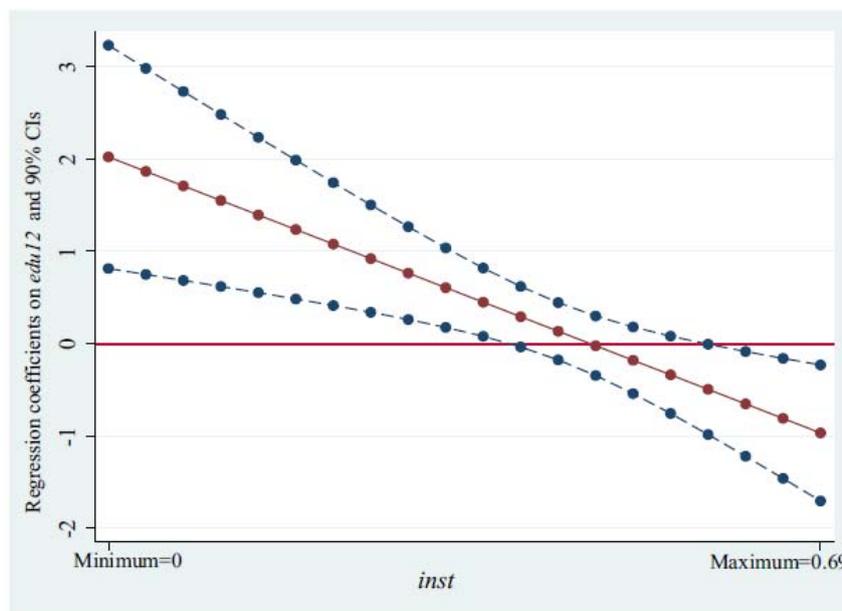
Figure 2. Marginal effect of the youth literacy rate on the shadow economy

Note: The solid line shows the marginal effect, while the dashed lines are the 90% confidence
intervals. Calculations are based on specification 5.

However, formation of institutions is a long-term process. They define the rule of the game
for both formal and informal economic agents. Changes in the shadow economy in the short
run (as in our sample period) may not cause a significant causal effect on persistent and slow
changing concepts such as institutions. On the contrary, in the long run a sizable shadow
economy may undermine the institutional quality of a country. The issue of possible reverse
causality between the shadow economy and institutions have already examined in the
literature: in a sample of 69 countries using instruments such as long-standing linguistic
fractionalization, the origins of the legal system, religious composition of the population and
latitude, Friedman et al. (2000, p. 460) conclude: "there is an exogenous component of
'institutions' that is significantly correlated with the size of the unofficial economy. This
suggests a causal link running from weak economic institutions to a large unofficial
economy". The exogeneity of institutions for the shadow economy is also demonstrated
empirically in Dreher et al. (2009). Nevertheless, we have also estimated a 2SLS model, using
internal instruments (1 to 3 lags of INST and INST*EDU1). Our main findings remain robust:
increasing education can decrease the size of shadow economy conditional on better quality of
political institutions (model 8). The Cragg-Donald Wald F statistic shows that instruments are
strong and relevant. The Hansen J statistic (over-identification test of all instruments) shows
that the instruments are also valid at 10% (not correlated with error term).

Another relevant concern is the possible correlation between education and institutions. If
education and institutions were strongly correlated, we may have a problem to identify their
individual effects on the shadow economy. The pairwise correlations between INST
[(ln(polity21)] and ln(EDU1) (secondary school enrollment) and ln(EDU12) (youth literacy
rate) however show that this it is not a serious problem: The correlation of institutions to
secondary education is 0.31 and to the youth literacy rate is 0.04. According to Baum (2006,
p.87), even if we had near co-linearity (not a perfect one), *"we can safely ignore it. Because
near co-linearity inflates standard errors, significant coefficients would become more
significant if the sample contained fewer collinear regressors"*.

4. Conclusion

The macroeconomic evidence of higher education on economic growth is often mixed and one wonders if the size of the shadow economy and the quality of institutions may explain these results. This paper examines the effect of education on the shadow economy for more than 80 countries from 1999 to 2007, taking into account the quality of institutions. We find that higher levels of educational participation reduce shadow economic activities only in an environment characterized by political institutions of high quality. Future research should focus on different case studies in various geographical regions in order to examine the role education plays for shadow economy activities and a potentially moderating role of income and institutions on that nexus at the micro level.

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Appendix

List of countries in Models 1-3 (88 countries)

Albania	Argentina	Armenia	Australia
Austria	Azerbaijan	Bahrain	Belarus
Belgium	Benin	Bolivia	Brazil
Bulgaria	Burkina Faso	Cameroon	Canada
Cape Verde	Colombia	Congo, Dem. Rep.	Costa Rica
Cote d'Ivoire	Croatia	Cyprus	Czech Republic
Denmark	Dominican Republic	Estonia	Finland
France	Georgia	Germany	Greece
Guatemala	Honduras	Hungary	Indonesia
Iran	Ireland	Israel	Italy
Jamaica	Japan	Jordan	Kazakhstan
Kenya	Korea Rep.	Latvia	Lithuania
Madagascar	Mali	Mauritius	Mexico
Moldova	Mongolia	Morocco	Namibia
Nepal	Netherlands	New Zealand	Niger
Norway	Oman	Panama	Paraguay
Peru	Poland	Portugal	Romania
Russian Federation	Senegal	Slovak Republic	Slovenia
South Africa	Spain	Sri Lanka	Sweden
Switzerland	Tajikistan	Thailand	Togo
Trinidad and Tobago	Tunisia	Turkey	Ukraine
United Kingdom	United States	Uruguay	Venezuela

List of countries in Models 4-6 (53 countries)

Albania	Argentina	Armenia	Azerbaijan
Bahrain	Bolivia	Benin	Brazil
Bulgaria	Burkina Faso	Congo Dem. Rep.	Costa Rica
Cameroon	Cote d'Ivoire	Croatia	Cyprus
Dominican Republic	Estonia	Greece	Guatemala
Honduras	Hungary	Indonesia	Iran
Italy	Jordan	Lithuania	Mali
Mexico	Moldova	Mongolia	Morocco
Nepal	Niger	Panama	Papua New Guinea
Peru	Poland	Romania	Russia
Senegal	Slovenia	South Africa	Spain
Sri Lanka	Thailand	Togo	Trinidad Tobago
Tunisia	Turkey	Ukraine	Uruguay
Venezuela			