

INSTITUTIONS, POLICIES AND ECONOMIC DEVELOPMENT. WHAT ARE  
THE CAUSES OF THE SHADOW ECONOMY?

LUISANNA ONNIS AND PATRIZIO TIRELLI

# Institutions, policies and economic development. What are the causes of the shadow economy?\*

Luisanna Onnis<sup>†</sup>  
University of Milano-Bicocca

Patrizio Tirelli<sup>‡</sup>  
University of Milano-Bicocca

June 2011

## Abstract

What are the causes of the shadow economy? We provide new answers to this old question. The sharp distinction between theoretical priors on the institutional determinants of the shadow economy and the technique used for its measurement is the first novel contribution of the paper. The second innovation is that, unlike previous contributions, we document a specific role for institutional variables in shaping economic incentives to "go underground", irrespective of the stage of economic development. The third innovation is that - after controlling for institutional quality and for the level of development - public expenditures have a negative impact on the shadow economy.

## 1 Introduction

The existence of a shadow economy has attracted considerable attention by economists and policymakers. This is hardly surprising. On the one hand, the unobserved component of national economies accounts for a large share of GDP in poor countries (La Porta and Shleifer, 2008) and remains important at least in some developed economies like Belgium, Greece, Italy, Portugal and Spain (Dell'Anno, 2003; Alañón-Pardo and Gómez-Antonio, 2005; Dell'Anno, Gómez-Antonio and Alañón-Pardo, 2007). On the other hand, the existence of a relatively large informal sector may have important economic consequences. For instance, the productive potential of unofficial firms is typically constrained by limited access to public goods (De Soto, 1989, 2000), but tax evasion also limits governments ability to supply such public goods and may give unofficial firms a substantial cost advantage (Farrell, 2004; Farrell, Baily and Remes, 2005).

---

\*We would like to thank Axel Dreher and Friedrich Schneider.

<sup>†</sup>Department of Economics, University of Milan-Bicocca, Piazza dell' Ateneo Nuovo 1, Milan, Italy. e-mail: luisanna.onnis@unimib.it.

<sup>‡</sup>Department of Economics, University of Milan-Bicocca, Piazza dell' Ateneo Nuovo 1, Milan, Italy. e-mail: patrizio.tirelli@unimib.it.

Three different views have been put forward to interpret this phenomenon. The first one emphasizes the role of institutional quality in shaping incentives to enter the official sector of the economy and is supported by several empirical studies (Friedman, Johnson, Kaufmann, and Zoido-Lobaton, 2000; Loayza and Rigolini, 2006; Torgler and Schneider, 2009; Chong and Gradstein, 2007; Dabla-Norris, Gradstein and Inchauste, 2008). The second one gives importance to the inherent inefficiency of unofficial firms (Amaral and Quintin, 2006; De Paula and Scheinkman, 2008) and looks at the formal and informal sectors as two parallel economies, where the inefficient informal sector is bound to recede when growth-enhancing policies raise the skills of the labour force and the quality of the public goods accessible to official firms. In this framework, cross country differentials in the relative size of the shadow economy are strictly related to different stages of economic development. Institutional quality therefore matters insofar as it is a pre-requisite for growth of the official economy, but does not play a specific role in determining the size of the shadow economy. The third one (Dessy and Pallage, 2001) sees government size and the relative dimension of the shadow economy as jointly endogenous outcomes, and suggests that a "big push" policy strategy may force the economy to settle in favourable equilibria, where the supply of public infrastructure and - more generally - of public goods is relatively large whereas the size of the shadow economy is relatively small.

This paper investigates the distinct roles played by institutions, growth of the official economy and government size in determining the unobserved economy. To this aim, we must first obtain measures of the shadow economy. Unlike previous contributions,<sup>1</sup> we cannot rely on estimates based on the Multiple Indicators and Multiple Causes (MIMIC) approach. The MIMIC method is used for inferring the dimension of the unrecorded activity through a set of "causal variables" (taxation, regulatory burden, moral attitudes toward the state) and "likely indicators" (changes in the demand for currency, in the labour force participation rate and in official GDP). Since variables that identify institutional quality are typically related to the "causal variables", interpreting MIMIC estimates on the grounds of institutional factors would be tautological. We must therefore rely on shadow economy estimates which are independent from the theoretical priors that drive our subsequent analysis. For this reason, we apply a version of the Modified Total Electricity (MTE) approach (Eilat and Zinnes, 2002) to a large panel of countries. This method obtains shadow economy estimates from electricity consumption data which are filtered to remove the influence of additional factors such as variations in electricity prices and in the relative weight of energy-intensive industrial sectors.

The sharp distinction between theoretical priors on the institutional determinants of the shadow economy and the technique used for its measurement is the first novel contribution

---

<sup>1</sup>Loayza (1996), Giles (1999a, 1999b, 1999c), Chatterjee, Chaudhury and Schneider (2003), Giles, Tedds and Werkneh (2002), Tedds and Giles (2002), Dell'Anno (2003), Bajada and Schneider (2005), Schneider (2004, 2005, 2008), Alañón and Gómez-Antonio (2005), Buehn, Karmann and Schneider (2007), Dell'Anno, Gómez-Antonio and Alañón-Pardo (2007), Brambila-Macias (2008).

of the paper. The second innovation is that, by exploiting the time series dimension of our panel, we are able to better investigate the link between stage of economic development - proxied by the official level of per-capita income - and the relative size of shadow economy. The third innovative aspect is that we are able to test the theoretical contribution of Dessy and Pallage (2001) apparently neglected in previous empirical work.

In a nutshell, our results suggest that all the interpretations of the shadow economy discussed above contain a grain of truth. We do find that the stage of development has a negative effect on the size of the shadow economy. But we also find an additional negative impact for indicators of institutional quality (such as measures of rule of law, government stability, democratic accountability and regulation of labour). Differently from La Porta and Shleifer (2008), these results suggest that the shadow economy should not be dismissed as the unpleasant side effect of economic underdevelopment. Instead this phenomenon seems to be related to some specific institutional aspects that may well survive even when the economy reaches higher development stages. This may explain why even some developed economies are characterized by a relatively large share of unrecorded income. Finally, we find that - after controlling for institutional quality and for the level of development - public expenditure still has a negative impact on the shadow economy. It is intriguing to relate this latter result to a long-standing controversy about the distinct roles of "institutions" and "macroeconomic policies" in determining economic outcomes. Our findings support the view that macroeconomic policies should not be seen as a mechanical consequence of a country's institutional setting (Glaeser et al., 2004), differently from Acemoglu et al. (2003) who claim that macroeconomic policies play a minor role in shaping economic outcomes once institutional variables are taken into account.

The remainder of the paper is organized as follows. Section 2 offers an overview of the literature. Section 3 outlines the approach adopted to estimate the shadow economy. Section 4 describes the model. Section 5 presents the results and Section 6 concludes.

## **2 Literature review**

De Soto (1989) defines the informal sector as the set of economic units that do not comply with government-imposed taxes and regulations. This apparently straightforward definition has an important implication: the informal sector exists because firms have an incentive to escape taxes and regulations and governments lack the capability to enforce full compliance. However, choosing an informal status entails several disadvantages. Informal activities are subject to the risk of being detected and to the ensuing income losses. Furthermore, informal firms cannot enjoy the same degree of property rights protection which is available to official firms, their access to credit is more difficult (Straub, 2005) and they are unlikely to benefit from public services such as social welfare, skill training programs, and government subsidies.

Received theoretical contributions model the relative size of the underground economy as the consequence of firms decisions about entry in the official economy. In this regard, policy decisions concerning tax rates and regulation play a key role, and the emphasis typically is on burdensome institutional environments. In Loayza (1996), producers can choose to avoid taxation but must then bear an exogenous cost of informality. In Sarte (2000), entrepreneurs flee to the underground economy in order to escape the costs generated by a rent-seeking bureaucracy. Loayza, Oviedo and Servén (2005) emphasize the adverse effects of labour regulation. Choi and Thum (2005) show that unofficial firms typically choose to operate with a suboptimally low level of physical capital in order to limit the risk of being detected.<sup>2</sup> Dessy and Pallage (2003) emphasize the double-edged incentives generated by the tax costs associated to entry in the official economy. In their model, tax revenues finance the provision of a productive public infrastructure, which creates a productivity premium from formalization. As a result, unofficial firms escape taxes but are inherently less productive than firms participating in the official economy. An important difference with the other contributions is that now the positive correlation between taxation and relative size of the shadow economy may break down. This happens when a reduction (increase) in tax rates causes a sufficiently large fall (increase) in the productivity premium associated to formality.<sup>3</sup>

Several contributions analyze the empirical determinants of the shadow economy. Loayza (1996) finds that in a panel of Latin American countries the size of the informal sector depends positively on proxies for the tax burden and labour market regulations and is inversely related to the quality of government institutions. Similar results are obtained by Johnson et al. (1998) in a larger sample including Latin American, OECD and transition economies. Botero et al. (2003) emphasize the role of labor regulation in raising the unofficial economy share in a sample of 85 countries. Torgler and Schneider (2009) base their analysis on the presumption that governments which are not constitutionally constrained exploit their coercive powers to extract rents from citizenry. They find that several proxies for the quality of institutions and a measure of "tax morale" are inversely related to the relative size of the shadow economy in a sample of 55 countries over the period 1990-1999.

Some studies have focused on the effects of corruption. Friedman et al. (2000) argue that entrepreneurs go underground not to avoid official taxes but to reduce the burden of bureaucracy and corruption. This, in turn, drains available tax revenues and shrinks government size: corrupt governments become small governments and only relatively uncorrupted governments can sustain high tax rates. They find that this prediction is confirmed in a panel of 69 countries. Hibbs and Piculescu (2005) argue that corruption increases the size of the underground sector for the opposite reason, i.e. corrupt bureaucrats can overlook unofficial

---

<sup>2</sup>Quintin (2000) and Antunes and Cavalcanti (2006) quantify the effects of the tax burden and limited protection of property rights on the informal sector size via calibrated numerical simulations.

<sup>3</sup>A similar conclusion is reached in Hibbs and Piculescu.(2010)

production in exchange for a bribe.<sup>4</sup> Dreher and Schneider (2010) distinguish between high and low income countries. They cannot find a robust relationship between corruption and the size of the shadow economy when perceptions-based indices of corruption are used. Employing an index of measured corruption they find that corruption increases the size of the shadow economy only in low income countries.

By and large, the bulk of theoretical and empirical analysis reviewed so far provides support for De Soto's (1989) argument that burdensome government intervention (and corruption) induces a large fraction of firms to go unofficial, thereby hampering their productive potential and creating a poverty trap for a large share of the population in developing countries. The argument lies at the root of the United Nations (2008) program for legal empowerment of the poor, which aims at gradually bringing unofficial firms (and workers) into formality by improving developing countries institutional quality.

La Porta and Shleifer (2008) challenge this approach. Using data from World Bank firm level surveys they document a huge productivity gap compared even to the small formal firms, suggesting that the two groups are very different. In addition, when looking at macro-determinants of the shadow economy they find that proxies for government regulation and institutional quality loose significance if one controls for a country's per capita income level. As a consequence, they propose an alternative interpretation of the determinants of the underground economy, where the latter merely is a consequence of underdevelopment and is bound to disappear as growth-promoting policies favour the birth of more productive new formal firms that displace unofficial ones.

In our view, the conclusion reached by La Porta and Shleifer is open to criticisms. First, large productivity differentials between unofficial and official firms might be endogenous to institutional quality and cannot be taken as a proof that unofficial firms cannot greatly benefit from improvements in a country's institutional setting. Second, their analysis of the macro-determinants of the shadow economy requires a long-term empirical analysis, whereas they run cross-country regressions for the period 1996-2006. Third, virtually all received measures of the shadow economy confirm that important differences in the relative size of the shadow economy persist among developed economies (Onnis and Tirelli, 2010; Schneider et al., 2010), suggesting that institutional differences could still play a role even after controlling for the stage of economic development over a relatively long period. Investigating the distinct roles played by growth, institutions and policies in determining the relative size of the shadow economy is the key purpose of our work.

---

<sup>4</sup>Johnson et al. (1998) find a positive relationship between different measures of corruption and the shadow economy.

### 3 Measuring the shadow economy

Measuring the size of the informal sector is an inherently difficult task. Schneider and Enste (2000) provide an exhaustive survey of methods that have been used to construct indirect estimates of the informal sector size using macroeconomic variables. The so called Currency Demand Method (Feige, 1979,1986,1996; Tanzi, 1980, 1983) assumes that transactions related to unofficial activities require cash payments, and therefore derives relative size of the shadow economy from currency holdings which are not explained by a standard money demand equation and are related to measures of tax pressure and of government regulation. As an alternative, the Multiple Indicator Multiple Cause (MIMIC) model specifies the informal sector as a latent endogenous variable which is related to a set of causal factors (taxation, regulatory burden, moral attitudes toward the state) and to a set of indicators (changes in the demand for currency, in the labour force participation rate and in official GDP).

Neither the currency demand nor the MIMIC method appear appropriate for the present analysis. In fact both methods obtain shadow economy estimates on the basis of the theoretical priors whose relevance we want to test. For our purposes it is crucial to obtain shadow economy estimates which are independent from the theoretical priors that drive our subsequent analysis. In this regard, the well known electricity consumption method appears more suitable. It typically relies on data on electricity consumption growth to proxy for total economic activity growth, from which official measures of economic activity are then subtracted to obtain estimates of the unofficial economy (Schneider and Enste, 2000; Eilat and Zinnes, 2002; Feige and Urban, 2003; Chong and Gradstein, 2007). The crucial assumption (and perhaps the main weakness of the approach) is that the ratio of electricity consumption growth to total economic activity growth is relatively stable. In fact, its level is likely to vary across countries and over time due to technological change, to relative electricity prices and to the energy-intensity of the sectorial composition of national GDP.

The argument concerning the potential downward bias caused by energy-saving technological change is straightforward and quite intuitive, but it neglects a long-standing debate on the Jevons' Paradox: it cannot be taken for granted that energy-saving technological change will reduce the energy intensity of aggregate production (Jevons, 1865, 1965; Iorgulescu and Polimeni, 2007; Polimeni and Iorgulescu, 2007; Grant, Hanley, McGregor, Swales and Turner, 2007). In fact, computable general equilibrium models support the view that energy consumption might "rebound" because energy demand is at best weakly correlated with a more efficient energy use. The reason why this might happen is easily explained. Following an improvement in energy efficiency, market forces drive some countervailing effects: (i) the fall in energy prices triggers a substitution effect towards more energy-intensive goods and production techniques; (ii) the income effect raises household consumption of all commodities, including energy consumption. In addition, the downward bias might be offset by other

forms of technological change, such as labor-saving innovations, which increase the energy intensity of the production function. For instance, early econometric work has shown that in the US manufacturing sector technical change has been energy intensive (Jorgenson and Fraumeni, 1981; Hogan and Jorgenson, 1991). Finally, one should bear in mind that sectorial specialization might change as the economy develops, thereby affecting the energy intensity of production.

For these reasons, our estimates for the size of the unofficial economy are obtained as in Onnis and Tirelli (2010), who apply a version of the MTE approach proposed by Eilat and Zinnes (2002). This involves a two-stages procedure. In the first stage, the series of electricity consumption growth is filtered to remove the influence of changes in the weight of the industry sector and in the relative price of electricity.<sup>5</sup> In the second stage, the growth rate of the shadow economy is obtained by subtracting the growth rate of the official economy from the filtered series of electricity consumption growth - where the latter proxies the growth rate of the overall economy. The first stage of our application of the MTE procedure is therefore based on the following equation:

$$\Delta Elec_{i,t} = \alpha_i + \beta_1 \Delta Eprice_{i,t} + \beta_2 \Delta IndGdp_{i,t} + \varepsilon_{i,t} \quad (1)$$

where subscripts  $t, i$  are time and country indexes,  $\Delta Elec$ ,  $\Delta Eprice$  and  $\Delta IndGdp$  respectively describe annual percentage changes in electricity consumption, in the real price of electricity and in the industry share of GDP.

Once the relative-price and demand-composition effects have been identified, the residual changes in electricity consumption,  $\Delta Elec^{res}$ , are used as a proxy for the growth rates of the overall (recorded and unrecorded) economic activity:

$$\Delta Elec_{i,t}^{res} = \Delta Elec_{i,t} - \left[ \hat{\beta}_1 \Delta Eprice_{i,t} + \hat{\beta}_2 \Delta IndGdp_{i,t} \right] \quad (2)$$

Then, the growth rate of the unrecorded income,  $\Delta SH$ , is approximated as follows:

$$\Delta SH_{i,t} = \Delta Elec_{i,t}^{res} - \Delta Gdp_{i,t} \quad (3)$$

where  $\Delta Gdp$  denotes the official GDP growth rate. Finally, we obtain our measures of the unofficial GDP by applying  $\Delta SH$  to pre-existing base-year estimates for  $SH$ .

We analyze 48 economies over the period 1981-2005.<sup>6</sup> Since the time series dimension of the panel is relatively long, the econometric methodology is based on a preliminary stationarity

---

<sup>5</sup>Our analysis is based on the assumption that changes in the domestic real price of electricity capture the effects of energy supply shocks and of long term efficiency gains caused by technical change, whereas changes in the industry share of GDP affect the component of electricity consumption which is directly related to the country-specific evolution in the composition of domestic output.

<sup>6</sup>See Appendix I for panel composition and details of our measurement methodology.



and cointegration analysis of the relevant variables. Variables  $\Delta Elec$ ,  $\Delta Eprice$ ,  $\Delta IndGdp$  exhibit non stationarity, tested by using Im, Pesaran and Shin (2003), Pesaran (2003, 2007), Hadri (2000), Kwiatkowski, Phillips, Schmidt and Shin (1992), ADF and Phillips-Perron unit root tests. A cointegrating relationship between  $\Delta Elec$ ,  $\Delta Eprice$  and  $\Delta IndGdp$  has been, therefore, detected by using the residual-based procedure developed by Pedroni (1999, 2004). Due to the presence of cointegrated time series, in our estimate of equation (1) we use the group-mean panel Fully Modified Ordinary Least Squares (FMOLS) method proposed by Pedroni (2000, 2001). The group-FMOLS estimates suggest that a positive and statistically significant relationship exists between the changes in electric consumption and those in the share of industry. On the contrary, a negative and statistically significant relationship exists between the changes in electric consumption and those in electricity price.<sup>7</sup>

We now present some descriptive statistics of our results and some comparisons with estimates obtained by using different measurement methods. In Table 1, we report the cross-country distribution of the average sample value for  $SH$  (defined in percent of official GDP), the mean value and the standard deviation of its growth rates. This table clearly shows that even some developed countries (Belgium, Greece, Italy and Spain) have been characterized by a relatively large shadow economy. Moreover, the mean value of the annual growth rates of the share of  $SH$  are always negative except for Brazil, Guatemala, Italy, Mexico, Paraguay, Peru, Philippines, and Venezuela. In Figure 1, we plot the beginning-of-sample value for the share of  $SH$  and the subsequent average yearly rate of change. This figure suggests that cross-country differences still persist in the latter part of the sample even if some countries initially characterized by a relatively large  $SH$  subsequently managed to achieve important reductions. In particular, we estimate a significant reduction in the relative size of  $SH$  for some developing countries (i.e. Botswana).

Table 1 also documents a substantial volatility in the growth rates of  $SH$ . In some cases, this may reflect the countercyclical pattern of the unobserved economy. The observed volatility is also likely to capture the dynamic adjustment to institutional reforms. In this regard, consider the evolution of  $SH$  in Bulgaria, Hungary, and in Poland (Figure 2). In these countries we observe a surge in the relative size of  $SH$  immediately after the collapse of communism in 1989. The share of unrecorded income has then begun to decrease, possibly following market-oriented reforms, based on privatization and price- and trade-liberalization measures (see Havrylyshyn and Wolf, 1999, and the discussion in Onnis and Tirelli, 2010).

Figures 3 and 4 provide a comparison between our estimates of unobserved sector and those obtained by using the MIMIC approach for the last part of the sample period (2000-2005). MIMIC estimates appear systematically larger than our MTE figures for the highly

---

<sup>7</sup>The use of country-specific electricity prices as an explanatory variable for changes in electricity consumption may generate problems of endogeneity. We have re-estimated equation (1) using the real price of energy for 26 OECD countries and a global index of energy price for the remaining 22 countries. In addition, we have used the global price of energy for the entire panel. In both cases our results have been confirmed.

industrialized OECD countries. This pattern is less apparent for the remaining countries.

As mentioned above, the MTE approach determines growth rates of the shadow economy and needs base-year values for  $SH$  to derive, country by country, the entire series of unobserved income. In Figures 5 and 6, we evaluate the importance of base-year estimates. In some countries, the average sample estimate for  $SH$  (in percent of official GDP) is very close to the starting values. In other countries, estimated dynamics cause a significant difference between the average sample estimate for  $SH$  and its base-year value.

Finally, in Figures 7 and 8, we show how different base year estimates, respectively obtained from Currency Demand and MIMIC estimates, would affect our average sample estimates for the share of  $SH$ . In section 5 below we shall test the robustness of our results to different choices of base-year values.

## 4 The model

La Porta and Shleifer (2008) group the determinants of the unofficial economy into three broad categories. *Costs of becoming formal*. These are typically associated with the resources devoted to fulfilling the procedures required to legally start a business. *Costs of staying formal*. They include tax payments and government regulations. Among government regulations, those related to workers' welfare are considered the most restrictive and costly for firms (Loayza, 1996).<sup>8</sup> As described in Botero et al. (2004), regulation of labour markets may take several forms. First, governments forbid discrimination in the labour market and endow workers with some basic rights (maternity leaves, minimum wage, etc.). Second, governments regulate employment relationships and may affect hiring and firing costs. Third, governments may legally empower labour unions to represent workers. In addition, corruption is widely believed to raise the cost of staying formal, thereby inducing entrepreneurs to flee to the underground economy (Friedman et al., 2000). *Benefits of being formal*. These are typically related to expanded access to public goods. Dessy and Pallage (2001) argue that the provision of a productive public infrastructure creates a productivity premium from formalization and, symmetrically, an opportunity cost of informality. Thus a relatively large government sector may be associated to a smaller size of the shadow economy. In addition, the inability to sign enforceable contracts creates uncertainty and increases transaction and monitoring costs in business dealings conducted in the unobserved sector (De Soto, 1989; Loayza, 1996).

Such costs and benefits may be proxied by institutional factors and policy variables. We therefore estimate the following model:

---

<sup>8</sup>Nipon (1991) estimated that in Thailand informal firms saved about 13 to 22 percent of labour wages by circumventing labour-protection laws. Tokman (1992) reported that labour regulations increased costs for small firms in Latin America by an average of around 20 percent.

$$SH_{i,t}^* = \beta_0 + \sum_{j=1}^h \beta_j IQ_{j,i,t} + \beta_{h+1} y_{i,t} + \beta_{h+2} G_{i,t} + \varepsilon_{i,t} \quad (4)$$

where  $SH_{i,t}^*$  defines  $SH$  as a share of official GDP,  $y$  is the log of per-capita GDP,  $G$  is the ratio of public expenditure to official GDP and  $IQ_j$  is one of  $h$  indicators of institutional quality, to be defined below.<sup>9</sup> As pointed out in the introduction, equation (4) includes  $y$  as a proxy for the stage of economic development, to control whether institutions and policies play a specific role in determining the size of the shadow economy.

#### 4.1 Definition of institutional variables

Some of the institutional variables most commonly used in the literature (Torgler and Schneider, 2009; Chong and Gradstein, 2007) may be seen as proxies for the costs and benefits associated to formality. The variable *rule of law* is the sum of two components. The *law* component assesses the impartiality of the legal system, and the *order* component assesses common observance of the law. We take this as an index of the benefits of formalization. The variable *democratic accountability* captures how responsive the government is to the electorate. The intuition is that accountability reduces policymakers' rent seeking activities, thus lowering the costs of being formal. The variable *government stability* rates government's ability to stay in office and carry out its declared program. The variable is the sum of three subcomponents: *government unity*, *legislative strength* and *popular support*. We posit that *government stability* is an inverse proxy for political uncertainty, where the latter lowers the benefits from staying in the formal economy. As a proxy for the regulation of labour, we use an index of workers' rights protection. Finally, the variable *corruption* measures corruption within the political system. Alternatively, the *corruption perception index (cpi)* measures the degree to which corruption is perceived to exist among public officials and politicians. The *cpi* is based on 13 different expert and business surveys.<sup>10</sup>

To test the robustness of our results, we consider four alternative measures of institutional quality. The *democracy indicator* is derived from coding of the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints

---

<sup>9</sup>Data on  $y$  are taken from United Nations, constant (1990) prices, US Dollars. Data on  $G$ , are taken from Penn World Tables.

<sup>10</sup>The variables *rule of law*, *democratic accountability*, *government stability* and *corruption* are taken from the International

Country Risk Guide (ICRG). The variables *rule of law* and *democratic accountability* range between 0 and 6 with increasing quality; *government stability* ranges between 0 and 12 with increasing quality; *corruption* ranges between 0 and 6 (very high level of corruption).

The *corruption perception index (cpi)* - based on 13 different expert and business surveys- is published by Transparency International and ranges between 1 and 10 (very high corruption).

The index of workers' rights protection is taken from Human Rights Dataset. Worker's rights may be: (0) severely restricted, (1) somewhat restricted, (2) fully protected.

on the chief executive. The subcomponent *executive constraints* refers to institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. In addition, the variable *civil liberties* measures the freedoms of expression and belief, associational and organizational rights, rule of law, and personal autonomy without interference from the state. The indicator *political rights* refers to the freedom of participation in the political process, including the right to vote freely for distinct alternatives in legitimate elections, compete for public office, join political parties and organizations, and elect politicians who are accountable to the electorate.<sup>11</sup>

Only for the post-1995 subsample, the Heritage Foundation publishes an *index of economic freedom*, defined as the simple average of 7 variables - *business freedom*, *fiscal freedom*, *trade freedom*, *monetary freedom*, *financial freedom*, *investment freedom* and *property rights*.<sup>12</sup> *Business freedom* is a quantitative measure of the ability to start, operate and close a business that represents the overall burden of regulation as well as the efficiency of government in the regulatory process. *Fiscal freedom* is a measure of the tax burden imposed by governments.<sup>13</sup> *Trade freedom* is a measure of the absence of tariff and non-tariff barriers that affect imports and exports of good and services. *Monetary freedom* combines a measure of price stability with an assessment of price controls. *Financial freedom* is a measure of banking security as well as a measure of their independence from government control. *Investment freedom* measures freedom to allocate resources into and out of specific activities, both internally and across the country's borders. Finally, the *property rights* component is an index of the capability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state. We shall include these variables in our analysis for the post-1995 subsample.

## 4.2 Econometric Methodology

To estimate equation (4), we employ the System GMM technique (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) that is considered particularly appropriate for our panel data.<sup>14</sup> This estimator has been, in fact, designed for situations with "small T, large N" panels, regressors that are not strictly exogenous, fixed effects, heteroskedasticity and autocorrelation within countries. The consistency of the System GMM estimator depends on whether lagged values of the explanatory variables are valid instruments in the regression. We address this issue by considering three specification tests: the Arellano-Bond test, the Hansen *J* test and the difference-in-Hansen test. The Arellano-Bond test for autocorrelation

---

<sup>11</sup>The *democracy indicator* is taken from Polity IV and ranges between 0 and 10 (very high democracy). Its subcomponent *executive constraints* ranges between 1 and 7. The variables *civil liberties* and *political rights* (source: Freedom House) range between 1 (least free) and 7 (most free).

<sup>12</sup>The *index of economic freedom* and its subcomponents range between 0 and 10 (very high freedom).

<sup>13</sup>*Fiscal freedom* includes both the direct tax burden in terms of the top tax rates on individual and corporate incomes and the overall amount of tax revenues as a percentage of GDP.

<sup>14</sup>Given the presence of gaps in our panel data, we use orthogonal deviations (Arellano and Bover, 1995).

has a null hypothesis of no autocorrelation and is applied to the differenced residuals. The first-order serial correlation test usually rejects the null hypothesis. Second-order serial correlation of the differenced residuals indicates that the original error terms are serially correlated and follow a moving average process at least of order one. If the  $AR(2)$  test fails to reject the null, the original error terms are, therefore, serially uncorrelated. The Arellano-Bond test is run on differenced residuals even after estimation in deviations.<sup>15</sup> The Hansen  $J$  test (robust to heteroskedasticity and autocorrelation) tests the overall validity of the instruments, i.e. it tests of whether the instruments, as a group, appear exogenous. Failure to reject the null hypothesis gives support to the model. Finally, the difference-in-Hansen methodology tests the exogeneity of each subgroup of instruments. We split each instrument subgroup in two for difference-in-Hansen purposes, one each for the transformed and level equations. This is especially useful for testing the instruments for the levels equation based on lagged differences of the dependent variable, which are the most suspect in System GMM.

As reported in the literature on GMM methodology, a large collection of instruments, even if valid in specification tests, can be collectively invalid in finite samples because they overfit endogenous variables.<sup>16</sup> Moreover, a large number of instruments also weaken the Hansen test for overidentifying restrictions. According to Roodman (2006, 2008), we combine two approaches to instrument containment. The first one is to use only certain lags instead of all available lags for instruments.<sup>17</sup> The second one is to adopt the "collapse" suboption which creates one instrument for each variable and lag distance, rather than one for each time period, variable, and lag distance.<sup>18</sup>

---

<sup>15</sup>The autocorrelation test assumes no correlation across individuals in the idiosyncratic disturbances. According to Roodman (2006), time dummies make this assumption more likely to hold.

<sup>16</sup>Tauchen (1986) demonstrates in simulations of very small samples (50-75 observations) that the bias of GMM rises as more instruments, based on deeper lags of variables, are introduced. Similar results are obtained in Ziliak (1997). In Monte Carlo tests of Difference GMM, Windmeijer (2005) reports that, on  $8 \times 100$  panels, reducing the instruments from 28 to 13 reduces the average bias in the two-step estimate of the parameter of interest by 40%.

<sup>17</sup>For each variable, the choice of the lags as instruments has been based on the results of the difference-in-Hansen tests.

<sup>18</sup>Following Roodman (2006), to avoid weakening the Hansen test, in the present analysis the instruments count never exceeds  $N$ .

## 5 Results

To facilitate discussion we present our estimates in stages.<sup>19</sup> The first striking result is that, even if we observe a negative and statistically significant effect of official per-capita GDP, measures of institutional quality retain a significant impact on the relative size of *SH*: variables *rule of law*, *democratic accountability* and *government stability* have the expected negative signs (Table 2). We also find evidence of a positive and statistically significant relationship between *protection of workers' rights* and our estimates of unrecorded income. In addition, in line with the theoretical results in Dessy and Pallage (2001), public expenditures have a negative impact on the shadow economy. To check whether our results are distorted by plausible correlations among the variables *rule of law*, *democratic accountability* and *government stability*, we re-estimate equation (4) for the entire panel of countries by using the simple average of the three institutional indicators.<sup>20</sup> The relationship between this aggregate measure and the size of unobserved sector is still negative and statistically significant. We also apply a Principal Component Analysis to these three institutional variables and extract the first component (*pca*). Again, we observe a negative and statistically significant relationship between this variable and *SH*. As a robustness check we substitute *rule of law*, *democratic accountability* and *government stability* with *democracy indicator*, *executive constraints*, *civil liberties* and *political rights* (Tables 3). All expected results are confirmed.

In Table 4 we explore the impact of corruption on the size of unobserved economy. Adopting the two alternative measures of corruption, we find that the effect on the unobserved economy is always negative and statistically significant. This is consistent with the theoretical predictions of Choi and Thum (2005, p. 829). In their model, the entrepreneurs' option to operate in the shadow economy constrains a corrupt official's ability to extract rents and strengthens the productivity of the official sector. The existence of the unofficial sector therefore acts as a complement to the official economy. In their framework corruption depends on the policymaker's ability to monitor official firms activity. When the monitoring technology improves, participation in the shadow economy becomes relatively less attractive compared to participation in the official economy and corruption will increase. In addition, the average dimension of unofficial firms will shrink in order to escape monitoring. Both effects might therefore induce a fall in the share of the unobserved economy.

In addition, we focus on the post-1995 subsample. The first step is to re-estimate the

---

<sup>19</sup>For all our system GMM regressions we report the results of the Arellano-Bond and Hansen tests. We always fail to reject the null hypotheses of no (second-order) autocorrelation and exogeneity of the entire group of instruments. The results of the single difference-in-Hansen tests are not reported in the tables. For both the transformed and the level equation, we always fail to reject the null hypothesis of exogeneity for each subgroup of instruments. Results available upon request.

In addition, we have also estimated equation 4 by including time-dummies (Roodman, 2006) and we have obtained the same results as the estimation without common time-dummies

<sup>20</sup>These have been normalized to the same scale range.

regression in column 6 of Table 2 over the shorter sample. Variables *rule of law*, *government stability*, *protection of workers rights* and *public expenditure* remain significant with the expected signs, whereas *democratic accountability* is no longer significant (Table 5). Then we add the *index of economic freedom* and, in separate regressions, its components as defined in Section 4.1 above. We present results for those regressions where these latter variables affect previous results. We find that the *index of economic freedom* is significant with the expected negative sign, but *rule of law* no longer matters. Similar results obtain when we replace the *index of economic freedom* with its components *business freedom* and *fiscal freedom*. By contrast, we couldn't find evidence of a specific role for other components of the index, such as *financial freedom* and *investment freedom*. This latter result suggests that restrictions to business activity and tax policies play a paramount role in determining the shadow economy.

Finally, in addition to the use of alternative indicators of institutional quality, we have made other two robustness checks. First, we have re-estimated all the regressions of Table 2 by using MTE estimates of  $SH$  obtained by using different starting values (Schneider and Enste, 2000; Friedman et al., 2000). As can be readily seen from Table 6, even if the use of different base year estimates may lead to significant differences in the relative size of unobserved sector (Figures 7 and 8), the variables *rule of law*, *government stability*, *democratic accountability*, *protection of workers rights*, *public expenditure* and official per-capita GDP remain significant with the expected signs. Second, in Table 7, we have re-estimated all the regressions of Table 2 by excluding from the panel the three countries characterized by an initial value of  $SH$ , ( $SH_{1981}$ ), larger than 1: Botswana, Egypt and Thailand. Again, previous results are confirmed.

## 6 Conclusions

Theoretical models suggest that the shadow economy is a constraint on economic efficiency. Our results show that triggering faster growth of the official economy is not a panacea for this, even though it has unambiguously beneficial effects. In fact, institutional design and even government size may determine additional cross-country differences in the relative size of the shadow economy. Thus, both institutional design and public expenditure policies should specifically target private sector's incentives to enter the official economy. This is a promising field for future research.

## References

- [1] Acemoglu, D., Johnson S., Robinson J. and Y. Thaicharoen, (2003) **Institutional Causes, Macroeconomic Symptoms: Volatility, Crises and Growth**, *Journal of Monetary Economics*, 50 (1), pp.49-123.
- [2] Alañón-Pardo, A., and M. Gómez-Antonio (2005), **Estimating the Size of the Shadow Economy in Spain: a Structural Model with Latent Variables**, *Applied Economics*, 37(9), pp.1011-1025.
- [3] Amaral, P.S., and E. Quintin (2006),. **A Competitive Model of the Informal Sector**, *Journal of Monetary Economics*, 53(7), pp. 541-53.
- [4] Arellano, M. and S. Bond. (1991), **Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations**, *The Review of Economic Studies*, 58, pp. 277-97.
- [5] Arellano, M. and O. Bover (1995), **Another Look at the Instrumental Variable Estimation of Error-Components Models**, *Journal of Econometrics*, 68, pp. 29-51.
- [6] Bajada, C. and F. Schneider (2005), **The Shadow Economies of the Asia-Pacific**, *Pacific Economic Review*, 10 (3), pp. 379-401.
- [7] Blundell, R., and S. Bond (1998), **Initial Conditions and Moment Restrictions in Dynamic Panel Data Models**, *Journal of Econometrics*, 87, pp. 115-43.
- [8] Botero, J.C., Djankov, S., La Porta, R., Lopez-de-Silanes, F., and A. Shleifer (2004), **The Regulation of Labor**, *Quarterly Journal of Economics*, 119(4), pp. 1339–82.
- [9] Brambila-Macias, J. (2008), **Modeling the Informal Economy in Mexico. A Structural Equation Approach**, MPRA Paper 8504, University Library of Munich, Germany.
- [10] Buehn, A., Karmann, A. and F. Schneider (2007), **Size and Development of the Shadow Economy and of Do-it-yourself Activities in Germany**, CESifo Working Paper Series.
- [11] Chatterjee, S., Chaudhury, K. and F. Schneider (2003), **The Size and Development of the Indian Shadow Economy and a Comparison with Other 18 Asian Countries: An Empirical Investigation**, Discussion Paper, Department of Economics, University of Linz, Austria.
- [12] Choi, J.P. and M. Thum (2005), **Corruption And The Shadow Economy**, *International Economic Review*, 46(3), pp. 817-836.



- [13] Chong, A. and M. Gradstein (2007), **Inequality and Informality**, *Journal of Public Economics*, 91(1-2), pp. 159-179.
- [14] Dabla-Norris, E., Gradstein, M., Inchauste G., **What Causes Firms to Hide Output? The Determinants of Informality**, *Journal of Development Economics*, 85(1-2), pp. 1-27..
- [15] Dell'Anno, R (2003), **Estimating the Shadow Economy in Italy: a Structural Equation Approach**, Economics Working Papers, School of Economics and Management,
- [16] University of Aarhus.
- [17] Dell'Anno, R., Gómez-Antonio, M. and A. Alañón-Pardo (2007), **The Shadow Economy in Three Mediterranean Countries: France, Spain and Greece. A MIMIC Approach**, *Empirical Economics*, 33(1), pp. 51-84.
- [18] De Paula, A., and J.A. Scheinkman (2008), **The Informal Sector**, Working Paper No. 08-018, Philadelphia: Pennsylvania Institute for Economic Research.
- [19] De Soto, H. (1989), **The Other Path**, New York: Harper and Row.
- [20] De Soto, H. (2000), **The Mystery of Capital. Why Capitalism Triumphs in the West and Fails Everywhere Else**, New York: Basic Books.
- [21] Dessy, S., and S. Pallage (2003), **Taxes, Inequality and the Size of Informal Sector**, *Journal of Development Economics*, 70(1), pp. 225-233.
- [22] Dreher, A., and Schneider, F., (2010) **Corruption and the Shadow Economy: An Empirical Analysis** Public Choice, 144(1):215-238
- [23] Eilat, Y. and C. Zinnes (2002), **The Shadow Economy in Transition Countries: Friend or Foe? A Policy Perspective**, *World Development*, 30 (7), pp. 1233-1254.
- [24] Farrell, D. (2004), **The Hidden Dangers of the Informal Economy**, *McKinsey Quarterly*, 2004 (3), pp. 26-37.
- [25] Farrell, D. , Baily, M. and J. Remes (2005), **U.S. Productivity After the Dot.Com Bust**, McKinsey Global Institute.
- [26] Feige, E. (1979), **"How Big is t he Irregular Economy?"** Challenge, 22:1, pp. 5-13.
- [27] Feige, E. (1986), **"A Re-examination of the 'Underground Economy'"** in the United States," IMF Staff Papers, 33:4, pp. 768-81.

- [28] Feige, E. (1996), **Overseas Holdings of U.S. Currency and the Underground Economy**, in Pozo, S. (ed.), *Exploring the Underground Economy*. Kalamazoo, Michigan, pp. 5-62.
- [29] Friedman, E., Johnson, S., Kaufmann, D. and P. Zoido-Lobaton (2000), **Dodging the Grabbing Hand: the Determinants of Unofficial Activity in 69 Countries**, *Journal of Public Economics*, 76 (3), pp. 459-493.
- [30] Giles, D.E.A. (1999), **Modeling the Hidden Economy in the Tax-gap in New Zealand**, *Empirical Economics*, 24(4), pp. 621-640.
- [31] Giles, D.E.A. , Tedds, L.M. and G. Werkneh (2002), **The Canadian Underground and Measured Economies: Granger Causality Results**, *Applied Economics*, 34(18), pp. 2347-52.
- [32] Glaeser E., La Porta R., Lopez-de-Silanes F., A. Shleifer (2004) **Do Institutions Cause Growth?**, *Journal of Economic Growth*, 9 (3), pp.271-303.
- [33] Havrylyshyn, O. and T. Wolf (1999), **Determinants of Growth in Transition Countries**, *Finance & Development Magazine*, 36 (2).
- [34] Hibbs, D. A. and Piculescu, V. (2010), **Tax Toleration and Tax Compliance: How Government Affects the Propensity of Firms to Enter the Unofficial Economy**, *American Journal of Political Science*.
- [35] Jevons, W.S. (1965), **The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal-Mines**, 3rd Edition revised by A.W. Flux, Augustus M. Kelley, New York.
- [36] Johnson, S., Kaufmann, D. and A. Schleifer (1997), **The Unofficial Economy in Transition**, *Brookings Papers of Economic Activity*, 28(2), pp. 159-239.
- [37] Johnson, S., Kaufmann, D. and P. Zoido-Lobaton (1998), **Regulatory discretion and corruption**, *American Economic Review*, 88, pp.387-392.
- [38] Lacko, M. (1996), **Hidden Economy in East-European Countries in International Comparison**, Laxenburg: International Institute for Applied Systems Analysis (IIASA), Working Paper.
- [39] Lacko, M. (1998), **The Hidden Economies of Visegrad Countries in International Comparison: A Household Electricity Approach**, in: Halpern, L. And Wyplosz, Ch (eds.), *Hungary: Toward a Market Economy*, Cambridge (Mass.): Cambridge University Press, pp. 128-152.

- [40] Lacko, M. (1999), **Hidden Economy- An Unknown Quantity? Comparative Analysis of Hidden Economies in Transition Countries in 1989-1995**, *Economics of Transition*, 8 (1), pp. 117-149.
- [41] La Porta, R. and A. Shleifer (2008), **The Unofficial Economy and Economic Development**, NBER Working Papers, National Bureau of Economic Research.
- [42] Loayza, N. (1996), **The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America**, Carnegie-Rochester Conference Series on Public Policy, 45, pp. 129-162.
- [43] Loayza, N., Oviedo, A. and L. Servén (2005), **The impact of regulation on growth and informality - cross-country evidence**, Policy Research Working Paper Series 3623, World Bank.
- [44] Loayza, N. and J. Rigolini (2006), **Informality Trends and Cycles**, Policy Research Working Paper Series, World Bank.
- [45] Nipon, P. (1991), **The Informal Sector in Thailand**, *The Silent Revolution*, Eds. A. Chickering and M. Salahdine, International Center for Economic Growth, San Francisco.
- [46] Roodman, D. (2006), **How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata**, Working Paper 103, Center for Global Development, Washington.
- [47] Roodman, D. (2008), **A Note on the Theme of Too Many Instruments**, Working Paper 125, Center for Global Development, Washington.
- [48] Sarte, P.G. (2000), **Informality and Rent-Seeking Bureaucracies in a Model of Long-Run Growth**, *Journal of Monetary Economics*, 46, pp. 173-97.
- [49] Schneider, F. (1997), **Empirical Results for the Size of the Shadow Economy of the Western European Countries over Time**, Working Paper, No. 9710, University of Linz, Austria.
- [50] Schneider, F. (2004), **The Size of the Shadow Economies of 145 Countries all over the World: First Results over the Period 1999 to 2003**, IZA DP No. 1431.
- [51] Schneider, F. (2005), **Shadow Economies around the World: What do we Really Know?**, *European Journal of Political Economy*, 21, pp. 598-642.
- [52] Schneider, F. (2008), **The Shadow Economy in Germany - A Blessing or a Curse for the Official Economy?**, *Economic Analysis and Policy*, 38(1), pp. 89-111.

- [53] Schneider, F., Klingmair, R. (2003), **Shadow Economies around the World: What do We Know?**, University of Linz, Austria. Manuscript.
- [54] Straub, S. (2005). ‘Informal Sector: The Credit Market Channel’, *Journal of Development Economics* 78: 299-321.
- [55] Tanzi, V. (1980), **The Underground Economy in the United States: Estimates and Implications**, *Banca Nazionale del Lavoro*, 135 (4), pp. 427-453.
- [56] Tanzi, V. (1983), **The Underground Economy in the United States: Annual Estimates, 1930-1980**, *IMF- Staff Papers*, 30 (2), pp. 283-305.
- [57] Tauchen, G. (1986), **Statistical Properties of Generalized Method-of-Moments Estimators of Structural Parameters Obtained from Financial Market Data**, *Journal of Business and Economic Statistics*, 4, pp. 397-416.
- [58] Tedds, L.M. and D.E.A. Giles (2002), **Taxes and the Canadian Underground Economy**, Canadian Tax Foundation: Toronto.
- [59] Tokman, V. (1992), **The Informal Sector in Latin America: From Underground to Legal**, *Beyond Regulation: The Informal Economy in Latin America*, Ed. V. Tokman, PREALC, Lynne Rienner, Boulder, Colorado.
- [60] Torgler, B. and F. Schneider (2009), **The impact of tax morale and institutional quality on the shadow economy**, *Journal of Economic Psychology*, 30 (2), pp. 228-245.
- [61] Windmeijer, F. (2005), **A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators**, *Journal of Econometrics*, 126, pp. 25-51.
- [62] World Bank (2010), **Doing Business publications**, <http://publications.worldbank.org>
- [63] Ziliak, J.P. (1997), **Efficient Estimation with Panel Data when Instruments are Predetermined: An Empirical Comparison of Moment-Condition Estimators**, *Journal of Business and Economic Statistics*, 16, pp. 419-431.

# Appendix I

## 6.1 Panel composition

The panel composition depends on the availability of data about electricity consumption, electricity price and the share of industry. Countries in the sample are Australia, Austria, Belgium, Botswana, Bulgaria, Brazil, Canada, Chile, Colombia, Costa Rica, Czech R., Denmark, Egypt, Finland, France, Germany, Greece, Guatemala, Hungary, Ireland, Israel, Italy, Japan, Korea, Malaysia, Morocco, Mexico, Netherlands, Norway, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Singapore, Slovak R., Spain, Sri Lanka, Sweden, Switzerland, Tanzania, Tunisia, Thailand, United Kingdom, United States, and Venezuela.

Data on electricity consumption, real price of electricity, share of industrial income and official GDP have been obtained from Energy Information Administration, International Energy Agency, World Bank and United Nations, respectively.

## 6.2 Construction of the series $SH_i$

We adopted base year estimates provided in Johnson et al. (1997) - for the transition economies, in Bagachwa and Nasho (1995) - for Tanzania, and in Lacko (1996, 1998) for the remaining countries. Except for the base year estimates from Johnson et al. (1997)- that define the shadow economy in percent of total GDP for the year 1990- the other starting values describe the average size of the unobserved economy in percent of official GDP for the period 1989-1990. Therefore, we obtain the unofficial GDP (in million of US dollars) for the year 1989 and the generic country  $i$ ,  $SH_{i,1989}$ , by solving this system:

$$SH_{i,1989-1990} = \frac{SH_{i,1989} + SH_{i,1990}}{2}$$

$$SH_{i,1990} = SH_{i,1989} * (1 + \Delta SH_{i,1990})$$

and deriving:

$$SH_{i,1989} = \frac{2 * SH_{i,1989-1990}}{2 + \Delta SH_{i,1990}}$$

where  $SH_{i,1989-1990}$  is the average unofficial GDP (in millions of US dollars) for the period 1989-1990, obtained by using the base year estimates of the size of unobserved economy (% official GDP) and the figures of real official GDP (in millions of US dollars) for the same period.

By applying  $\Delta SH_{i,t}$  to  $SH_{i,1989}$  we reconstruct, country by country, the entire series of

$SH_i$  (in millions of US dollars) for the period 1981-2005, following the rule:

$$SH_{i,t} = SH_{i,t-1} * (1 + \Delta SH_{i,t})$$

## Tables

Table 1_ Size of <i>SH</i> (% official GDP), mean value and standard deviation of its growth rates							
Country	<i>SH</i> <sub>1981–2005</sub>	<i>GR_Mean</i>	<i>GR_StDev</i>	Country	<i>SH</i> <sub>1981–2005</sub>	<i>GR_Mean</i>	<i>GR_StDev</i>
AU	13.4	-0.027	0.062	MY	33.6	-0.031	0.079
AT	13.5	-0.015	0.085	MA	41.2	-0.007	0.100
BE	21.8	-0.016	0.025	MX	42.9	0.0042	0.064
BW	38.6	-0.068	0.109	NL	12.9	-0.022	0.024
BG	38.1	-0.016	0.106	NO	7.4	-0.040	0.033
BR	28.7	0.001	0.062	PA	30.8	-0.025	0.109
CA	10.7	-0.032	0.039	PY	31	0.055	0.211
CL	31.4	-0.022	0.098	PE	33.9	0.005	0.116
CO	24.8	-0.021	0.091	PH	49.6	0.001	0.095
CR	29.6	-0.026	0.075	PL	19.8	-0.027	0.083
CZ	6.6	-0.000	0.089	PT	17.5	-0.004	0.046
DK	15.6	-0.024	0.036	RO	15.9	-0.006	0.098
EG	66.2	-0.039	0.078	SG	11.1	-0.055	0.065
FI	14.2	-0.017	0.071	SK	6.9	-0.004	0.146
FR	12.5	-0.014	0.030	ES	24.7	-0.018	0.034
DE	14.1	-0.023	0.035	LK	36.3	-0.022	0.047
GR	20.2	-0.003	0.044	SE	10.1	-0.022	0.043
HU	38.1	-0.011	0.075	CH	10.4	-0.007	0.032
GT	54.4	0.021	0.086	TZ	30.6	-0.061	0.150
IE	16.8	-0.060	0.056	TH	73.1	-0.034	0.098
IL	24.7	-0.025	0.051	TN	39.9	-0.014	0.045
IT	20.6	0.003	0.030	GB	12.9	-0.037	0.031
JP	14.9	-0.014	0.039	US	9.6	-0.037	0.032
KR	40.7	-0.056	0.060	VE	26.6	0.006	0.116

Note: *SH*<sub>1981–2005</sub> = mean value of *SH* (MTE estimates, % official GDP) for the period 1981–2005. *GR\_Mean* and *GR\_StDev* = mean value and standard deviation of the annual growth rates of *SH* (% official GDP).

<b>Table 2- SGMM- SH (share of official GDP), Quality of Institutions and Public Expenditure</b>								
Dependent Variable: SH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rule of law	-0.016**			-0.097**	-0.012**	-0.013*		
Government stability		-0.006***		-0.007***	-0.005**	-0.007***		
Democratic accountability			-0.02***	-0.012*	-0.015**	-0.018*		
Quality of institutions							-0.034***	
Quality of institutions (pca)								-0.03***
Protection workers' rights					0.012**	0.017**	0.022***	0.015**
Public expenditure						-0.9**	-1.08*	-0.73*
Log_gdp	-0.155***	-0.118***	-0.14***	-0.075***	-0.09***	-0.08***	-0.067**	-0.075***
Observations	1030	1030	1026	1026	978	959	959	959
AR(2)	0.9	0.9	0.8	0.8	0.9	0.9	0.9	0.9
Hansen	0.5	0.3	0.3	0.2	0.2	0.2	0.3	0.1
Regressions with constant terms and two step-robust standard errors (not reported).								
Statistical significance at: 10% (*), 5% (**), 1% (***).								



<b>Table 3- Changes in institutional measures</b>								
Dependent Variable: SH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democracy indicator	-0.016**	-0.027**						
Executive constraints			-0.019**	-0.041***				
Civil liberties					-0.04**	-0.039**		
Political rights							-0.035**	-0.043*
Protection workers' rights		0.013*		0.018**		0.019*		0.02*
Public expenditure		-0.89*		-1.18*		-0.67*		-0.81*
Log_gdp	-0.13***	-0.08**	-0.16***	-0.097**	-0.14***	-0.09***	-0.16***	-0.09**
Observations	1161	1090	1161	1090	1122	1052	1122	1052
AR(2)	0.6	0.8	0.5	0.4	0.5	0.6	0.8	0.8
Hansen	0.4	0.5	0.18	0.3	0.28	0.3	0.27	0.34
Regressions with constant terms and two step-robust standard errors (not reported).								
Statistical significance at: 10% (*), 5% (**), 1% (***)								

<b>Table 4- SH (share of official GDP) and Corruption</b>				
Dependent Variable: SH	(1)	(2)	(3)	(4)
Rule of law	-0.017***	-0.018***	-0.012**	-0.013**
Government stability	-0.004*	-0.007***	-0.005**	-0.009***
Democratic accountability	-0.012*	-0.013*	-0.017**	-0.012*
Corruption	-0.02***	-0.02***		
Corruption Perception Index			-0.03**	-0.018*
Log_gdp	-0.079***	-0.07***	-0.14***	-1.01***
Protection workers'rights		0.01**		0.017**
Public expenditure		-0.56*		-0.67*
Observations	1026	959	704	644
AR(2)	0.9	0.9	0.5	0.6
Hansen	0.29	0.29	0.76	0.35
Regressions with constant terms and two step-robust standard errors (not reported).				
Statistical significance at: 10% (*), 5% (**) or 1%(***).				

<b>Table 5- SH (share official GDP) and Economic Freedom</b>					
Dependent Variable: SH	(1)	(2)	(3)	(4)	(5)
Rule of law	-0.014**	-0.002		-0.02*	-0.002
Government stability	-0.006*	-0.005**		-0.007**	-0.006**
Democratic accountability	-0.003	-0.000		-0.008	-0.008
Protection workers'rights	0.02*	0.03***	0.023**	0.02**	0.02**
Public expenditure	-1.53**	-0.88**	-1**	-1.02***	-0.92**
Fiscal freedom				-0.03***	-0.026***
Business freedom					-0.022**
Economic freedom		-0.06**	-0.057**		
Log_gdp	-0.09***	-0.06**	-0.074***	-0.09***	-0.077***
Observations	465	459	462	459	459
AR(2)	0.9	0.3	0.28	0.9	0.97
Hansen	0.6	0.46	0.54	0.55	0.5
Regressions with constant terms and two step-robust standard errors (not reported).					
Statistical significance at: 10% (*), 5% (**) or 1%(***).					

**Table 6- SH (share official GDP) with different base-year estimates**

Dependent Variable: SH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rule of law	-0.02***			-0.018***	-0.02***	-0.02**		
Government stability		-0.006***		-0.006***	-0.007***	-0.007***		
Democratic accountability			-0.025***	-0.011*	-0.009**	-0.017*		
Quality of institutions							-0.03***	
Quality of institutions (pca)								-0.026***
Protection workers' rights					0.01*	0.014**	0.015**	0.012**
Public expenditure						-1.15**	-1.03**	-1**
Log_gdp	-0.17***	-0.14***	-0.17***	-0.09***	-1***	-1***	-0.09***	-0.09***
Observations	1030	1030	1026	1026	978	959	959	959
AR(2)	0.9	0.9	0.9	0.8	0.9	0.9	0.9	0.9
Hansen	0.5	0.4	0.2	0.5	0.4	0.3	0.4	0.2

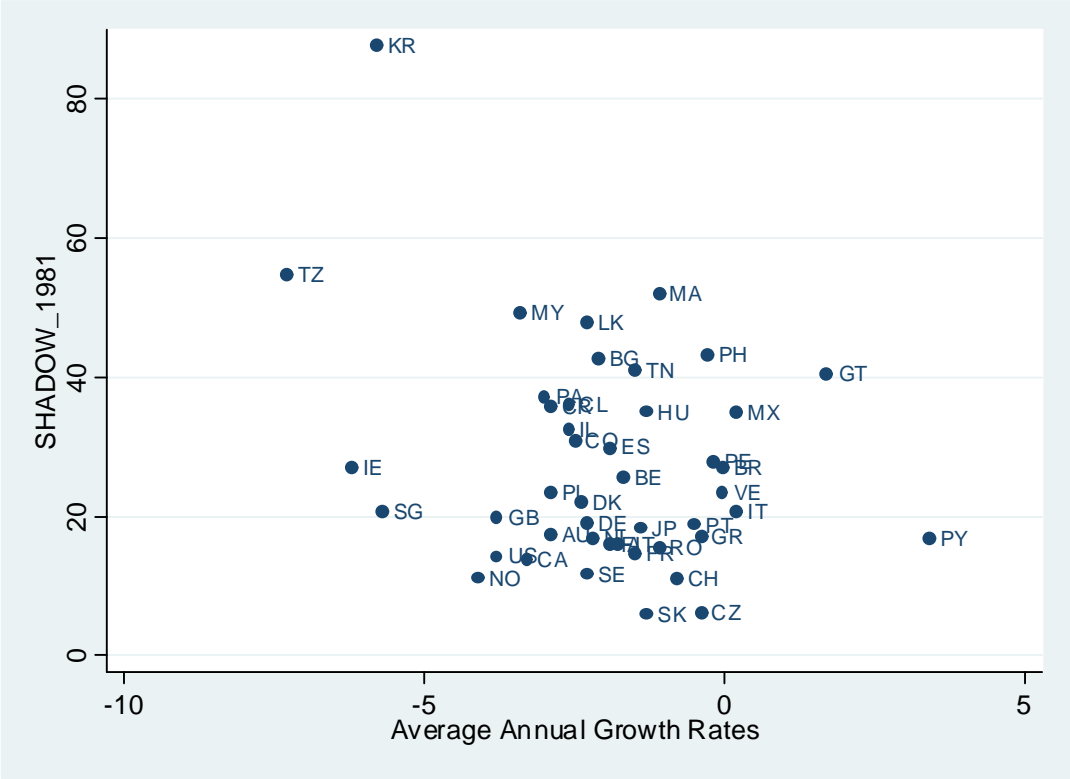
**Table 7- Excluding Botswana, Egypt and Thailand**

Dependent Variable: SH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rule of law	-0.013***			-0.007**	-0.011**	-0.015**		
Government stability		-0.006***		-0.005***	-0.006***	-0.008***		
Democratic accountability			-0.02***	-0.015**	-0.016**	-0.016*		
Quality of institutions							-0.025***	
Quality of institutions (pca)								-0.03***
Protection workers' rights					0.01**	0.01*	0.014**	0.04***
Public expenditure						-0.72*	-0.92**	-0.49*
Log_gdp	-0.14***	-0.11***	-0.13***	-0.09***	-0.09***	-0.09***	-0.08***	-0.08***
Observations	965	965	961	961	916	899	899	899
AR(2)	0.7	0.6	0.5	0.6	0.6	0.7	0.7	0.5
Hansen	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.4

<b>Table 8- Variables definitions and Descriptive Statistics</b>					
	Mean	Std. Dev.	Min	Max	Source
Shadow Economy (SH)	0.258	0.173	0.041	1.289	Omnis and Tirelli (2010)
Rule of law	4.411	1.507	0	6	ICRG
Government stability	7.731	1.991	1	11.08	ICRG
Democratic accountability	4.641	1.373	1	6	ICRG
Corruption	3.870	1.363	0	6	ICRG
Corruption perception index (cpi )	5.985	2.394	1.04	10	Transparency International
Protection workers'rights	1.303	0.751	0	2	Human Rights Dataset
Public expenditure	0.187	0.061	0.066	0.437	Penn World Tables
Democracy indicator	7.300	3.589	0	10	Polity IV
Executive constraints	5.757	1.757	1	7	Polity IV
Civil liberties	2.598	1.555	1	7	Freedom House
Political rights	2.306	1.702	1	7	Freedom House
Fiscal freedom	6.365	1.539	2.98	9.02	Heritage Foundation
Business freedom	7.146	1.087	5.5	10	Heritage Foundation
Economic freedom	6.813	0.823	4.501	8.797	Heritage Foundation
Log_gdp	8.596	1.356	5.139	10.614	United Nations

# Figures

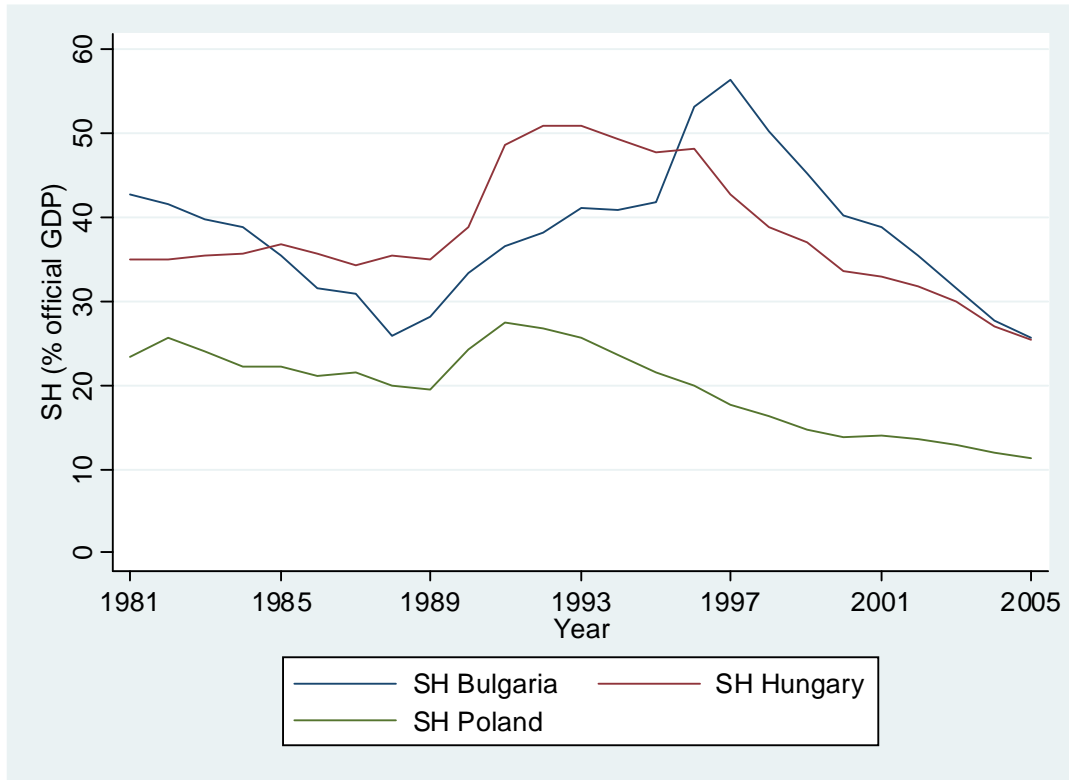
Figure 1- SH\_1981 and Average Annual Growth Rates



Note: SHADOW\_1981 = *SH*(% official GDP) for 1981. The Average Annual Growth Rates for the entire period 1981-2005 are calculated as the compound annual growth rates of *SH*(% official GDP).

Source: Own calculations.

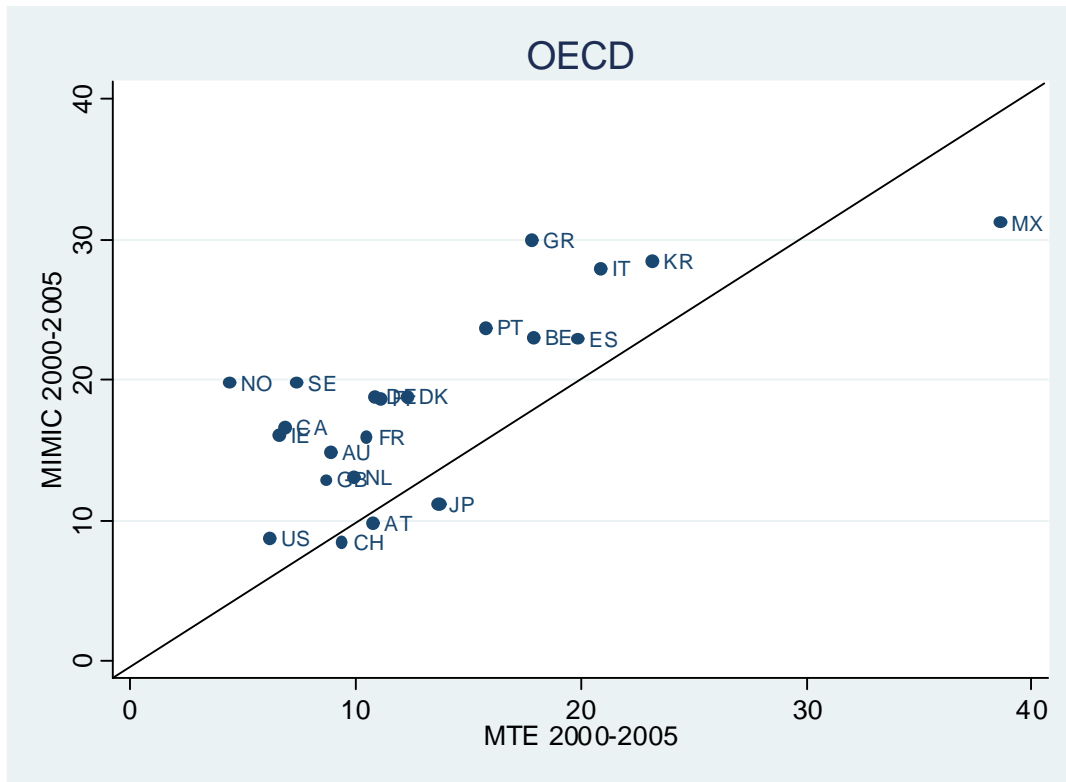
Figure 2- Evolution of *SH* in Bulgaria, Hungary and Poland



Source: Own calculations.



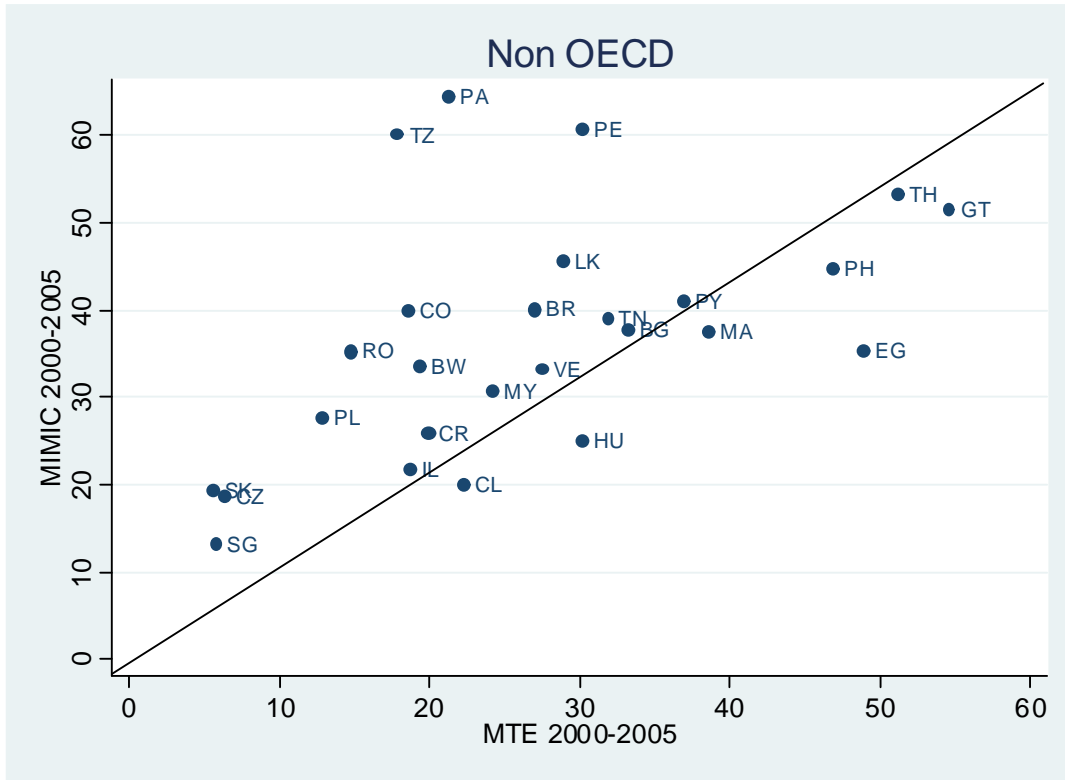
Figure 3- MTE and MIMIC estimates of SH (% official GDP)



Note: MTE and MIMIC estimates of *SH* (% official GDP) for the period 2000-2005. OECD = 22 highly industrialized OECD countries

Source: MTE = Own calculations, MIMIC = Schneider et al. (2010)

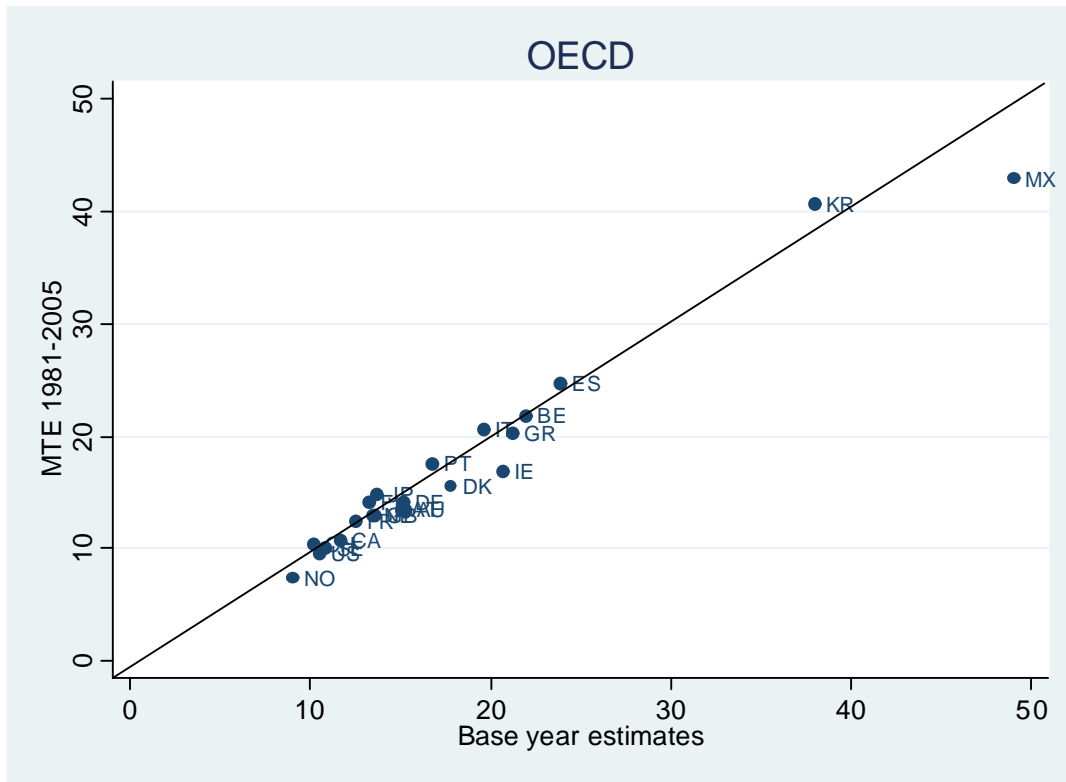
Figure 4- MTE and MIMIC estimates of SH (% official GDP)



Note: MTE and MIMIC estimates of *SH* (% official GDP) for the period 2000-2005.

Source: MTE = Own calculations, MIMIC = Schneider et al. (2010)

Figure 5- MTE and base year estimates of SH (% official GDP)



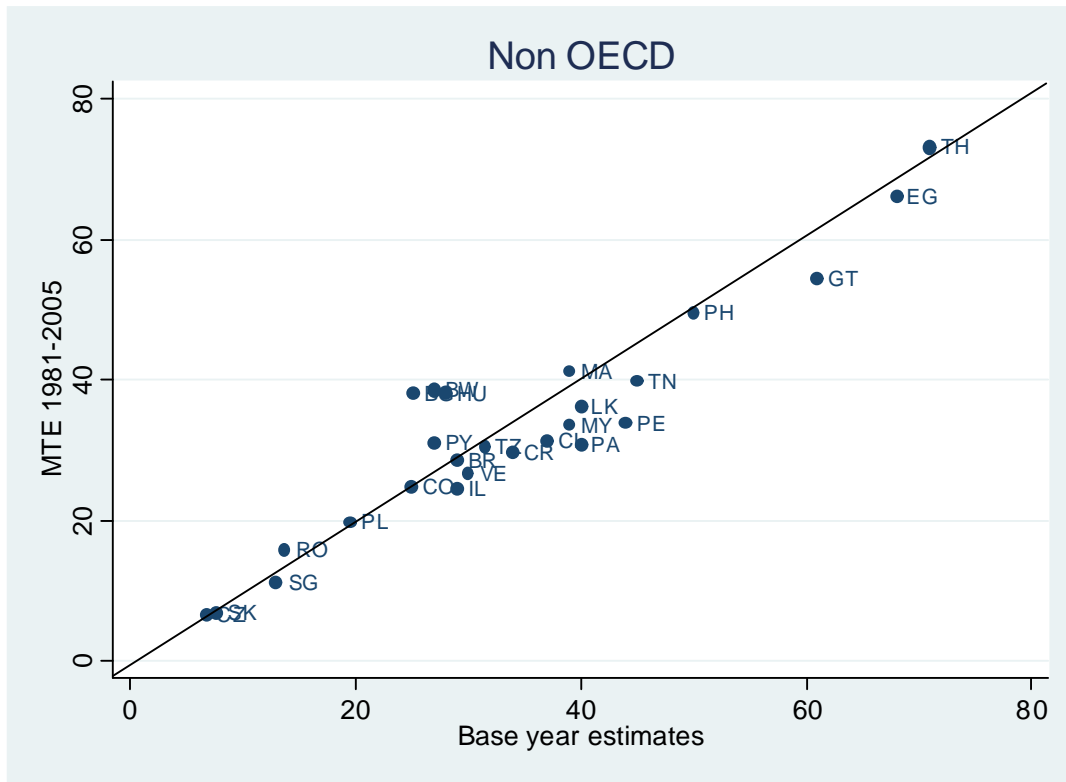
Note: MTE and base year estimates of  $SH$  (% official GDP). OECD = 22 highly industrialized OECD countries

Sources:

i) Base year estimates = Lacko (1999) for  $SH_{1989-1990}$

ii) MTE = Own calculations

Figure 6- MTE and base year estimates of SH (% official GDP)



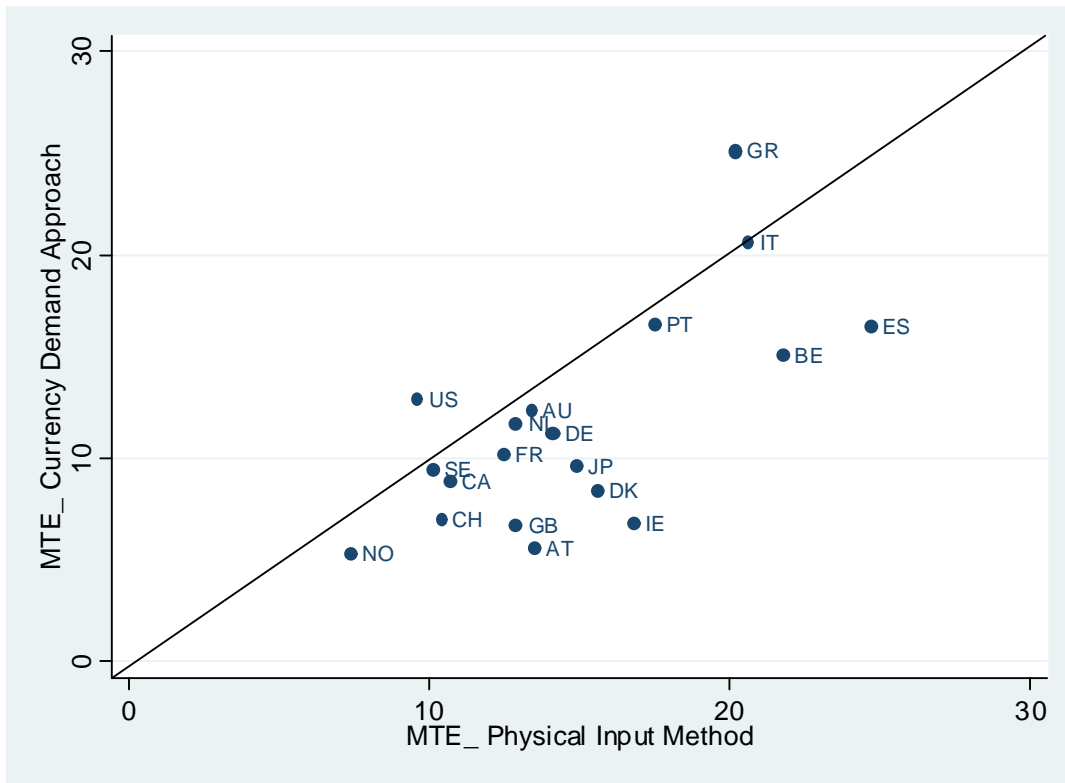
Note: MTE and base year estimates of  $SH$  (% official GDP)

Sources:

*i*) Base year estimates = Lacko (1999) and Bagachwa and Naho (1995, for Tanzania) for  $SH_{1989-1990}$ ; Johnson et al. (1997, for Central and Eastern European countries) for  $SH_{1990}$

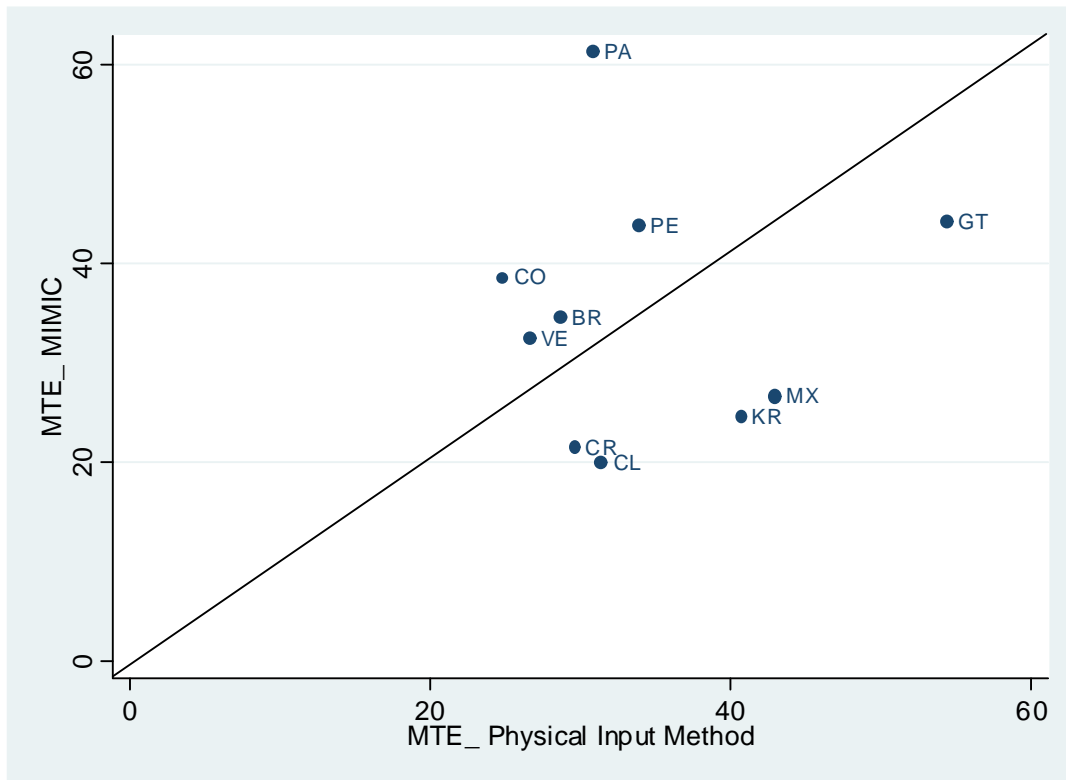
*ii*) MTE = Own calculations

Figure 7- MTE estimates with different starting values- Currency Demand Approach



Note: MTE\_Physical Input Method = MTE estimates of SH (% of official GDP) obtained by using as base year estimates the figures of Lacko (1999), MTE\_Currency Demand Approach = MTE estimates of SH (% of official GDP) obtained by using as base year estimates the figures obtained by using the Currency Demand Approach as reported in Friedman et al. (2000).

Figure 8- MTE estimates with different starting values- MIMIC



Note: MTE\_Physical Input Method = MTE estimates of SH (% of official GDP) obtained by using as base year estimates the figures of Lacko (1999), MTE\_MIMIC = MTE estimates of SH (% of official GDP) obtained by using as base year estimates the figures obtained by using the MIMIC approach as reported in Loayza (1996). For South Korea, we have used the starting value obtained by Yoo and Hyun, (1998)- as reported in Schneider and Enste (2000)- by adopting the income discrepancy method.