Shadow Economy and Poverty

Hesam Nikopour and Muzafar Shah Habibullah

Faculty of Economics and Management University Putra Malaysia (UPM)

5. June 2010

Shadow Economy and Poverty

Hesam Nikopour [1], *Muzafar Shah Habibullah*[2]

Abstract

This study attempts to investigate the relationship between shadow economy and poverty by explaining the mechanism through which shadow economy affects poverty via its impact on government size and economic growth, and using the human poverty index (HPI) for developing and developed countries. In order to achieve this objective, the three-way interaction model is utilized using data of 139 developing and 23 developed countries separately during 1999-2007. For developing countries the dynamic panel system GMM and for developed countries, the fixed and random effects method of estimation is used. The results suggest that increasing the shadow economy leads to increase poverty in developing countries while it decreases poverty in developed countries.

JEL Classification: O17, I3, C23
Keywords: Shadow economy, Poverty, Panel data analysis.

1. Introduction

Governments lose a large portion of their revenues through tax evasion, tax avoidance, and inefficient fiscal authorities or in sum shadow economy, which can contribute toward poverty reduction and promoting sustainable development.

Poverty alleviation is at the top of the Millennium Development Goals' (MDGs) list of eight goals. In the year 2000, nearly all heads of states and governments met and reaffirmed their faith in the united nation organization (UN) as necessary foundations of a more peaceful, prosperous and just world. At this meeting, the MDGs were adopted which the first goal is eradicate extreme poverty and hunger.

The question of how to finance poverty reduction measures has been a major concern for policy makers and international organizations for many years. Although it is useful to focus on the quantity and quality of foreign aid and development assistance of donor communities, it is not the solution. In the long term, countries can only prevail against their dependency on foreign aids when they are able to move enough domestic resources to guarantee universal access to essential public goods and services. Politicians and international organizations have been frequently emphasizing the importance of mobilizing

1- Ph.D. candidate, Department of Economics, Faculty of Economics and Management University Putra Malaysia (UPM), Email: hessamnik@yahoo.com and gs18533@mutiara.upm.edu.my.

2 - Professor of Economics, Department of Economics, Faculty of Economics and Management University Putra Malaysia (UPM), 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia. Email: muzafar@econ.upm.edu.my,Tel.: +603-89467635 ;Fax: +603-89486188.

domestic resources. This issue gained prominence at the UN conference on financing for development in Monterrey in 2002. Nevertheless, non-governmental organizations (NGOs) responded to this rather suspiciously. They doubted that governments of wealthy countries wanted to divert attention from their responsibilities.

Recently, civil society organizations have focused more on public revenues in their own countries. Among others, redistribution and increased taxation of domestic elites as well as examining how public revenues are contributing to fighting poverty and actualizing economic, social and cultural rights are most important.

To reach this goal, designing an efficient tax system that permits governments to increase the necessary resources, and transparent and participatory budgets should be noted as the starting steps (Martens, 2007).

However, up to now the mobilization of domestic resources in order to eradicate poverty and redistribute income has been facing several internal and external barriers including the growth of shadow economy because a significant amount of tax revenues are lost through the shadow economy. Cobham (2005) estimates that tax revenues in developing countries would produce an additional US$ 252 billion per year if the shadow economy were fully integrated into the official economy.

Although there are some studies[3] on the link between shadow economy and income inequality, to our knowledge, this is the first study that investigates the relationship between shadow economy and poverty based on panel data and focusing on capability poverty using the human poverty index (HPI).

Obayelu Abiodun and Larry (2007) in a comparative analysis of the relationship between poverty and underground economy using Schneider (2005) shadow economy data of 145 countries found that "underground economy and poverty have no geographical boundary. The incidences of poverty and shadow economy are larger in the poor, developing and transition, countries when compared with the highly developed countries. There is also a causal link between poverty and underground economy especially in the developing and transition countries".

There are some critics on this study since they have concluded a causal relationship by only comparison of shadow economy and poverty sets of data in different time periods and finding the empirical evidence of the relationship between these variables in developing countries based on sampling people in Nigeria and interviewing on their opinions about underground economy and poverty and the possible causes that may lead them into such shadow economy. As it is evident, concluding causal relationship using this approach is problematic. They have also not explained theoretically the mechanism through which shadow economy affects poverty.

[3] - Rosser et al. (2000, 2003 and 2004) and Valentini (2007).

2. Relative Literatures and Hypotheses

An increase in the size of shadow economy affects poverty by reducing state revenues through which governments finance poverty reduction and social protection measures. Further, shadow economy has direct consequences on tax financed government expenditure, government size, and its effects on economic growth, intermediary that in turn affects poverty. The latter mechanism is explained by studying the relationship between economic growth and poverty as well as the relationship between shadow economy, government size and economic growth.

2.1. The Relationship between Economic Growth and Poverty

According to Dollar and Kraay (2002), economic growth is the most important determinant and the necessary condition for poverty reduction. Although, economic growth does not necessarily imply development, however, significant and sustainable growth rates can provide the resources that societies need to combat poverty and high levels of deprivation and achieve improvements in the human condition (Elu, 2000). Many statistical studies have found association between national per capita income and national poverty indicators, using both income and non income measures of poverty.

Dollar and Kraay (2002) in their study of 80 countries, including a period of four decades, found that on average the income of the bottom 20 percent of the population rose one-for-one with the overall growth of the economy as defined by per capita gross GDP. Moreover, they found that there is no difference between the income of the poor on average and that in rich countries and that policy-induced growth was as good for the poor as it was for the overall population. Another study of White and Anderson (2001) also shows that the "growth effect" is dominated, while the "distribution effect" being important in only a minority of cases. These studies establish only association and not causation. In fact, the causality could well go the other way. In these cases, poverty eradication could be necessary to implement stable macroeconomic policies or to achieve higher growth.

In the transition countries of the Former Soviet Union (FSU), the conversion to a market system was correlated with a rapid initial reduction in output and higher levels of poverty. The increasing of poverty was initiated by the collapse of GDP, which fell by 50 percent in the FSU countries and 15 percent in Central and Eastern Europe (World Bank, 2000).

Gupta et al. (1998) in their study of a cross-national analysis to investigate the relationship between growth and poverty found that higher growth is correlated with poverty reduction. They used income growth of the bottom quintile as the dependent variable and growth in GNP, natural resources, initial income of the lower quintile, initial secondary schooling, education inequality, and initial distribution of assets, social spending and growth in corruption were used as explanatory variables.

Quibria (2002) in his study provides a good example of sharp economic growth conducting to a decrease in poverty incidence. However, income distribution did not change over the period of growth even in this special case of rapid growth. Easterly (2001) using data from

Ravallion, and Chen, (1997), found that the incidence of poverty was reduced in countries with positive economic growth during 1981-1999, although it is concluded that "measures of inequality show no tendency to get either better or worse with economic growth."

Summarizing, the results of studies show that income increases with economic growth and vice versa. It should be noted that economic growth does not necessarily lead to more equal income distribution an increase in income may benefit the rich rather than bringing the poor out of poverty. Thus, it is not the pro-poor growth. Some define pro-poor growth as economic growth that benefits the poor relatively more than the non-poor (Pernia, 2003). Others define it as "economic growth that is associated with reductions in absolute poverty" (Ravallion and Chen, 1997 and DFID, 2004). For the purposes of this study, it is not necessary to discuss which one of these definitions is preferred. The most important point, which there is little disagreement about it, is that income distribution is an important factor in the relationship between economic growth and poverty alleviation.

2.2. The Relationship between Shadow Economy, Government Size and Economic Growth

Shadow economy grows when individuals choose the "exit" option rather than "voice" option as the reaction to increasing burdens (Schneider and Enste, 2000).

In modern societies government has a deep role including setting rules and laws, defending against external forces, supplying public goods and services, providing infrastructure, providing security and justice, and undertaking policies to facilitate domestic calmness. However, the power of government may enhance general welfare or erode it. Friedman (1997) observed that "Government has an essential role to play in a free and open society. Its average contribution is positive; but I believe that the marginal contribution of going from 15% of the national income to 50% has been negative." Karras (1996) noted that "the optimal government size is 23 percent for the average country but ranges from 14 percent for the average OECD country to 33 percent in South America; and the marginal productivity of government services is negatively related to government size." (karras, 1996)

In their study, Tanzi and Schuknecht (1995) argue that increasing government expenditure cannot be justified by social improvements since "Higher spending on social programs has not commensurately improved critical social indicators such as life expectancy, infant mortality, or school enrolment, suggesting that increases in public spending are not necessarily productive beyond a certain level". Gupta et al., (2001) also conclude that "Government spending needs to be no higher than 30 percent of GDP to achieve socially desirable goals" Thus, large size governments do not work better than small governments to reach these goals.

Armey (1995) by introducing the Armey curve illustrates the existence of a government share of GDP that maximizes GDP growth (an optimal size of government).

When private and government sectors decide together on resource allocation, output often is larger. With a small government, increasing government size is associated with output enhancing. However, more expansion in government size leads to diminishing output enhancing aspects of government and further expansion of it conduces to economic stagnation and decline.

By growing governments, the diminishing returns law begins. Although providing infrastructure such as building roads assists output expansion, the construction of secondary roads have less marginal positive impact. Moreover, by increasing tax rates and enforcing new taxes with adverse effects on economic behaviour, financing government expenditure through tax or borrowing imposes increasing burdens. Thus, new government spending no longer increases economic growth (Atukeren, 2005).

As mentioned in the text, the relationship between government expenditures and economic performance is a subject of continuing discussion in economics and public policy making. On the one hand, increased government size may distort the economic and political environment and crowd out private sector investments. On the other hand, through investment in physical and human capital infrastructures such as education and health, the government may contribute to development of private sector. Therefore, government involvement leads to crowd in private sector investments by provision of physical, legal, and human capital infrastructure (Gramlich, 1994). This argument is especially valid in a developing country framework.

The literature on this topic shows that in contrast to the neoclassical points of view which advocate crowding out, the Keynesian school believes that increasing government spending stimulates the domestic economic activity and crowds in private investment. According to the Ricardian Equivalence theorem, “increases in deficit financed by fiscal spending will be matched with a future increase in taxes and so they leave interest rates and private investment unchanged” (Bahmani-Oskooee, 1999).

In empirical studies, the government involvement in the economy is generally explained by a widely defined government size variable that also includes other government consumption items, public sector wages and salaries and transfer payments. However, even by using such aggregate government size variable, the empirical studies on the effects of government size on economic performance show different results. For example, Ram (1986), Aschauer (1989), Dowrick (1996), Sanchez-Robles (1998), Fan and Rao (2003) and, Esfahani and Ramires (2003) find evidence that increases government size are positively correlated with economic growth.

Landau (1986), Grier and Tullock (1989), Peden and Bradley (1989), Barro (1991), Gwartney et al. (1998), Dar and Amirkhalkhalim (2002), Folster and Herkson (2001), Abu-Bader and Abu-Qarn (2003), Mo (2007) and, Higgins et al., (2009), among others, do not support these conclusions, and report a negative relationship, while Kormendi and Meguire (1985) find no relationship. Terasawa and Gates (1998) argue that the relationship between

government size and economic growth is positive in less developed countries and a negative relationship arises in developed countries.

Terasawa and Gates (1998) assume that by increasing the level of development, the share of productive government spending decreases and the share of unproductive items increases.

It is generally expected that shadow economy affects the tax system structure, the tax financed government expenditure (government size) and it's crowding out or crowding in effects on private sector investment and the economic growth in a dynamic sense. Considering both lines of theoretical argument about the effects of government size on economic growth, the effects of an increase in the size of the shadow economy on economic growth may be ambiguous. Since researchers such as Terasawa and Gates (1998) argue that the relationship between government size and economic growth is positive in less developed and negative in developed countries, the relationship between shadow economy and economic growth may depends on the level of development.

Schneider (2005) by estimating a basic equation for a sample of 110 developing and developed countries with further estimates for two separate sub samples of 21 OECD countries and 89 developing and transition countries, point out all three sets of regression show that shadow economy has a significant influence on official economic growth. This influence is positive for transition and OECD countries and negative for developing countries.

2.3. Hypotheses

In sum, increasing the shadow economy decreases tax revenues as the main financial resource of government expenditure (government size) which in turn may have positive (neoclassical view) or negative (Keynesian view) effects on economic growth rate. Since economic growth is the most important factor influencing poverty, increasing the shadow economy may lead to decrease or increase poverty depends on the level of development. Thus, following hypotheses are formulated:

Hypothesis 1*: Increasing the shadow economy leads to increase poverty in developing countries, ceteris paribus.*

Hypothesis 2*: Increasing the shadow economy leads to decrease poverty in developed countries, ceteris paribus.*

3. Model

Since economic growth and government size affects on shadow economy and all three together affects on poverty, this study specifies the model using three-way interaction between shadow economy, government size and economic growth, as follows:

$$\begin{aligned} Poverty_{i,t} &= \alpha + \beta_1 (shadow)_{i,t} + \beta_2 (Gov)_{i,t} + \beta_3 (g)_{i,t} + \beta_4 (shadow \times Gov)_{i,t} \\ &+ \beta_5 (shadow \times g)_{i,t} + \beta_6 (Gov \times g)_{i,t} + \beta_7 (shadow \times Gov \times g)_{i,t} + \gamma Z_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

where, $Poverty_{i,t}$ is the human poverty index for country i in period t. ($shadow$) is the shadow economy, (Gov) is the government consumption (government size), (g) is the economic growth rate, ($shadow \times Gov$) is the interaction term of shadow economy and government size, ($shadow \times g$) is the interaction term between shadow economy and economic growth, ($Gov \times g$) is the interaction term of government size and economic growth, ($shadow \times Gov \times g$) is the interaction term between shadow economy, government size and economic growth and $Z_{i,t}$ is a set of conditioning information for country i in period t. $Z_{i,t}$ includes, governance and rural population.

Governance: Kaufmann et al. (1999, 2004) define governance as, "The traditions and institutions by which authority in a country is exercised. This includes (1) the process by which governments are selected, monitored and replaced, (2) the capacity of the government to effectively formulate and implement sound policies, and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them."

Better governance reduces poverty in different dimensions including empowerment, capabilities, opportunities, and security. The poor can influence policy making, budget priorities, and program designing through participating in political and administrative processes.

Government has also a key role in defining the rules governing access to private markets. The poor may not access to markets of lands, credit and labor due to social exclusion. Lack of physical access to markets limits the available opportunities to the poor to enter in more profitable activities, which is important for reducing vulnerability to agricultural shocks. Thus, Governments need to reform the regulations to improve market access, and distribute information to the poor about opportunities for employment, asset ownership, and local and international prices as the measures of poverty reduction.

By improving justice system and limiting exploitation by police, governments can also reduce vulnerability to crime, violence, and corruption of the poor (Girishankar et al., 2002).

Rural Population: In most developing countries the likelihood of being poor and the severity of poverty are more in rural areas due to five characteristics of rural space; a strong dependency on the natural resource base to sustain livelihoods leading to high risk environment, a low population density and geographic constraints leading to high transaction costs and reduced access to physical and social infrastructure, an informal economy, which makes it more difficult for policy makers to provide targeted poverty reduction measures, cultural and linguistic differences leading to limited voice and participation in national and even local decision making processes, not recognizing the important role of women in income generating programs (Cord, 2002). Despite the rural sector's importance to strategies for economic growth and poverty reduction, rural stakeholders often find their interests poorly represented in national policymaking

processes. Nearly 75 percent of the world's poor are located in rural areas, and at current trends the global percentage of poor in rural areas will not fall below 50 percent before 2035 (Ravallion, 2000 and Alderman, 2001). Hence it is expected rural population positively influences poverty.

4. Econometric Methodology

Multiple regression models often contain interaction terms. First off, let's start with what a significant continuous by continuous interaction means. It means that the slope of one continuous variable on the response variable changes as the values on a second continuous change. If there is a moderator variable which influences the regression of the dependent variable on an independent/predictor variable, the regression model has a significant two-way interaction of continuous variables. In the formula (2), Y is the response variable, X the predictor (independent) variable with Z being the moderator variable. The term XZ is the interaction of the predictor with the moderator.

$$Y = b_0 + b_1X + b_2Z + b_3XZ \quad (2)$$

If there are two moderator variables which jointly influence the regression of the dependent variable on an independent variable, the regression model has a significant three-way interaction of continuous variables. In the formula (3), Y is the response variable, X the predictor (independent) variable with Z and W being the two moderator variables.

$$Y = b_0 + b_1X + b_2Z + b_3W + b_4XZ + b_5XW + b_6ZW + b_7XZW \quad (3)$$

To explain a three-way interaction, simple slopes, i.e., the slopes of the dependent variable on the independent variable when the moderator variables are held constant at different combinations of high and low values, are computed. This method is adapted by Dawson and Richter (2004).

The terms can be reordered into two groups, the first grouping (terms that do not contain X) defines the intercept while the second grouping (all the terms that contain an X) defines the simple slope.

$$Y = (b_0 + b_2Z + b_3W + b_6ZW) + (b_1 + b_4Z + b_5W + b_7ZW)X \quad (4)$$

Next, high values (one standard deviation above the means) of Z and W will be defined as being one standard deviation above their respective means and will be denoted as Hz and Hw. The low values (one standard deviation below the means) will be defined as one standard deviation below their means and will be noted as Lz and Lw. Altogether there are four possible combinations of conditions:

1) High value of z and high value of w (HzHw)
2) High value of z and low value of w (HzLw)
3) Low value of z and high value of w (LzHw)
4) Low value of z and low value of w (LzLw)

Here are the formulas for the simple slope and intercept for condition 1) when both Z and W are at their high values. The formulas for the other three conditions are exactly the same except that the values for Z and W are different.

$$\text{simple slope 1} = b_1 + b_4Hz + b_5Hw + b_7HzHw$$
$$\text{intercept 1} = b_0 + b_2Hz + b_3Hw + b_6HzHw$$

After computing the slopes and intercepts for each of the four regression lines, four simple regression lines can be plotted.

As the right-hand-side variables in equation (1) may be endogenous, the dynamic panel system GMM estimator is used. However, since computing human poverty index as a measure of capability poverty is different for developing and developed countries, the GMM method of estimation cannot be used to study the effects of shadow economy on poverty for developed countries due to limitation of cross sections and the fixed and random effects method is used.

5. Data

Until few years ago, quantitative analyses of interactions between variables such as shadow economy, indexes of rules of law, corruption and economic freedom have been virtually impossible. Fortunately, the recent availability of data on the scope of shadow economy now makes such a study possible. In particular, Schneider et al. (2010) estimate of the shadow economy as percentage of official GDP is used. The collected data set consists for 139 developing countries and 23 developed countries during 1999-2007.

Shadow economy: The shadow economy includes all market-based legal goods and services production that are on purpose hidden from public authorities for the following reasons:

1) Tax evasion,
2) Avoiding the social insurance contribution payment,
3) Refusing to observe specified legal measures such as minimum wage, maximum work hours and protective or health measures, and
4) Refusing to observe specified administrative methods and procedures such as completion of statistical questionnaires, escaping bureaucratic formalities etc.

In this study, the shadow economies data constructed by Schneider et al. (2010) based on the DYMIMIC and currency demand method is used.

Human Poverty Index (HPI): The HPI-1 is the human poverty index for developing countries. It is discarded income in the variable mix and included only "the most basic dimensions of deprivation: a short life, lack of basic education, and lack of access to public and private resources" (Doraid, 1997). The formula used to calculate the HPI-1 is:

$$\text{HPI-1} = \left[1/3\left(P_1^{\alpha} + P_2^{\alpha} + P_3^{\alpha}\right)\right]^{1/\alpha}$$

Where: P_1 = Probability at birth of not surviving to age 40 (times 100), P_2 = Adult illiteracy rate, P_3 = 1/2(population not using an improved water source) + 1/2(children under weight for age), $\alpha = 3$

For selected OECD countries, the HPI-2 is the human poverty index. It measures deprivations in the same basic dimensions at the HPI-1 and also captures social exclusion. Thus it reflects deprivations in four dimensions. The formula used to calculate the HPI-2 is as follows:

$$\text{HPI-2} = \left[1/4\left(P_1^{\alpha} + P_2^{\alpha} + P_3^{\alpha} + P_4^{\alpha}\right)\right]^{1/\alpha}$$

Where: P_1 = Probability at birth of not surviving to age 60(times 100), P_2 = Percentage of adults lacking functional literacy skills, P_3 = Percentage of population below income poverty line (50% of the median adjusted household disposable income), P_4 = Rate of long term unemployment (lasting 12 months or more), $\alpha = 3$

Governance: The institutional quality data sets we employed in the analysis are newly assembled dataset by Kaufmann *et al.* (2008). These indicators are constructed based on information gathered through a wide variety of cross-country surveys as well as polls of experts. Kaufmann *et al.* (2008) use a model of unobserved components, which enables them to achieve levels of coverage of approximately 212 countries for each of their indicators. They construct six different indicators, each representing a different dimension of governance: (i) *Voice and Accountability*, (ii) *Political Stability and Lack of Violence*, (iii) *Government Effectiveness*, (iv)*Regulatory Quality*, (v) *Rule of Law*, and (vi) *Control of Corruption*. The definition of the above institutional quality indicators are provided in Table 2 (Appendix).

Due to collinearity between these indicators, the average of voice and accountability, and political stability, is defined as the political freedom and stability and average of government effectiveness, regulatory quality, rule of law and corruption as the government efficiency (Law and Azman-Saini, 2008).

6. Empirical Results

To investigate the relationship between shadow economy and poverty, two cases are considered (i) shadow economy and poverty in developing countries, and (ii) shadow economy and poverty in developed countries because computing human poverty index as a measure of capability poverty is different for developing and developed countries. Therefore, the GMM method of estimation cannot be used to study this relationship for developed countries due to limitation of cross sections the fixed and random effects method is used[4].

[4]- Table 5 shows the results of GMM-SYS and GLS estimation of the relationship between shadow economy and poverty for developed countries.

6.1. Dynamic Panel Data Estimator for Poverty and Shadow Economy in Developing Countries

To empirically test the relationship between shadow economy and poverty, a three-way interaction model is considered. This model is explored using two step system GMM method with t-values and test statistics that are asymptotically robust to general heteroscedasticity and corrected for a small sample bias. The estimates of relationship between poverty and shadow economy in developing countries are presented in Table 1 which its columns present different specifications. In all models the variables of interest are shadow economy and the interaction term between shadow economy, government size and economic growth.

There is no control variable in specification 1. This typical econometric model is used as the base of econometric estimations; but as the robustness check in specification 2, rural population (% of total population) and political freedom and stability are considered as control variables. Both models include a set of year dummies. In all specifications, year dummies and levels equation are used as instrument variables because all other regressors are not strictly exogenous. The poverty equation for developing countries fits the data well as indicated by the regression statistics. In all specifications, according to AR(1) and AR(2) statistics[5], selection of one lag period is needed for dependent variable (poverty) in order to rid the serial correlation of residuals.

In both specifications, the coefficients of shadow economy and the interaction term between shadow economy, government size and economic growth are positive and statistically significant at 1% level, indicating that increasing the shadow economy leads to increase poverty in developing countries.

The coefficient of economic growth (*g*) is negative and significant at 1% level. This negative effect is expected as economic growth is the most important factor influencing poverty. This result is consistent with the results of numerous statistical studies finding a strong association between economic growth and poverty indictors, both income and non-income measures of poverty.

The coefficient of (*Gov*) is negative as expected and statistically significant at 1% level in both specifications. This negative effect indicates that increasing government consumption (government size) on social services such as health and education could benefit the poor.

In both specifications, the coefficients of interaction term between shadow economy and economic growth and also shadow economy and government size, are positive and statistically significant at 1% level. These results indicate that while increasing economic growth and government consumption decreases poverty, the increased economic growth and government consumption accompanied by shadow economy is not pro poor and increases poverty in developing countries.

[5] - In general, an optimum lag period is determined by rendering the panel VAR residual free of serial correlation. Therefore, the optimal lag is selected until no serial correlation in residual is obtained (Arellano, 2003).

In specifications 1 and 2, the coefficient of interaction term between economic growth and government size, is negative and statistically significant at 1% level. This result is supported by Keynesian school of thought that believes an increase in the government spending stimulates the domestic economic activity and crowds in private investment and increase economic growth. Increasing economic growth in turn decreases poverty.

In specification 2, the lagged coefficient of rural population is positive and significant at 1% level indicating that in developing countries the likelihood of being poor and the severity of poverty are more in rural areas. This result is in accord with Cord (2002).

The coefficient of political freedom and stability is negative and significant at 5% level in specification 2. These results are consistent with Girishankar et al. (2002) which argue that political freedom and stability reduces poverty in different dimensions including empowerment, capabilities, opportunities, and security.

Three types of diagnostic test are used for the empirical models. First, the Sargan test of identifying restrictions under the null hypothesis of the validity of the instruments (Arellano and Bond, 1991). The results of the Sargan test in system GMM estimator are reported in Table 1. Based on the Sargan test statistic for all models, the high p-value indicates that the null hypothesis of no over-identifying restrictions fail to reject. Therefore, the Sargan test statistics indicate that all specifications are well specified and that the instrument vector is appropriate.

The second test is proposed by Arellano and Bond (1991), which examines the hypothesis that the residual from the estimated regressions is first-order correlated but not second-order correlated. The second test examines the statistics (AR(1) and AR(2)) for presence of serial correlation in the first differenced residuals of first and second order, reported as the asymptotically standard normal distribution values. The results of the test for first-order autocorrelation AR(1) indicate that the null hypothesis is rejected, the p-values of the Arellano and Bond statistics reported in Table 1 are significant at 1% level.

The test results for second-order autocorrelation AR(2) fail to reject the null hypothesis of no autocorrelation and the statistics reported are p-values, giving the probability of correctly rejecting the null hypothesis of no autocorrelation. The absence of serial correlation shows the differenced residuals by significant negative first-order serial correlation and no second-order serial correlation. Therefore, the Arellano-Bond test statistics show that the instruments used are independent of the error term, no autocorrelation, and hence appropriate for the estimation, overall, the first and the second order serial correlation tests are all satisfied. The third test statistics also reject the null hypothesis that the time dummies are jointly equal to zero at 1% level.

For computing the main effect of shadow economy on poverty, there are four possible combinations depends on high, one standard deviation above the means, and low, one standard deviation below the means, values of economic growth and government size as moderators:

1) High value of economic growth and high value of government size (HgHgov)
2) High value of economic growth and low value of government size (HgLgov)
3) Low value of economic growth and high value of government size (LgHgov)
4) Low value of economic growth and low value of government size (LgLgov)

Appendix A shows how to compute intercepts and slopes using STATA 10. Table 3 indicates the slopes and the intercepts with high and low moderator.

As shown in Table 3, in model 1, the main positive effects of shadow economy on poverty in developing countries are statistically significant at 1% level, only when high values of government size and high and low values of economic growth are considered and equal to 0.239 and 0.129 respectively. In model 2, the main positive effect of shadow economy on poverty are statistically significant at 1% level, only when high values of economic growth and government size is considered and equal to 0.236. Figure 1 plot the relationship between poverty and shadow economy with high and low moderators in developing countries.

6.2. Fixed and Random Effects Estimator for Poverty and Shadow Economy in Developed Countries

To empirically test the hypothesis indicating that increasing the shadow economy leads to decrease poverty in developed countries, a three way interaction model using fixed and random effects methods of estimation is applied. The regression results for the fixed and random effects in different specifications are presented in Table 2. The Hausman test statistics equals to 60.39 and 53.69 and statistically significant. Therefore, it rejects the null hypothesis that the model is random, suggesting the fixed effects model is better than the random effects one. The Wald test statistics reject the null hypothesis that the explanatory variables are jointly equal to zero at the one percent level.

In all models the variables of interest are shadow economy and the interaction term between shadow economy, government size and economic growth. In model 1, there is no control variable while in model 2, political freedom and stability is considered as control variable.

In both specifications, the coefficients of shadow economy and the interaction term between shadow economy, government size and economic growth are negative and statistically significant at 10% level or better, indicating that increasing the shadow economy leads to decrease poverty in developed countries.

The time dummies in model 1 are positive and statistically significant at 5% level or better, indicating that in developed countries, capability poverty has increased in recent years.

The coefficient of economic growth (g) is negative and significant at 10% level. This negative effect is expected as economic growth is the most important factor in influencing poverty. This result is consistent with the results of numerous statistical studies finding a strong association between economic growth and poverty indictors, both income and non-income measures of poverty.

The coefficient of (*Gov*) is negative as expected and statistically significant at 1% level in both specifications. This negative effect indicates that increasing government consumption (government size) on social services such as health and education could benefit the poor.

In both specifications, the coefficients of interaction term between shadow economy and economic growth and also shadow economy and government size, are positive and statistically significant at 10% level or better. These results indicate that while increasing economic growth and government consumption decreases poverty, the increased economic growth and government consumption accompanied by shadow economy is not pro poor and increases poverty in developed countries.

The coefficient of the interaction term between economic growth and government size is positive and statistically significant at 10% level in specification 2 while this positive effect is not significant in specification 1. This result is supported by neoclassical school of thought believes that an increased government involvement in the economy might distort the economic and political environment of business and discourage or crowd out private sector investments and decreases economic growth. Decreasing economic growth in turn increases poverty.

In specification 2, the coefficient of political freedom and stability is negative and significant at 10% level. These results are consistent with Girishankar et al. (2002), who argue that political freedom and stability reduces poverty in different dimensions including empowerment, capabilities, opportunities, and security.

For computing the main effect of shadow economy on poverty, there are four possible combinations depends on high, one standard deviation above the means, and low, one standard deviation below the means, values of economic growth and government size as moderators: 1) HgHgov, 2) HgLgov, 3) LgHgov and 4) LgLgov. Table 4 indicates the slopes and the intercepts with high and low moderator.

As shown in Table 4, in model 1, the negative effect of shadow economy on poverty in developed countries considering HgHgov, HgLgov, LgHgov, and LgLgov are statistically significant at 5% level or better and equal to -2.260, -3.656, -2.201 and -3.954 respectively.

In model 2, the main negative effects of shadow economy on poverty in developed countries are statistically significant at 1% level only when low values of government size and high and low values of economic growth are considered and equal to -1.954 and -2.279 respectively. Figure 2 plot the relationship between poverty and shadow economy with high and low moderators in developed countries.

7. Conclusion and Policy Implications

The empirical results of this study indicate that in developing countries, increasing shadow economy leads to increase poverty considering high value of government size and in developed countries, shadow economy decreases poverty when low value of government size is taken into account.

From a public choice perspective a government may not have a strong interest to reduce the shadow economy to a large extent due to the facts, that tax losses may be moderate as a large amount of the income earned in the shadow economy is immediately spend in the official economy. Similarly, income earned in the shadow economy increases the standard of living of a large portion of working population and the decline of the shadow economy will increase the social welfare only if a larger part of production and labour is transferred into the official economy, and also people who work in the shadow economy have less time for other things like to go on demonstrations, etc. However, the empirical results of this study show that only for developed countries, increases shadow economy decreases poverty and for developing countries it increases poverty. In fact, as the results show, shadow economy cannot increase social welfare for developing countries. Therefore:

1. In order to raise the necessary resources for financing of key development tasks outlined in the MDGs, developing governments need to overcome shadow economy.

2. The social welfare effects of the shadow economy in developed countries should not be considered as a reason for moving into shadow economy. It implicitly suggests that the size of government should be optimal.

In terms of further studies, one may consider the optimal size of government with respect to different measures of social welfare constructed by UNDP, such as Human Development Index (HDI), HPI, the Gender Empowerment Measure (GEM), and the Gender-Related Development Index (GDI) instead of considering the optimal size of government with respect to GDP measures.

References:

Abu-Bader, S., and Abu-Qarn, A.S. (2003). Government Expenditures, Military Spending and Economic Growth: Causality Evidence from Egypt, Israel and Syria. *Working Papers*, No. 163, Ben-Gurion University of the Negev, Department of Economics.

Alderman, H. (2001). *What Has Changed Regarding Rural Poverty Since Vision to Action?*. Rural Strategy Background Paper 5. World Bank, Washington, D.C.

Arellano, M. (2003). *Panel Data Econometrics*. Oxford University Press, New York.

Arellano, M., and Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and Application to Employment Equations. *Review of Economic Studies* 56:277-297.

Armey, D. (1995). *The Freedom Revolution*. Regnery Publishing,Washington.

Aschauer, D.A. (1989). Is Public Expenditure Productive. *Journal of Monetary Economics* 23:177-200.

Atukeren, E. (2005). Interactions between Public and Private Investment: Evidence from Developing Countries. *Kyklos* 58(3):307-330.

Bahmani-Oskooee (1999). Do federal budget deficits crowd out or crowd in private. *Journal of Policy Modelling* 21(5):633-640.

Barro, J. R. (1991). Economic Growth in a Cross-Section of Countries. *Quarterly Journal of Economics* 106:407-443.

Cobham, A. (2005). Tax evasion, tax avoidance and development finance. *Queen Elizabeth House Working Paper* 129, University of Oxford.

Cord, L. (2002). *Poverty Reduction Strategy Sourcebook*. Chapter 15, Rural Poverty. Washington D.C., The World Bank.

Dar, A.A., and Amirkhalkhali, S. (2002). Government size, factor accumulation, and economic growth: Evidence from OECD countries. *Journal of Policy Modeling* 24:679-692.

Dawson, J.F. and Richter, A.W. (2004). A significance test of slope differences for three-way interactions in moderated multiple regression analysis. *RP0422*. Aston University, Birmingham, UK

DFID (Department for International Development). (2004). *What is Pro-poor Growth and Why do we Need to Know? Pro-poor Growth Briefing*. Note 1. London: DFID, The World Bank.

Dollar, D., and Kraay, A. (2002). Growth Is Good For The Poor. *Journal of Economic Growth* 7(3):195-225.

Doraid, M. (1997). *Analytical Tools for Human Development*. Human Development Report Office, UNDP. http://www.undp.org. August.

Dowrick, S. (1996). Estimating the impact of government consumption on growth: growth accounting and endogenous growth models. *Empirical Economics* 21 (1):163-186.

Easterly, W. (2001). *The Elusive Quest for Growth.* MIT Press, Cambridge and London.

Elu, J. (2000). Human Development in Sub-Saharan Africa: Analysis and Prospects for the Future. *Journal of Third World Studies* 17(2):53-71.

Esfahani, H.S., and Ramirez, M.T. (2003). Institutions, Infrastructure and Economic Growth. *Journal of Development Economics* 70:443-477.

Fan, S., and Rao, N. (2003). Public Spending in Developing Countries: Trends, Determination, and Impact. *EPTD, discussion papers*, No. 99, International Food Policy Research Institute (IFPRI).

Friedman, M. (1997). If Only the U.S. Were as Free as Hong Kong. *The Wall Street Journal* July 8:A14.

Folster, S., and Herekson, M. (2001). Growth effects of government expenditure and taxation in rich countries. *European Economic Review* 45:1501-1520.

Girishankar N., Hammergren, L., Holmes, M., Knack, S., Levy, B., Litvack, J., Manning, N., Messick, R., Rinne, J., and Sutch, H. (2002). *Poverty Reduction Strategy Sourcebook*, Chapter 8, Governance. World Bank, Washington D.C.

Gramlich, E.M. (1994). Infrastructure Investment: A Review Essay. *Journal of Economic Literature* 32:1176-1196.

Grier, K.B., and Tullock, G. (1989). An Empirical Analysis of Cross-National Economic Growth 1951-80. *Journal of Monetary Economics* 24(2):259-276.

Gupta, S., Davoodi, H., and Alonso Terme, R. (1998). Does Corruption Affect Income Equality and Poverty?. *IMF Working Paper* 98/76.

Gupta, S., Leruth, L., de Mello, L., and Chakravarti, S. (2001). Transition Economies: How Appropriate Is the Size and Scope of Government?. *International Monetary Fund Working Paper* No. WP/01/55. www.imf.org/external/pubs/ft/wp/2001/wp0155.pdf.

Gwartney, J., Holcombe, R. and Lawson, R. (1998). The Scope of Government and the Wealth of Nations. *Cato Journal* 18(2):193-190.

Higgins, M.J., Levy, D., and Young, A.T. (2009). Federal, State and Local Governments: Evaluating their Sparate Roles in US Growth," http://mpra.ub.uni-muenchen.de/13094/1/federal_state_local_Jan_2009.pdf

Karras, G. (1996). The Optimal Government Size: Further International Evidence on the Productivity of Government Services. *Economic Inquiry* 34.

Kaufmann, D., Kraay, A., and Zoido-Lobaton, P. (1999). Aggregating governance indicators. *World Bank Working Paper*, no 2195 (Washington, D.C.: World Bank).

Kaufmann, D., Kraay, A., and Mastruzzi, M. (2004). Governance Matters III: Governance Indicators for 1996, 1998, 2000, and 2002. *World Bank Economic Review* 18:253-287.

Kaufmann, D., Kraay, A., and Mastruzzi, M. (2008). Governance Matters VII: Aggregate and Individual Governance Indicators 1996-2007. *The World Bank, Policy Research Working Paper* 4654, http://ssrn.com/abstract=1148386

Kormendi, R., and Meguire, P. (1985). Macroeconomic Determinants of Growth: Cross-Country Evidence. *Journal of Monetary Economics* 16(2):141-163.

Landau, D. (1986). Government and Economic Growth in Less Developed Countries: An Empirical Study for 1960-1980. *Economic Development and Cultural Change* 35(1):35-75

Law, S.H., and Azman-Saini, W.N.W. (2008). The Quality of Institutions and Financial Development. *Proceedings of Applied International Business Conference.*

Martens, S. (2007). The Precarious State of Public Finance, Tax Evasion, Capital Flight and the Misuse of Public Money in Developing Countries- and What can be done about it. *Global Policy Forum Europe*, DGB-Bildungswerk.

Mo, P.H. (2007). Government Expenditures and Economic Growth: The Supply and Demand Sides. Fiscal Studies 28(4):497-522.

Obayelu Abiodun, E., and Larry, U. (2007). Comparative Analysis of the Relationship Between Poverty and Underground economy in the Highly developed, Transition and Developing Countries. http://mpra.ub.uni-muenchen.de/2054/1/MPRA_paper_2054.pdf

Peden, E.G., and Bradley, M.D. (1989). Government size, productivity, and economic growth: The postwar experience. *Public Choice* 61:229-245.

Pernia, E. (2003). Pro-poor Growth: What is it and how is it Important?. *ERD Policy Brief* 17. Manila: Asian Development Bank.

Quibria, M.G. (2002). Growth and Poverty: Lessons from the East Asian Miracle Revisited. Asia Development Bank Research Paper 33.

Ram, R. (1986). Government Size and Economic Growth: A New Framework and Some Evidence from Cross-Section and Time-Series Data. *American Economic Review* 76(1):191-203.

Ravallion, M. (2000). *On the Urbanization of Poverty*. World Bank. Washington, D.C. Processed.

Ravallion, M., and Chen, S. (1997). What Can New Survey Data Tell Us about Recent Changes in Distribution and Poverty?. *The World Bank Economic Review*, 11(2):357-382.

Rosser, B.J., Rosser, M.V., and Ahmed, E. (2000). Income Inequality and the Informal Economy in Transition Economies. *Journal of Comparative Economics* 28(1):156-171.

Rosser, B.J., Ahmed, E., and Rosser, M.V. (2003). Multiple unofficial economy equilibria and income distribution dynamics in systemic transition. *Journal of Post Keynesian Economics* 25(3):425-447.

Rosser, B.J., Rosser, M.V., and Ahmed, E. (2004). Income Inequality, Corruption, and the Non-Observed Economy: a Global Perspective. *presented at the conference: New Economic Windows* 2004: Complexity Hints for Economic Policy, Salerno, Italy.

Sanchez-Robles, B. (1998). Infrastructure Investment and Economic Growth: Some Empirical Evidence. *Contemporary Economic Policy* 16:98-108.

Schneider, F. (2005). Shadow Economies around the World: What do we really know?. *European Journal of Political Economy* 21(3):598-642.

Schneider, F., Buehn, A., and Montenegro, E.C. (2010). Shadow Economies all over the World: New Estimates for 162 Countries from 1999 to 2007. http://www.economics.uni-linz.ac.at/members/Schneider/files/publications/LatestResearch2010/ShadEconomies162countries.pdf

Schneider, F., and Enste, D.H. (2000). Shadow Economies: Size, Causes, and Consequences. *Journal of Economic Literature* 38:77-114.

Tanzi, V., and Schuknecht, L. (1995). The Growth of Government and the Reform of the State in Industrial Countries. *IMF Working Paper*, WP/95/130, The International Monetary Fund, Washington, D.C..

Terasawa, K. L., and Gates, W.R. (1998). Relationships between Government Size and Economic Growth: Japan's Reforms and Evidence from OECD. *International Public Management Journal* 1(2):195-223

Valentini, E. (2007). Inequality and Underground Economy: A Not So Easy Relationship. *Universita Politecnica Delle Marche, Quaderni Di Ricerca*, No. 283.

White, H., and Anderson, E. (2001). *Growth versus Distribution: Does the Pattern of Growth Matter?*. Institute of Development Studies, Brighton. Processed.

World Bank (2000). *Making Transition Work For Everyone: Poverty and Inequality in Europe and Central Asia*. Washington D.C.

Table 1: The Estimated Results from the Two Step Dynamic Panel GMM-SYS (Effects of Shadow Economy on Poverty in Developing Countries)

Dependent variable: $\log(HPI1)_t$	**Model (1)**	**Model (2)**
$\log(HPI1)_{t-1}$	0.946 (63.83)***	0.805 (20.31)***
$\log(shadows)_t$	0.925 (3.33)***	0.978 (3.49)***
$\log(Gov)_t$	-1.086 (-2.97)***	-1.112 (-2.82)***
$\log(g)_t$	-0.887 (-3.35)***	-1.088 (-3.43)***
$\log(shadows)_t \times \log(Gov)_t$	0.287 (2.94)***	0.300 (2.93)***
$\log(shadows)_t \times \log(g)_t$	0.226 (3.15)***	0.281 (3.31)***
$\log(Gov)_t \times \log(g)_t$	-0.278 (-3.17)***	-0.307 (-3.04)***
$\log(shadows)_t \times \log(Gov)_t \times \log(g)_t$	0.070 (2.92)***	0.077 (2.85)***
$\log(rural)_{t-1}$		0.295 (2.62)***
$\log(politicalfreedom)_t$		-0.038 (-2.40)**
$dummy2000$	-0.042 (-3.82)***	-0.027 (-2.52)**
$dummy2004$	-0.019 (-2.86)***	-0.010 (-2.48)**
$dummy2005$	-0.020 (-2.73)***	-0.017 (-3.64)***
$dummy2006$	-0.119 (-13.86)***	-0.119 (-15.03)***
$dummy2007$	-0.046 (-4.63)***	-0.055 (-6.04)***
$-cons$	-3.321 (-3.27)***	-4.055 (-3.93)***
Number of observation	611	605
Number of groups	113	112
Arellano-Bond test for AR(1), (p value)	0.000	0.001
Arellano-Bond test for AR(2), (p value)	0.166	0.056
Sargan test of overid. (p value)	0.702	0.386
Wald test $(H_0 : dummy_t = 0)$	(298.79)***	(460.40)***

Notes: All models are estimated using the Arellano and Bond dynamic panel system GMM estimations (Stata xtdpdsys command). Figures in the parentheses are t-statistics. *** Significant at the 1 percent level, ** Significant at the 5 percent level and * Significant at the 10 percent level.

Table 2: The Estimated Results from the Panel Fixed and Random Effects (Effect of Shadow Economy on Poverty in Developed Countries)

Dependent variable: $\log(HPI2)_t$	**Model (1)**		**Model (2)**	
	Fixed effects	**Random effects**	**Fixed effects**	**Random effects**
$\log(shadows)_t$	-16.633 (-6.35)***	-6.075 (-2.88)***	-16.418 (-6.05)***	-5.034 (-2.67)***
$\log(Gov)_t$	-11.689 (-5.03)***	-5.421 (-2.80)***	-12.901 (-5.29)***	-4.533 (-2.65)***
$\log(g)_t$	-4.119 (-1.68)*	-5.870 (-2.13)**	-4.396 (-1.77)*	-5.786 (-2.04)**
$\log(shadows)_t \times \log(Gov)_t$	4.595 (5.36)***	2.056 (2.83)***	5.124 (5.76)***	1.675 (2.60)***
$\log(shadows)_t \times \log(g)_t$	1.748 (1.88)*	2.395 (2.28)**	1.852 (1.95)*	2.389 (2.22)**
$\log(Gov)_t \times \log(g)_t$	1.339 (1.61)	1.959 (2.09)**	1.430 (1.70)*	1.949 (2.02)**
$\log(shadows)_t \times \log(Gov)_t \times \log(g)_t$	-0.568 (-1.80)*	-0.797 (-2.25)**	-0.599 (-1.87)*	-.801 (-2.20)**
$\log(politicalfreedom)_t$			-0.488 (-1.73)*	-.947 (-4.15)***
$dummy2004$	0.075 (2.17)**	0.057 (1.69)*		
$dummy2005$	0.097 (2.76)***	0.053 (1.59)		
$dummy2006$	0.119 (2.65)***	0.056 (1.41)		
$dummy2007$	0.132 (2.83)***	0.025 (0.74)		
$-cons$	45.201 (6.34)***	18.338 (3.28)***	46.047 (5.83)***	20.190 (3.86)***
Observations	153	153	153	153
Groups	23	23	23	23
Hausman test		60.39 (0.000)		53.69 (0.000)
$\mathbf{R^2}$	0.33	0.16	0.29	0.43
Wald test	(5.33)***	(16.17)	(6.11)***	(26.12)***

Notes: All models are estimated using the fixed and random effects estimations (Stata xtreg command). Figures in the parentheses are t-statistics. *** Significant at the 1 percent level, ** Significant at the 5 percent level and * Significant at the 10 percent level.

Table 3: Slopes and Intercepts with High and Low Moderator, Developing Countries

	Model (1)		Model (2)	
	Intercept	**Slope**	**Intercept**	**Slope**
HgHgov	-0.727 (-4.05)***	0.239 (4.36)***	-0.336 (-1.28)	0.236 (4.08)***
HgLgov	0.005 (0.04)	0.042 (1.27)	0.399 (1.65)	0.034 (0.61)
LgHgov	-0.311 (-2.36)**	0.129 (2.98)***	0.285 (1.12)	0.070 (1.31)
LgLgov	0.071 (0.42)	0.021 (0.48)	0.633 (2.50)**	-0.032 (-0.54)

Notes: Figures in the parentheses are z-statistics. *** Significant at the 1 percent level, ** Significant at the 5 percent level and * Significant at the 10 percent level.

Table 4: Slopes and Intercepts with High and Low Moderator, Developed Countries

	Model (1)		Model (2)	
	Intercept	**Slope**	**Intercept**	**Slope**
HgHgov	8.634 (3.64)***	-2.260 (-2.62)***	3.511 (2.25)***	-0.375 (-0.67)
HgLgov	12.255 (5.20)***	-3.656 (-4.29)***	7.538 (4.66)***	-1.954 (-3.32)***
LgHgov	8.489 (3.57)***	-2.201 (-2.55)**	3.355 (2.14)**	-0.323 (-0.58)
LgLgov	12.952 (5.54)***	-3.954 (-4.68)***	8.282 (5.16)***	-2.279 (-3.90)***

Notes: Figures in the parentheses are t-statistics. *** Significant at the 1 percent level, ** Significant at the 5 percent level and * Significant at the 10 percent level.

Table 5: Effects of Shadow Economy on Poverty in Developed Countries

Dependent variable: $\log(HPI2)_t$	**GMM-SYS**	**GLS**
$\log(HPI2)_{t-1}$	1.256 (4.70)***	
$\log(shadows)_t$	-14.230 (-2.17)**	-2.089 (-1.30)
$\log(Gov)_t$	-13.647 (-2.30)**	-2.325 (-1.63)
$\log(g)_t$	-9.712 (-2.57)**	-7.536 (-1.97)**
$\log(shadows)_t \times \log(Gov)_t$	4.766 (2.24)**	0.725 (1.34)
$\log(shadows)_t \times \log(g)_t$	3.859 (2.71)***	3.070 (2.15)**
$\log(Gov)_t \times \log(g)_t$	3.124 (2.48)**	2.717 (2.08)**
$\log(shadows)_t \times \log(Gov)_t \times \log(g)_t$	-1.240 (-2.62)***	-1.094 (-2.26)**
$\log(politicalfreedom)_t$		-1.490 (-8.84)***
$dummy2002$	0.049 (3.17)***	
$dummy2003$	0.084 (3.50)***	
$dummy2004$	0.117 (4.42)***	
$dummy2005$	0.073 (3.77)***	
$-cons$	39.976 (2.24)**	15.753 (3.61)***
Number of observation	131	153
Number of groups	19	23
Arellano-Bond test for AR(1), (p value)	0.368	
Arellano-Bond test for AR(2), (p value)	0.429	
Sargan test of overid. (p value)	1.000	
Wald test $(H_0 : dummy_t = 0)$	(24.30)***	

Notes: Figures in the parentheses are t-statistics. *** Significant at the 1 percent level, ** Significant at the 5 percent level and * Significant at the 10 percent level.

Figure 1: The Relationship between Shadow Economy and Poverty with High and Low Moderator, Developing Countries

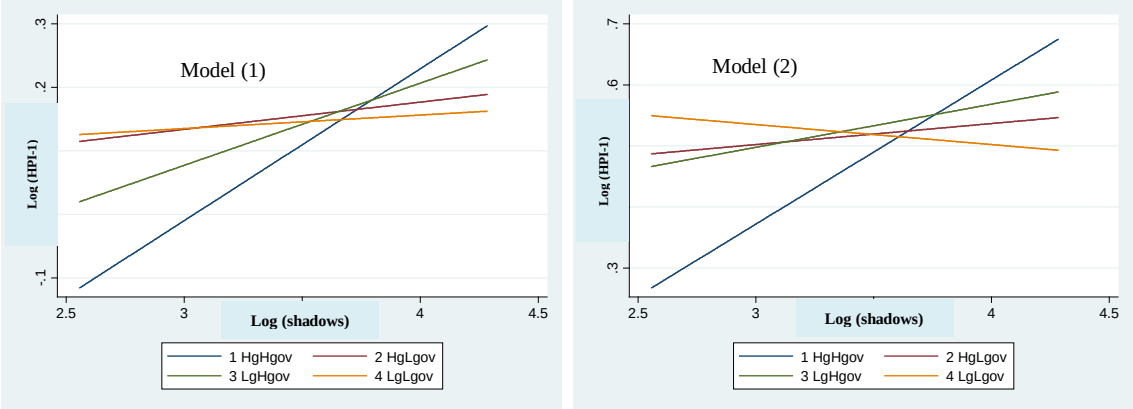

Figure 2: The Relationship between Shadow Economy and Poverty with High and Low Moderator, Developed Countries

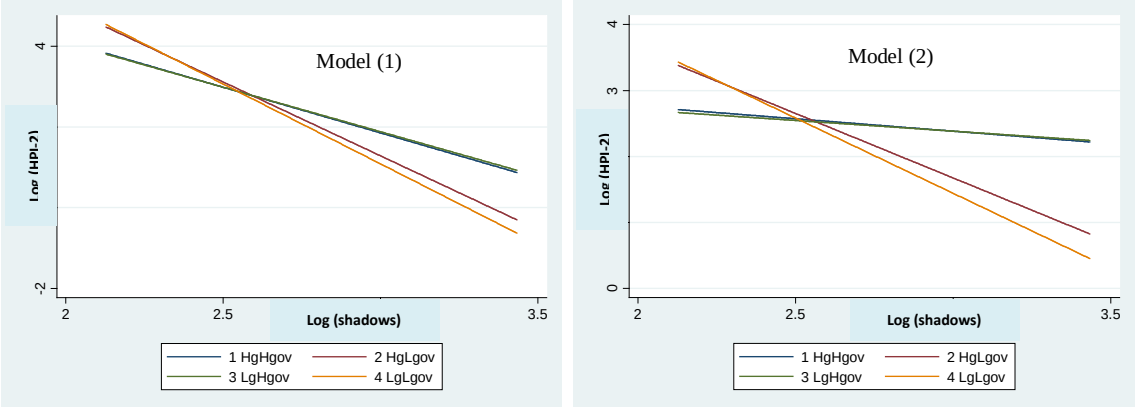

Table 6: Sources and Characteristics of Sample Data

Variables	Unit	Abbreviation	Mean	SD	Min	Max	Obs.	Data Source
Shadow Economy	% of GDP	*shadows*	34.4	13.3	8.4	72.5	1429	Schneider et al. (2010)
Economic growth	%	*g*	4.6	4.6	-31.3	62.3	1415	WDI
Government Consumption	% of GDP	*Gov*	15.5	6.3	2.8	69.5	1338	WDI
Rural Population	% of total population	*rural*	48.5	23.9	0	91.6	1104	WDI
Political Freedom and Stability	Standard deviation	*politicalfreedom*	46.6	26.1	1.0	99.7	1458	Kaufmann et al. (2008)
Human Poverty Index (developing countries)	%	*HPI*1	26.2	15.5	1.5	65.5	871	HDR, UNDP
Human Poverty Index (developed countries)	%	*HPI*2	11.5	3.8	6	29.9	163	HDR, UNDP

Table 7: Countries included in the Analysis

Albania	Dominican Republic	Latvia	Russian Federation
Algeria	Ecuador	Lebanon	Rwanda
Angola	Egypt, Arab Rep.	Lesotho	Saudi Arabia
Argentina	El Salvador	Liberia	Senegal
Armenia	Equatorial Guinea	Libyan Arab	Sierra Leone
Australia	Eritrea	Lithuania	Singapore
Austria	Estonia	Luxembourg	Slovak Republic
Azerbaijan	Ethiopia	Macao, China	Slovenia
Bahamas	Fiji	Macedonia, FYR	Solomon Islands
Bahrain	Finland	Madagascar	South Africa
Bangladesh	France	Malawi	Spain
Belarus	Gabon	Malaysia	Sri Lanka
Belgium	Gambia	Maldives	Sudan
Belize	Georgia	Mali	Suriname
Benin	Germany	Malta	Swaziland
Bhutan	Ghana	Mauritania	Sweden
Bolivia	Greece	Mauritius	Switzerland
Bosnia & Herzegovina	Guatemala	Mexico	Syrian Arab Republic
Botswana	Guinea	Moldova	Taiwan
Brazil	Guinea-Bissau	Mongolia	Tajikistan
Brunei Darussalam	Guyana	Morocco	Tanzania
Bulgaria	Haiti	Mozambique	Thailand
Burkina Faso	Honduras	Myanmar	Togo
Burundi	Hong Kong, China	Namibia	Trinidad and Tobago
Cambodia	Hungary	Nepal	Tunisia
Cameroon	Iceland	Netherlands	Turkey
Canada	India	New Zealand	Uganda
Cape Verde	Indonesia	Nicaragua	Ukraine
Central African	Iran, Islamic Rep.	Niger	United Arab Emirates
Chad	Ireland	Nigeria	United Kingdom
Chile	Israel	Norway	United States
China	Italy	Oman	Uruguay
Colombia	Jamaica	Pakistan	Venezuela
Comoros	Japan	Panama	Vietnam
Congo, Dem. Rep.	Jordan	Papua New Guinea	Yemen, Rep.
Congo, Rep.	Kazakhstan	Paraguay	Zambia
Costa Rica	Kenya	Peru	Zimbabwe
Côte d'Ivoire	Korea, Rep.	Philippines	
Croatia	Kuwait	Poland	
Cyprus	Kyrgyz Republic	Portugal	
Czech Republic	Lao PDR	Qatar	
Denmark	Dominican Republic	Romania	

Appendix A: Do-File to Make Three-Way Interaction Model (STATA 10)

```
rename lHPI y
rename lshadow x
rename lgov w
rename lg z
rename lrural v1
rename lpolitical v2

generate xz  = x*z
generate xw  = x*w
generate zw  = z*w
generate xzw = x*z*w

regress y x z w xz xw zw xzw v1 v2   (xtdpdsys or xtreg)

quietly sum x
global hi=r(max)
global lo=r(min)
quietly sum w
global Hw=r(mean)+r(sd)
global Lw=r(mean)-r(sd)
quietly sum z
global Hz=r(mean)+r(sd)
global Lz=r(mean)-r(sd)
quietly sum v1
global m1=r(mean)
quietly sum v2
global m2=r(mean)

global HzHw "x + ($Hz)*xz + ($Hw)*xw + ($Hz)*($Hw)*xzw"
global HzLw "x + ($Hz)*xz + ($Lw)*xw + ($Hz)*($Lw)*xzw"
global LzHw "x + ($Lz)*xz + ($Hw)*xw + ($Lz)*($Hw)*xzw"
global LzLw "x + ($Lz)*xz + ($Lw)*xw + ($Lz)*($Lw)*xzw"

/* simple slopes */
lincom $HzHw
global b1 = r(estimate)
lincom $HzLw
global b2 = r(estimate)
lincom $LzHw
global b3 = r(estimate)
lincom $LzLw
global b4 = r(estimate)

/* intercepts */
lincom _cons + $Hz*z + $Hw*w + $Hz*$Hw*zw + $m1*v1 + $m2*v2
global c1 = r(estimate)
lincom _cons + $Hz*z + $Lw*w + $Hz*$Lw*zw + $m1*v1 + $m2*v2
global c2 = r(estimate)
lincom _cons + $Lz*z + $Hw*w + $Lz*$Hw*zw + $m1*v1 + $m2*v2
global c3 = r(estimate)
lincom _cons + $Lz*z + $Lw*w + $Lz*$Lw*zw + $m1*v1 + $m2*v2
global c4 = r(estimate)
```