

## **The Effect of Corruption on Shadow Economy: An Empirical Analysis Based on Panel Data**

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### **Abstract**

Quite often shadow economy (SE) and corruption are seen as "twins", which need each other or fight against each other and theoretically can be either complements or substitutes. Therefore, the relationship between SE and corruption has been a controversial and polemical issue and in the spotlight of a remarkable collection of economists and social researchers.

The main objective of this study can be served as an investigation and identification of the effect of corruption on SE and its dependence on the level of development. To test our two hypothesis, the econometric panel-data approach is employed for the period of 1999 to 2007 in two blocks of 25 countries containing high-developed and developing countries (including I.R.IRAN) under different indexes for corruption in the context of Static and Dynamic panel regression models (by using of 2SLS and GMM methods of estimation).

The results of estimations specially based on dynamic panel models indicate that our two hypotheses cannot be rejected and corruption has a significant effect on SE depending on the level of development. Despite of these findings, our results show that there is no robust relationship between corruption and the size of the SE in terms of the sign and the nature of these effects. In other words, the relationship will vary according to different corruption indexes and estimation methods. Other findings have been described in the terminal sector of paper.

**Key Words:** Shadow Economy, Corruption, Static Panel Regression Models, Dynamic Panel Regression Models.

**JEL Classification:** O17, O57

### **1-Introduction**

Under a structural approach, economic activities may be classified into two groups: official and unofficial which the main portion of unofficial activities are

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being implemented in shadow economy (SE). Shadow activities of economic agents can be the score of multiple stimulant factors. At a glance, two schools of thought can be recognized: the first one identifies tax and social security burdens as the principle causes of shadow activities. According to this viewpoint, economic agents are not willing to pay high taxes and so are going out of the official economy. The second school of thought presumes institutional quality - bureaucracy, regulatory discretion, rule of law, corruption and a weak legal and judicial system - as the main causes of hidden activities. This claim is based on the assumption that the huge government is not sufficiently constitutionally constrained and therefore , exploits its forcible powers against the citizenry.

Undoubtedly, the natural reaction of economic agents to this exploitation is to go shadow losing all publicly provided benefits. Thus, it is clear that there is a potential relationship between the misbehavior of governance -particularly corruption- and the SE. As a consequence, corruption and shadow activities have been argued jointly in recent years.

On the one hand, investigation and achievement on scientific findings about the extent of shadow activities and its relationship with corruption, is very essential for efficient allocation of resources per country.

In other words, with regard to the role of SE in official economy and the importance of effective policy-decisions , the study of determinants of the SE has a special status in applicable research and such researches can be served as a scientific passion in order to learning unknowns and predisposing accurate policy-makings. On the other hand, the SE and corruption are frequently seen as twins, which need each other or fight against each other. Therefore, the SE and corruption can theoretically be either complements or substitutes. As a consequence, the relationship between the SE and corruption is a controversial and important issue.

Thus, we ought to answer to our questions after empirical analysis and the investigation and research seems to be necessary and substantial. Beside, the majority of previous studies consider rather small samples and because of this, employing instrumental variable techniques and related econometric methods was infeasible.

Thus the majority of them employ usual techniques notwithstanding on endogeneity of corruption variable. For instance, Johnson et al. in 1997 and 1998 and Friedman et al. (2000) have performed their investigations for 15, 39 and 35 countries respectively. Moreover, in previous studies, there is no separation of countries with regard to their development when the relationship between corruption and the SE is studied.

According to these important aspects and necessities, the main objective of this study is an investigation and identification of the effect of corruption on the

SE and its dependence on the level of development. This paper analyzes the influence of corruption on the SE through the following two hypotheses:

Hypothesis 1: Corruption has a significant effect on the size of the SE.

Hypothesis 2: In developing countries the SE and corruption are complements and in developed countries are substitutes.

The hypotheses are tested for two groups of 25 developing and developed countries. Regarding the potential endogeneity of corruption index, we employ instrumental variables (IV) in the context of static and dynamic panel regression models- by using TSLS and GMM method of estimation-and compare the results in selected developing and developed countries. The remainder of the paper is organized as follows. In section 2 we review the theoretical foundations. Section 3 presents the previous empirical studies. In section 4 we specify our models and introduce data and econometric methodology. We also present the estimation results. Finally, in section 5 we conclude.

## **2-Theoretical Foundations**

### **2-1-Defining the Shadow Economy (SE) and Corruption**

Researchers attempting to investigate the SE face the problem of defining a SE. In terms of terminology, there is strong variety in the literature, meeting over 40 terms that describe unofficial activities (Voicu, 2012, 111). Some of them have been used more than others, such as: grey economy, hidden economy, parallel economy and underground economy (Georgiou, 2007). Regarding the variety of terms, everyone can find ample of alternative definitions to the phrase unofficial and SE. In this paper the following definition is used:

The SE includes all market-based legal production of goods and services that are deliberately concealed from public authorities to avoid payment of income, value added or other taxes; payment of social security contributions; compliance with certain legal labor market standards, such as minimum wages, maximum working hours, safety standard, etc; and compliance with certain administrative procedures, such as completing statistical questionnaires or administrative forms (Schneider et al, 2010, 3). Given this definition, important determinants of the SE are: Tax and social security contribution burdens, Changes in labor market conditions and employment system, Intensity of regulations, changes in individual values such as tax moral, public sector effectiveness and public services, the state of official economy, institutional quality -bureaucracy, corruption, ... , etc.

On the other hand, corruption usually defined as: The abuse of public power for private gains (Dreher and Schneider, 2010, 216). Arguably, corruption, in the common usage of the word, can mean different things in different contexts.

## **2-2- Theoretical background of the relationship between corruption and the SE**

Theoretically, the relationship between corruption and the SE is unsettled and ambiguous. This means that corruption and the SE can either be complements or substitutes. Summarizing the literature, theoretical views can be classified and investigated into two following general axes:

### **2-2-1-The substitutional relationship between corruption and the SE**

By substitutional relationship we mean: there is an inverse relation between corruption and the size of shadow activities. Consequently, an increase in corruption always decreases the size of the SE and control of corruption will ultimate to the growth of shadow activities. For example: Choi and Thum (2004) show that the option of economic agents to go underground constrains a corrupt official's ability to ask for bribes, corruption and the SE then being substitutes. Dreher et al. (2005) set up a theoretical model which captures in a stark way the relationship between institutional quality, the SE and corruption. They emphasize that there is a potential relationship between corruption and the SE, but what the precise relationship is? Dreher et al. approach the question empirically by structural equation modeling and conclude that corruption and the SE are indeed substitutes. Thus, they find that in the presence of SE, bribe demands of official authorities will be decreased (Dreher et al. 2005, 2). Rose-Ackerman (1997) notes that "going underground is a substitute for bribery, although sometimes firms bribe officials in order to avoid official taxes" (Rose-Ackerman, 1997, 21).

Some viewpoints indicate that the relationship between corruption and the SE might differ among high and low income countries. As they argue, in high income countries, only craftsmen or very small firms have the option of going shadow and there are no bribes necessary or possible to way out of official sector. In these countries, individuals have the option of bringing a corrupt official to court. Furthermore, corruption frequently takes place to get huge contracts –in the official economy- from the public sector. In other words, in high income countries people bribe in order to be able to engage in more official economic activities (Schneider, 2007, 23). Some authors claim that corruption oils the wheels of the official economy (Meon and sekkat, 2005; Meon and Weill, 2006).

### **2-2-2-The complementary relationship between corruption and the SE**

Alternatively, according to this viewpoint, there is a complementary relationship between corruption and the SE. By complementary relationship we mean: corruption and the SE are positively related and reinforce each other. Consequently, from this point of view, an increase in corruption always decreases the size of the SE and high corruption leads to high unofficial economy. For instance, Johnson et al's investigation (1998) consider corruption and the SE as complements. In their model, corruption can be viewed as one

particular form of taxation and regulation and therefor, increases the size of the SE (Johnson et al, 1998, 391). Hindriks et al. (1999) also show that the SE is a complement to corruption. This is because, the tax payers colludes with the inspector so the inspector underreports the tax liability of the tax payer in exchange for bribe. Friedman et al. (2000) argue that entrepreneurs when faced with weak economic institution, go shadow hiding their activities. As a consequence, tax revenues fall as well as the quality of public institutions further reducing a firm's incentive to remain official. Hibbs and Piculescu (2005) indicate that corrupt bureaucrats can connive unofficial production in exchange for a bribe, so that the SE and corruption are complements.

Similarly, there are arguments about complementary relationship based on different mechanisms. According to Gerxhani (2003) and Schneider (2005), in low income countries, corruption often takes place in order to pay for shadow activities, so that the SE entrepreneur can be sure not to be detected by public authorities. Thus, the SE and corruption likely reinforce each other. In low income countries, we therefore expect a complementary relation (Dreher and Schneider, 2010, 218).

### **3- Previous empirical studies**

Recent decades have witnessed a surge of interest in the SE and corruption-related issues and many economists and other social scientists have tried to investigate and explain the prevalence of shadow activities and corruption in various dimensions.

Dreher et al. (2005) investigate the OECD countries and show that an improvement in institutional quality reduces the SE directly and corruption both directly and indirectly -through its effect on the shadow market. Virta (2007) examine the impact of corruption on the size of the SE with regard to a geographical differences between countries and find evidence that corruption and the SE seem to be substitutes in tropics. Schneider (2007) estimates the SE for 145 countries from 1999 to 2005 and investigates the impact of the SE on corruption. He concludes that the SE reduces corruption in high income countries but increase corruption in low income countries. Again, in 2009, Schneider and Buehn in the context of similar study including 120 countries, reach a similar conclusion. Marinov (2008) argues that, besides the tax and regulation issues, the SE is influenced by other socio-economic factors such as: limited and low quality of public sector services; corrupted, slow and closed legislative systems; deficiency of administrative capacity and competence of the governments. Polonski (2009) investigates the relationship between corruption and the SE for 66 Ukrainian and Russian regions and find no evidence of such a relation. The relationship between these two phenomena is also studied by Dreher and Schneider (2006) in 70 countries over the period 1999 to 2005. They show that

an increase in the intensity of regulation increases both corruption and the SE. Again, in 2010, they analyze the influence of the SE on corruption and vice versa and show that there is no robust empirical relationship between corruption and the size of the SE. Putnins and Sauka (2011) study and estimate an index of the size of shadow economies in the Baltic States and analyze the factors that influence participation in the SE. They conclude that an important driver of shadow activity in the Baltic States is entrepreneurs dissatisfaction with and distrust in the government and the tax system. Elgin and Garcia (2011) have tried to explain the impact of public trust and taxes on unofficial sector. Elgin and Oztunali (2012) find that richer countries tend to have a smaller SE size.

#### **4- The model specification and estimation**

##### **4-1: The model specification**

As mentioned before, there is no doubt that the shadow activities is influenced by quality of governance institutions. Concentrating on corruption, this study attempts to investigate the effect of corruption on the size of the SE. Naturally, we face with various regressors. The main regressor is corruption and the other regressors are some of the institutional variables. The general form of the panel data model used to describe the effect of corruption on the size of the SE in this study is given in equation (1):

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \varepsilon_{it} \quad (1)$$

Here,  $Y_{it}$  and  $X_{it}$  is the size of the SE and corruption respectively and  $Z_{it}$  is a vector of other factors and control variables.  $\varepsilon_{it}$  is the one-way error term and  $i$  and  $t$  represent indices of country and time, respectively. In section 2-4 we present data description.

According to paper's hypotheses, we estimate the specified model for two selected groups of countries including 25 developed countries and 25 developing countries over the period 1999 to 2007 at annual frequency. Appendix A contains a list of countries included in the empirical analysis and the criteria of their selection. Our cross-country panel-data regression model includes 450 and 2250 observations for any variable and model, respectively.

Because the level of corruption is potentially endogenous, instrumental variables (IV) have to be used to analyze the impact of corruption on the size of the SE. An obvious and important problem is identification of valid instruments. Regarding the general-to-specific approach, in order to identify the main determinants of corruption and select instruments we follow Dreher and Schneider (2010). To test the validity of IV, we rely on the usual two statistical tests:

- a- correlation-tests between the instruments and the residuals of the full model.
- b- F-tests and comparing the calculated statistics with the corresponding Staiger-Stock critical value. According to Staiger-Stock's argument, the value is equal to

10 when there is one endogenous regressor in the model. After this elementary step, in this paper we estimate our models using two econometric methods: Two Stage Least Squares method (TSLS) in the context of static panel data models and Generalized Method of Moments (GMM) in the context of dynamic panel data (DPD) models, and finally results will be compared. DPD models have the feature that lags of the dependent variable appear as regressors and therefore, the dynamic adjustment effects of dependent variable can be considered. These models are designed for panels with a large number of cross-sections and a short time series. DPD models are superior to ordinary panel regression models because of the dynamic analysis. Then, the Sargan test will be employed for testing the validity of IV in GMM estimation. The Sargan statistic is asymptotically distributed as a Chi-Square variable. Under the null hypothesis of this test, IV are valid and there is no needs for additional instruments (Baltagi, 2005).

#### **4-2- Data description**

\*Shadow economy: As mentioned before,  $Y_{it}$  is the size of the SE and will be symbolized as  $SHE_{it}$ . In this paper, the definition of SE is based on the World Bank's study which has been performed for 162 countries using MIMIC approach. Thus, the data source of  $SHE_{it}$  is the World Bank's working paper No.5356.

\*corruption:  $X_{it}$  is the size of corruption. As one problem in many corruption-related studies, the use of one perceptions-based index of corruption has been challenged. This is because, it is not obvious what this index measures. Arguably, opinions of citizens in countries with different institutional environment might vary according to their own idiosyncratic definitions (Dreher and Schneider, 2010, 217). Therefore, the perceptions-based index of corruption occasionally doesn't reflect the size of actual corruption. Thus, to analyze empirically the effect of corruption on the SE using a single perception-based index is not clearly rational and can be censurable. Accordingly, we employ two different corruption indices and compare the sensitivity of results in terms of them. First, we use Control of Corruption index (COCO) which has been published in World Governance Index Report in 20 September 2013. The data source of COCO is the World Bank's WGI report No.5430. COCO is measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes and lower level of corruption. Second, we replace Freedom from Corruption (FRCO) as a corruption index and investigate the robustness of our results by using an alternative index. FRCO derived from Annual Report of Economic Freedom which has provided by Heritage Foundation since 1995. This index is graded using a scale from 0 to 100, where 100 represent the maximum freedom and minimum corruption.

\*Per capita GDP (PGDP): PGDP is gross domestic product divided by midyear population. The data source of PGDP (based on PPP) is the World Bank.

\*Government Effectiveness (GOEF): This variable is another governance indicator. GOEF is constructed using an unobserved component methodology. The data of this variable is collected from World Bank's WGI 2013.

\*Regulatory Quality (REQU): This variable accounts for the effect of intensity of regulation. The data source of REQU is World Bank's WGI 2013.

\*Business Freedom (BUFR): BUFR is the ability to create, operate and close an enterprise quickly and easily and reflects the burdensome of regulatory rules as well as government's efficiency in regulatory process. We use the data constructed by Heritage Foundation for BUFR. Appendix B reports descriptive statistics for two groups of selected countries.

#### 4-3: Estimation results

Based on section 4-1, per capita GDP (PGDP), fiscal freedom (FISFR) and rule of law (RULA) has been considered as IV to deal with the potential endogeneity of corruption. Tables 1 and 2 represents the correlation between instruments and the residuals of the full models for two groups of selected countries:

**Table 1-Correlation tests (instruments for corruption in group 1)**

	(1)		(2)	
	COCO	Residuals of full model	FRCO	Residuals of full model
Corruption Index*	-	-1.2E-15	-	-6.2E-15
Per capita GDP	0.3720	-3.54E-15	0.2786	-5.54E-15
Financial freedom	-0.1404	-0.1350	-0.1019	-0.0931
Rule of law	0.9358	-0.0903	0.6529	-0.1745

\*corruption indices are COCO and FRCO in column (1) and (2), respectively.

Source: research calculations

**Table 2-Correlation tests (instruments for corruption in group 2)**

	(1)		(2)	
	COCO	Residuals of full model	FRCO	Residuals of full model
Corruption Index*	-	-7.5E-16	-	1.6E-15
Per capita GDP	0.6293	-8.04E-16	0.3339	1.38E-15
Financial freedom	-0.2819	0.2969	0.0889	0.2895
Rule of law	0.7999	-0.0750	0.3928	-0.0784

\*corruption indices are COCO and FRCO in column (1) and (2), respectively.

Source: research calculations

As it can be seen, the correlation between the IV and the residuals is reasonably low and the correlation between most of the instruments and corruption is comparably high. These results imply that the instruments are valid and

powerful. To be more certain, we perform F-tests. For this purpose we run the following regression equation:

$$X = \gamma' I + \varepsilon \quad (2)$$

With I representing the vector of IV. The regression results for equation 2 are presented based on two different corruption indices in table 3.

**Table 3-F-tests (in terms of corruption indices)**

Selected Countries	Group 1		Group 2	
Corruption Index	FRCO	COCO	FRCO	COCO
F statistic (F-test, First Stage)	67.97	709.48	29.54	327.86

Source: research calculations

As the F-tests in the table 3 indicate, the Staiger-Stock critical value of 10 is easily passed. Therefore, our instruments are significant jointly and F-tests show that they are good and valid predictors of the degree of corruption.

Regarding the above-mentioned results, the TSLS estimation results are presented in table 4, employing the identified instruments.

**Table 4- TSLS estimation results**

Corruption Index (X)	COCO		FRCO	
Selected countries Independent Variable	Group 1 (1)	Group 2 (2)	Group 1 (3)	Group 2 (4)
C	10.98 (44.33)*	40.41 (61.29)	10.42 (57.56)	25.90 (57.56)
X	-0.0736 (-0.75)	-0.031 (-0.16)	-0.0023 (-2.55)	0.0021 (1.05)
PGDP	0.0002 (21.53)	0.0022 (60.15)	0.0002 (18.41)	0.0023 (49.60)
GOEF	0.3892 (5.27)	1.2588 (4.92)	0.2878 (4.65)	1.3114 (6.88)
REQU	0.0501 (0.66)	-0.5892 (-2.96)	-0.0141 (-0.20)	-0.7353 (-3.71)
BUFR	0.0052 (3.38)	-0.0006 (-0.27)	0.0068 (4.07)	-0.0025 (-0.92)
R <sup>2</sup> -adjusted	0.99	0.99	0.99	0.99
F-statistic	14574.02	12849.53	14567.48	12808.47

Source: research calculations

\*(t- statistics)

Clearly, table 4 shows that our estimation performs extremely well in terms of goodness-of-fit statistics and specified models are significant at conventional levels. According to the contents of table 4 the following results can be extracted:

-If we use COCO as corruption index, there is no significant impact of corruption on the SE (in both developing and developed countries), while there is a significant effect in developed countries at the 5% level of significance when we use FRCO instead of COCO (column 3). The sign of

estimated coefficient of FRCO suggests that corruption and the SE are complements in 25 developed countries.

-According to the TSLS estimations, in selected developing countries we can argue that there is no significant effect of corruption on the SE, neither in the case of COCO nor in the case of FRCO, but in 25 developed countries the significance of this effect depends on corruption index which is employed. Then we estimate the specified models using GMM. Table 5 reports the results:

**Table 5- GMM estimation results**

Corruption Index (X)	COCO		FRCO	
Selected countries Independent Variable	Group 1 (1)	Group 2 (2)	Group 1 (3)	Group 2 (4)
C	0.5235 (22.27)*	0.5118 (8.19)	0.5259 (16.52)	0.5101 (11.04)
X	-0.6005 (-8.25)	1.1892 (2.85)	0.0075 (3.21)	-0.0171 (-2.13)
PGDP	0.0053 (7.23)	0.0012 (8.47)	0.00456 (9.37)	0.0012 (15.35)
GOEF	0.3129 (4.33)	1.2588 (4.92)	-0.0314 (-1.12)	2.6176 (4.18)
REQU	0.3028 (2.48)	1.6286 (3.05)	0.4490 (5.37)	-3.6337 (-12.2)
BUFR	0.0091 (5.32)	-3.2564 (-12.43)	0.0065 (4.26)	0.0460 (3.2935)
J-Statistic	22.35936	20.3896	21.8118	23.3822
Sargan Test(p-value)	0.614918	0.726104	0.646589	0.611247

Source: research calculations

\*(t- statistics)

As it can be seen, the Sargan test does not reject the null hypothesis at conventional levels of significance. Thus, the Sragan test implies that the model is identified and that the instruments are relevant. Table 5 shows the following results:

-There is a significant impact of corruption on the SE in both of two groups of countries, using the GMM. Comparing with TSLS, the GMM results confirms our hypothesis 1 irrespective to the groups of countries or the the type of corruption indices.

-Table 5 (column 1 and 2) shows that corruption and the SE are complements in 25 developed countries while they are substitutes in 25 developing countries when COCO is used. Employing FRCO, however, inverts the results. In other words, estimating models based on FRCO (column 3 and 4), a widespread corruption decreases the size of the SE in developed countries while increases the size of the SE in developing countries. Consequently, in spite of confirming our hypothesis 1, GMM estimation confirms Hypothesis 2 when we employ FRCO. In general, we find that there is significant effect of corruption on the size of the SE (hypothesis 1) but we must admit we have no clear and robust findings that confirm our hypothesis 2 and the relationship

may be complementary or substitutional based on corruption index. These results support Virta (2007) who shows that the use of different corruption indices may, and does, result in opposite results. This seems to be in line with the nature of perception-based indices and their potential weakness in reflectance of actual and prevalent corruption. According to the tables 4 and 5, other useful findings can be summarized as follows, considering both methods of estimation:

-Per capita GDP has positive and significant effect on the size of the SE for all mentioned countries. Thus, as the economic growth increases, the country's shadow activities will tend to spread.

- Regulatory quality (REQU), negatively and significantly affect the size of the SE in 25 developing countries. Thus, as the regulation quality improves, the SE will tend to decrease.

-The signs of the estimated coefficients of BUFR are positive and significant for developed countries. So, it is expected that SE activities decrease by increasing business freedom. The GMM confirms this result for mentioned developing countries.

## 5- Conclusion

At least in two recent decades, many researchers in economics and other social sciences have tried to study and explain the effects of corruption. Indeed, corruption is closely associated with every aspect of society. One of the ambiguous and important aspects of corruption is its relation with the SE. Theroretically, both types of complementary and substitutional relationship between corruption and the SE may stand.Regarding the importance and necessity of corruption-related empirical studies, this paper has taken a step towards understanding the effect of institutional quality and corruption on the size of the SE in terms of the level of development. We hypothesized that corruption has a significant effect on the size of shadow activities. Moreover, in developing countries we expected the SE and corruption to be complements and in developed countries, on the contrary, we expected to be substitutes. In this way, the specified panel-data regression models are estimated in two methods of static and dynamic panel estimation (TSLS and GMM) by using the data of 25 selected developing and 25 selected developed countries for the time period of 1999-2007. The mentioned hypotheses were tested employing two different indices: Control of Corruption (COCO) and Freedom from Corruption (FRCO) and the results were compared and analyzed.

The TSLS results show that in selected developing countries there is no significant effect of corruption on the SE. However, in 25 developed countries, significance of this effect depends on the type of corruption index. Employing FRCO as an index of corruption, the TSLS results confirm the first hypothesis and show the complementary relation between corruption and the SE. Comparing with TSLS, the GMM results confirm the first hypothesis irrespective to the groups of countries or the type of corruption indices and can be served robust. Regarding the second hypothesis, empirical findings also imply clearly that the relationship between corruption and the SE differs in developing and developed countries. Moreover, in line with the previous literature, the mentioned relationship differs, in terms of corruption index.

Other findings can be summarized as follows: for all selected countries, as the economic growth increases, the size of the SE will tend to increase. Any improvement in regulatory quality, cause to lower shadow activities in developing countries. Futhermore, it is expected that shadow activities in selected developed countries decrease when the degree of business freedom increases.

**Appendix A****Table A-1 – Countries included in the analysis**

Group 1: Developed countries			Group 2: Developing countries		
1-Norway	10-Germany	19-Belgium	1-Brazil	10-South Africa	19-Fiji
2-Australia	11-Sweden	20-Austria	2-Iran, Islamic, rep	11-Tunisia	20-Romania
3-Netherlands	12-Switzerland	21-France	3-Malaysia	12-El Salvador	21-Philippines
4-United States	13-Japan	22-Singapore	4-Paraguay	13-Bulgaria	22-Ukraine
5-New Zealand	14-Hong Kong	23-Spain	5-Belize	14-Indonesia	23-Bolivia
6-Canada	15-Island	24-Cyprus	6-Mongolia	15-Nicaragua	24-Peru
7-Ireland	16-Korea, rep	25-Italy	7-Thailand	16-Uruguay	25-Pakistan
8-Luxembourg	17-Finland		8-Colombia	17-Morocco	
9-United Kingdom	18-Denmark		9-Egypt, Arab Rep.	18-India	

**Table A-2 – The criteria of selection**

Group 1	Group 2
Very high human development countries	Medium human development countries (84 < HDI rank < 128)
IMF selected advanced economies	
OECD high income countries	
Countries with World Bank's GDP(PPP) rank less than 30	Countries with : 75 < GDP(PPP) rank < 128 in World Bank's ranking.
Countries with IMF's GDP(PPP) rank less than 30	

**Appendix B****Table B-1 – Descriptive statistics**

Selected countries	Group 1				Group 2			
	Mean	Minimum	Maximum	Standar deviation	Mean	Minimum	Maximum	Standar deviation
SHE	16.75	8.40	30.80	5.71	40.02	18.40	71.30	12,35
COCO	1.75	0.24	2.62	0.55	-0.29	-1.34	1.05	0.48
FRCO	76.91	10	100	18.21	34.70	10	90	13,40
PGDP	3338 7.7	17410.07	74021.46	8780.05	5622	1684.45	13122.11	2661.41
GOEF	1.76	0.32	2.45	0.41	-0.15	-1.01	1.11	0.46
REQU	1.49	0.45	2.01	0.33	-0.12	-1.61	0.81	0.47
BUFR	80.52	55	100	10.82	62.13	39.80	85	10.81

Source: research calculations

**References**

1. Baltagi, Badi H. 2005, *Econometric Analysis of Panel Data*, Third Edition, John Wiley & Sons Ltd
2. Buehn A, Schneider F. 2009, *Corruption and the Shadow Economy: A Structural Equation Model Approach*, IZA Discussion Paper, No. 4182, 1-39
3. Choi J, Thum M. 2005, *Corruption and the Shadow Economy*, *International Economic Review*, 46(3), 817-836.
4. Dell'Anno, R. 2007, *The shadow economy in Portugal: An analysis with the MIMIC approach*, *Journal of Applied Economics*, 10, 253-277.
5. Dell'Anno, R. 2008, *What is the Relationship Between Unofficial and Official Economy? An Analysis in Latin American Countries*, *European Journal of Economics, Finance and Administrative Sciences*, 12, 185-203
6. Dreher A., Kotsogiannis C., McCorrison S. 2005, *How do Institutions Affect Corruption and the Shadow Economy?*, University of Exeter Discussion Paper.
7. Dreher A., Schneider F. 2010, *Corruption and the shadow economy: an empirical Analysis*, *Public Choice*, 144, 215-238
8. Enste D., Schneider F. 2000, *Shadow Economies: Size, Causes and Consequences*, *Journal of Economic Literature*, Vol xxxviii, 77-114
9. Feld L.P, Schneider F. 2010, *Survey on the Shadow Economy and Undeclared Earnings in OECD Countries*, *German Economic Review*, 11/2, 109-149.
10. Frey Bruno S., Weck-Hannemann H. 1984, *The Hidden Economy as an Unobserved Variable*, *European Economic Review*, 26, 33-53
11. Frey Bruno S., Schneider F. 2000, *Informal and Underground Economy*, *International Encyclopedia of Social and Behavioral Science*, 12, 1-16
12. Friedman Eric, Johnson S., Kaufmann D., Zoido-Lobaton P. 2000, *Dodging the grabbing hand: the determinants of unofficial activity in 69 countries*, *Journal of Public Economics*, 76, 459-493.
13. Georgiou George M. 2007, *Measuring the Size of the Informal Economy: A Critical Review*, *Central Bank of Cyprus*, May, pp.1-40
14. Gerxhani K. 2003, *The Informal Sector in Developed and Less-Developed Countries: A Literature Survey*, *Public Choice*, 114(3-4), 295-318.
15. Gujarati Damodar N. 2004, *Basic Econometrics*, Fourth Edition, The McGraw-Hill Companies
16. Heritage Foundation. 2011, *Index of Economic Freedom*, Washington, DC.
17. Hibbs D. A., Piculescu. 2005, *Institutions, corruption and tax evasion in the unofficial economy*, Göteborg, Department of Economics.

18. Hindriks J., Muthoo A., Keen M. 1999, Corruption: extortion and evasion, *Journal of Public Economics*, 74, 395-430.
19. Johnson S., Simon K., Kaufmann D., Zoido-Lobaton P. 1998b, Corruption, public finances and the unofficial economy, Discussion paper, The World Bank, WashingtonDC.
20. Kaufmann D., Kraay A., Mastruzzi M., 2010, The Worldwide Governance Indicators : Methodology and Analytical Issues , Policy Research working paper ; no. WPS 5430 , The World Bank , Development Research Group , Macroeconomics and Growth Team ,1-31
21. Méon, P.G., Sekkat K. 2005, Does corruption grease or sand the wheels of growth?, *Public Choice*,122(1-2),69-97.
22. Polonskyi, G. 2009, corruption and shadow economy: evidence from ukraine and Russia, A thesis submitted in MA in Economics, Kyiv School of Economics
23. Putnins, Talis J. , Sauka D. 2011, size and determinants of shadow economies in the Baltic States, *Baltic Journal of Economics*,11(2),5-25
24. Schneider F. 2005, Shadow Economies Around the World:What Do We Really Know? , *European Journal of Political Economy* ,21,598-642
25. Schneider F. ,Buehn A., Montenegro C. E. 2010, Shadow Economies All Over The World: New Estimates for 162 Countries from 1999 to 2007, Policy Research working paper ; no. WPS 5356,The World Bank , Development Research Group , Human Development Economics Unit ,1-54
26. Virta Heli.2007. Corruption and Shadow Economy:Differences in the Relationship between Countries, Discussion Paper No. 171, Helsinki Center of Economic Research,1-28
27. Wooldridge Jeffrey M. 2010,Econometric Analysis of Cross-Section and Panel Data , Second Edition,The MIT Press