THE IMPACT OF CORRUPTION ON GDP PER CAPITA

Nazar Mustapha
Dillard University, New Orleans, LA

ABSTRACT

The paper studies the impact of corruption on the GDP per capita. A panel data covers the period between 2003 and 2011. The objective is to test the hypothesis that there is a strong negative impact of corruption on the GDP per capita. Three tests were conducted, the pool OLS, The Fixed Effect and the Random effect estimations. The main result of this study is that all three tests had shown strong statistically significant negative impact of corruption on the GDP per capita.

INTRODUCTION

There are mixed results in the literature in the debate over the impact of corruption on economic growth. While The efficient grease' hypothesis argues that corruption enhances efficiency in the economy , where bribes serves as a lubricant that reduces delays and transaction costs and thus leads to growth (Leff (1964) and Huntington (1968)), other academic work show that corruption negatively impacts economic growth. Kaufman and Wei (1999); Aidt (2009); Mauro (1995) and Mauro (1997), Shleifer and Vishny (1993), Blackburn et al (2009), Barreto (1996); Tanzi (1997))

The purpose of this study is to examine the impact of corruption on countries' GDP per capita. Transparency international publishes yearly a corruption index for all countries around the world. Countries which are very "clean" like Scandinavian countries are represented by a small number in the index (in 2011, Denmark and Finland have each a score of 2, Sweden's score is 4), while countries that are highly corrupt like North Korea, Somalia have large number in the index (in 2011 both are at the bottom of the list with a score of 182).

Examining the index, it is worth noting that corruption in Eastern European countries, that have completed accession the European Union, has decreased dramatically, while those countries in Eastern Europe that are not part of the European Union continues to have a high level of corruption. For example, in 2011 Belarus had a score of 143 on the index, Tajikistan' score is 152, Kyrgyzstan's is 164. On the other hand Estonia's score is 29, Slovenia's is 35 and Poland score is 41.The reason for that is the European Union had set rigid requirements for the accessing countries; "country must have stable institutions guaranteeing democracy, the rule of law, human rights, and a functioning market economy"and it is known that countries that enjoy the above characteristics have lower level of corruption.

The objective of this study is to test the hypothesis that there is a strong negative impact of corruption on the GDP per capita. Three tests were conducted, the pool OLS, The Fixed Effect and the Random effect estimations.

The main result of this study is that all three tests had shown strong statistically significant negative impact of corruption on the GDP per capita, which proves the hypothesis.

LITERATURE REVIEW

Leff (1964) argues that corruption enhances efficiency in the economy. "Corrupt bureaucrats can force the government to become involved in promoting economic activities and can make a higher rate of investment possible because investors need assurance of noninterference in their affairs"

Kaufman and Wei (1999) examine the relationship between bribe payment, management time wasted with bureaucrats, and cost of capital. Their results contradict the efficient grease' hypothesis. The authors find "that firms that pay more bribes are also likely to spend more, not less, management time with bureaucrats negotiating regulations, and face higher, not lower, cost of capital"

Aidt (2009) tackling the topic whether corruption sands or greases the wheels wrote "While corruption in a very narrow sense can be seen as a lubricator that may speed things up and help entrepreneurs getting on with wealth creation in specific instances, in a broader sense, corruption must be considered as an obstacle to development". The author finds a strong negative correlation between growth and corruption.

Mauro (1995 and 1997) find that corruption lead to a decrease of economic growth by decreasing investment.

Kisunko and Kapoor (2000), building on the work of Mauro, use data for Bangladesh during the 1990's investigate the relationships between corruption and growth and between corruption and investment.

The authors' findings suggest "that countries serious about improving governance and reducing corruption should redefine the role of government, overhaul the system of incentives, and strengthen domestic institutions to make sure the necessary checks and balances are in place"

Mauro (2004) questions the reasons why corruption persists despite the negative impact on growth. To answer this question, he uses two models involving strategic complementarities and multiple equilibria. His explanation is that "when corruption is widespread, individuals do not have incentives to fight it even if everybody would be better off without it".

Igwike, Hussain, and Noman (2012) study the link between corruption and economic development. They employed the annual growth rate of the gross domestic product to measure economic development. The authors find that corruption has a negative impact on economic growth.

Li and Wu (2010) examine the puzzle that some countries experience high economic growth despite rampant corruption. They studied the role of trust in the corruption-efficiency relationship. The authors use a pooled data set of 65 countries. Their results support their hypothesis that trust mitigates the negative effect of corruption on economic growth.

Blackburn et al (2009) study the issue of why corruption in some countries has less economic impact than in other. By developing a dynamic general equilibrium model, the authors predict "that countries with organized corruption networks are likely to display lower levels of bribes, higher levels of research activity and higher rates of growth than countries with disorganized corruption arrangements".

Rock et al (2004) examine the robustness of the relationship between corruption and economic growth by using four different corruption datasets. The authors find that the impact of corruption on growth depends on the economic development of the country." corruption slows growth and/or reduces investment in most developing countries, particularly small developing countries, but increases growth in the large East Asian newly industrializing economies. The author explains this Asian paradox" in terms of stable and mutually beneficial exchanges of government promotional privileges for bribes and kickbacks".

DATA METHODOLOGY

Three tests were conducted, the pool OLS, The Fixed Effect and the Random effect estimations.

The independent variable in this study is the GDP per capita. The dependent variables are Corruption index, foreign investment and bank loans. Included also dummy variables for the years from 2004 to 2011. The base year is 2003, an interaction term y11crp (year2011*corruption). The coefficient on this dummy variable will measure how the GDP per capita has changed over the eight- year period to an additional unit increase in corruption.

The data consists of 20 countries; 10 with low level of corruption on the index and 10 with high level of corruption in the index. The time period is between 2003 and 2011.

The variables "GDP per capita", "foreign investment" and "bank loans as a percent of GDP" were collected from the World Bank website. The Corruption index data was collected from the transparency international website.

Table1. Statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
GDP per capita	180	21705.72	19401.83	410	60160
Corruption index	180	70.54444	61.60609	1	177
Bank loans as a percent Of GDP	180	111.5666	82.14515	-6.15	337.47
Net Foreign investment(in millions)	180	31418.4	63087.47	-25304.2	340065

The model for the pool OLS:

$$GDPpercapi\,ta = \beta_0 + \delta_0 y_{11} + \beta_1 corruption\ index + \beta_2 foreigninv + \beta_3 bankloan + \delta_1 y_{11} corruption + u$$

For the Fixed Effect and the Random Effect models:

$$GDPpercapita = \beta_0 + \delta_0 y_{11} + \beta_1 corruptionindex + \beta_2 foreigninv + \beta_3 bankloan + a_0 + u$$

Where is the unobserved effect.

The main objective of this study is to test the hypothesis that there is strong negative impact of corruption on the GDP per capita.

The hypothesis is:

$$H_0 : \beta_{corruption} = 0$$

$$H_1 : \beta_{corruption} \prec 0$$

First the model was estimated using Pooled OLS. Below are the results.

Table 2 Pooled OLS results

```
. reg  gdppercapita  corruptionindex  bankloansasapercentofgdp  forinv   y11crp
> y04- y11
```

Source	SS	df	MS			
Model	5.4193e+10	11	4.9267e+09			
Residual	7.5673e+09	148	51130596.5			
Total	6.1761e+10	159	388431433			

				Number of obs	=	160
				F(11, 148)	=	96.35
				Prob > F	=	0.0000
				R-squared	=	0.8775
				Adj R-squared	=	0.8684
				Root MSE	=	7150.6

gdppercapita	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
corruption~x	-284.9269	14.6946	-19.39	0.000	-313.9652	-255.8886
bankloansa~p	-4.437786	10.76708	-0.41	0.681	-25.71486	16.83929
forinv	.028748	.0096073	2.99	0.003	.0097627	.0477332
y11crp	.4751197	25.30024	0.02	0.985	-49.52125	50.47149
y04	(dropped)					
y05	6467.74	2277.386	2.84	0.005	1967.347	10968.13
y06	7353.951	2283.147	3.22	0.002	2842.173	11865.73
y07	10795.29	2317.182	4.66	0.000	6216.257	15374.33
y08	12575.18	2314.455	5.43	0.000	8001.532	17148.82
y09	14162.05	2313.681	6.12	0.000	9589.928	18734.16
y10	14739.53	2321.067	6.35	0.000	10152.82	19326.25
y11	15731.67	3005.531	5.23	0.000	9792.375	21670.97
_cons	31868.05	2393.68	13.31	0.000	27137.84	36598.25

As we see from table 2 which means that the higher the level of corruption in a country the less is the GDP per capita .The results are very statistically significant. A country's 10 points increase on the corruption index will lead to a decrease in the amount of $2849 of the GDP per capita.

Foreign investment data is in millions of dollars; .That means for every 10 billion increase in foreign investment the GDP per capita will increase by $287. The impact has the right sign but doesn't seem to be too strong. As for bank loans coefficient, the sign is expected to be positive, which is not the case, although the coefficient is not statistically significant.

What is interesting in the results of table 2 is that the coefficients on the dummy variables show a sharp increase over the years. For example the coefficient on y11 implies that, holding foreign investment, bank loans, corruption index, and other factors fixed, the GDP per capita on average worldwide has increased by $15,731 in 2011 from what it was in 2003. This can be explained by the tremendous growth in the BRICS countries and the emerging markets in general.

To further test the significance of the dummy variables and since the dummies are individually quite significant a test was conducted to check whether these dummies as a group are jointly significant. Below are the results.

Table 3. Test of the joint significance of the dummy variables

```
. test  y04  y05  y06  y07  y08  y09  y10  y11

 ( 1)   y04 = 0
 ( 2)   y05 = 0
 ( 3)   y06 = 0
 ( 4)   y07 = 0
 ( 5)   y08 = 0
 ( 6)   y09 = 0
 ( 7)   y10 = 0
 ( 8)   y11 = 0
        Constraint 1 dropped

      F( 7,   147) =     8.24
            Prob > F =     0.0000
```

As we see in Table 3: F(7, 147) = 8.24 and . So the year dummies are jointly statistically significant.

Next the model was estimated using the Fixed Effect and the random effect. This way the pooled OLS can be compared with the other two estimations. Below are the results.

Table 4 Fixed Effect estimation results

```
. iis  countrycode

. tis  year

. xtreg  gdppercapita  corruptionindex  forinv  bankloansasapercentofgdp  y04- y
> 11 , fe
```

Fixed-effects (within) regression	Number of obs =	160
Group variable: **countrycode**	Number of groups =	20
R-sq: within = 0.6101	Obs per group: min =	7
between = 0.8925	avg =	8.0
overall = 0.8390	max =	9
	F(10, 130) =	20.35
corr(u_i, Xb) = 0.7807	Prob > F =	0.0000

gdppercapita	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
corruption~x	-116.24	23.9211	-4.86	0.000	-163.5651	-68.915
forinv	.0143259	.007337	1.95	0.053	-.0001895	.0288412
bankloansa~p	8.907901	21.7009	0.41	0.682	-34.02473	51.84054
y04	(dropped)					
y05	5465.107	991.8863	5.51	0.000	3502.778	7427.435
y06	6542.813	997.3485	6.56	0.000	4569.678	8515.947
y07	8639.937	1091.66	7.91	0.000	6480.219	10799.65
y08	10372.45	1097.539	9.45	0.000	8201.098	12543.8
y09	10796.9	1175.617	9.18	0.000	8471.078	13122.71
y10	11399.49	1193.184	9.55	0.000	9038.914	13760.06
y11	12260.77	1221.3	10.04	0.000	9844.573	14676.96
_cons	20829.43	2885.505	7.22	0.000	15120.8	26538.06
sigma_u	12138.829					
sigma_e	3018.1243					
rho	.94178026	(fraction of variance due to u_i)				

```
F test that all u_i=0:       F(19, 130) =     36.88          Prob > F = 0.0000
```

In Table 4 the coefficients on the corruption index and on foreign investment show the same sign as with the pooled OLS and they are statistically significant at the 5% level; as for bank loan coefficient, although it shows the expected positive sign, but it still statistically insignificant.

Next the model was estimated using the Random Effect. Below are the results.

Table 5 shows that all the coefficients, including the bank loan coefficient, have the expected signs.

Furthermore all the coefficients are statistically significant at the 5 % level.

CONCLUSION

The objective of this study is to test the hypothesis that there is a strong negative impact of corruption on the GDP per capita. Three tests were conducted, the pool OLS, The Fixed Effect and the Random effect estimations. The main result of this study is that all three tests had shown strong statistically significant negative impact of corruption on the GDP per capita.

Table 5. Random Effect estimation results

```
. iis  countrycode

. tis  year

. xtreg  gdppercapita  corruptionindex  forinv  bankloansasapercentofgdp y04- y
> 11 , re
note: y04 dropped because of collinearity

Random-effects GLS regression              Number of obs       =        160
Group variable: countrycode                Number of groups    =         20

R-sq:  within  = 0.5897                     Obs per group: min =          7
       between = 0.8774                                     avg =        8.0
       overall = 0.8569                                     max =          9

Random effects u_i ~ Gaussian               Wald chi2(10)       =     286.73
corr(u_i, X)       = 0 (assumed)            Prob > chi2         =     0.0000
```

gdppercapita	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
corruption~x	-177.4419	20.70511	-8.57	0.000	-218.0232	-136.8606
forinv	.016068	.007535	2.13	0.033	.0012997	.0308362
bankloansa~p	34.53369	17.14585	2.01	0.044	.9284345	68.13894
y05	5941.665	1038.334	5.72	0.000	3906.568	7976.763
y06	6898.619	1045.879	6.60	0.000	4848.733	8948.505
y07	9354.726	1128.644	8.29	0.000	7142.624	11566.83
y08	10999.95	1133.311	9.71	0.000	8778.7	13221.2
y09	11452.82	1193.838	9.59	0.000	9112.938	13792.7
y10	12058.82	1209.664	9.97	0.000	9687.927	14429.72
y11	12965.41	1234.622	10.50	0.000	10545.6	15385.23
_cons	21708.05	3111.287	6.98	0.000	15610.04	27806.06
sigma_u	6891.9008					
sigma_e	3018.1243					
rho	.83908324	(fraction of variance due to u_i)				

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ABOUT THE AUTHOR

Nazar Mustapha, email:nmustapha@dillard.edu

Dr. Nazar Mustapha is an assistant professor of finance at Dillard University in New Orleans, LA at the Department of Financial Economics. His current research expertise is in the areas of banking and financial institutions and international finance. He frequently presents at international conferences in economics and finance, and has numerous publications in refereed journals. Dr. Mustapha has been the recipient of several prestigious research grants, and is the College of Business "Faculty of the Year" award winner for several years. Dr. Mustapha was a member of the Business Advisory Council at Dillard University where he has contributed in instituting, integrating and enhancing the College of Business educational programs.