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Corruption and Growth: A Nexus Revisited

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Abstract

This study revisits the relationship between corruption and growth. The different indices are used to measure the corruption but this study uses the corruption perception index. We estimated the conventional Barro equation along with the set of control variables, using annual data series for 104 countries. The results indicate a negative impact of corruption on GDP per capita but it does not affect the GDP growth. It is suggested that authorities should concentrate on anticorruption policies along with other economic and non-economic reforms to enhance the level of GDP.

I. Introduction

Corruption is affecting human life from the beginning of human beings. Treisman (2000) emphasized that it is hard to conduct an empirical study on corruption and its determinants. It is also mentioned that corruption occurs in secret and it cannot be directly observed like the other variables. Therefore, the reliability of the measurement and the consistency of data series for this variable are important issues in any empirical study for corruption-growth nexus. However, in the recent years, some major advances are witnessed to measure the corruption. Researchers have begun to look, with a trust, at corruption indices that are produced by private rating agencies. We also use Corruption Perceptions Index (CPI) that is produced by Transparency International. To accomplish our task, we use a panel data consisting of 104 countries and 11 years of period from 1995 to 2005.

Many renowned researchers replicated the pioneer work of Barro (1991), pertaining to corruption, economic growth and investment. Indeed, the replication is an essential part of scientific methodology and it should naturally invite skepticism about empirical results that are reported in economic journals (Dewald et al. 1986). The corruption-growth nexus is and remained long debated issue among the development economists. Even the classical text book literature explained the stories that the self interests drive the firms to make cartels, prevent the new entries to get more profits than the equilibrium level and try to keep workers' wages below equilibrium. Corruption is simply an exercise in self-interest. Adam Smith did not say that the self-interest in all aspects was good; but it was a fact. However, theoretically, the economists put their views through two so-called strands that are,

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efficiency-enhancing strand (Leff 1964, Huntington 1968, Lui 1985, Beck and Maher 1986, Lien 1986) and efficiency reducing strands (Santhanam 1964, Myrdal 1968 Andvig 1991). The contradictory outcomes of corruption depend on the different economic and noneconomic factors. Most of the studies utilize the neoclassical growth model to investigate the relationship between corruption and growth. The rationale behind this practice is that physical capital; labor, human capital and institutional variable (like corruption) contribute to the steady state per capita income level. However, there is problem to model the corruption-growth nexus because of the differences between institutions, culture and religion and the rate of growth (Islam 1995, Triesman 2000).

Institution, especially 'public institutions', play an important role in controlling corruption. Klitgaard, (1998) pointed out that corruption is an outcome of pathetic state administration when an individual or organization has monopoly power over a commodity or service, discretion over making decisions, limited or no accountability, and low level of income. However, there are still two contradictory views (Lambsdorff 1999) First; corruption greases the wheels by enabling individuals or organizations to avoid bureaucratic delays. Second, corruption "sands the wheels" mainly by lowering the protection of property rights and misallocating resources. Kaufmann and Wei (1999) and Johnson et al. (1998) oppose the view about greases the wheels by finding the positive correlation between corruption and the size of the hidden economy. Treisman (2000) finds a positive impact of state intervention on corruption. World Development Report (1997) explains the correlation between corruption and a measure of policy distortion for 39 countries.

Following Barro's (1991) pioneering work, there has been a remarkable expansion in the empirical literature on economic growth and investment. Mauro (1995), by using Business International Index (BI), found a significant negative relationship between corruption and the average annual economic growth rate over the 1960-85 periods. He also found the same relationship between corruption and the investment-GDP ratio and other kinds of investments for 1960-85 and for 1980-85 as well. Interestingly, he also found empirical support for the speed money argument, which states that in the presence of a slow bureaucracy, corruption can get bureaucrats to work faster. Mauro (1997) found that corruption reduces expenditures on health and education.

Researchers provide a number of studies on the relationship between growth and corruption over the last 10 years. This research has been facilitated by a growing number of efforts to measure corruption at the national level. Both negative and positive, and statistically significant, signs are reported in different studies. For example, the negative correlation between corruption and GDP is supported by Brown et al. (2005), Kunicova and Rose-Ackerman (2005), Lederman et al. (2005), Braun and Di Tella (2004), Chang and Golden (2004) and etc. On the other hand, some studies also proved the positive relation between these variables like Braun and Di Tella (2004) and Frechette (2001). The positive relation between corruption and

income distribution is supported by the findings of Paldam (2002) and Amanullah and Eatzaz (2007). Then Pelligrini and Gerlagh (2004) add trade openness as an additional channel through which the effect of corruption on the growth is transmitted. However, a negative relationship between trade openness and level of corruption is also pointed out by various studies like: Gurgur and Shah (2005), Brunetti and Weder (2003) and Knack and Azfar (2003). On the contrary, a positive relation between these two is supported by the findings of Graeff and Mehlkop (2003) and Paldam (2001). Mo (2001) showed that the lower human capital accumulation and undermining political stability are the channels through which corruption affects economic growth. Moreover, Meon and Sekkat (2005) investigated the relationship between corruption and growth through the channel of quality of governance.

Most of the above cited studies utilized the cross-sectional data that ignores the endogeneity problem. If there are, some studies that care the endogeneity with panel data have small sample. Keeping in view these drawbacks, we revisited the relationship by using a panel data of 104 countries. We utilize the most recent data set for the maximum number of countries. Moreover, for the main estimation, we do not estimate for any specific group of countries as other studies do[2]. We try to include a vast set of control variables that are different, according to our best knowledge, to reduce the chance of model misspecification.

The rest of the study is designed as follows. The model and econometrical issue are discussed in the section II. The section III concentrates on the rational for the selection of variables and data sets. Empirical results are discussed in section IV. Section V concludes the study and suggests some policy implications.

II. Methodology and Econometric Issues

Following Barro (1991), this study uses the growth model in the presence of various geographic, policy, and demographic variables that are affecting the growth. Our benchmark model looks like as following:

$$g_{i,t} = a + b_1 IGDP_{i,t} + b_2 CRP_{i,t} + \beta_1 X_{i,t} + \beta_2 Z_{i,t} + u_{i,t} \qquad (1)$$

Where, '*g*' is average annual GDP growth rate, *CRP* is an index that is used to measure the corruption level, *IGDP* is the initial level of GDP, *X* is a vector of regional dummies, '*Z*' is a pool of policy, geographic and demographic variables, and *u* is the error term. Moreover, "*i*" refer to the unit of observation; *t* refers to the time period.

It is possible that corruption and growth respond simultaneously to an omitted factor. Such factor could be, for example, a cultural disposition towards

[2] *It is important to mention here, we also carried out estimation for different groups of countries but do not find any contradictory results with our main estimations.*

leisure or morality, the legal framework, the historical evolution of the nation in question, etc. Moreover, corruption may directly be affected by the rate of economic growth; as for example, it could be the case that rich and fast-growing countries have more resources to combat and control corruption. In either case, corruption would be correlated with the error term in the OLS regression and the estimates would be biased.

Many studies in the past have used instrumental variable techniques as an attempt to correct this potential bias. The main instrument in the literature has been the Ethno Linguistic Fractionalization (ELF) index[3]. This variable, however, has been shown to be directly and indirectly correlated with economic growth (Easterly and Levine, 1997) and thus, it cannot be considered as a valid instrument in our regressions. Another method is widely used by different previous studies by taking averages of the variables. The use of averages reduces short run fluctuations and allows us to concentrate on the relationships of interest for this study[4].

In this study, we used fixed effect regression where the variables are averaged over three-year period: 1995-1997, 1998-2000, 2001-2003, and 2004-2005. Four observations are for each country. The last observation is average of two years because of data availability problem.

III. The Data and Chart Analysis

We are focused to investigate the relationship between corruption and GDP growth. Therefore, the main variable of concern is corruption. It is important to mention here that corruption occurs in secret and it can not be directly observed like the other variables. Therefore the reliability of the measurement and the consistency of the data of this variable is an important issue in any empirical study for corruption-growth nexus. There are several indices that measure different aspects of corruption, such as the Business International Index (BI), the Institute for Management Development index (IMD), the International Country Risk Guide index (ICRG) from Political Risk Services, the Corruption Perceptions Index (CPI) from Transparency International and the World Bank's Control of Corruption Index (CCI). Among these, CPI, CCI and ICRG indices are widely used for the empirical analysis. The ICRG index ranks the country on the basis of expert opinions. Importantly, it does not measure the corruption but it indicates about the political risks involved in the corruption (Lambsdroff 2004a, 2004b). Triesman (2000) also cautions and finds some rankings by the ICRG index puzzling. On the other side, CPI and the CCI are based on a number of separate surveys of businesses' perceptions of corruption. For this study we use CPI following some recent studies like Gyimah-Brempong and de

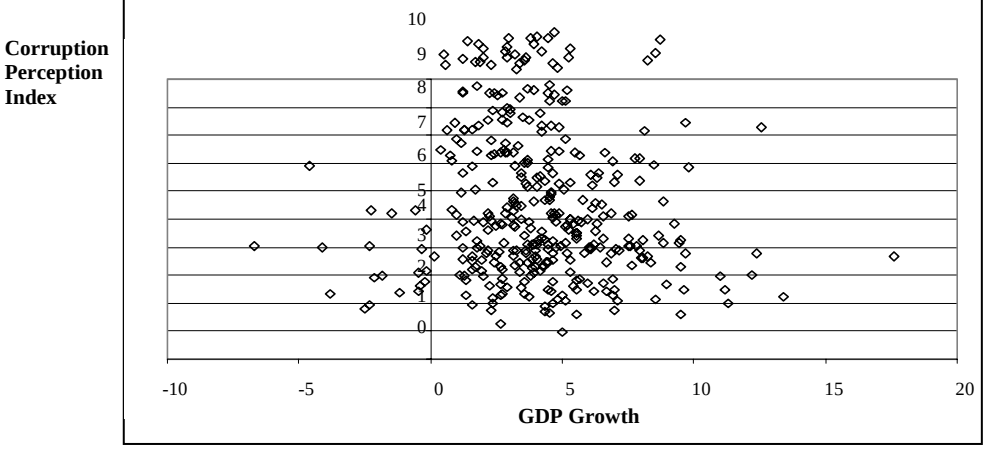
[3] *For detail see: Easterly and Levine, 1997.*
[4] *Many other studies have used five-year averages for similar purposes. See, for example, Deinninger and Squire (1996), Li et al. (2000), Fabio and Sepulveda (2004), and Paldam (2002, 20003).*

Comacho (2006), Gyimah-Brempong (2002), and Ganuza and Hauk (2001) because it is available on the annually basis while the CCI is available only every other year. Therefore, it permits a larger set of data as compare to CCI. It measures perceived corruption rated on a scale from zero (most corrupt) to ten (no corruption). It has the advantage, as mentioned before, of being posted consecutively since 1995 for most countries in the sample[5]. The expected direct effect of the CPI (higher value of CPI indicates a low level of corruption) on GDP is positive.

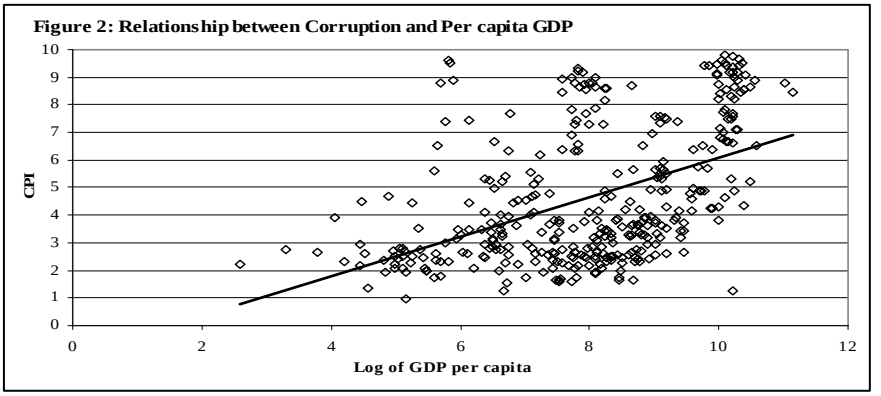
Other variables are taken, mostly, from World development Indicators (WDI 2006). These are GDP per capita level and growth, gross Fixed Capital formation percentage of GDP, gross enrollment rate in secondary schooling (SED), Public spending on education (PSED), Foreign Direct Investment as a percentage of GDP (FDI), average annual population growth (POP), openness measured as ratio of exports plus imports to GDP (OPEN), general government final consumption expenditures percentage of GDP (GEXP) and inflation measured as, log of Consumer Price Index (INFL). Along these variables, some important dummy variables for cultural and regional affect are also in this setting. For example, LA is a dummy variable taking the value of 1 for Latin American countries and 0 other wise). Similarly, SSA for Sub-Saharan African, SA for South Asian countries, EAS East Asian countries, EU for European countries, OECD for OECD countries and MUS for Muslim countries are used.

The following two figures show the relationship among GDP growth and GDP per capita with corruption. Actual averaged data is used for the relationships. It is argued that high growth is associated with less corruption[6]. As CPI increases growth rate will increase. The figure 1 depicts a weak relationship. Next relationship

Figure 1: Relationship between Corruption and GDP growth



[5] *For detail see: net source (http://www.transparency.org).*
[6] *See: Mauro (1995).*



CPI: Corruption Perception Index

is between log of GDP per capita level and corruption. The idea is about transition hypothesis. Corruption decreases when poor and middle-income countries moves through the grand transition from low income to high income[7]. Fig, 2 shows strong evidence about transition hypothesis.

IV. Empirical Results

We estimated the two versions of the model that is specified by equation 1. One is estimated to investigate the relationship between corruption and GDP per capita and the other one is for the relationship between corruption and growth rate of GDP per capita. Table: 1 shows the result of fixed effect with; set of control variables, constant and time dummies by using log of GDP per capita as a dependent variable.[8]

The coefficients of initial GDP have positive sign but insignificant meaning no sign of convergence as expected. It is evident from the table that our variable of interest, CRP, has positive sign and statistically significant. It indicates that as corruption goes down (corruption index goes up), the level of GDP must increase. The figure 2 also presents the same relation between these two variables. Therefore, it reflects that the countries, which are less corrupted, have high level of per capita, and vice versa. So analysis of causality is important to discuss. Therefore we also test the Granger Causality between these two and other variables. The quantitative effect of corruption index on log of GDP per capita can be measure by following Wei (1997). For example according to results table 1 column 4 the coefficient of CRP is

[7] *See: Husted (1999), Treisman (2000) and Pladam (2001, 2003).*
[8] *The results of Fixed Effect with out time dummies are available on request.*

Table: 1. Dependent Variable is Log of GDP/Capita

Variables	1	2	3	4	5	6	7	8	Fixed Effect
LnGDP-1	0.177 (0.088)	0.167 (0.09)	0.165 (0.112)	0.079 (0.103)	0.0573 (0.101)	0.032 (0.098)	0.101 (0.118)	0.086 (0.084)	-0.378 (0.0662)
CRP	0.311* (0.059)	0.307* (0.063)	0.162** (0.069)	0.285* (0.061)	0.216* (0.073)	0.197* (0.067)	0.107 (0.083)	0.245* (0.067)	-0.194 (0.134)
SED	0.001 (0.003)	0.0008 (0.003)		0.004 (0.003)	0.005*** (0.003)			0.002 (0.003)	
PUBSED			0.101 (0.096)				0.059 (0.105)		
INFL				-0.123 (0.118)					
UNEMP			-0.030 (0.024)	-0.022 (0.023)	-0.025 (0.026)	-0.020 (0.025)	-0.040 (0.029)		
GEXP		0.006 (0.016)		0.041** (0.019)	0.035*** (0.019)	0.032*** (0.018)	0.028 (0.022)	0.013 (0.015)	
FDI	0.003 (0.017)	0.006 (0.018)							
POP			-0.088 (0.125)	-0.033 (0.120)				-0.137 (0.123)	
OPEN	0.002 (0.002)	0.001 (0.002)							
MUS							-0.773 (0.766)		
OECD					0.469 (0.361)	0.426 (0.340)	0.408 (0.395)	0.652** (0.324)	
LAM					0.083 (0.340)	0.067 (0.325)	0.146 (0.390)	0.548 (0.347)	
SSA					0.262 (1.089)	0.087 (1.077)	0.314 (1.118)	-0.897** (0.392)	
EAS					-0.363 (0.496)	-0.441 (0.490)	0.332 (0.750)	-0.010 (0.461)	

Each equation is estimated by GLS (using OLS residuals). Data starts from 1995 to 2005. In parenthesis standard errors are reported. (*=1%, **=5%, ***=10%)

0.285, this would means that for Pakistan, a reduction in corruption from its current level (CRP averaged index 2.4) to a level of, say, Denmark (CRP averaged index 9.7) would increase Pakistan's annual average log of GDP per capita during the period 1995-2005 by 2.08 percentage points (0.285 * (9.7-2.4) = 2.08). Thus, in other words, if corruption in Pakistan could be reduced to levels existing in developed economy like Denmark, then during the period Pakistan could have increased its

annual average per capita rate by more than 2 percent. The results of fixed effect are also reported and these are not robust with corruption index.

Secondary education variables is used in 5 regressions but only in one regression this variable is significant at 10 percent level, while the sign of coefficient is positive, which indicates the positive impact on per capita. Second education variable is public spending on education, which is also insignificant in this regressions model. This implies that GDP per capita is not capturing the full effect of these educational variables.

All other explanatory variables except Government Consumption Expenditure (GEXP) are insignificant. This variable is significant and positively affecting the GDP per capita. The coefficient is about 0.035 in most regressions; its quantitative impact is not bigger but significant impact. Population growth and unemployment rate have negative sign but mostly insignificant. The result indicates that only CRP variable is important for log of GDP per capita when model is estimating with cultural variables. The cultural dummies are also reported in the same table. In cultural variables only OECD and SSA (African countries) are significant at one place. The dummy for Muslim culture has negative signs but insignificant. The other dummies EAS (East Asian countries) and LAM (Latin America) are also insignificant. In sum we can say, when dependent variable is log of GDP per capita then CRP variable is significant and has positive relation with GDP per capita. The next results displayed in table: 2 are based on the fixed effect and set of control variables that is using GDP per capita growth rate as dependent variables and the numbers of independent variables including corruption and initial GDP per capita. The results reported in table 2. It is not proved to be significant variable here in each regression.

There are 9 regressions and in all GDP growth is insignificant, meaning not different from zero. The sign of coefficient is also negative. The graph of these two variables, corruption and GDP growth is also not giving clear picture (figure 1). We also included a quadratic term for corruption that allows a test for a positive growth maximizing level of corruption. But this test fails to capture the maximizing level of corruption.[9] As we expand the list of explanatory variables the magnitude of the coefficient on corruption remains roughly the same. The most significant variables in growth equations are inflation rate, and unemployment rate. These two variables have negative sign and mostly are significant.

Secondary school enrolment (SED) has positive sign but all coefficients are insignificant. Public spending on education is also same as SED not proving a significant variable. Government expenditure variable is also included in growth equation but it does not prove to be significant variable. And it means government consumption expenditure is not playing any significant role in growth. FDI has positive relation with growth but it is not significant. Population growth is negatively

[9] *The results for quadratic term of Corruption variable will be available on request.*

affecting the growth as shown in table 2, but only one coefficient is significant at 10 percent. Trade openness is also not proved as a significant variable in the model.

Table 2 presents the results of combined economic and cultural variables on growth. When we expand our model with cultural dummies the results are almost same, and the corruption variable is same as without cultural dummies. Among

Table: 2. Dependent Variable is GDP/Capita Growth

Variables	1	2	3	4	5	6	7	8	Fixed Effect
LnGDP-1	-0.150 (0.156)	-0.053 (0.193)	-0.057 (0.192)	-0.106 (0.196)	-0.100 (0.216)	-0.194 (0.194)	-0.0760 (0.192)	-0.111 (0.182)	0.031 (0.143)
CRP	0.113 (0.121)	-0.129 (0.113)	-0.169 (0.120)	-0.151 (0.117)	-0.26*** (0.137)	-0.198 (0.132)	-0.023 (0.141)	-0.017 (0.133)	0.053 (0.292)
SED	0.003 (0.006)	0.003 (0.006)	0.004 (0.006)	0.003 (0.006)		0.001 (0.006)	0.002 (0.006)	0.001 (0.005)	
PUBSED					0.238 (0.191)				
INFL				-0.448** (0.211)	-0.084 (0.245)	-0.403*** (0.217)	-0.385*** (0.211)	-0.407** (0.202)	
UNEMP		-0.074*** (0.043)	-0.070 (0.043)	-0.053 (0.043)	-0.060 (0.047)	-0.086*** (0.049)	-0.096** (0.047)	-0.094** (0.046)	
GEXP	-0.028 (0.030)				-0.0157 (0.039)	-0.010 (0.036)	-0.011 (0.034)		
FDI			0.025 (0.034)	0.020 (0.0334)	0.034 (0.031)	0.016 (0.031)	0.018 (0.030)	0.023 (0.029)	
POP	-0.51*** (0.297)				-0.416 (0.239)	-0.223 (0.315)	-0.269 (0.349)		
OPEN		0.004 (0.004)	0.002 (0.005)	0.002 (0.005)					
EU	2.351* (0.801)						2.397* (0.829)	2.001* (0.661)	
MUS						-1.098 (1.058)	-0.037 (1.089)		
LAM	-1.28*** (0.699)					-1.206 (0.813)	-0.571 (0.818)	-0.237 (0.675)	
SSA	-0.181 (0.800)					2.111 (2.071)	2.452 (2.011)	2.780 (1.920)	
EAS	0.806 (0.951)					-0.184 (1.091)	0.202 (1.066)	0.489 (0.971)	

Each equation is estimated by GLS (using OLS residuals). Data starts from 1995 to 2005. In parenthesis standard errors are reported. (*=1%, **=5%, ***=10%).

cultural dummies the OECD countries have positive coefficient, which indicates the positive impact on growth. MUS (Muslim countries dummy) are still insignificant, but it has negative sign. This indicates the Muslim countries have lower growth. The

LAM (Latin America) dummy has negative sign in all regressions and only one is significant, but their affect on growth is very low. Sub-Saharan Africa and East Asian dummies are insignificant.

In cultural dummies, we used new variable MUS for Muslim countries. For these countries, corruption is not proved to be significant. Other cultural variables EU, OECD, HY (high-income countries) and LAM (Latin America) are significant in most of the regression for corruption index. In growth model, the corruption does not affect the growth of GDP per capita, while corruption does affect the log of GDP per capita. Therefore, the relation with corruption and level growth is important and same results are found by Paldam (2002). In next section, we will present the granger causality between corruption and growth and log of GDP per capita.

1. The Causality Relationship

We also test the direction of causal relationship of the variable of interest by using Granger Causality test. Table 3 presents the results of test the null hypothesis that corruption does not granger cause to GDP growth rate, and rejected, which implies that corruption does cause to GDP growth rate. But this result should be taken cautiously. Because we find, as mentioned before, in our results that corruption is not significantly affecting growth but affecting the real GDP per capita. The possible explanation for this contradictory result is that we have only 4 observations for each country, when we test the Granger causality, we must take the enough lag value of variables and loose degree of freedom, hence we cannot fully trust on these results, but just overview of the results of existing data set. The null hypothesis that growth does not granger cause to corruption is also tested, and accepted, which implies that growth does not causing the corruption. In addition, this result is consistent with our results in previous section.

The table: 4 report the results about the causal relationship between corruption and GDP per capita. The null hypothesis that corruption does not Granger-cause the GDP per capita is tested. It is evident from the table that corruption does cause to per capita GDP, which is consistent with our findings. The null hypothesis that GDP per capita does not Granger cause to corruption is also rejected.

Table: 3. Granger Causality Test

Dependent variable	Independent variable	Wald test for exclusion restriction Chi^2(2)	Prob.
Per Capita GDP Growth	Corruption	10.46	[0.0012] **
Corruption	Per Capita GDP Growth	0.022	[0.8809]

Table: 4. GDP per Capita does not Granger cause Corruption

Dependent variable	Independent Variable	Wald test for exclusion restriction Chi^2(2)	Prob.
Log of per capita GDP	Corruption	47.87	[0.0000] **
Corruption	Log of per capita GDP	6.80	[0.0091] **

V. Conclusions and Policy Implications

In this study, our main hypothesis was that corruption does affect the per capita GDP and GDP growth. To test this hypothesis; we utilized Barro (1991) equation by applying fixed affect along with a set of control variables. Our findings indicated that corruption does not affect the growth of GDP per capita, while corruption does affect the log of GDP per capita but it is not significant. Therefore, the relationship between corruption and real GDP per capita is important and Paldam (2002) finds same results. We have also applied Granger causality to test the sensitivity of our results. There are some contradictory results for relationship between corruption and GDP growth. We think that the lack of observation is a major reason because we do not take higher lags to avoid the risk of degree of freedom loss. For reliable results, more time series data is needed for Granger causality. However, we find the two-way causality between real GDP per capita and corruption.

Our study has some certain policy implications, especially for the developing countries. We find a statistical significant relationship between corruption and per capita GDP. It suggests that the authorities should focus on the anti-corruption policies along with the other economic reforms to encourage the economic growth. There is very interesting example that contradicts, at first sight, with our result but actually supporting our suggestion. China is the corrupt country according to CPI index (CPI for 2007 is 3.8), as compare to the other developed country but still it achieved the high growth over the several years. It is interesting to mention here that CPI was 2.16 in 1995. After that CPI improved gradually and the growth of GDP of China is highest among the competitors. Therefore, we claim, this is good support for our argument that per-capita GDP may increase with the increase of CPI. This is also true for the other developing countries, especially for the transitional countries.

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