THE ECONOMIC COSTS OF CORRUPTION: DOES CORRUPTION REALLY AFFECT GDP PER CAPITA?

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Abstract

Corruption, being one of the most common characteristics of developing countries, has earned the subtle recognition of crippler to the economy. However, the co-existence of underdevelopment and corruption makes it important to establish causality. This paper tries to do so, under a cross country setting, based on data collected from the World Bank(WB) and Transparency international(TI) . Findings from Ordinary Least Square (OLS) regression suggest 'corruption does lower GDP per capita, although the overall magnitude is moderate and varies from country to country.

Keywords: Corruption, GDP per capita, Ordinary Least Square, Regression, Correlation, Effects of corruption, Human Development Indicators, Corruption Perception Index, Asia, Africa, OECD, South America

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Introduction

Corruption

Definition of corruption:

The definition of corruption is varied from country to country and institution to institution because of specified and unspecified social norms, an activity which is illegal in one country may be legal in another country. Despite the absence of universally accepted definition, there is a common set of characteristics that represent the nature of corruption. A question may arise that why the definition of corruption is so important? The answer relies that the different definition of corruption leads to yield the meaningless result in the assessment of corruption or other works related to corruption.

Generally, corruption is a kind of criminal activity or dishonesty done by a person who holds the authority position of a particular institution to consume illicit benefit. It may also include the activity of embezzlement or bribery. [1]Usually, corruption is more visible in the countries where democracy is too weak or the countries where the establishment of the rule of law is inefficient.

According to TI for private gain when a person (entrusted) abuses his/her power, this will be defined as an act of corruption. Thus, TI features three key ingredients of corruption and those are private gain/benefit, power abusing and the private/public sector where corruption takes place.

[1] Retrieved 2012-09-25.Archived from the original (PDF) on 2015-05-05, "Report" (PDF). siteresources.worldbank.org.

Corruption is an act, tend to provide some advantage to someone but that is not consistent with the right of others and official duty, according to authors Shumaker and Leinsdorf (1910).

Karen Katz (2011) identified, typically in the public sector, corruption is the exploitation of a trusty position that may not be financial but to achieve private benefit somehow, she also indicated Bribery as corruption's most common form.

Justice Souter defined, a political process' supervision is corruption because after they (politicians) had elected to their respective positions, they displaced from their obligations to their official duty for private gain or gain for their political campaigns.

Example: Trends in the prevalence of corruption in recent years[2]

In 2010, an earthquake hit Haiti and the devastating earthquake killed more than 30,000 people. More than 1, 65,000 people were also killed through the building collapsed since 2000 to 2010 with the most powerful earthquake.

Nicholas Ambrose argues that the consequences of earthquakes tell more than poverty about corruption's extension. They found in their recent study that where corruption is virulent, the magnitude of corruption is very devastating. The reason is, in high corrupted countries, people usually do not follow the regulations and building code, but by providing the bribe, they get permission easily for building their buildings.

Scales and methods of corruption[3]:

According to authors Shahl & Huther(2000), [4] they scaled corruption on three parts, such as, regulatory or state capture, grand corruption and petty or bureaucratic corruption. Where-

Table-01: Scales and methods of corruption

Regulatory or State capture (systematic corruption):	This type of corruption takes place when within a system, agents or the officials are encouraged to addict with the corrupt activities for a number of reasons, like, discrimination in incentive, less monitoring, a high probability of gain from corruption, etc. Methods: Influence peddling, networking, abuse of discretion, favoritism, nepotism & clientelism, abuse of discretion, bribery, embezzlement, theft and fraud etc.

[2] Bernard Wasow, March 10, 2011, The Globalist

[3] 7 United Nations Handbook on Practical Anti-Corruption Measures For Prosecutors and Investigators" (PDF).UNODC. Retrieved November 3, 2012

[4] Shahl & Huther(2000), Anti-Corruption Policies and Programs: A Framework for Evaluation World Bank Policy Research Working Paper No. 250117

Grand corruption:	This type of corruption takes place when a small number public official who holds the highest level of a government but misuses the position of personal or party's illicit benefit. Usually, such sort of corruption takes place in the countries where there is a presence of an autocratic type of government or there is lack of regulations for controlling corruption. Methods: Graft, abuse of discretion, favoritism, nepotism and clientelism, extortion and blackmail, etc.
Petty or Bureaucratic corruption:	This type of corruption takes place when a large number of public or government official takes favor or bribe from the public while providing public service but in a small amount compared to the other scales of corruption.[5] Methods: Extortion and blackmail, bribery, embezzlement, theft & fraud, influence peddling, etc.

*A description of the methods of corruption has been attached to the appendix (4.Notes/N1-Methods of Corruption)

Literature Review

Previous Empirical Studies on Corruption

Though generally corruption is supposed to have negative effects from earlier studies, but it is also found that it has positive impacts from many researches. So, a mixed with both positive and negative effects of corruption is already found. For instance, Knack and Keefer (1995), Rahman, Kisunko & Kapoor (1999), Aidt et al. (2008), Tanzi & Davoodi (1997), Mo (2001), Abed & Davoodi (2002), Aizenman & Glick (2003), Guetat (2006), Lambsdorff (2003) showed the negative effects of corruption on GDP growth, and GDP per capita income. Other studies by Bardhan (1997), Huang (2012). Rock & Bonnett (2004), Leff (1964), Colombatto (2003), Li & Wu (2010), Wedeman (2002), Bayley (1966), and Acemoglu, & Verdier (1998) showed the positive effects of corruption in relation with GDP/capita income and GDP growth.
So, in conclusion, of the mixed effects of corruption, we can say that GDP/capita increases with the positive impact of corruption or GDP per capita decreases with the negative impact of corruption.

But one question may be arrived that when does corruption brings positive and when bring negative effects or simply what is the basis for the type of impact of corruption? Blackburn, Bose, & Haque (2005), described this by dividing the base like bad equilibrium and good equilibrium. Where good equilibrium countries are the countries those have high GDP/capita with low corruption and tend to have a positive impact of corruption and bad equilibrium countries are the countries those have low GDP/capita with high corruption and tend to have a negative impact of corruption.

[5] Hamilton & Alexander (2017), "Can We Measure the Power of the Grabbing Hand? A Comparative Analysis of Different Indicators of Corruption" (PDF). WB Policy Research Working Paper Series

Brempong & Camacho (2006), using growth model and gini-coefficient model, found that corruption effects, income distribution, and economic growth negatively, but that effects vary regionally on the basis of the characteristics of corruption. Ugur (2014), using 327 estimates of corruption from 29 primary studies, review-protocol and peer-reviewed, found that corruption negatively affects per-capita GDP growth, and added that, that effect would be more adverse if the included data were mainly from the countries those have very low income per capita. Wei (1999), attempted a huge number of empirical studies to find out the very significant result of corruption's effect on economic growth and resulted that corruption mainly bring adverse affect on growth (economic) because over expanding government consumption and reduction in domestic investment. Mustapha (2014), using 2003 to 2011 period's panel data and three tests, such as, Random Effect Estimation, Fixed Effect Estimation and pool OLS found that the GDP/capita is negatively significantly statistically affected by all the three tests. Pulok (2010) showed in his study that in the long run corruption decreases with efficiency in the administration and thus increases GDP/capita income, but that is not true in the case of short run according to Pulok. The same result is concluded by Gundlach and Paldam (2000) who used the IV and found that in the long run as GDP/capita increases so corruption decreases. Paldam, M. (2001) who used cross-sectional data in his study, also showed the strong negative link with GDP/capita income, and concluded that when corruption vanishes, a country becomes richer.

So, to summarize the literature on corruption, by these studies it is proved that corruption has a different type of effect on the different type of elements of economy, and ultimately influences the economy, especially GDP/capita income, but not on all the country with same effects. So, it would be an interesting question to arise that, what would be the effect of corruption if we include all kind of regions in one dataset?

Corruption and GDP/capita

Where Leff (1964) showed the grease hypothesis of corruption on GDP, on other the hand, Huntington (1968)'s study showed the sand hypothesis of corruption on GDP. So, a very mixed result is found in the investigations of corruption.

In most of the cases, corruption affects income growth, or GDP per capita income negatively, and so, it is generally accepted. But this generally accepted notion also varies on the basis of the nature of GDP/capita and corruption perception rankings. Shleifer & Vishny (1993) found the reason behind this variation and that is the centralization and decentralization of corruption which also varies not only in countries to countries but also in regions to regions which is also supported by Kwabena Gyimah-Brempong · Samaria Munoz de Camacho (2006).

Though, many studies found the adverse impact of corruption, but the breadth of corruption is not still identified or simply left behind the wall. It has become the main hindrance of economic development or growth because GDP is strictly, in some case directly affected by corruption, especially in the poor countries of Africa and South America.

The research paper is kind of quantitative in nature. Hence, the main aim of the paper is to analyze the practical problem of corruption by its effect on GDP/capita. Since, it is a quantitative research work and the measurement and analysis of the research problem is also difficult to do, so, the author tried to replicate the paper of Kwabena Gyimah-Brempong (2002). Here, one difference is noticeable that research work on such topic had been done many years ago and

there is very less available other recent works on the effect of corruption on GDP/capita is available. Since, within this period of time, the world is witnessed of various political, societal, religious, economical, especially, technological changes in most of the countries, but all of the countries. This reason encouraged me to do a quantitative research work on this issue.

Therefore, this paper, is attempting to bring to light the average effect of corruption on GDP/capita income. To find the effect on average, the paper included the data of various variables related with GDP/capita from four regions to keep a balance and an unbiased estimate of the result.

Purpose

Therefore, the purpose of the paper is to discover the effect of corruption on GDP/capita income.

So, this paper deals with some questions regarding corruption and per-capita GDP income:

1. Is there any correlation between per-capita GDP income and corruption?
2. What is the effect of corruption and that effect of corruption is statistically significant or not?
3. The effect of corruption regionally different or not?

Methodology

Data and Descriptive Statistics

To do this research work, a total number of 70 countries had been selected as observations or samples. The countries were chosen on the basis of their most representativeness from their respective regions (continents). To reiterate this more clearly, the observations were chosen either they were the most corrupted or less corrupted countries in their region on the basis of the information of TI. The world countries had been divided into four regions; as, Asia region, Africa region, Latin America region, and OECD region. 14 countries were from South America region, 14 countries were from OECD region, 22 countries were from Africa region, and 20 countries were from Asia region. *The list of selected countries is attached to the appendix(3.Table/T1- Observations)

The data of edus, expgr, incm, govtcn, invtr, variables had been collected from World Development Indicators-2017 of the World Bank since the data of World Bank is considered as the most reliable source data than any other sources and also available. And the data of corptn was collected from the Transparency International's ranking of corruption perception index.[6]

[6] Information based on surveys and suggestions from the experts, annually TI publishes the rankings of countries with their level of corruption scores. The rankings are established on the scale of 0 to100; where a country gets scores very close to zero or around, supposed to be the most corrupted and if a country gets scores very close to 100 or around, is perceived to be the less corrupted country.

Table-02: Variables

edus	Total expenditure on education (% of the GDP)
expgr	Growth rate of the real export (% of the GDP)
corptn	Corruption perception ranking
govtcn	Total government consumption (% of the GDP)
invtr	Investment rate (% of the GDP)
incm	Per capita income in the US dollar

*All the values of GDP income per capita are the PPP adjusted.

Dummy variables:

Dum1 = OECD, Dum2 = Africa, Dum3 = Asia, Dum4 = South America

Equation/model for OLS estimation:

$$incm = \beta_0 + \beta_1\, corptn + \beta_2\, edus + \beta_3\, govtcn + \beta_4\, invtr + \beta_5\, expgr + \varepsilon$$

Note: Here, βs are coefficients of their respective variables and **ε** is the standard errors of the equations.

Table-03: Summary Statistics of the Variables

Variables	Mean	Standard Deviation	Min	Max
corptn	97.67143	51.92462	8	180
income	12183.49	16651.93	338.5	71311.8
expgr	.3352843	.2052227	.082	.882
invtr	.225	.0728061	.1	.46
edus	.0426571	.0148508	.01	.077
govtcn	.2509571	.22942	.1	.99
dum 1	.1857143	.3916837	0	1
dum 2	.3285714	.4730851	0	1
dum 3	.2857143	.4550158	0	1
dum 4	.1971831	.4007036	0	1

The summary statistics shows that-

Data for corruption ranges from 8 to 180, with a mean of 97.67 and standard deviation of 51.92. For GDP/capita, we have a wide range between 338.5 and 71311.8. Average GDP/capita for the dataset is 12183.49 with Standard deviation of 16651.93.

Among 70 observations; the lowest real export growth rate of the GDP is 8%, the highest rate is 88% approximately, and mean value is .3352843. The lowest investment rate of the GDP is 10%, the highest rate is 46% approximately, and mean value is .225. The lowest education expenditure rate of the GDP is 1%, the highest rate is 7% approximately, and mean value is .0426571.The lowest government consumption expenditure rate of the GDP is 1%, the highest rate is 99% approximately, and mean value is .2509571.

Results and Discussion

Regression Analysis Result

Table-04: Multiple Regression Model

Variables	Coefficents
corptn	-133.3513** (29.99478)
invtr	3301.924 (19804.1)
edus	199566.6** (100243.3)
expgr	-9076.12 (6801.686)
govtcn	12172.88** (5987.611)

Among 70 observations at 5% significance level (α = 0.05);

1 unit increase in corptn would like to decrease incm by $ 133.3513 while holding fixed the other variables, 1 unit increase in invtr would like to increase incm by $ 3301.924 while holding fixed other variables, 1 unit increase in edus would like to increase incm by $ 199566.6 while holding fixed other variables, 1 unit increase in expgr would like to decrease incm by $ 9076.12 while holding fixed other variables and 1 unit increase in govtcn would like to increase incm by $ 12172.88 while holding fixed other variables. Here, the reason behind the negative coefficient of expgr can be that, increased corruption may intense the trend to abuse the resources of export or export-product.

Among all these variables, govtcn and edus found as significant and have matched to prior researches those believed these variables have positive impact. Where corptn has found significant and matched to those researches which support corruption's negative impact. But in this research, invtr is not found as significant but support the positive impact which is already proved in earlier researches and the same is also found in expgr.

Table-05: Correlation

Variable	Correlation in Multiple Regression	Correlation in Linear Regression
corptn	-0.6722	-0.6722

The table shows that the linear relationship, between GDP/capita and corruption in both regression analyses, is moderately negative.

Table-06: Dummy variables' test for joint significance

Dum1=0	F(3, 61) = 9.24
Dum2=0	
Dum3=0	Prob.> F = 0.0000
Dum4=0	

Since, the value of F (3,61) = 9.24, it can be said that the dummies were significant as a group variable since the F value of the dummies is smaller than the F value in the table and also the probability 0.0000 rejects the null hypothesis.

Discussion

Th**e** regression result of this paper indicates that the regressor corruption has a negative coefficient for the regressand GDP/capita income. That is, the findings demonstrate that there is a moderate negative correlation between two variables, corruption, and GDP/capita income. Therefore, this paper confirms the negative effect of corruption. So, in accordance with the model, established in the methodology section, would be like this-

incm = 10941.46 - 133.3513 corptn + 199546.6 edus + 12172.88 govtcn + 3301.924 invtr - 976.12 expgr + ε

The result makes an evidence that it supports the results of studies those follow the 'sand on the wheel'[7] concept of corruption and do not fit with studies those follow 'grease on the wheel' [8]concept of corruption. A new sight into the relationship of corruption and GDP/capita income is that, though regionally following the characteristics of corruption, corruption may have positive or negative effects but in all the regions as a whole, it has a moderate negative impact and this

[7] The one sect of researchers who believe that the increase in corruption in a country would like to hamper the economic efficiency and growth of that country

[8] The other sect of researchers who believe that the increase in corruption in a country would like to increase the economic efficiency and growth of that country

research has proved it. May be for this reason it's impact always be found as mixed one according to the literature review section.

So, the result, found in this paper, should be consided in mind at the time of making policies related to GDP/capita income. Especially, for the countries in the African region, because this is the only region in this study which has negative coefficient. Since, corruption has negative impact, this is why the most of the African countries per capita GDP income is very low and so the poverty level. So, in terms of poverty alleviation program or intensifying economic growth related policies, GDP/capita income might get priority which can be controlled by controlling the level or organization of corruption since the average effect is empirically proved with this paper.

The Limitations of the result:

- Since the result is moderately negative, so it is not a very strong coefficient that can indicate a more stable or fixed impact.
- The data of corruption extracted from Transparency International and the rest variables' data were extracted from World Bank. Though TI and WB are considered to be the most accurate and neutral sources for data but any miscalculation providing the variables' data online may or may not disapprove the result of this paper.
- Only the multiple and liner regression were used to confirm the impact of corruption, but there are other methods of estimation are available which were not used in this study.

Recommendations from the result:

- Since, this paper used cross-sectional data of 2017 and found moderate impact, so further research should be done on the same topic in other years to compare the impacts.
- From the limitations of the paper, it can also be recommended that the impact of corruption should be sought using the other estimation and data from other sources.
- As some other variables' link to GDP/capita, have found to have significant coefficients, so these variables' coefficients can be used for further studies in relation of measuring per capita GDP income.

Conclusion

Using the cross-sectional data of 2017 and regression analysis, the paper aimed at finding the average effect of corruption on GDP/capita income. With the data from Transparency International and World Bank, it has been found that GDP/capita income is affected moderately negatively, and statistically the result is found as significant. We also found that regionally, increased corruption affects Asia, OECD and South America positively, but Africa. The earlier researches established a cause for such regional differences as the different organization of corruption, that corruption is either centralized or decentralized, that those regional countries face. Therefore, the suggestion, in accordance with the result of the paper, in make policies relevant to GDP/capita income should take account the regional and average impact of corruption cautiously since it has an average negative impact and regionally different impacts. The result would be useful to various specifications, the measure of corruption, the measure of investment, the measure of government expenditure, the measure of education, and the measure of export growth rate in relation with GDP/capita.

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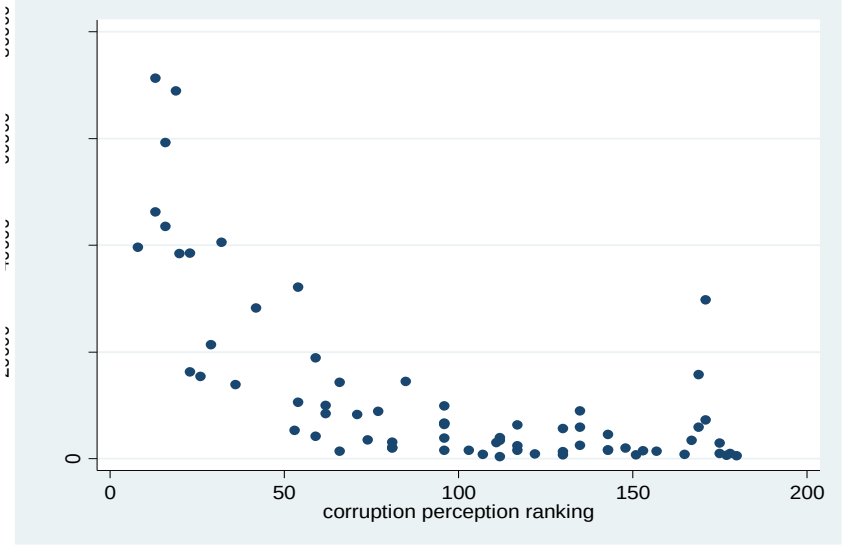
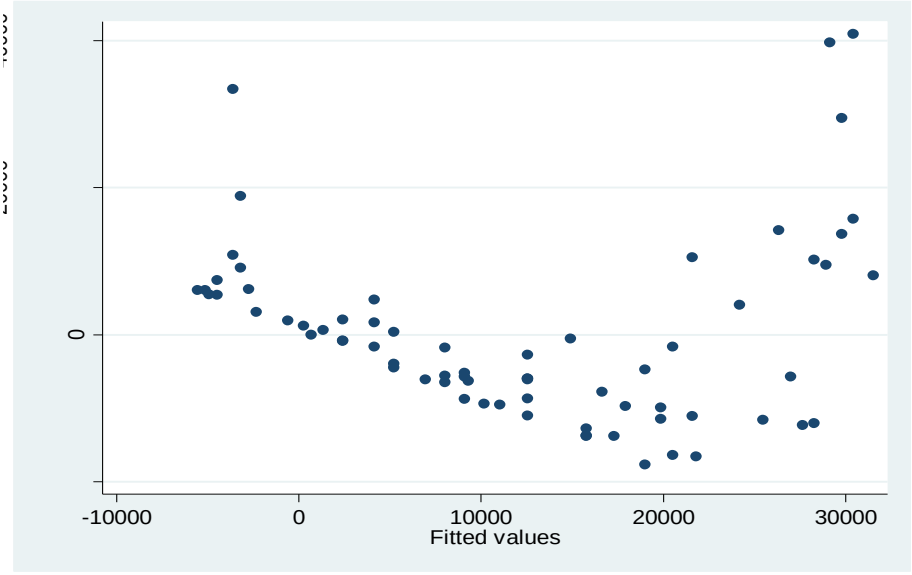
Appendix

1. Graphs

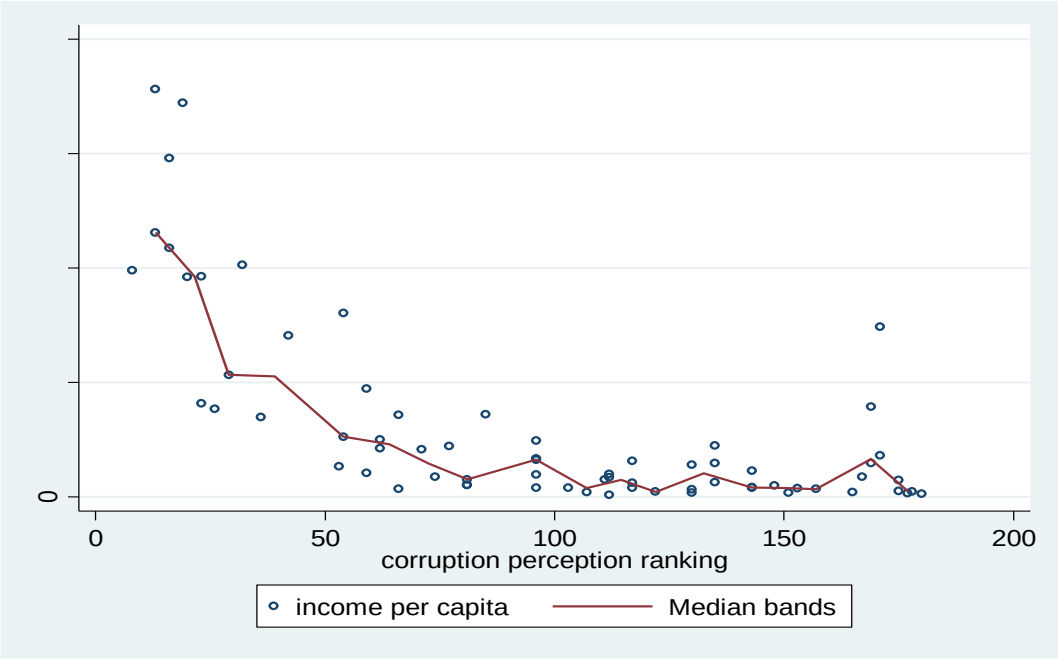
G1-Scatter Plot



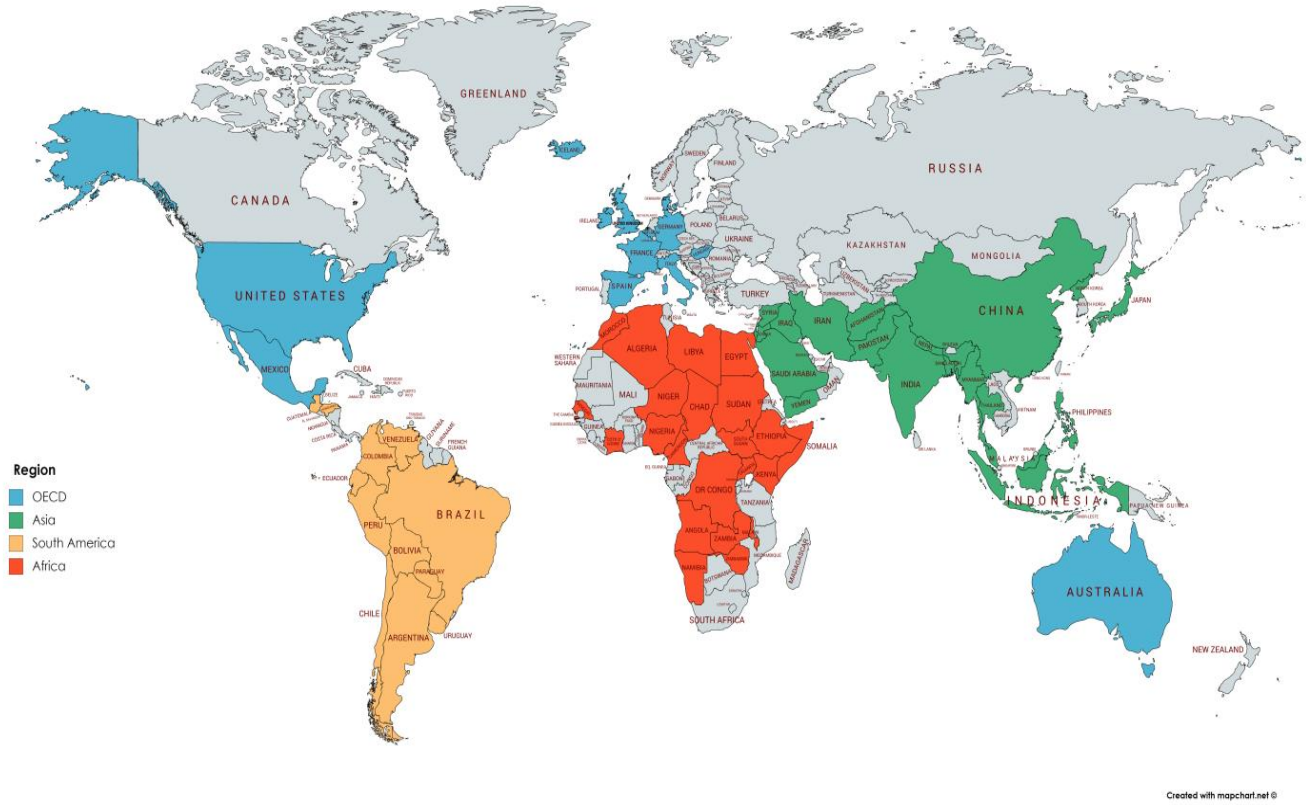
G2-Fitted Values and Residuals



G3-Scatter Plot with Line



G4-Regions



2. Table

T1- Observations

Serial no.	Africa	Asia	South America	OECD
1	Cameroon	China	Argentina	Belgium
2	Cote d' lvoire	Hongkong	Bolivia	France
3	Egypt	India	El Salvador	Greece
4	Uganda	Indonesia	Chile	Hungary
5	Algeria	Israel	Brazil	Iceland
6	Kenya	Japan	Colombia	Ireland
7	Malawi	Saudi Arabia	Ecuador	Italy
8	D. R. Congo	Korea	Peru	Mexico
9	Morocco	Malaysia	Uruguay	US
10	Namibia	Pakistan	Paraguay	UK
11	Nigeria	Philippines	Guatemala	Spain
12	Senegal	Thailand	Cuba	Germany
13	Tunisia	Bangladesh	Honduras	Denmark
14	Zambia	Iran	Venezuela	Australia
15	Zimbabwe	Afghanistan		-
16	Sudan	Nepal	-	-
17	Somalia	Myanmar	-	-
18	Chad	Syria	-	-
19	Niger	Yemen	-	-
20	Ethiopia	Iraq	-	-
21	Libya	-	-	-
22	Angola	-	-	-

3. Regression Results

R1-The Correlation in Multiple, and Linear Regression

```
. correlate incm corptn invtr edus expgr govtcn
(obs=70)
```

	incm	corptn	invtr	edus	expgr	govtcn
incm	1.0000					
corptn	-0.6722	1.0000				
invtr	-0.0454	0.0308	1.0000			
edus	0.3175	-0.2748	-0.1434	1.0000		
expgr	0.1097	-0.1880	0.2750	0.1069	1.0000	
govtcn	-0.0247	0.1264	-0.0108	-0.3456	0.0340	1.0000

```
. correlate incm corptn
(obs=70)
```

	incm	corptn
incm	1.0000	
corptn	-0.6722	1.0000

R2-Multiple and Linear Regression

```
. regress incm corptn invtr edus expgr govtcn dum1 dum2 dum3 dum4
note: dum4 omitted because of collinearity
```

Source	SS	df	MS	Number of obs	=	70
				F(8, 61)	=	13.90
Model	1.2355e+10	8	1.5444e+09	Prob > F	=	0.0000
Residual	6.7776e+09	61	111107692	R-squared	=	0.6458
				Adj R-squared	=	0.5993
Total	1.9133e+10	69	277286845	Root MSE	=	10541

incm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
corptn	-133.3513	29.99478	-4.45	0.000	-193.3295	-73.37298
invtr	3301.924	19804.1	0.17	0.868	-36298.82	42902.67
edus	199566.6	100243.3	1.99	0.051	-882.2446	400015.5
expgr	-9076.12	6801.686	-1.33	0.187	-22676.93	4524.692
govtcn	12172.88	5987.611	2.03	0.046	199.9165	24145.85
dum1	20327.93	4500.35	4.52	0.000	11328.93	29326.94
dum2	-1544.569	3805.711	-0.41	0.686	-9154.559	6065.422
dum3	6059.483	4143.709	1.46	0.149	-2226.375	14345.34
dum4	0	(omitted)				
_cons	10941.46	8200.165	1.33	0.187	-5455.781	27338.71

```
. regress incm corptn
```

Source	SS	df	MS	Number of obs	=	70
				F(1, 68)	=	56.06
Model	8.6458e+09	1	8.6458e+09	Prob > F	=	0.0000
Residual	1.0487e+10	68	154219893	R-squared	=	0.4519
				Adj R-squared	=	0.4438
Total	1.9133e+10	69	277286845	Root MSE	=	12419

incm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
corptn	-215.5786	28.79203	-7.49	0.000	-273.0323	-158.125
_cons	33239.36	3179.84	10.45	0.000	26894.09	39584.63

R3-Summary

```
. summarize
```

Variable	Obs	Mean	Std. Dev.	Min	Max
country	0				
corptn	70	97.67143	51.92462	8	180
incm	70	12183.49	16651.93	338.5	71311.8
gdpgr	70	.0361571	.0251117	-.039	.081
invtr	70	.225	.0728061	.1	.46
edus	70	.0426571	.0148508	.01	.077
expgr	70	.3352843	.2052227	.082	.882
govtcn	70	.2509571	.22942	.1	.99
continent	0				
dum1	70	.1857143	.3916837	0	1
dum2	70	.3285714	.4730851	0	1
dum3	70	.2857143	.4550158	0	1
dum4	71	.1971831	.4007036	0	1

R4- Dummy variables' test for joint significance

```
. test dum1 dum2 dum3 dum4

 ( 1)  dum1 = 0
 ( 2)  dum2 = 0
 ( 3)  dum3 = 0
 ( 4)  o.dum4 = 0
       Constraint 4 dropped

       F(  3,     61) =    9.24
            Prob > F =    0.0000
```

4. Notes

N1-Methods of Corruption

Bribery**:** For personal benefit, when there is an exchange of favors or gift in monetary or non-monetary term but that is improper, is called as bribery.

Embezzlement, theft and fraud: When one illegally takes control of others' asset or fund, this is theft or embezzlement in the form of corruption, where fraud is kind of deception with the asset owner to gain an asset.

Graft: This is a sort of corruption when a public official, especially, a high position holder of a government maximizes own benefits by abusing public projects or funds.

Extortion and blackmail: These are corruption arise in the form of threat of imprisonment or torture or violence to increase illegal personal benefit.

Influence peddling: This is the kind of corruption when people use their own or relative's particular position as an influence for personal gain.

Networking: This is another method of influential corruption where people try to acquire personal benefits through the channel of personal relationship with the officials. In the job market, such kind of corruption is mostly visible.

Abuse of discretion: This is a method of corruption where a person is holding the position of decision maker, such as, a judge, but intentionally make a decision which is out of logic or rule or regulation, but for in his or her own interest.

Favoritism, nepotism, and clientelism: These are the method of corruption where a person is not qualified for a position, permission or benefit, but still got those only because he/she is a chosen one or has a relationship with family or friends.

The above-mentioned methods are the most visible forms of corruption, but it can be agreed that corruption can take place anywhere in any forms, may be some of those forms have not include here.