Analyzing the Economic Costs of Corruption Using a Basic Keynesian Framework: Part 1

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Abstract

This study attempts to analyze the impact of corruption on the economy by adopting the Keynesian Framework. Current studies show that corruption has adverse effects on GDP, GDP growth rate, and investment, among others. Such studies, however, used the "economic cost-corruption perception index" model. An alternative model is to adopt a Keynesian framework incorporating corruption as a factor in the model. Utilizing the concepts of investment and government multipliers, the comparative analysis between the "with"-and-"without" corruption is used in analyzing the economic cost of corruption. The results show that government multiplier is less than the investment multiplier when there is corruption. Based on the theses/arguments, this study concludes that (a) when there is corruption, the impact of government expenditure on the economy is less than the impact of investment expenditure on the economy, (b) the Keynesian model can enhance the explanatory power of the existing "economic cost-corruption perception index" model of analyzing the economic cost of corruption, and (c) the results of integrating corruption into the Keynesian model reveal that GDP and GDP growth rate are overestimated for countries with a certain proportion of government expenditure that go to corruption.

Keywords: corruption, corruption perception index, Keynesian framework, investment multiplier, government multiplier

JEL Classification: D730

1.0 Introduction

Corruption is not only a domestic problem of a country, but a very serious concern internationally, as well. To address this problem, studies have been conducted to determine the causes and the effects of corruption, on one hand, and to identify the policy measures that can be adopted, on the other. This study takes on the consequential aspect of corruption.

Empirical studies provided evidence on the negative consequence of corruption on the economy in terms of its impact on growth (Mauro, 1995; Mauro, 1997; Murphy, Shleifer and Vishny, 1993; and Pellegrini and Gerlagh, 2004), foreign direct investment (Wei, 2000), and on both growth and investment (Rock and Bonnet, 2004).

Upon close examination, however, the above studies have two major limitations. First, various models for these studies have one thing in common. These models used corruption index as an explanatory variable. This is due to the difficulty of directly obtaining data on corruption particularly on the amount of government expenditure that goes to corruption. The question asked in this case would be: If corruption perception index changes by one unit by how much would be the change

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in GDP, investment, and the like? On the other hand, suppose instead that a certain proportion of government expenditure goes to corruption. What is its impact on the economy?

Second, Keynes (1964) himself and in the traditional Keynesian Framework (see, for example, Ackley, 1978; Blanchard, 2003; Frank and Bernanke, 2001; and Samuelson and Nordhaus, 2005) analyze the impact of government expenditure on the economy and proceed to show that government multiplier and the investment multiplier are equal. Unfortunately, the absence of corruption is assumed in such a framework.

What happens if corruption is included in the Keynesian Framework?

My main theses/arguments in this paper are: (a) investment multiplier and government multiplier are not necessarily equal as claimed by John Maynard Keynes that they are; (b) determining the impact of corruption on the economy using the basic Keynesian model can enhance the explanatory power of, or in addition to, the existing "economic cost-corruption perception index" approach of analyzing the economic cost of corruption; and (c) after integrating corruption into the Keynesian model, the results of the mathematical derivations can cast doubt on the GDP and GDP growth estimates of countries with a certain proportion of government expenditure that go to corruption.

In view of the above, I have attempted to introduce formally corruption into the Keynesian Framework.

2.0 Methods

This study uses the "with-and-without" corruption approach in the Keynesian framework. In this approach, the impact of the investment and the government expenditures on the economy "without" corruption is compared with the impact of the said expenditures on the economy "with" corruption. The concepts of investment multiplier and government multiplier, which are endemic in the Keynesian framework, are utilized in conducting such comparison.

Instead of using the corruption index, I use the **proportion** of government expenditure that goes to corruption. Such usage is reasonable considering that corruption can be in the form of "ghost projects" and/or "jack-upping" of prices such that the project costs would be higher than what could have been.

The comparative analyses between the "with" and "without" corruption proceed by using the building-block approach where a closed economy is assumed first followed by an open economy model, and from assuming without income tax, first, then with income tax. Such approach is adopted so that the reader can meaningfully follow the presentation of analyzing the economic costs of corruption using the basic Keynesian framework.

3.0 Results

3.1 The Basic Keynesian Framework: Without Corruption

In a closed economy, the economy is composed of three sectors: the household, the business, and government. The behavior of the economy is influenced by the behavior of these sectors in terms of the behavior of consumption expenditure (C) by the household, investment expenditure (I) by the business, and the government expenditure (G). While C is an endogenous variable, that is, C is a function of disposable income, I, and G are assumed autonomous variables.

The basic Keynesian model (Keynes, 1964) in a closed economy is as follows (see also, Ackley, 1978; Blanchard, 203; Frank and Bernanke, 2001; and Samuelson and Nordhaus, 2005):

$$C = \mathbf{a} + \mathbf{b}Y_d, \quad (0 < b < 1) \qquad [1]$$

$$I = I_o \qquad [2]$$

$$G = G_o \quad [3]$$
$$Y = C + I + G \quad [4]$$

where: C is consumption expenditure, Y_d is disposable income, **b** is the marginal propensity to consume, I is investment expenditure, G is government expenditure, and Y is equilibrium income or gross domestic product (GDP).

Note that without tax, $Y_d = Y$. Thus, $C = a + \mathbf{b}Y$, hence, substituting Equations 1, 2, and 3 into Equation 4, the equilibrium income is

$$Y = [1/(1 - \mathbf{b})] (\mathbf{a} + I_o + G_o) \quad [5]$$

Differentiating Y with respect to I and G, yields

$$\partial Y/\partial I = 1/(1 - \mathbf{b}) \quad [6]$$
$$\partial Y/\partial G = 1/(1 - \mathbf{b}) \quad [7]$$

Equations 6 and 7 are known as investment and government multipliers, respectively. These multipliers measure the impact of one unit change in investment or the government expenditure, respectively, on the economy.

At this juncture, it is important to note that Equations 6 and 7 are equal under the basic Keynesian framework without corruption.

With income taxation, $Y_d = Y - \mathbf{t}Y$, where **t** is the marginal propensity to tax. The equilibrium level of income is, then,

$$Y = [1/(1 - \mathbf{b}\{1 - \mathbf{t}\})](\mathbf{a} + I_o + G_o) \quad [8]$$

Differentiating Y with respect to I and G, yields

$$\partial Y/\partial I = 1/(1 - \mathbf{b}\{1 - \mathbf{t}\}) \quad [9]$$
$$\partial Y/\partial G = 1/(1 - \mathbf{b}\{1 - \mathbf{t}\}) \quad [10]$$

Comparing Equations 6 with 9, and Equations 7 with 10, it can be observed that income tax reduces both the investment and government multipliers, respectively. Again, under the Keynesian framework, without corruption, the investment multiplier and the government multiplier are equal.

What happens if there is corruption? Will the investment multiplier and government multiplier remain equal? What will be the impact of corruption on the economy?

The next section will incorporate corruption into the basic Keynesian framework.

3.2 The Basic Keynesian Framework: With Corruption

This section will incorporate corruption into the basic Keynesian framework by assuming that a certain proportion ($\boldsymbol{\psi}$) of government expenditure goes to corruption. In this case, the intended government expenditure (G_o) decreases by $\boldsymbol{\psi}G_o$. Thus, Equation 3 becomes $G = G_o - \boldsymbol{\psi}G_o$ and, hence, Equation 5 becomes

$$Y = \mathbf{a} + \mathbf{b}Y_d + I_o + G_o - \boldsymbol{\psi}G_o, \quad (0 < \boldsymbol{\psi} < 1)$$
or
$$Y = \mathbf{a} + \mathbf{b}Y_d + I_o + (1 - \boldsymbol{\psi})Go \quad [11]$$

Without tax, the equilibrium level of income, Equation 6, becomes

$$Y = [1/(1 - \mathbf{b})] [a + I_o + (1 - \boldsymbol{\psi})G_o] \quad [12]$$

Differentiating Y with respect to I, Equation 6 is retained, that is

$$\partial Y/\partial I = 1/(1 - \mathbf{b}). \quad [13]$$

However, differentiating Y with respect to G, Equation 7 becomes

$$\partial Y/\partial G = [1/(1 - \mathbf{b})] (1 - \boldsymbol{\psi})$$
or
$$\partial Y/\partial G = (1 - \boldsymbol{\psi})/(1 - \mathbf{b}). \quad [14]$$

Comparing Equations 7 and 14, we can conclude that corruption reduces the government multiplier. Moreover, comparing Equations 14 and 13, we can conclude that with corruption the government multiplier is less than the investment multiplier. This is particularly true when corruption is in the form of "ghost projects" and/or "jack-upping" of prices such that project cost would be higher than what could have been.

Further, if the budget deficit worsens due to corruption, the government may raise taxes from $\mathbf{t}_o$ to $\mathbf{t}_1$. In this case the equilibrium income, Equation 8, becomes

$$Y = [1/(1 - \mathbf{b}\{1 - \mathbf{t}_1\})] [a + I_o + (1 - \boldsymbol{\psi})G_o] \quad [15]$$

and shows that with increased tax rate the government multiplier is further reduced from Equation 14 to

$$\partial Y/\partial G = (1 - \boldsymbol{\psi})/(1 - \mathbf{b}\{1 - \mathbf{t}_1\}). \quad [16]$$

In an open economy, however, the equilibrium condition equation, Equation 12 becomes

$$Y = C + I + (1 - \boldsymbol{\psi})G + (X - M) \quad [17]$$

where, C, expressed in terms of Equation 1, I, and G are as previously defined, X is export and M is import. Assuming that import is a certain proportion of income, Y, then

$$M = \mathbf{m}Y, \qquad (0 < \mathbf{m} < 1) \quad [18]$$

where **m** is the marginal propensity to import.

Substituting Equation 18 into Equation 17, the equilibrium level of income is

$$Y = a + \mathbf{b}Y_d + I + G + (X - \mathbf{m}Y) \quad [19]$$

or

$$Y = [1/(1 - \mathbf{b}\{1 - \mathbf{t}\} + \mathbf{m})] [a + I_o + (1 - \boldsymbol{\psi})G_o + X]. \quad [20]$$

Differentiating Y with respect to I,

$$\partial Y/\partial I = [1/(1 - \mathbf{b}\{1 - \mathbf{t}\} + \mathbf{m})], \quad [21]$$

And differentiating Y with respect to G,

$$\partial Y/\partial G = [1/(1 - \mathbf{b}\{1 - \mathbf{t}\} + \mathbf{m})] (1 - \boldsymbol{\psi}). \quad [22]$$

Comparing Equations 21 and 22 with Equations 9 and 10, respectively, we can observe that opening the economy to foreign trade reduces further both the investment and government multipliers. However, just because of these results, it should not be construed that an open economy is not desirable.

What is crucial to realize is the implication of an open economy on the investment side of Equations 19 or 20. This is where the corruption perception index can come in, thus, Equation 2 becomes

$$I = I(cpi). \quad [23]$$

In other words, in an open economy, investment is influenced by how foreign investors perceive a government to be corrupt such that foreign direct investment is inversely related with corruption perception index.

Denoting the level of investment corresponding to a certain corruption perception index as I_x and substituting this into Equation 20, we have

$$Y = [1/(1 - \mathbf{b}\{1 - \mathbf{t}\} + \mathbf{m})] [a + I_x + (1 - \boldsymbol{\psi})G_o + X]. \quad [24]$$

It is important to realize that the investment multiplier is

$$\partial Y/\partial I_x = [1/(1 - \mathbf{b}\{1 - \mathbf{t}\} + \mathbf{m})] \quad [25]$$

And the impact of foreign direct investment after accounting for corruption perception index is

$$\partial Y = [1/(1 - \mathbf{b}\{1 - \mathbf{t}\} + \mathbf{m})]\, \partial I_x. \quad [26]$$

Thus, what Equation 26 tells us is that lower levels of foreign direct investment due to worsening corruption perception on a government by foreign investors, will result to higher levels of potential loss of its economy in terms of economic growth, *ceteris paribus*.

4.0 Numerical Examples

Let us illustrate with numerical examples by applying hypothetical values to the parameters and variables to the results of the foregoing analyses. The first two sections are concerned with income determination, with and without corruption. The third section is concerned with comparing the impact of investment and government expenditures on the economy, with and without corruption. In these sections, the-without-and-with income tax scenarios are also considered.

4.1 Income Determination: Without Corruption

Suppose that the values of the parameters and variables in Equations 1 to 3 are respectively as follows: $\mathbf{a} = 100$, $\mathbf{b} = 0.5$ such that $C = 100 + 0.5Y_d$, $I = 100$, and $G = 100$. Substituting into Equation 5, the level of income Y or GDP, in a closed economy and without tax, is:

$$Y = [1/(1 - 0.5)]\,(100 + 100 + 100) = 600, \quad [5a]$$

and the values of the investment and government multipliers are, respectively,

$$\partial Y/\partial I = 1/(1 - 0.5) = 2 \quad [6a]$$
$$\partial Y/\partial G = 1/(1 - 0.5) = 2 \quad [7a]$$

If the government imposes a tax of 10%, i.e., $T = 0.10Y$, by Equation 8, the equilibrium level of income is:

$$Y = [1/(1 - 0.5\{1 - 0.1\})]\,(100 + 100 + 100) = 545.40, \quad [8a]$$

and the value of the investment and government multipliers are, respectively,

$$\partial Y/\partial I = 1/(1 - 0.5\{1 - 0.1\}) = 1.818 \quad [9a]$$
$$\partial Y/\partial G = 1/(1 - 0.5\{1 - 0.1\}) = 1.818 \quad [10a]$$

At this point, it is clear that an increase in income tax decreases the level of income, *ceteris paribus*. Note also that the two multipliers are equal.

4.2 Income Determination: With Corruption

Using the same values of the parameters and the variables above, what happens to the level of income if, say, 10% of government expenditures goes to corruption. Then, the value of $\boldsymbol{\psi}$ in Equation 11 is 0.1 and the level of equilibrium income, without tax, is

$$Y = [1/(1 - 0.5)]\,[100 + 100 + (1 - 0.1)100] = 580, \quad [11a]$$

and the value of the investment and government multipliers are, respectively,

$$\partial Y/\partial I = 1/(1 - 0.5) = 2 \quad [6a]$$
$$\partial Y/\partial G = (1 - 0.1)/(1 - 0.5) = 1.8 \quad [14a]$$

Comparing Equations 5a and 11a, it is obvious that corruption can reduce the level of income or GDP. It is worthwhile to realize that the government multiplier, Equation 14a, is less than the investment multiplier, Equation 6a.

With income tax of 10%, the equilibrium income is

$$Y = [1/(1 - 0.5\{1 - 0.1\})]\,[100 + 100 + (1 - 0.1)100] = 527.22, \quad [15a]$$

and the value of the investment and government multipliers are, respectively,

$$\partial Y/\partial I = 1/(1 - 0.5\{1 - 0.1) = 1.818 \quad [9a]$$
$$\partial Y/\partial G = (1 - 0.1)/(1 - 0.5\{1 - 0.1\}) = 1.636 \quad [16a]$$

Comparing Equations 8a and 15a, income tax can reduce the already low equilibrium level of income due to corruption. Similarly, comparing Equations 14a and 16a, government multiplier decreases with the increase in the tax rate. Again, note that with corruption the government multiplier, Equation 16a, is less than the investment multiplier, Equation 9a.

Suppose that the budget deficit worsens due to corruption and the government decides to increase the tax rate to 12%, i.e., T = 0.12Y, then the equilibrium level of income is

$$Y = [1/(1 - 0.5\{1 - 0.12\})]\,[100 + 100 + (1 - 0.1)100] = 517.86, \quad [15b]$$

and the value of the investment and government multipliers are, respectively,

$$\partial Y/\partial I = 1/(1 - 0.5\{1 - 0.12) = 1.786 \quad [9b]$$
$$\partial Y/\partial G = (1 - 0.1)/(1 - 0.5\{1 - 0.12\}) = 1.607 \quad [16b]$$

Comparing Equations 15a and 15b, the increase in tax further decreases the already low level of income due to corruption. Also, comparing Equations 9a with 9b, and Equations 16a with 16b, the values of the respective multipliers decrease with the increase in the tax rate.

What happens in an open economy scenario? In what way can corruption adversely affect economic growth? To answer these, let us suppose that export, X, is 100 and import, M, is dependent on the level of income, Y, of the economy. Suppose further that the marginal propensity to import is 0.2 such that M = 0.2Y. Then, substituting into Equation 19, the level of equilibrium income, with income tax of 10%, is:

$$Y = 100 + 0.5Yd + 100 + 100 + (100 - 0.2Y)$$
$$Y = [1/(1 - 0.5\{1 - 0.1\} + 0.2)]\,[100 + 100 + (1 - 0.1)100 + 100] = 519.87, \quad [19a]$$

and the value of investment and government multipliers are, respectively,

$$\partial Y/\partial I = [1/(1 - 0.5\{1 - 0.1\} + 0.2)] = 1.333 \quad [21a]$$
$$\partial Y/\partial G = (1 - 0.1)/[(1 - 0.5\{1 - 0.1\} + 0.2)] = 1.2 \quad [22a]$$

Comparing Equations 12a and 19a, it appears that foreign trade decreases the level of income. Also, comparing Equations 9a with 21a and Equations 16a with 22a the values of the respective multipliers further reduce when an economy opens up to foreign trade. However, this should not be construed that an open economy is not desirable. What is crucial to consider, at this point, is the implication of an open economy on the investment side in the equation, Equation 20 or Equation 19a.

Suppose that a component of investment, I, of 100 in Equation 19a is foreign direct investment. Suppose further that due to corruption, the reduction in foreign direct investment decreases investment by 20. Thus, the lower level of investment, I_x, is now 80. Utilizing Equation 24, the equilibrium level of income is

$$Y = [1/(1 - 0.5\{1 - 0.1\} + 0.2)]\,[100 + 80 + (1 - 0.1)100 + 100] = 493.21. \quad [24a]$$

Comparing Equations 19a and 24a, the decrease in the level of income is due to the decrease in investment from 100 to 80. Note that the worse the corruption perception on a government by foreign investors becomes the lower is the level of investment via foreign direct investment, and thus the higher the potential loss would be to an economy in terms of economic growth.

4.3 Comparative Analysis on the Impact of Investment and Government Expenditures on the Economy With and Without Corruption

Determining the impact of corruption on the economy can also be meaningfully analyzed in terms of the multiplier effect of one unit change in investment and government expenditure on the level of income, with and without corruption. This section numerically shows the impact of corruption on the economy using the multiplier impact analysis endemic in the Keynesian model. The values of the various multipliers in the foregoing analyses under various scenarios are summarized in Table 1.

The values of these multipliers under different scenarios (Columns 5 and 6) are derived from the hypothetical values used in the foregoing numerical examples. These are computed by substituting into the relevant formula/equations earlier presented the hypothetical values of the marginal propensity to consume, **b**, (Column 1), the tax rate, **t**, (Column 2), the marginal propensity to import, **m**, (Column 3), and the proportion of government expenditure that goes to corruption, **ψ**, (Column 4).

The respective impact of the investment and government expenditures on the economy (Columns 7 and 8) are computed by multiplying the investment multiplier and the government multiplier by the respective change in investment and government expenditures by one unit (you can try using 100 units, etc).

Finally, the combined impact of the investment and government expenditures on the economy (Column 9) is obtained by adding Columns 7 and 8.

What is noticeable in Table 1 are as follows: (1) the values of the investment and government

Table 1.Impact of Investment and Government Expenditures on the Economy With and Without Corruption

SCENARIO	**b** (Column 1)	**t** (Column 2)	**m** (Column 3)	**Ψ** (Column 4)	Investment Multiplier (Column 5)	Government Multiplier (Column 6)	Impact of one unit of Investment (Column 7)	Impact of one unit of Government Expenditure (Column 8)	Combined Impact on the Economy (Column 9)
	WITHOUT CORRUPTION								
A. CLOSED ECONOMY									
Without Tax	0.5	0	0	0	2	2	2	2	4
With Tax									
Initial	0.5	0.10	0	0	1.818	1.818	1.818	1.818	3.636
New	0.5	0.12	0	0	1.786	1.786	1.786	1.786	3.572
B. OPEN ECONOMY									
Without Tax	0.5	0	0.2	0	1.429	1.429	1.429	1.429	2.858
With Tax									
Initial	0.5	0.10	0.2	0	1.333	1.333	1.333	1.333	2.666
New	0.5	0.12	0.2	0	1.316	1.316	1.316	1.316	2.632
	WITH CORRUPTION								
C. CLOSED ECONOMY									
Without Tax	0.5	0	0	0.10	2	1.8	2	1.8	3.8
With Tax									
Initial	0.5	0.10	0	0.10	1.818	1.636	1.818	1.636	3.454
New	0.5	0.12	0	0.10	1.786	1.607	1.786	1.607	3.393
D. OPEN ECONOMY									
Without Tax	0.5	0	0.2	0.1	1.429	1.286	1.429	1.286	2.715
With Tax									
Initial	0.5	0.10	0.2	0.1	1.333	1.2	1.333	1.2	2.533
New	0.5	0.12	0.2	0.1	1.316	1.184	1.316	1.184	2.500

multipliers (Columns 5 and 6) are equal in the absence of corruption, but the government multiplier is less than the investment multiplier when corruption is present; (2) tax rate and an open economy systematically reduce the values of the two multipliers, and (3) the impact of government expenditures on the economy (Column 8) is less than the impact of investment on the economy (Column 7) when there is corruption and as the tax rate increases.

5.0 Discussion

Having mathematically explained and illustrated the significance of the basic Keynesian model in analyzing the economic cost of corruption, I will present my arguments vis-à-vis my three main theses presented earlier.

The fundamental macroeconomic equation in the basic Keynesian model in an open economy is Y = C + I + G + (X - M), where the variables are as earlier defined. What this model tells us is that changes in gross domestic product (Y) can be explained by changes in one or all of the components of aggregate demand (e.g., changes in I and/or G). One important feature of this model is that the impact of one unit change in investment or the government expenditure on the economy can be determined using the multiplier analysis as explained and illustrated earlier.

In general, a unit change in investment will have an impact on the economy by the amount of the investment multiplier times the change in investment. Similarly, a unit change in the government expenditure will have an impact on the economy by the amount of the government multiplier times the change in the government expenditure. Note that John Maynard Keynes claimed that these two multipliers are equal. However, this is true in the absence of corruption!

Regarding my first argument, I have mathematically shown in this paper that when there is corruption the government multiplier is less than the investment multiplier. Moreover, the higher is the proportion of government expenditure that goes to corruption the lower is the government multiplier, *ceteris paribus*.

Thus, if the proportion of the government budget allocated for certain projects goes to corruption, the impact of the government expenditure on the economy becomes less than the impact of investment on the economy, the government multiplier being less than the investment multiplier. Such diversion can be explained by the rent-seeking theory (Samuelson and Nordhaus, 2005; Murphy, Shleifer and Vishny, 1993). It is important to note that the proportion of government expenditure that goes to corruption is higher in less developed countries than in the rich countries as implied by Romer (2000). Moreover, LaPalombara (1994) pointed out that the higher the country's proportion of government budget to GDP, the higher the corruption level in this country.

Now, if the budget deficit worsens due to corruption, governments can either increase tax or result to borrowings. This can become tantamount to increasing tax or borrowing to finance corruption if corruption is left unabated. Such measures cannot only hamper the growth process of the country, but can also have adverse implications on the welfare of its society.

For my second argument, it is important to realize that another important feature of the basic Keynesian model is that since the economy is divided into component structure (the household, business, the government and the foreign trade sectors) it can provide and enhance the explanatory power of the existing "economic cost-corruption perception index" model of analyzing the economic cost of corruption.

For instance, the empirical studies (Mauro, 1995; Mauro, 1997; and Wei, 2000) showing a negative relationship between corruption perception

index and economic growth, on one hand and corruption perception index on investment, on the other, can be explained via its effect on foreign direct investment which in turn affects economic growth. Since the investment multiplier is greater than the government multiplier with corruption it, therefore, follows that corruption can pose more serious limitations on growth for every one unit of investment lost than one unit of government expenditure. In other words, with corruption, a positive impact on the economy of one unit of government expenditure cannot outweigh the negative impact of one unit of investment lost because the government multiplier is less than the investment multiplier.

Moreover, the Keynesian model can provide a theoretical basis for, and enhance the explanatory power of, the findings of Rock and Bonnett (2004) that corruption tends to hamper growth and/or investment in most developing countries, taking into account the views of Romer (2000), LaPalombara (1994), and that of Ades and Di Tella (1995) who pointed out that countries with poor competitive environment is associated with countries having corrupt governments.

My point is that if the law of demand is explained by the income effect and substitution effect of a price change (see, for example, Samuelson and Nordhaus, 2005; and Henderson and Quandt, 1980), the relationship between corruption perception index and economic growth is explained by the (1) reduced impact of government expenditure on the economy relative to investment, and (2) decrease in investment due to reduced foreign direct investment.

Finally, for my third argument, I realize the power of mathematics in discovering the implication of corruption as regards the GDP and GDP growth estimates. What is the implication on GDP and GDP growth estimates if corruption is in the form of "ghost project" or "jack-upping of price"? A non-existent project produces no output, yet, reported in the GDP account as part of the government expenditure with the corresponding resulting output reflected in GDP. What is the implication of the expenditure on rice production program but no rice is produced but reflected in GDP as output produced? What is the implication of the expenditure on non-existent roads and bridges, and school buildings, yet, these are reported as already produced? These and many more will have implications not only in terms of the level of GDP but also on the rate of growth in GDP estimates! Since $Y = C + I + G$ any increases in G means significant increases in Y. Therefore, through mathematical illustration using the Keynesian model, I concluded that the higher is the proportion of government expenditure that goes to corruption the higher is the overestimation of the level of GDP and GDP growth rates of a country with corruption.

6.0 Conclusion

This study incorporates corruption as a factor in the basic Keynesian Framework. Based on the mathematical derivations, it can be concluded that (a) since the government multiplier is less than the investment multiplier when there is corruption, the impact of government expenditure on the economy is less than the impact of investment expenditure on the economy, (b) since basic Keynesian model divides the economy into component structure (the household, business, the government and the foreign trade sectors) it can provide better and inclusive analytical framework for dealing with the economic cost of corruption, and (c) since $Y = C + I + G + (X - M)$ any increases in G means significant increases in Y. Therefore, through mathematical illustration using the Keynesian model, the higher is the proportion of government expenditure that goes to corruption the higher is the overestimation of the level of GDP and GDP growth rates of a country with corruption.

It is suggested that a more realistic model can be incorporated into the basic Keynesian framework by taking the different proportions vis-à-vis government expenditures of the different government agencies or programs/projects that go to corruption.

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