**Corruption Threshold: The Effect of Corruption on Economic Growth**

**-The Evidence from Asia Pacific Countries-**

**Abstract**

This study examines the corruption thresholds and the effect of corruption in government expenditure on economic growth. Specifically, by analyzing both the direct and indirect effects of corruption on economic growth across Asia-Pacific countries, this research asseses whether or not a country`s corruption effect on economic growth is positive when its corruption level is below the corruption threshold. The corruption effect, on the other hand, shows a negative relationship with economic growth when the corruption level is above the threshold. Compared to the existing literatures in similar topic which propose to group the countries based on income level, on the other hand, this study uses different approach which does not group the countries. The approach allows to indicate a country corruption level`s position related to corruption threshold in order to analyze whether a country manages to lower its corruption level or remains struggling in high corruption level. The estimation results show that the direct effect of corruption on economic growth is negative for countries which have high corruption levels. The indirect effect of corruption in government investment expenditure shows a positive association with economic growth. In addition, the finding illustrates that most of the Asia-Pacific countries are struggling in high corruption level over the years.

1. **Introduction**

Many studies have been done to scrutinize the corruption issue; however, none can eradicate the corruption from growing. The previous researches have inconclusive results regarding the relationship between corruption and economic performance. Many of them find the negative effect of corruption, particularly on investment and economic growth. In contrast, a few studies present that corruption reveals growth enhancing. This study proposes to measure a certain corruption level to determine whether corruption effect is either positive or negative on economic growth. This certain corruption level is defined as corruption threshold. Moreover, the corruption effects are varied according to the threshold. If the corruption level is above the threshold, the adverse effect of corruption have retarded the economic growth. In contrast, the corruption may support “grease the wheels” hypothesis when the corruption level is below the threshold. In this research, the focus is on the corruption threshold and how corruption in government expenditures affect the economic growth. This contributes to create an indicator for any governments to decide what policies to be taken.

Another purpose of this study is that the threshold can be used to determine a country corruption level`s position related to the threshold. The position indicates a country`s corruption performance. It is important to analyze the countries which manage to control the corruption level to stay below the corruption threshold. Most countries, on the contrary, are struggling in high corruption level above the threshold over the years. Unlike the existing studies on a similar topic which group the countries based on income level, this study does not differentiate the countries into groups. This approach confirms that corruption level does not directly correspond with income level. The finding shows that the trend for high-income countries is similar to the developing and low-income countries.

Many studies provide frameworks of corruption in government sector and growth relationship. Blackburn, Bose, & Emranul Haque (2006) emphasize a theoretical framework of government role in corruption and growth nexus. In addition, Mauro 1998, pp.263-279; Monte & Papagni 2001, pp.1-16 find that corruption undertaken by bureaucrat deteriorates public expenditure effectiveness by both increasing the budget nominal and composing unproductive projects. D`agustino et al. (2016) have revealed that the indirect effects of corruption on growth utilized by the interaction between corruption and components of government spending - namely military and investment- have negative impact. A recent study, Huang (2016) has highlighted that there is a positive relationship between corruption and growth in South Korea and China. Furthermore, many existing studies focus on determining a linear specification and find the inconclusive results. Bose et al. (2008) confirm a nonlinear specification which shows evidence of corruption threshold.

Unlike the other regions in the World, Asia-Pacific displays unique yet significant pattern towards the corruption threshold. Some countries like China, South Korea, and India, which are dominant in the economy, turn out to hit high corruption level. Abe (2018) argues that corruption is likely to be the cause of difficulty experienced by developing Asia-Pacific countries in advancing beyond the middle-income bracket. In addition, Rock and Bonnett (2004) demonstrate that a special feature in Asia is different from other regions such as Africa and Latin America. It indicates that economic growth and corruption patterns presented in Asia may result from differences in the domestic politics, economic openness to foreign trade, and state patron’s domination. Panel data of 25 Asia-Pacific countries for period 1995-2014 is utilized to estimate the corruption threshold using threshold model proposed by Hansen (2000). The model is widely implemented to consider the heterogeneity of income levels and economic performance of Asia-Pacific countries.

The paper consists of five sections as follows. Section 1 is introduction. Section 2 describes the literature review, providing a range of existing research in the similar area. Section 3 provides data and methodology employed in the estimation. Section 4 elaborates the empirical results, and finally, section 5 offers some recommendations and remarks for future research. In general, this study will conclude two points. Firstly, the direct and indirect relationships between corruption in government expenditures and economic growth might be varied in different corruption thresholds. Secondly, most countries in Asia-Pacific are struggling with corruption issue over the years, but some countries managed to lower corruption level and succeeded to improve their corruption problem.

**2. Literature Review**

The study about the economics of corruption generates comprehensive understanding and theoretical background on factor determinants through which corruption takes place in the economy. Mauro (1995) provides a fundamental theory of corruption channel towards public and private investments. Corruption shows a robust negative correlation to economic growth after controlling for institutional efficiency. Some researches find that corruption creates uncertainty for the investor, therefore increases the investment risk in high corruption level countries (Guriev 2004, pp.489-504; Kaufmann, Daniel and Wei 2000). A similar study suggests that corruption hinders investment due to increasing economic uncertainty (Bardhan 1997, pp.1320-1346).

Several studies present theoretical backgrounds which modeled government expenditure in the incidence of corruption (Blackburn et al. 2006, pp.2447-2467; Bose et al. 2008, pp.1173-1191; Monte & Papagni 2001, pp.1-16). Mauro (1997) argues that public official is more likely to exploit the budget due to low institutional efficiency. The empirical studies focusing on government expenditure confirm that education is the only component of government expenditure which is prone to be corrupted, while other expenditures show no significant relationship to corruption (Delavallade 2006, pp.222-239). In the extant literature, corruption hinders economic growth through several channels such as trade, institutional inefficiency, and expenditure allocation policy (Hessami 2010). Dzhumashev (2014b) contributes to model a two-way relationship between government expenditure and corruption. High corruption level country more likely correlates with the low-efficiency governance, and in this situation, government tends to spend higher budget to raise up the growth rate. The similar contributions are supporting this view (Fisman & Gatti 2002; Treisman 2000, pp.399-457). Another study, proposed by Keefer & Knack (2000), suggests that corruption contributes to public expenditure inefficiency and extracts rent-seeking by altering the budget structure. The corruption effects in public expenditures not only create inefficiency but also generate higher social losses (Aidt & Hillman 2008, pp.545-553). Monte & Papagni (2001) presented the adverse effect of corruption through infrastructure investment in Italy, mainly dealing with corruption in public goods procurement. Moreover, a recent study, d’Agostino, Dunne, & Pieroni (2016) confirm significantly harmful corruption effect in military and consumption expenditures, in contrast, corruption in consumption expenditure is likely to show a positive effect.

Despite more findings which result the destructive effect of corruption on economic growth, some studies prove that corruption enhances economic development. Starting from Leff, H (1964), bribery to policymaker under political instability condition turns up promoting economic efficiency. Colombatto (2003) argues that in developing countries, corruption eliminates the unfavorable condition that hinders development. Corruption may act like “speed money” in the condition of political instability and institutional inefficiency. Huang (2016) has highlighted a causal relationship between corruption and economic development using data from Asia-Pacific countries. She found that South Korea and China have experienced an advancing economy and faced corruption problem at the same time. A similar consideration explains the corruption determinants in firm behavior, Kato & Sato (2015) have found evidence of “grease the wheels” effect of corruption in firm-level in India. Using a different approach, Ugur (2014) analyzes a meta-analysis approach to corruption-economic development relationship in low-income countries. In countries which bureaucratic condition is inefficient, the indirect effects of corruption through public finance and human capital channels are likely to harm the economic development.

Many of the existing studies determine a linear specification and find the inconclusive results. On the contrary, Durlauf & Johnson (1995) explore a non-linear specification and exhibit multiple regimes of corruption using cross-country analysis. They suggest that countries appear to have different production functions, and this may vary the corruption effect in each country. Aidt, Dutta, & Sena (2008) argue that the corruption effect is influenced by the quality of governance. Corruption is harmful if the government implements good governance, in contrast, the effect is positive in inefficient governance. Aidt (2009) concludes that the marginal effect of corruption is conditional on the institutional environment.

Moreover, some comprehensive works stress about determining the threshold over which corruption may hinder economic development after crossing the threshold. Bose et al. (2008) provide a framework which assesses the interaction effect of corruption and both government and firm in the provision of public goods. They found two distinct regimes of corruption. The first regime shows high corruption level, and the effect of corruption in the first regime is negative. On the other hand, the second regime confirms a low corruption level and shows that corruption is growth enhancing. This finding is also supported by (Aidt 2009, pp.271-291; Dzhumashev 2014a, pp.202-215). Haque and Kneller (2004) postulate the existence of the corruption threshold clubs. The club generally means if some countries lie in the same regime over the years due to highly persistent corruption levels, they would have difficulty to manage to a lower corruption level.

**3. Methodology**

**3.1 The Estimation and Threshold Model**

To begin with, corruption threshold is constructedusing threshold model specification developed by Hansen (2000). Corruption threshold is defined as a certain figure which determines whether corruption effect on economic growth is either positive or negative. The threshold will divide the data sample into two regimes. The first regime consists with countries which have corruption level below the threshold value, and corruption effect is considered positively related to economic growth. On the other hand, the second one consists with countries with corruption level above the threshold, and after crossing the threshold, corruption effect suggests to be growth deteriorating.

The baseline estimation to measure the corruption threshold is demonstrated by the following forms:

(1)

(2)

where the subscript *i* denotes the country and *t* is for the period. Specifically, *cor*is corruption as the threshold variable, and is the threshold value that divides the threshold variable into two regimes. is a vector of control variables. Since this study proposes not only focusing on the corruption threshold but also the direct effect of corruption on growth, we allow the corruption to include in both explanatory and threshold variables. The equation (1) and (2) can be written as a single threshold regression as follows:

(3)

where y*it ,* cor,γ, and are as above, and I(.) is an indicator function of threshold variable.

Next step is testing the hypothesis written as follows:

The null hypothesis is linear regression which indicates that there is no threshold, and the alternative hypothesis demonstrates the non-linear regression. Under the null hypothesis, linear regression ( is accepted, hence no threshold exists in the estimation. When the null hypothesis is rejected, then the alternative hypothesis ( is present. It generally confirms the presence of a threshold in the estimation. In addition, the rejection of null hypothesis is indicated by the significance level of the *p-value* in equation (3). The confidence interval of 95% is calculated based on likelihood ratio (LR) statistic. Therefore, the threshold is occurred if the *p-value* is below 5 percent significance level.

Considering that multiple thresholds may be present in the estimation, the model derives a sample-splitting technique to test for the second and multiple thresholds. The technique needs a data construction in two steps before regressing the equation (4) and (5). First is analyzing the number of observations in each regime which is formed after regressing the first threshold. If we notice that one regime`s sample data is bigger than the other one, it is presumed that the second threshold may exist for that regime. Second is dropping the observations in the regime which has fewer sample data. Finally, we further test the presence of second threshold using the splitting data by following this equation:

(4)

Then, the equation allows for multiple thresholds (*j* thresholds) regression as follows:

(5)

The equations are estimated sequentially from single, second and multiple thresholds. In addition, the threshold model utilizes the bootstrap procedure and encourages the construction of confidence regions using 1000 times repetitions for each regression.

**The Indirect Effect of Corruption in Government Expenditure Composition on Economic Growth.**

Several studies concern on the consequences of corruption on economic growth through components of government expenditure (Bose et al. 2008). This study addresses two questions of what the indirect effects of the interaction between corruption and government expenditure are. Do government expenditure compositions exacerbate or relieve the adverse effect of corruption on economic growth? Dzumashev (2012) found that the direct effect of corruption does not show robust negative result in many empirical studies. He argues that the indirect effect of corruption proves statistically negative significant result on economic growth. D`agustino et al. (2016) demonstrates that corruption effect through military and investment expenditures are growth deteriorating. Those studies provide a considerable evidence for the indirect effect of corruption through government expenditures. The interaction term is utilized to two types of government expenditures namely: consumption and investment. Investment expenditure is estimated to support economic growth, while consumption expenditure has proven to be inefficient expenditure due to its allocation to unproductive sector. The interaction term has been widely applied in empirical studies to obtain the indirect effect of a particular variable.

This study considered the heterogeneity of income level in Asia-Pacific countries. The income level is relaxed from the assumption to get the effect of corruption on different income level. Another issue in corruption and growth nexus is that corruption is either the cause or the influenced factor in which creates a two-way causal relationship. The ignorance of causality issue may induce the estimates coefficient bias. Caner and Hansen (2004) have provided a specific method to head on the causality issue by applying an instrumental variable and GMM estimators. However, because the focus of interest measured the corruption threshold, this research sidestepped the issue and mitigated the estimation bias using the inclusion of lagged variables.

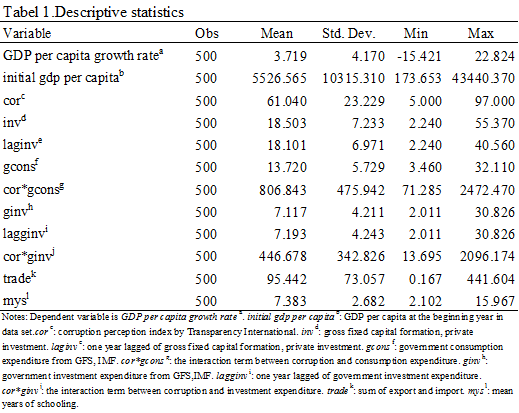
**3.2 Data**

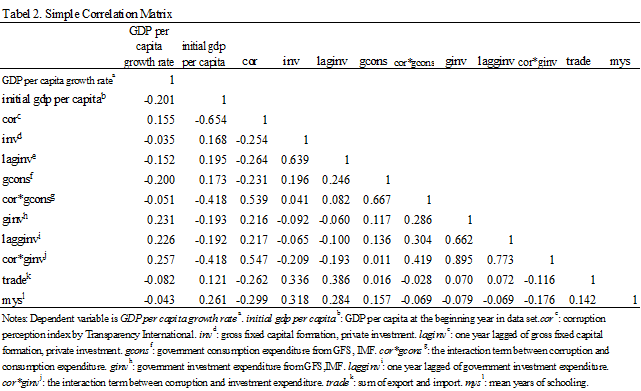
The data covers 25 Asia-Pacific countries[[1]](#endnote-1) out of 36 countries from period 1995 to 2014. Gross Domestic Product (GDP) per capita growth rate from World Bank proxies the economic growth. The strand for measuring corruption is Corruption Perception Index (CPI) compiled from Transparency International (TI). CPI, *cor*, ranges from zero to 100, presenting the range from more corrupted to less corruption. For practical interpretation, the CPI is reversed; therefore, zero presents to be less corruption. According to Campos, Dimova, & Saleh (2016), a sensitivity analysis of corruption measurements such as CPI from TI, International Country Risk Guide (ICRG), and Control of Corruption of World Bank suggests that CPI shows a significant effect in the relationship between corruption and economic growth. Accordingly, the measurement is still convincing as the measurement of corruption.

Government expenditure is divided into two components, namely investment (and consumption (, and they are measured as the share of GDP. Government expenditures data are compiled from International Montery Fund (IMF) which provides a comprehensive data base for government financial statistics. The other control variables are taken from World Bank. Initial GDP per capita in nominal USD is used to control for convergence effect of income level. The growth rate is expected to negatively associate with the initial income at the beginning of dataset. The proxy for private investment is gross fixed capital formation of private investment (*inv*). Trade represents the economic openness and is obtained by the sum of export and import as the share of GDP. Mean years of schooling (*mys*), indicating the investment in human capital, is obtained from World Bank.

The other control variables are one year lagged of private investment (laginv) and government investment expenditure (lagginv) to capture the multi-years effect of physical infrastructure development. To obtain the indirect effect of corruption in government expenditures, the interaction term is used to estimate corruption in investment and consumption expenditures (*cor*\**ginv* and *cor*\**gcons*), respectively.

The threshold model Hansen (2000) prerequisites a balanced data set, consequently, some countries which CPI and government expenditure data are insufficient are not included in the estimation. Descriptive statistics of the variables is displayed in table 1. Table 2 shows a correlation matrix between the variables, and the coefficients show no severe multicollinearity problem.





**4. Estimation Results**

To begin with, we estimated the equation (3) to test for the presence of the first threshold. The second and multiple thresholds are tested by following equations (4) and (5). The *p-value* reveals that the null hypothesis of no threshold is rejected at the 5 percent significance level. The results confirm the presence of the first and second thresholds. Moreover, the corruption thresholds in columns (1)-(6) exhibit slightly different ranges regarding the variables estimated in each specification. The threshold values and *p-values* are summarized in table (3).



Each threshold value differentiates the data set into two regimes. For example, in column (1), the first threshold is found at 79. The first regime includes in countries which have corruption level below 79, and the second regime consists of countries with corruption level above 79. Next step, we asses whether or not the second threshold exits using sample splitting technical method as explained in the previous section. Firstly, the countries which have corruption level above 79 are deleted from the data set. Therefore, the data set remains countries with corruption level below 79. Secondly, the equation (4) is estimated, and the second threshold is found at 64. The first regime in the second threshold consists of countries with corruption level below 64, and countries with corruption level above 64 are in the second one. The other thresholds in columns (2)-(6) apply a similar method.

**The Direct Effect of Corruption**

Table (4) and (5) allow the direct effects of corruption and control variables to change in different thresholds. The control variables, initial GDP per capita, corruption, private investment, consumption expenditure, investment expenditure, trade and mean years of schooling are included in all columns (1)-(6). The inclusion of one year lagged private investment is in column (2). Both one year lagged private investment and investment expenditure are introduced in column (3). Column (4) emphasizes the indirect effect of corruption in consumption expenditure, and corruption in investment expenditure variable is in column (5). Finally, column (6) includes all variables in the estimation.



Table (4) reports results in first corruption threshold. Corruption shows a negative relationship with economic growth in the first and the second regimes. The coefficient of corruption is negative at the 1 percent significance level in the second regime across columns (1)-(3). The second regime consists of countries with high corruption level, and these findings confirm the neo-classical theory that corruption reduces the economic growth. The association between consumption expenditure and economic growth appears negative across regimes, yet statistically significant in the first regime, in columns (1)-(3). It is evident that consumption expenditure is likely to be allocated to unproductive sectors such as wage and salary for countries which have corruption level below 79. Consistent with the theory, investment expenditures support economic growth in both regimes and are statistically significant in columns (1)-(3). Inline with investment expenditure effect, private investment contributes to enhancing economic growth in both regimes in columns (1)-(3). The coefficients are found statistically significant at the 1 percent and 10 percent significance level only in the first regime. It is clear that the corrupt environment can create an additional premium on investment, and it leads to lower private investment.

On the contrary, the coefficients of trade are negative across regimes in most of the estimations, yet statistically significant at the 1 percent and 5 percent significance level in the second regime. In this estimation, the trade comes in wrong sign as our expectation. Trade is expected as the contributing factor to economic development. The findings imply that in high corruption level countries, business and foreign investment have impeded economic growth by corrupt practices. Mean years of schooling`s coefficients are negative at least at the 5 percent significance level in columns (2) and (3). The results imply that human capital is estimated to be restricted by the destructing effect of corruption which consequently impedes economic development. The findings support the evidence why Asia-Pacific experiences the difficulty in advancing the economy (Masato Abe 2018).



Table (5) reports the results in the second threshold. The association between corruption and growth shows the presence of an inverted U-shaped pattern in column (1). The coefficient of corruption is positive in the first regime and turns out negative at the 1 percent significance level after crossing the threshold. The pattern generally means that the corruption can be a threat and harmful to economic growth if the corruption level exceeds the threshold value. The coefficients of consumption expenditure are negative yet statistically significant in the second regime in columns (1)-(3), and the productivity of investment expenditure gives positive impacts in both regimes in columns (1)-(3). These are contrary with the result of D`agustiono et al. (2016). In fact that economic advancing and high corruption in Asia-Pasific may explain a unique pattern compared to cross-country studies. The results suggest that investment expenditure contributes significantly in boosting the economic performance in Asia-Pacific. Private investment shows a positive association across regimes, yet statistically significant in low corruption regime. Trade in low corruption regime appears statistically insignificant; in contrast, trade effects become significant to raise the growth rate in high corruption regime.

The inclusion of one year lagged private investment provides control for investment multiple years effect. The coefficient shows negative at the 1 percent significance level across regimes, in columns (2) and (3). The lagged private investment are negative and statistically significant across regimes. Asia-Pacific data confirms that private investment may pose difficulties in high corruption environment. For example, bribery, collution, and government crony exist and impede the private investor. We introduce one year lagged government investment expenditure in column (3). In the first regime, lagged investment expenditures reveal positive association; however, it turns out to be negative in the second regime, yet statistically insignificant. Evidently, accumulation of government investment tends to occur as an important determinant in both high and low corruption countries.

**The Indirect Effect of Corruption through Government Expenditure**



The main concerns regarding the indirect effect of corruption in government expenditure components are displayed in table (6) and (7). In table (6), we focus on the interaction term of corruption and consumption expenditure which appears negative across regimes in columns (4) and (6), yet statistically significant in the first regime (column 4). The results are convincing and supporting to the other findings in similar topic that the characteristic of consumption expenditure is most likely harmful to economic growth because of its allocation to unproductive sectors such as salary. According to Mauro (1998), corruption in administrative matters such as the payment of salary and service provision is less attractive and easier to get monitored by the auditor. Another channel of corruption is through investment expenditure. The coefficients of corruption in investment expenditure are positive in the 1 percent significance level across regimes of the first threshold; however, the coefficients become statistically insignificant in column (6) when all variables are included in the estimation.



In the second threshold, corruption in consumption expenditure is likely to reduce economic growth in both regimes, and the indirect effect is stronger in the second regime. The findings are consistent with the first threshold. In contrast, the positive effects of corruption in investment expenditure are benefited to economic growth across regimes in columns (5) and (6). These results support that corruption in investment expenditure may not be the primary cause of the declining economic growth. It is worth noting that in developing and low income countries, the government roles through investment sector proves to support economic development. In fact that in those countries, corruption may also be a threat in impeding the development.

**The Corruption Thresolds and Group of Countries**

This research figures out that corruption thresholds provide a measurement to evaluate a country`s corruption performance. Using the corruption thresholds resulted from the empirical results, we raise a question whether a country`s corruption levels have been improving or even suffering from the corruption problem over the years. The estimation has resulted in the corruption thresholds at different levels, and we can group the countries based on these thresholds. This research did not categorize according to income level and geographical location like Bose et al.(2008) because our purpose is to assess which countries manage to low corruption level or remain in high corruption level over the years.

To begin with, we have two values for each threshold. The threshold values in column (6), representing all variables of interest, will be utilized (76 for the first threshold and 70 for the second one) to analyze the countries corruption perfomance. Countries included in the first threshold are divided into two groups. The first group is for countries which have corruption level below 76, and the second one is above 76 (table 8). For the second threshold, table 9 displays the first group for countries with corruption level below 70 and the second group for corruption level between 70 and 76 (76 is the upper corruption level in the second threshold`s data set). We can also analyze the distribution of countries based on corruption level and the thresholds as displayed in figure 1. It is clearly shown that the sample data is mainly concentrated when CPI scores are above 60. Moreover, the range of the first and second thresholds are

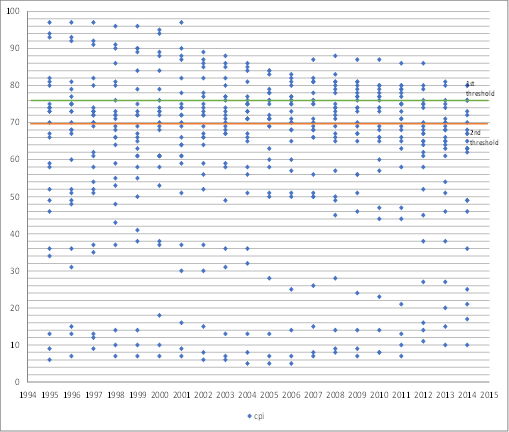


Figure 1. CPI distribution and corruption thresholds





In table 8, based on the first corruption threshold at 76, this findings revealed that most of the Asia-Pacific countries are included in low corruption group. However, Myanmar remained in high corruption group over the years. Papua New Guinea, Lao PDR, Timor Leste have managed to low corruption group since 2011. Indonesia experienced a declining corruption level in 1998. In fact, Indonesia retrieved to low corruption group in 2008. China has improved its corruption level since 1997 and succeeded to manage to low corruption group. Global financial crises, war, political instability could be the reasons why corruption becomes a more severe problem over the years.

In table 9, the second threshold is at 70. Bangladesh, Lao PDR, Myanmar, Papua New Guinea, and Timor Leste remain trapped in high corruption level group. However, some countries succeeded to improve their corruption condition and shifted to low corruption level group such as China, Indonesia, India, Maldives, Philippines, Vietnam, and Vanuatu. However, this approach might be too restricted in evaluating the complexity of corruption. It is worth noting that corruption threshold may give insights to assess whether or not a country`s corruption condition, compared with other countries, has been improving or declining.

**5. Conclusion**

This study suggested that measuring corruption threshold develops a better understanding of the corruption effect in different conditions. Corruption threshold contributes as an indicator for the government to implement actions when the corruption effect has impeded the economy. The evidence that corruption negatively impacts the economy showed robust and convincing. The view that government sector is the source of corruption has increased our interest in the indirect effect of corruption towards government expenditure components. The harmful effect of corruption in consumption expenditure confirms the existing literature which found that consumption expenditure is likely to reduce economic growth. On the contrary, the indirect effect of corruption in government investment expenditure shows a statistically significant positive effect on economic growth. This result implies that the adverse effect of corruption may not exceed the supporting effect of investment expenditure in most of the Asia-Pacific countries. From the estimation results, we may conclude that corruption in government investment expenditure is not the primary cause of a declined in economic growth. Government may continue to initiate investment expenditure as an instrument to raise the economic growth.

This paper demonstrated that corruption threshold contributes as a tool to evaluate whether a country`s corruption level has been improving or declining. The figure for the Asia-Pacific region might vary with other regions. Hence, it is recommended for further research to exercise using data of other specific region or across regions.

1. Endnotes:

   Australia, Bhutan, Bangladesh, China, Cambodia, Japan, South Korea, India, Indonesia, Lao PDR, Maldives, Mongolia, Malaysia, Myanmar, Sri Lanka, Philippines, Nepal, New Zealand, Papua New Gunea, Singapore, Thailand, Timor Leste, Vanuatu, Vietnam, Samoa. [↑](#endnote-ref-1)