



# Research on the Impact of Corruption on a Country's Trade Flows — Based on the Extended Trade Gravity Model

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**Abstract:** According to Transparency International, the level of corruption in Indonesia has been high. Based on the traditional gravity model, this paper introduces CPI and its secondary items as explanatory variables, and constructs a balanced panel data to explore the impact of corruption on the import in Indonesia. GMM estimates show that the corruption in Indonesia has an inverted U-shaped relationship with its foreign imports, and the corruption of Indonesia and its trading partners will lead to the growth of bilateral trade flows in the short term, but that will not achieve the sustained and healthy development of Indonesia's trade. In order to promote the prosperity and development of China's external trade, China should on the basis of its actual situation to propel the reform of the legal system and the construction of anti-corruption, clarify the powers and responsibilities of its governments, and standardize foreign trade procedures.

**Keywords:** corruption, import trade flow, CPI, inverted U-shaped relation

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## 1. Introduction

In his report to the 19th CPC National Congress, General Secretary Xi Jinping pointed out that since the 18th CPC National Congress, China has made remarkable achievements in comprehensively enforcing strict party self-governance. The central Committee issued the Eight-point Decision on Government Policy to severely cracking down on formalism, bureaucracy, hedonism and extravagance, and resolutely opposing privileges. The goal of daring not to corrupt was initially achieved. The cage against corruption is getting stronger. The dam against corruption is being built. The overwhelming momentum of the fight against corruption has taken shape and is being consolidated and developed. The foundational proposal was put forwarded like scraping the poison off the bone so as to eliminate all the factors that impair the Party's advanced nature and purity and eliminate all the viruses that erode the healthy body of the Party.

Corruption is a universal concern of all countries in the world, which erodes the political system of a country and impairs the interests of the state and the people. Governance of corruption is a long-term problem, and corruption shows different characteristics in different development stages of each country. China has taken effective measures to prevent corruption in a timely manner. Since the 18th National Congress of the Communist Party of China (CPC), New progress has been made in combating corruption.

However, the operational mechanism of corruption on economy and trade can be roughly divided into three categories in the field of international trade: Some scholars believe that corruption can stimulate a country's trade growth under certain conditions. While, some scholars believe that corruption can only produce side effects on international trade at any time and place. The third group of scholars believe that the relationship between corruption and trade presents an "inverted U shape". In order to demonstrate whether corruption is a cancer or a lubricant for the economic and trade development of a country, this paper takes Indonesia, which has obvious corruption characteristics, as the research subject, and the extended gravity model was adopted to demonstrate the relationship between corruption and import trade flow.

Indonesia is not only largest economy in Southeast Asia, but also a founding member of the Association of Southeast Asian Nations. Indonesia is rich in natural and human resources. It is the world's largest producer of palm oil and second largest producer of natural rubber. Indonesia is rich and widely distributed in oil, gas, gold, silver, copper and other mineral resources, and mining plays an important role in the Indonesian economy. In recent years, Indonesia's economic development has maintained a steady growth, but there is still a gap compared with other economies.

As a result, this is related to Indonesia's dependence on agriculture, relatively low level of industrialization and problems in its economic development model. As shown in Figure 1, after collating the data, it can be found that Indonesia's per capita GDP is far from the world's per capita GDP level. In recent years, Indonesia's average inflation rate is about 4% with unemployment rate higher than the regional average. From the perspective of foreign trade, the total export flow of Indonesia

has been on a downward trend since 2011, dropping to \$144.5 billion in 2016. Meanwhile, Indonesia's total foreign import flows fell from \$191.7 billion in 2012 to \$135.7 billion in 2016, which was a contraction of about \$56 billion.

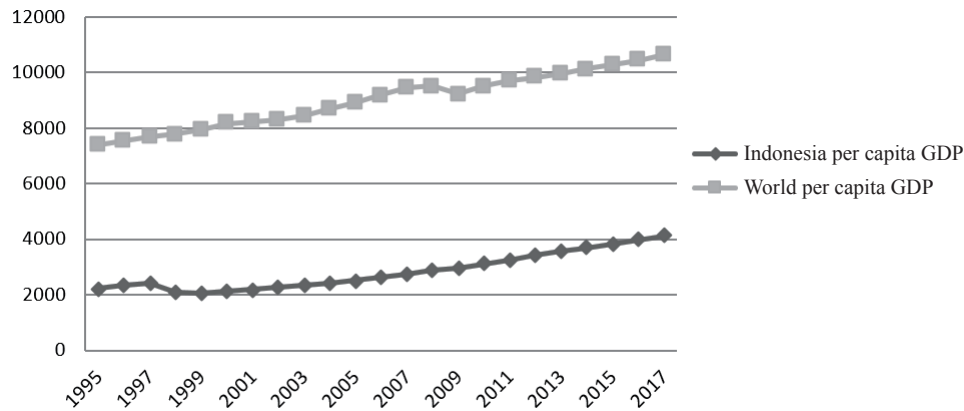


Figure 1. Comparison of World per capita GDP and Indonesia per capita GDP (UNIT: US dollars)

Source: Compiled from the World Bank database (<https://data.worldbank.org.cn/indicator/NY.GDP.PCAP.KD>)

Corruption in Indonesia is one of the most influential factors for Indonesia's political and economic growth. Corruption is a deep-rooted historical problem in Indonesia, which takes frequent presence in the process of Indonesia's modernization. As measured by the Corruption Perception Index (CPI), Indonesia's CPI is one of the lowest in Southeast Asia. Singapore is famous for its clean government construction. Although its corruption index score has declined in recent years, it still ranks first among Southeast Asian countries, which proves that Singapore's construction of clean government is effective with low level of corruption. Malaysia came in second with a corruption index at around 50.

In contrast, the score of Indonesia in corruption even dropped below 20 points. Despite some improvements since 2001, Indonesia's corruption index was still the second-lowest in some Southeast Asian countries until 2005, and the score has never exceeded 40 until 2016. An emerging economy with contradictory economic development and resource endowment gave rise to numerous domestic economic and political problems, top priority should be given to corruption. Corruption has an obvious erosive function on politics, which has an incalculable impact on economic trade. Therefore, corruption is a problem that the Indonesian government, academia and the public are concerned about and need to be solved urgently. Therefore, this paper takes Indonesia as the research subject and explores the relationship between corruption and import trade through an extended trade gravity model. Based on the experience, corresponding policy and suggestions were put forward for the development of China's foreign trade.

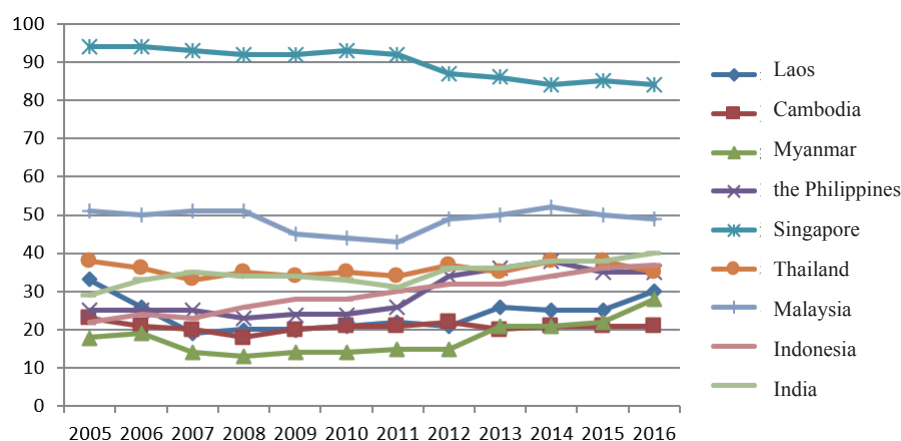


Figure 2. CPI index of some Southeast Asian countries

Data source: Compiled from the Transparency International database (<https://www.transparency.org/search?topic=14>)

## 2. Model setting and data source

In order to estimate whether corruption factors will have an impact on Indonesia's import flow, the classic gravity model is adopted in this paper in the field of international trade. The traditional gravity model takes bilateral economic scale and distance as the core variables, and its general form presents as:

$$T_{ij} = \frac{A(Y_i^{\beta_1} Y_j^{\beta_2})}{D_{ij}^{\beta_3}} \quad (1)$$

Where,  $T_{ij}$  refers to the bilateral trade flow, which is proportional to the size of the bilateral economy  $Y_i, Y_j$  and it is inversely proportional to the distance  $D_{ij}$  between the two sides. In order to avoid heteroscedasticity and non-normal distribution of model residuals, gravity model is usually converted into logarithmic form to linearize its formula, as shown in Equation (2) :

$$\ln T_{ij} = \beta_0 + \beta_1 \ln Y_i - \beta_3 \ln D_{ij} + \varepsilon_{ij} \quad (2)$$

Based on the traditional gravity model, the model of this paper studies how these factors affect Indonesia's import trade flow by introducing corruption index, quadratic term of corruption index, whether the trade target country is a member of WTO, or whether it belongs to the same source of law and other variables. The complete form of the model is as follows:

$$\ln IMP_{ijt} = \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln disw_{ijt} + \beta_4 CPI_{it} + \beta_5 CPI_{jt} + \beta_6 CPI_{jt}^2 + \beta_7 GW + \beta_8 Comleg + \varepsilon \quad (3)$$

**Table 1. Variable description and data sources**

Variable name	Meaning of variable	data sources	Expected signs
$IMP_{ij}$	Indonesia's Foreign Imports	UNCOMTRADE	
$GDP_{ij}$	Real GDP of Indonesia's trade partners	UNCOMTRADE	+
$GDP_{jt}$	Indonesia's real GDP	UNCOMTRADE	+
$Distw_{ijt}$	Bilateral weighted distance between Indonesia and trading countries	CEPII	—
$CPI_{it}$	Corruption index of Indonesia's trade partners	TRANSPARENCY INTERNATIONAL	+
$CPI_{jt}$	Corruption Index of Indonesia	TRANSPARENCY INTERNATIONAL	+
$CPI_{jt}^2$	The second component of Indonesia's corruption index	TRANSPARENCY INTERNATIONAL	—
$GW$	Is Indonesia's trade partner a member of GATT/WTO or not	CEPII	+
$Comleg$	Whether the legal origin of Indonesia and trade target country is the same	CEPII	+

Among them, the level of corruption in a country is indirectly reflected in customs duties, customs clearance time, trade volume and other aspects of trade. This paper introduces the corruption perception index CPI provided by Transparency International in order to accurately quantify the impact of corruption on trade flows.

$CPI^2$  denotes the quadratic term of the corruption index, which aims to check whether there is an inverted U-shaped relationship between corruption and trade flow. If the coefficient of Indonesia's corruption index is positive and the second coefficient is negative, it indicates that there is an inverted U-shaped relationship between corruption and economy.

Due to the serious lack of major explanatory variables in some countries, target countries that developed stable trading relationship with Indonesia were selected with in this paper, including Britain, France, Germany, Italy, Saudi Arabia and 26 countries around the Pacific. The selection period of the samples lasted from 1995 to 2016, and a balanced panel data with a total sample amount of 572 was constructed.

## 3. Empirical analysis

Mixed regression was first performed on the extended model with an  $R^2$  of 0.834, indicating that all variables in the

model could explain the change of Indonesia's import flow to an extent of 83.4%. Then, in light of the lack of zero-flow countries in sample selection and the interaction between corruption and trade flows, the endophytism of the model can be developed, the Indonesian Corruption Index ( $CPI_{it}$ ) is removed as a reference frame and the regression is conducted again. The results are shown in Column (1) of Table 2. The GDP coefficient of Indonesia increased by 15.4%, and the quadratic coefficient sign of its corruption index changed from negative to positive, indicating that the model needs further revision.

Subsequently, the hausman test was performed to determine whether there were endogenous variables in the model. The test results reject the null hypothesis that all explanatory variables are exogenous. The P value of DWH test is also less than 0.05, so it can be considered that the Indonesian Corruption Index ( $CPI_{it}$ ) is an endogenous explanatory variable, and there exists heteroscedasticity for the model.

To solve the problem of endogeneity, this paper introduces two instrumental variables, that is, democracy index and import price for re-evaluation. The democratic indicator is the DEMOC indicator from the Polity IV database of the Center for Systemic Peace. It includes scores on a number of items, including public participation in politics and civil service recruitment, which are highly correlated with corruption. Import prices are used as instrumental variables because corruption will increase deadweight costs and then reflect the import prices of goods. The variable is derived from the percentage change in commodity prices from the previous year in the IMF's database. After degree recognition test, the tool variables are all exogenous variables.

From the results, the coefficient estimates of 2SLS, LIML and GMM show great similarity. Because of the heteroscedasticity of the model, GMM is more efficient than 2SLS.

**Table 2. Empirical results of Indonesia's import model**

	(1) ols no cpil	(2) ols with cpil	(3) tsls	(4) liml	(5) gmm	(6) igmm
lnGDP (exporter)	0.926*** (0.0335)	0.924*** (0.0326)	0.923*** (0.0292)	0.923*** (0.0293)	0.923*** (0.0293)	0.923*** (0.0293)
lnGDP (importer)	1.567*** (0.352)	1.413*** (0.344)	1.319*** (0.361)	1.319*** (0.361)	1.308*** (0.360)	1.308*** (0.360)
lnDistw	-1.608*** (0.0616)	-1.605*** (0.0599)	-1.603*** (0.0550)	-1.603*** (0.0550)	-1.603*** (0.0550)	-1.603*** (0.0550)
CPI (exporter)	0.0167*** (0.00197)	0.0169*** (0.00192)	0.0169*** (0.00174)	0.0169*** (0.00174)	0.0170*** (0.00174)	0.0170*** (0.00174)
CPI <sup>2</sup> (importer)	0.000183 (0.000309)	-0.00612*** (0.00115)	-0.00998*** (0.00216)	-0.00998*** (0.00216)	-0.0100*** (0.00215)	-0.0100*** (0.00215)
GW (exporter)	-0.129 (0.170)	-0.141 (0.166)	-0.148 (0.130)	-0.148 (0.130)	-0.147 (0.130)	-0.147 (0.130)
Comleg	-0.306*** (0.114)	-0.307*** (0.111)	-0.307*** (0.107)	-0.307*** (0.107)	-0.305*** (0.107)	-0.305*** (0.107)
CPI (importer)		0.344*** (0.0607)	0.554*** (0.117)	0.554*** (0.117)	0.558*** (0.116)	0.558*** (0.116)
_cons	-33.94*** (9.344)	-34.16*** (9.091)	-34.29*** (9.464)	-34.29*** (9.465)	-34.05*** (9.443)	-34.05*** (9.443)
N	558	558	558	558	558	558
R <sup>2</sup>	0.824	0.834	0.830	0.830	0.830	0.830

Standard errors in parentheses  
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Note: From columns (1)—(6), there are OLS regression, OLS, 2SLS, maximum likelihood, GMM and iterative GMM without Indonesian CPI index respectively.

Based on the results in Table 2, the corruption index coefficients of Indonesia and its trade partners are 0.558 and 0.017 respectively, indicating that when Indonesia imports from abroad, the corruption level of both Indonesia and its trade partners has a significant positive relationship with bilateral trade flows, but there is a weak influence of corruption level of trade partners on bilateral trade is slightly weak. The quadratic term (CPI<sup>2</sup> coefficient of Indonesia's corruption index is -0.01, which is significant at the level of 1%, indicating that with the deepening of corruption in Indonesia, corruption will restrain Indonesia's imports.

The results of the model confirm that corruption, if not effectively addressed, will hamper the healthy development of Indonesia's foreign trade in the long run. Although trade partners can benefit Indonesia's import and export enterprises by

providing them with convenience in the form of rent-seeking, such trade growth in the form of corruption is not reliable and may even bring about serious efficiency loss. The loss of efficiency includes the increase of marginal tax rate due to corruption, which increases the marginal cost of enterprises. Besides, it also include the damages to the effect of government projects and the external coordination effectiveness of the government.

Long-term corruption will result in loss of corporate profits, ineffective allocation of resources and huge social costs. The positive influence of corruption on economy or trade appears when the system is defective and the market mechanism is insufficient. However, when institutions are well constructed with effective market mechanisms, trade will be stifled by corruption. It can be seen that the control of corruption has a decisive impact on the long-term sustainable development of a country's foreign trade.

Contrary to expectations, whether the target country is a member of the WTO or whether the legal origin of Indonesia's bilateral trade is the same fail to stimulate Indonesian imports. In 1996, Indonesia was accused of dumping a number of products. In 2017, Indonesia failed a lawsuit in WTO disputes. Indonesia is not comfortable with WTO rules, so its trade partners, if they are members of the WTO, may restrain Indonesia's trade. With the development of regional economic integration, such as the establishment of China-ASEAN free Trade Area, the role of WTO is gradually weakened. For Indonesia, with imperfect system and serious corruption, when both sides of the trade have the same legal source and both sides are familiar with the specific content of the legal regulations, it will increase the restriction of Indonesia's import, thus affecting the import trade.

In short, based on the empirical research, although the corruption in Indonesia promotes the growth of its import trade in the short term, in the long run, the high level of corruption in Indonesia has an important restraining effect on the growth of its trade flow. Therefore, if Indonesia, whether as an importer or exporter of trade, allows corruption to flourish, it will result in greater market distortion and waste of social resources.

## **4. Policy based suggestions**

Since the 18th National Congress of the Communist Party of China (CPC), China has been working with unprecedented courage and determination to comprehensively govern the Party with strict discipline and fight corruption. The task of fighting against corruption is arduous, but great results have been achieved with fundamental, overall, extensive and long-term significance and influence. The study of corruption in Indonesia is conducive to a correct understanding of corruption, arouses public thinking, and provides valuable experience for the high-quality development of China's foreign trade under the new situation. For China's foreign trade in the new era, relevant experience and lessons can be summarized from Indonesia's case, mainly including the following four policy suggestions:

### **4.1 Proceeding from the actual national conditions with adherence to the "Anti-corruption policy" with Chinese characteristics**

Long-term corruption has a negative and corrosive effect on a country's healthy economic and trade development. Therefore, China needs to continue to strengthen its resolve to "fight both tigers and flies", "investigate all cases and punish all corruption", and implement a series of measures to "put power into an institutional cage".

While unswervingly following the path of socialist development with Chinese characteristics, it is also necessary to carry out strong institutional reform in light of actual problems, constantly improve oversight mechanisms, promote transparency and openness of information, effectively protect the rights and interests of the people, and ensure that policies will be effective and laws can be implemented. Party members and officials are required to thoroughly study Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, especially on building clean Party conduct and comprehensively enforcing strict Party self-governance and party management, so as to strengthen their belief in clean government for the people.

### **4.2 Adherence to the goal of high-quality economic development to strengthen internal and external supervision of foreign trade enterprises**

Foreign trade enterprises as one of the main body of a country's foreign trade activities, there is a significant relationship between the corruption of enterprises and the healthy development of foreign trade. Therefore, both internal and external enterprises need to establish a feasible supervision mechanism. External parts of enterprises need to be guided by the government and the industry to help foreign trade enterprises establish correct core values and corporate culture. At the same time, the government and the industry also need to strengthen the management and punishment of foreign trade enterprises in all aspects. The internal parts of the enterprise can be improved by leadership in audit, accounting and accounting mechanism to establish effective supervision and management, and form a clean and efficient corporate culture.



### 4.3 Optimization of the foreign trade business environment to promote its sustainable development

Government power distorts the allocation of resources, which leads to corruption. Therefore, it is necessary to reasonably delimit the boundary of government intervention in the market and clarify the government's functions and responsibilities for economic trade. Government departments should reduce unnecessary intervention. Officials shall be prevented from taking bribes or obstructing the normal development of import and export enterprises by taking advantage of their power to introduce foreign investment from the customs.

At the same time, we must promptly remedy market deficiencies, guard against the inflow of harmful and illegal goods from abroad to enable the market mechanism to fully play its role, and ensure that domestic and foreign resources are fully utilized. We will strengthen the "accountability system" and intensify punishment. In terms of foreign trade policy, we need to improve the structure of traded products, vigorously promote regional cooperation between China and neighboring countries in the Free Trade Area of the Asia-Pacific and among the Belt and Road to speed up innovation-driven development, and build high-quality "Made in China" products. Today, in the post-epidemic era, in order to enhance the growth of foreign trade, we should not take a blind eye on the business environment, instead, we should strive to create a fair, non-discriminatory and efficient foreign trade environment while exploring "fast channels" and "new land-sea channels".

### 4.4 Strengthening customs audit and standardizing foreign trade procedures

The customs is an indispensable link in dealing with corruption in foreign trade. China Customs shall improve and perfect the customs legal system and scientifically standardize the duty scope of the port supervision departments. We will step up efforts in auditing, implement full coverage of auditing, and establish an internal and external oversight system that clearly defines powers and responsibilities. Efforts can be made to simplify approval procedures, and import and export procedures can be strictly controlled to establish a comprehensive system and measures in prevention and control. We will prevent officials from engaging in embezzlement and favoritism, from disrupting the market and wasting resources. Accordingly, efforts can be made in punishment to resolutely punish corrupt officials in accordance with the law.

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