Dwiputri, Inayati Nuraini; Arsyad, Lincolin; Pradiptyo, Rimawan

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The corruption-income inequality trap: a study of Asian countries

Inayati Nuraini Dwiputri, Lincolin Arsyad, and Rimawan Pradiptyo

Abstract
The existence of ambiguity in the study of the impact of corruption on economic growth, namely the *grease the wheel hypothesis* and *sand the wheel hypothesis*, trigger this research to look at the impact of corruption through another perspective, i.e. income inequality. This study identifies the mutual influence between corruption and income inequality in Asian countries, because in general, Asian countries have high levels of corruption and poor governance. This research attempts to contribute literature on the theoretical modeling of the effect of corruption on income inequality, using the Ramsey Growth model's development. Using the Ordinary Least Square (OLS), Tobit, and Two Stage Least Square (2SLS) methods, this study also proves that a reciprocal influence exists between corruption and income inequality in Asia, otherwise known as the corruption-inequality trap. The results show that the higher the level of corruption is, this can aggravate income inequality, and the higher the income inequality level is, this can affect the level of corruption in Asian countries. Other variables that have a robust effect on income inequality in Asia are per capita income, the gross enrollment rate in primary education, population growth, foreign direct investment, and governance.

JEL D63 D73 O11
Keywords Economic growth; income inequality; corruption; grease the wheel hypothesis; sand the wheel hypothesis

Authors
Inayati Nuraini Dwiputri, Universitas Negeri Malang, Indonesia, inayatinadp@gmail.com
Lincolin Arsyad, Universitas Gadjah Mada, Indonesia
Rimawan Pradiptyo, Universitas Gadjah Mada, Indonesia

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1. Introduction

Macro indicators such as economic growth and income inequality, among others, were used as the measures for the achievement of economic development. Birdsall (1998), Forbes (2000), and Scully (2003) indicate that high levels of economic growth can cause higher income inequality. However Danielson (2004) suggests the otherwise, in Jamaica the high rate of economic growth can lead to lower income inequality. The study of the relationship between economic growth and income inequality provides a space for the study of the effects of corruption, as seen from the perspective of income inequality. Several studies have shown that corruption does a disservice to economic growth and income inequality[1]. Therefore, some massive campaigns to combat corruption have been undertaken in some countries. Nevertheless, there are still some studies that consider that corruption can have a positive effect on economic growth (Dreher & Gasebner, 2013; Leff, 1964; Leys, 1965; Huntington, 1968; Lui, 1985).

Some studies show identical results, that corruption can increase income inequality (Batabyal & Chowdhury, 2015; Dincer & Gunalp, 2008; Gupta, Davoodi, & Alonso-Terme, 2002; Gyimah-Brempong, 2002; Mo, 2009). The study by Birdsall (1998) shows that increasing employment, and improving cheap and affordable public services for the poor, can reduce income inequality. Given the research that shows corruption can increase income inequality, therefore efforts to reduce the level of corruption can also be used as a means to reduce income inequality.

Generally, corruption can be divided into three activities, namely bribery, extortion, and embezzlement (Bowles, 2000). In the case of public-private corruption, corruption can be regarded as a transfer from a private individual to a particular public official. In the case of public corruption, corruption can be seen as a transfer from the public to certain public officials. This can lead to higher income inequality among the public, especially in the middle to lower levels of society, with public officials who receive bribes and/or levies. In the implementation of bribery and extortion, rich people have more options and resources to pay extortion fees, bribes and monitoring the public officials than the poorer ones (You & Khagram, 2005)[2].

[1]The studies showing that corruption has a negative impact on economic growth include Adenike, 2013; Bardhan, 1997; Dridi, 2013; Dzhumashev, 2014; Erlich & Lui, 1999; Mauro, 1995, 1998; Meon & Sekkat, 2005; Mo, 2001, Shleifer & Vishny, 1993. Studies showing that corruption is detrimental to income inequality include Batabyal & Chowdhury, 2015; Dincer & Gunalp, 2008; Gupta, Davoodi, & Alonso-Terme, 2002; Gyimah-Brempong, 2002; Mo, 2009.

[2] When certain public employees receive bribes, levies, and embezzle government budgets, it can be analogized as a transfer from the public to the certain public employees.

You and Khagram (2005), Fried, Lagunes, & Venkataramani (2010) argue that income inequality can promote corruption. Batabyal & Chowdhury (2015), Dincer & Gunalp (2008), Gyimah-Brempong (2002), Gupta, Davoodi, & Alonso-Terme (2002), Mo (2009), argue and prove empirically that corruption leads to income inequality. If it is viewed from the determinants of corruption, Serra (2006) concludes that there are only five robust variables affecting corruption i.e income, democracy, religion, the political condition, and colonial history[3]. From the analysis of Serra (2006), it can not be concluded that income inequality robustly affects corruption, because the income inequality variable is not included in that analysis. Shabbbir & Anwar (2008) found that income inequality is not a determinant of corruption in developing countries; the results of their analysis indicated that the effect of income inequality was not a significant factor in corruption. Therefore, the relationship between corruption and income inequality can still be questioned.

The difference in the empirical results of studies of the relationship between corruption and income inequality (Batabyal & Chowdhury, 2015; Dincer & Gunalp, 2008; Gupta, Davoodi, & Alonso-Terme, 2002; Gyimah-Brempong, 2002; Mo, 2009; Uslaner, 2007, 2011; You & Khagram, 2005), provokes the question of whether it is corruption that is fueling income inequality, or income inequality that lead to corruption? Another question is whether there is a reciprocal effect between the two? Uslaner (2007, 2011) states that there is an inequality trap in the relationship between corruption and income inequality in Africa[4]. That opinion is in line with Apergis, Dincer, & Payne (2010) who concluded that there is two-way causality between corruption and income inequality, both in the short and long term, by using the sample of 50 US states.

Uslaner (2007, 2011) explains that income inequality will lead to greater levels of corruption through low levels of trust between groups. The growing inequality in incomes is due to the high level of trust in the private group and the less trust they have toward others outside the group (Uslaner, 2007, 2011). The condition of people who have greater trust in their group than they do in others outside their group can lead to corruption. This is because corruption is an activity that is usually done jointly (joint corruption). Then the corruption that arises is corruption that is done together by a group. Furthermore, corruption leads to higher income inequality and lower trust in others outside the group. Therefore, Uslaner (2007,

[3]Serra (2006) uses a global sensitivity analysis based on Extreme Bound Analysis (EBA) as did Levine& Renelt (1992). According to Serra (2006) the level of corruption is lower in rich countries, long-standing democratic countries, Protestant-majority countries, and countries that were former British colonies. Serra (2006) adds that corruption levels are higher in unstable political conditions.

[4]Uslaner (2007, 2011) used a sample of 14 countries in Africa, using data from afrobarometer.

2011) argues that the higher income inequality can cause the lower trust, and the lower trust lead to the higher corruption, therefore, the higher corruption can contribute to the higher income inequality, and so on. Then comes a trap caused by the effects of income inequality and corruption, which is called corruption-inequality trap.

Uslaner (2007, 2011) argues that the transmission of the relationship between corruption and income inequality is through trust. To the best of the authors' knowledge there is still no research that proves theoretically how corruption can affect income inequality. The existing research is still in the empirical realm. Therefore, this study will provide a theoretical framework related to the process of corruption's influence on income inequality.

From the study of the relationship between corruption and income inequality, the authors' believe there is still no study that discusses the existence of the corruption-income inequality trap in the Asian region[5]. The study of the existence of the corruption-income inequality trap in Asia is considered necessary because the majority of countries in the Asian region have high levels of corruption. In addition, their efforts to eradicate corruption may require cooperation with neighboring countries [6].

The identification of the relationship between corruption and income inequality provides a space for eradicating corruption. If it is proven that there is a corruption-income inequality trap, then the eradication of corruption can be done through a decrease in income inequality. Efforts to eradicate corruption can be done by working with neighboring countries, especially in the Asian region. This research seeks to identify the existence of the corruption-income inequality trap in Asian countries, and attempts to provide policy recommendations related to efforts to eradicate corruption. It is, therefore necessary to identify the problem of the existence of the corruption-inequality income trap in Asian countries.

[5]The study of the relationship between corruption and income inequality have been conducted by, among others, Apergis, Dincer, & Payne, 2010; Barreto, 2001; Batabyal & Chowdhury, 2015; Chong & Gradstein, 2007; Dincer & Gunalp, 2008; Gupta, Davoodi, & Alonso-Terme, 2002; Gyimah-Brempong, 2002; Li, Xu, & Zou, 2000; Serra, 2006; Shabbir & Anwar, 2008; Uslaner, 2007, 2011; You & Khagram, 2005.

[6] Cooperation of countries in the Asian region can be through the Association of South East Asia Nations (ASEAN). The Association of South East Asia Nations (ASEAN) is a form of bilateral cooperation between Southeast Asian countries in various fields of politics and economics. The hope is that this research can increase cooperation among countries in the Asian region, so they can cooperate in the efforts to eradicate corruption, in their region in particular. Various forms of cooperation efforts to eradicate corruption have been tried, one was by the countries that are incorporated in the Organization for Economic Cooperation and Development (OECD) who signed the Convention Combating Bribery of Foreign Public Officials in International Business Transactions (Cuervo-Cazurra, 2006).

2. The Relationship between Income Inequality and Corruption

Several studies have identified the effect of corruption on economic growth and income inequality[7]. Inequality can be caused by humans' rational behavior (Birdsall, 1998). Birdsall (1998) argues that men from wealthy families tend to choose women from wealthy families as their spouses, and vice versa. Naturally, individuals feel comfortable in a relationship if there is no inequality between the two people. Another phenomenon is that the poor tend to have more children than the rich (Birdsall, 1998). The higher number of children leads to higher family life needs, resulting in lower per capita expenditure. This causes lower levels of health and education, so that poor families tend to remain poor. From this phenomenon, Birdsall (1998) argues that inequality is a form of world injustice because income inequality can occur naturally from humans' rational behavior.

The levels of income inequality and people's poverty will worsen with higher levels of corruption (Gupta, Davoodi & Alonso-Terme, 2002)[8]. Tanzi (1998) argues that systemic factors, such as social norms and attitudes, changes in foreign economic policies, and government activities are an important determinant of income inequality. According to Tanzi (1998), with the closeness of traditional community groups that have a limited public sector involvement, social norms become very important; whereas the role of government and the impact of foreign economic pressures become more important for more developed, open societies.

Tanzi (1998) added that income inequality is created because of the contribution of social norms, and the distribution of assets to social capital and positional rents[9]. Thus, the government plays a role in the formation of human capital formation, and affects the condition of income inequality. This opinion is linear with that of Eicher, García-Peñalosa, van Ypersele (2009), who stated that income inequality occurs due to institutional and educational factors.

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[7]The studies identifying the effects of corruption on economic growth include Adenike, 2013; Bardhan, 1997; Barreto, 2001; Dreher & Gassebner, 2013; Dridi, 2013; Dzhumashev, 2014; Erlich & Lui, 1999; Ghalwash, 2014; Lui, 1985; Mauro, 1995; Meon & Sekkat, 2005; Meon & Weill, 2010; Mo, 2001; Svensson, 2005. The research that attempts to identify the effects of corruption on income inequality include that by Barreto, 2001; Batabyal & Chowdhury, 2015; Dincer & Gunalp, 2008; Gupta, Davoodi, & Alonso-Terme, 2002; Gyimah-Brempong, 2002; Mo, 2009; Serra, 2006; Uslaner, 2007, 2011; You & Khagram, 2005.

[8]Gupta, Davoodi, & Alonso-Terme (2002) identify several important variables that are capable of influencing the distribution of income, including natural resource endowment, as a share of natural resources in total exports, the initial income of the poor, initial secondary schooling proxied as years of secondary education in the population aged 15 and over in the initial year, educational inequality that is proxied as a percentage of the adult population with completed secondary and higher education, capital stock-to-GDP ratio, and social spending relative to GDP. Furthermore, this study will accommodate these variables for identification.

[9] With the development of a country, income inequality will be more affected by the distribution of human capital than the distribution of real assets.

SSewanyana, Okidi, Angemi, & Barungi (2004), explain that in Uganda, income inequality can be affected by the age of the head of the household, the gender of household's head, the number of family members, the level of education and public services. Lee, Kim, & Cin (2013) show that in Korea, income inequality can be affected by the education, per capita income, investment, unemployment rate, female unemployment rate, inflation, trade openness, and an aging population. While in the long run or the short term, income inequality can be affected by the national income and the level of economic openness (Bahmani-Oskooee, 2008)[10].

The inequality in income is believed to be a problem caused by financial factors. Clarke, Xu, & Zou (2003) found that the development of the financial sector was able to reduce income inequality. Batabyal & Chowdhury (2015) developed this by identifying the combined effects of financial sector development policies and the eradication of corruption on income inequality. The results of their research, in Commonwealth countries, indicate that the simultaneous use of policies for reducing corruption and developing the financial sector will have a greater impact on decreasing income inequality than the implementation of the two policies separately.

Gyimah-Brempong (2002) found that corruption had a negative effect on economic growth and income distribution in African countries. This suggests that increased corruption is positively correlated with income inequality. Furthermore, Gyimah-Brempong (2002) explains that the combined effect of decreasing income growth and increasing inequality suggests that corruption is more detrimental to the poor than the rich in African countries.

You & Khagram (2005) argue that income inequality can lead to corruption because rich people can pay bribes more easily, because they have more wealth than the poor. The rich usually occupy strategic and important positions, so that they have more power to corrupt, especially by extortion and embezzlement. Poor people are more vulnerable to being declared illegal, so income inequality increases. Then, through the field experimental method, Fried, Lagunes & Venkataramani (2010) found that police tend to ask for bribes from lower-class individuals and tend to let the rich go, in the case of traffic violations. Their study concludes that corrupt behavior tends to benefit the rich, because of the higher likelihood of the demand for bribes by the police from the poor. The results of Fried, Lagunes & Venkataramani (2010)

[10] Bahmani-Oskooee (2008) with a sample of 16 countries namely Chile, Colombia, Ecuador, Egypt, India, Indonesia, Iran, Kenya, Malaysia, Mauritius, Panama, Phillippines, Syria, the United States, Venezuela, and Zimbabwe used time series data analysis.

supports the conclusion of You & Khagram (2005), that income inequality can lead to corruption.

You & Khagram (2005) also found that income inequality has an adverse effect on the social norms related to corruption, and public confidence in the legitimacy of the rules and institutions. Further, You & Khagram (2005) added that the condition makes it easier for people to tolerate corruption as an acceptable behavior. Societies become more permissive. Therefore, You & Khagram (2005) stated that income inequality could affect corruption, and corruption could also affect income inequality, so the country falls into a vicious circle between corruption and income inequality. Similarly Uslaner (2007, 2011) stated that there is a trap between income inequality and corruption. Uslaner (2007, 2011) concluded that income inequality triggers corruption and corruption also triggers income inequality, resulting in the pitfalls of income inequality caused by corruption; while Apergis, Dincer, & Payne (2010) found a reciprocal causal relationship between corruption and income inequality in both the short term and long term.

The question of whether income inequality is one of the causes of corruption can also be identified through the study of the determinants of corruption (Aidt, 2003; Guerrero & Orreggia, 2008; Kolstad & Wiig, 2008; Swami, Knack, Lee, & Azfar, 2001; Serra, 2006; Svensson, 2005; Treisman, 2000). Of the many studies into the determinants of corruption, Serra (2006) used extreme bound analysis methods and found that the robust variables causing corruption are income, democratic systems, religion, colonial history, and political instability. Shabbbir & Anwar (2008) added that the determinants of corruption in developing countries are economic freedom, globalization, the development level, and education level. Meanwhile, according to Serra (2006), Shabbir & Anwar (2008), income inequality is not a robust variable as a determinant of corruption.

Chong & Calderon (2000), Li, Xu & Zou (2000) found that corruption's relationship with income inequality is in the form of an inverted U. However, Barreto (2001) found no such quadratic relationship. In general, the existing research finds that there is a positive correlation between income inequality and corruption: The higher the level of corruption, the greater the income inequality[11].

In fact, the difference in research lies only in the form of causality; whether income inequality can affect corruption and/or corruption can also affect income inequality. Apergis,

[11]The studies are Apergis, Dincer, & Payne (2010), Barreto (2001), Batabyal & Chowdhury (2015), Dincer & Gunalp (2008), Gupta, Davoodi, & Alonso-Terme (2002), Gyimah-Brempong (2002), Uslaner (2007, 2011), You & Khagram (2005).

Dincer, & Payne (2010), Uslaner (2007, 2011), You & Khagram (2005) conclude that there are traps caused by corruption and income inequality. The existence of these disagreements lies behind this study's attempts to identify the form of causality between corruption and income inequality.

3. Methodology

In identifying the effect of corruption on income inequality, this research attempts to model corruption as a bribe to obtain a business permit by developed and used the model by Barro & Sala-i-Martin (2004: 85). In this case, it is assumed that bureaucratic households receive bribes from companies in order to get the permits of business easier. Then, each household i.e. bureaucratic household and worker household, maximizes their utility. Households use income that is not consumed to accumulate more assets. Therefore, we can identify that the flow of assets in bureaucratic households, as bribery recipients, is greater than in workers' households. Then, the capital growth between bureaucrat and worker households has a difference, in which the growth of bureaucratic households' capital is higher than that of the workers' households. The development of model by Barro & Sala-i-Martin (2004: 85) would be written as follows.

The flow of household assets of workers is:

$$\dot{a}_{nç} = \left(r - n_{nç}\right)a_{nç} + (w)_{nç} - c_{nç} \quad \text{(1)}$$

The flow of a bureaucrat's household assets, as the recipient of bribes from the company is:

$$\dot{a}_{be} = (r - n_{be})a_{be} + (w + b - g)_{be} - c_{be} \quad \text{(2)}$$

Changes in the capital growth of both types of households will lead to income inequality between the two types of households, in both the short run and long term. When transfers (bribes) from companies to bureaucrats are directly used in their economic activities, then income inequality can occur in the short term. The use of *bribery money* directly in the economic activities of bureaucratic households is influenced by the degree of detection of corruption, or the corruption level of the legal system. It is reflected by governance variable (g) in the model. Thus income inequality can occur because of the bribes that cause the asset flow and capital growth to be different between the two types of households. Inequality of income can occur due to bribery by a private individual to bureaucrats. A bribe given by a company can lead to a reduction in the wages of workers or an increase in consumer expenditure, due to higher prices. Therefore, the gap in both households' capital growth will be greater. Then, income inequality between the workers' and bureaucrats' households will be higher.

This research wants to identify the existence of the corruption-income inequality trap in Asia. This is because, in general, countries in Asia have high levels of corruption and weak governance systems[12]. Corruption-income inequality trap occurs when there is a mutual influence between corruption and income inequality. This will be identified through two regression models, namely one with income inequality as the dependent variable and the other with corruption as the dependent variable. The first model has income inequality as the dependent variable and corruption as the independent variable. The second model has corruption as the dependent variable and income inequality as the independent variable. This study will identify, in greater depth, the influence of corruption on income inequality and the effect of income inequality on corruption, controlled by the variables affecting corruption and income inequality, according to the previous research.

Equations 1) and 2) explain that income inequality can be affected by population growth, the value of rent for capital, capital, wage levels, and the rate of bribery. In addition to accommodating the variables in the theoretical model, other independent variables adopted from Apergis, Dincer & Payne (2010), You and Khagram (2005) are as follows:

$$GINI_{it} = \alpha_i + \gamma_{1i} COR_{it} + \gamma_{2i} Z_{it} + \varepsilon_{it} \quad \text{………………………………………………….. (3)}$$

The Z variable is a vector of the macroeconomic variables, consisting of the levels of openness to trade, investment, the unemployment rate, population structure, and globalization. The level of globalization is measured by certain trade variables, namely the sum of the exports and imports of Gross Domestic Product (GDP). To identify the effect of income inequality on corruption, this study only uses variables that are considered robust in affecting corruption, according to Serra (2006), Shabbbir and Anwar (2008) so as to contribute methodologies to the previous studies. The research model is as follows:

$$COR_{it} = \alpha_i + \gamma_{1i} GINI_{it} + \gamma_{2i} X_{it} + \varepsilon_{it} \quad \text{…………….………………………………….…. (4)}$$

Variable X is a vector of the macroeconomic variables consisting of income, governance, education level, and globalization. The identification of the variables in models (3) and (4) is shown in Appendix 1.

The causality analysis between corruption and income will be done with Ordinary Least Square (OLS) and Tobit Regression methods. This is because the dependent variable of the research model is the index scale. The dependent variable of corruption and income inequality is expressed in the form of the index with a scale from 0 to 100. The use of a Tobit regression in this study is expected to be a contribution to the literature, because previous

[12] Basically the *grease the wheel hypothesis* states that corruption can have a positive impact on economic growth in countries with weak governance.

research (You & Khagram, 2005) usually used a regression analysis with the OLS method in estimating the relationship of corruption and income inequality, in which corruption was a dependent variable or vice versa, and income inequality became the dependent variable. This research will use the OLS method as the comparison with the Tobit method, and a 2SLS method analysis with instrumental variables.

To overcome any bias due to the potential problems of endogeneity, due to the emergence of reciprocal effects between corruption and income inequality, instrument variables are used. The instrument variables are an ethnic index and religious fractionalization index for the corruption variables, as used in the research of Dincer & Gunalp (2008). Meanwhile, the mature cohort size variable will be used as an instrumental variable for income inequality's affect on corruption, as used by You & Khagram (2005). The mature cohort size variable represents the ratio of the population aged 65 years and over to the population aged 15 to 64 years. The mature cohort size variable is assumed to affect only the income inequality variables and does not directly affect the corruption variables.

4. Results and Discussion

The result of the regression analysis using the OLS method is shown in Table 1 and the analysis using the Tobit regression method is in Table 2. Because of the missing data on the independent and dependent variables, the sample of Asian countries becomes diminished. The sample data of the research that met the requirements for it to be analyzed numbered 56 samples[13].

[13] Research samples that can be analyzed consist of 14 countries namely Armenia (2007-2009), Azerbaijan (2008), Bangladesh (2005, 2010), Bhutan (2007, 2012), China (2008, 2010), Iran (2005, 2009), Malaysia (2004, 2007, 2009), Mongolia (2010), Pakistan (2004, 2007, 2010, 2011, 2013), the Philippines (2003, 2006, 2009), Thailand (1996, 1998, 2002, 2004, 2006-2013), Turkey (2008-2013), Ukraine (2002-2014), and Vietnam (1998).

Table 1. *The Influence of Corruption on Income Inequality in Asia Using the OLS Method*

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Corruption	-2.645***	-2.693***	-2.367**	-2.123**	-0.410	-0.639
	(0.890)	(0.895)	(0.903)	(0.961)	(0.886)	(0.852)
Unemployment	-0.278**	-0.273**	-0.276**	-0.266**	-0.112	-0.118
	(0.120)	(0.121)	(0.118)	(0.119)	(0.122)	(0.122)
Ln_GDP per capita	6.451***	6.349***	5.658***	5.633***	5.073***	5.219***
	(1.140)	(1.151)	(1.213)	(1.232)	(1.309)	(1.293)
Primary education	0.188**	0.180**	0.136**	0.144*	0.104	0.108
	(0.073)	(0.073)	(0.078)	(0.077)	(0.070)	(0.070)
Secondary education	0.004	0.003	0.031	0.023	0.046	0.040
	(0.055)	(0.055)	(0.057)	(0.056)	(0.047)	(0.047
Tax revenue	-0.730***	-0.734***	-0.840***	-0.850***	-0.576**	-0.566**
	(0.202)	(0.203)	(0.210)	(0.214)	(0.237)	(0.238)
Health expenditure	-1.254**	-1.186**	-1.177**	-1.047**	0.225	0.197
	(0.498)	(0.507)	(0.498)	(0.508)	(0.657)	(0.661)
Share capital	0.091	0.082	0.052	0.061	-0.021	-0.023
	(0.074)	(0.075)	(0.076)	(0.075)	(0.069)	(0.070)
Population growth	2.499***	2.498***	2.392***	2.488***	2.219***	2.200***
	(0.759)	(0.762)	(0.751)	(0.751)	(0.693)	(0.696)
FDI	-0.464***	-0.481***	-0.476***	-0.453***	-0.347**	-0.370***
	(0.149)	(0.151)	(0.149)	(0.150)	(0.130)	(0.131)
Democracy	-0.027	-0.045	-0.199	-0.169	0.210	0.212
	(0.196)	(0.198)	(0.217)	(0.212)	(0.203)	(0.206)
Governance	8.207***	8.671***	9.821***	9.734***	6.013***	6.274***
	(2.528)	(2.600)	(2.657)	(2.660)	(2.229)	(2.321)
Trade	0.004	0.002	-0.004	-0.002	-0.004	-0.006
	(0.022)	(0.022)	(0.022)	(0.022)	(0.021)	(0.021)
Capital growth		0.024	0.107*	0.085*		0.009
		(0.029)	(0.060)	(0.050)		(0.025)
GDP per capita growth			-0.250			
			(0.159)			
Corr*GDPCapGrowth				-0.064	-0.015	
				(0.043)	(0.021)	
Expense					-0.365***	-0.355***
					(0.094)	(0.093)
Constant	-8.010	-5.715	5.737	3.630	-0.095	-0.469
	(12.230)	(12.594)	(14.352)	(13.903)	(10.923)	(11.124)
F test	19.23***	17.76***	17.34***	17.22***	25.27***	25.00***
Adj R^2	0.8116	0.8101	0.8167	0.8156	0.8750	0.8738
N	56	56	56	56	53	53

Note: standard error in parentheses

*** p<0.01, ** p<0.05, * p<0.1. All models have met the OLS assumption of passing the test of normality, non-heterokedasticity, and non-multicolinearity.

Source: author's calculation (2017)

Table 1 and Table 2 show that corruption has a significant effect on income inequality in Asia. The lower the level of corruption in a country, the lower is the level of income inequality in that same country. The countries in the Asia region with samples that could be analyzed are: Armenia, Azerbaijan, Bangladesh, Bhutan, China, Iran, Malaysia, Mongolia, Pakistan, the Philippines, Thailand, Turkey, Ukraine, and Vietnam. Although models (5) and (6), using the OLS and Tobit methods show that corruption has a negative effect, it is not significant, but in general, we can conclude that a lower level of corruption can lead to a lower level of income inequality.

Table 2. *The Influence of Corruption on Income Inequality in Asia Using the Tobit Method*

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Corruption	-2.666***	-2.723***	-2.374***	-2.107**	-0.395	-0.625
	(0.782)	(0.777)	(0.773)	(0.822)	(0.749)	(0.720)
Unemployment	-0.282***	-0.277**	-0.281***	-0.270**	-0.116	-0.122
	(0.105)	(0.105)	(0.101)	(0.102)	(0.103)	(0.103)
Ln_GDP per capita	6.494***	6.381***	5.636***	5.607***	5.119***	5.231***
	(1.002)	(0.999)	(1.038)	(1.054)	(1.107)	(1.092)
Primary education	0.187***	0.177***	0.129*	0.137**	0.102*	0.105*
	(0.064)	(0.064)	(0.067)	(0.066)	(0.059)	(0.059)
Secondary education	0.004	0.003	0.003	0.024	0.047	0.041
	(0.048)	(0.048)	(0.049)	(0.048)	(0.040)	(0.040)
Tax revenue	-0.744***	-0.750***	-0.867***	-0.879***	-0.590***	-0.580***
	(0.178)	(0.176)	(0.181)	(0.185)	(0.201)	(0.202)
Health expenditure	-1.267***	-1.190***	-1.181***	-1.040**	0.233	0.222
	(0.438)	(0.440)	(0.426)	(0.435)	(0.556)	(0.558)
Share capital	0.092	0.082	0.049	0.059	-0.023	-0.026
	(0.065)	(0.065)	(0.065)	(0.064)	(0.059)	(0.059)
Population growth	2.501***	2.499***	2.385***	2.489***	2.201***	2.187***
	(0.667)	(0.661)	(0.643)	(0.642)	(0.586)	(0.588)
FDI	-0.455***	-0.472***	-0.466***	-0.440***	-0.334***	-0.358***
	(0.131)	(0.131)	(0.127	(0.129)	(0.110)	(0.111)
Democracy	-0.021	-0.042	-0.208	-0.176	0.221	0.217
	(0.172)	(0.171)	(0.186)	(0.181)	(0.172)	(0.174)
Governance	8.326***	8.868***	10.15***	10.06***	6.106***	6.463***
	(2.222)	(2.262)	(2.289)	(2.291)	(1.885)	(1.966)
Trade	0.003	0.000	-0.006	-0.004	-0.005	-0.008
	(0.019)	(0.019)	(0.019)	(0.019)	(0.018)	(0.018)
Capital growth		0.028	0.118**	0.095**		0.013
		(0.026)	(0.052)	(0.044)		(0.021)
GDP per capita growth			-0.271*			
			(0.137)			
Corr*GDPCapGrowth				-0.069*	-0.014	
				(0.037)		
Expense					-0.373***	-0.363***
					(0.080)	(0.079)
Constant	-7.838	-5.192	7.335	5.060	0.102	0.203
	(10.743)	(10.932)	(12.346)	(11.952)	(9.234)	(9.409)
LR Chi2	107.3***	108.4***	112.3***	111.9***	127.4***	127.2***
Pseudo R2	0.2910	0.2942	0.3045	0.3035	0.3646	0.3638
N	56	56	56	56	53	53

Note: standard error in parentheses
*** p<0.01, ** p<0.05, * p<0.1.
Source: author's calculation (2017)

The results of the analysis also show the other variables that significantly influence the level of income inequality are the unemployment rate, income per capita, gross enrollment rate in primary education, tax revenue, health spending, population growth, Foreign Direct Investment (FDI), governance system, GDP per capita growth and total government spending. The higher the unemployment rate, the lower the income inequality level. High per capita

incomes can lead to higher income inequality. The greater the number of people there are who receive a primary school education can cause the level of income inequality to become higher.

The high tax revenues and government spending on the health sector can lead to low levels of income inequality. Increasing population growth has a significant positive effect on income inequality; this means that with increasing population growth, the income inequality level will become higher. A higher FDI value for the country can reduce the level of income inequality. Meanwhile, improved governance systems can actually increase income inequality. Furthermore, a higher percentage of government spending on GDP can lower the level of income inequality. Meanwhile, the growth in the gross fixed capital formation has a significant positive effect on income inequality, meaning that a higher growth for the gross fixed capital formation will cause higher income inequality.

Interaction variables between corruption and GDP per capita growth are also significant in influencing income inequality. With lower corruption and higher GDP per capita growth, this can lead to lower levels of income inequality. Higher GDP per capita growth can also lead to lower income inequality. The variables of this study which have no significant effect on income inequality are: Gross enrolment rates for secondary education, gross fixed capital formation (% of GDP), democracy and trade variables. Thus, the analysis of the effect of corruption on income inequality using both the OLS and Tobit methods concludes that corruption has a significant negative impact on income inequality. This shows that the level of income inequality will be lower with lower corruption in Asian countries.

Table 3. *The Influence of Income Inequality on Corruption in Asia Using the OLS Method*

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	-0.066***	-0.067***	-0.062**	-0.064**	-0.022	-0.023
	(0.024)	(0.025)	(0.024)	(0.025)	(0.031)	(0.031)
Unemployment	-0.017	-0.016	-0.015	-0.015	-0.022	-0.021
	(0.021)	(0.021)	(0.020)	(0.020)	(0.025)	(0.025)
Ln_GDP per capita	0.789***	0.779***	0.794***	0.786***	0.648**	0.621**
	(0.165)	(0.169)	(0.156)	(0.160)	(0.266)	(0.276)
Primary education	0.026**	0.025*	0.027**	0.026**	0.022**	0.021**
	(0.013)	(0.013)	(0.012)	(0.013)	(0.010)	(0.010)
Secondary education	-0.011	-0.011	-0.013	-0.012	-0.013	-0.013
	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)	(0.013)
Tax revenue	0.003	0.001	0.012	0.008	0.002	0.003
	(0.039)	(0.040)	(0.040)	(0.039)	(0.047)	(0.048)
Health expenditure	-0.041	-0.034	-0.029	-0.029	-0.157	-0.143
	(0.123)	(0.124)	(0.123)	(0.122)	(0.157)	(0.163)
Share capital	0.032**	0.031*	0.032*	0.031*	0.038***	0.036***
	(0.015)	(0.015)	(0.016)	(0.016)	(0.012)	(0.013)
Population growth	0.375**	0.375**	0.367**	0.371**	0.263	0.266***
	(0.180)	(0.180)	(0.179)	(0.179)	(0.183)	(0.180)
FDI	-0.092***	-0.094***	-0.091***	-0.093***	-0.073***	-0.076***
	(0.019)	(0.019)	(0.021)	(0.019)	(0.016)	(0.017)
Democracy	-0.018	-0.020	-0.008	-0.013	-0.032	-0.036
	(0.037)	(0.037)	(0.038)	(0.038)	(0.037)	(0.038)
Governance	1.321**	1.388**	1.245**	1.311**	1.039*	1.117*
	(0.530)	(0.532)	(0.478)	(0.499)	(0.607)	(0.621)
Trade	0.002	0.002	0.002	0.002	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Capital growth		0.003	-0.003			
		(0.003)	(0.007)			
GDP per capita growth			0.019	0.012		0.003
			(0.020)	(0.009)		(0.003)
Expense					0.038*	0.037
					(0.022)	(0.022)
Constant	-2.634	-2.298	-3.110	-2.740	-2.961	-2.563
	(2.455)	(2.456)	(2.095)	(2.302)	(2.727)	(2.819)
F test	23.98***	24.92***	26.21***	28.05***	24.95***	24.41***
Adj R^2	0.8385	0.8405	0.8426	0.8422	0.8530	0.8550
N	56	56	56	56	53	53

Note: standard error in parentheses

*** p<0.01, ** p<0.05, * p<0.1. Model (1), (2), (3), (4) have met the OLS assumption of passing the test of normality, non-heterokedasticity, and non-multicolinearity. Models (5), (6) have not met the non-multicolinearity assumption.

Source: author's calculation (2017)

In the same way, the research model to test the effect of corruption on income inequality is also used to examine the effect of income inequality on corruption. The test to identify the effect of corruption on income inequality is done with a robust method, because some models do not fulfill non-heteroskedasticity assumptions. Therefore, by using a robust method the model has met the assumption of non-heteroskedasticity. The test results of the effect of income inequality on corruption can be seen in Table 3 and Table 4. Models (5) and (6) in Table 3 are known not to meet the non-multicolinearity assumptions but other models

in the table meet the OLS regression assumption. Therefore, the conclusion for Table 3 will be based on Model (1) up to Model (4). Table 4 shows the test results using the Tobit regression method.

Table 4. *The Influence of Income Inequality on Corruption in Asia Using the Tobit Method*

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Inequality	-0.065***	-0.067***	-0.061***	-0.064***	-0.022	-0.023
	(0.019)	(0.019)	(0.020)	(0.019)	(0.027)	(0.026)
Unemployment	-0.016	-0.015	-0.014	-0.014	-0.020	-0.020
	(0.017)	(0.017)	(0.017)	(0.017)	(0.020)	(0.020)
Ln_GDP per capita	0.792***	0.783***	0.797***	0.789***	0.643***	0.617**
	(0.180)	(0.179)	(0.179)	(0.178)	(0.236)	(0.236)
Primary education	0.026**	0.025**	0.027**	0.026**	0.022*	0.021*
	(0.010)	(0.010)	(0.011)	(0.010)	(0.011)	(0.011)
Secondary education	-0.011	-0.011	-0.013*	-0.012	-0.013*	-0.013*
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
Tax revenue	0.005	0.003	0.015	0.010	0.005	0.006
	(0.032)	(0.032)	(0.034)	(0.032)	(0.042)	(0.042)
Health expenditure	-0.035	-0.029	-0.023	-0.024	-0.148	-0.134
	(0.074)	(0.074)	(0.074)	(0.074)	(0.105)	(0.105)
Share capital	0.031***	0.030***	0.031***	0.030***	0.037***	0.035***
	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)
Population growth	0.376***	0.376***	0.368***	0.371***	0.267**	0.270**
	(0.106)	(0.105)	(0.105)	(0.105)	(0.122)	(0.122)
FDI	-0.092***	-0.094***	-0.091***	-0.092***	-0.073***	-0.075***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.021)	(0.021)
Democracy	-0.021	-0.023	-0.011	-0.016	-0.035	-0.039
	(0.027)	(0.027)	(0.030)	(0.027)	(0.033)	(0.034)
Governance	1.339***	1.403***	1.256***	1.329***	1.054***	1.129***
	(0.348)	(0.354)	(0.391)	(0.344)	(0.373)	(0.381)
Trade	0.002	0.002	0.002	0.002	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Capital growth		0.003	-0.003			0.003
		(0.004)	(0.009)			(0.004)
GDP per capita growth			0.019	0.012		
			(0.022)	(0.010)		
Expense					0.038**	0.037**
					(0.017)	(0.017)
Constant	-2.693	-2.369	-3.206	-2.796*	-2.988*	-2.603
	(1.661)	(1.699)	(1.945)	(1.644)	(1.716)	(1.766)
LR Chi2	101.5***	102.2***	102.9***	102.8***	101.5***	101.6***
Pseudo R2	0.6393	0.6433	0.6480	0.6470	0.6619	0.6664
N	56	56	56	56	53	53

Note: standard error in parentheses
*** p<0.01, ** p<0.05, * p<0.1.
Source: author's calculation (2017)

From Table 3 and Table 4 it is known that income inequality can have a significant effect on the level of corruption. The higher the level of income inequality that exists can lead to higher levels of corruption. Another variable that significantly affects the level of corruption is per capita income, the gross enrollment rates for primary and secondary

education, gross fixed capital formation (% of GDP), population growth, FDI, and governance. High per capita income can lead to lower levels of corruption. The greater the number of people there are who get a primary school education can cause the level of corruption to decrease. However, the number of people who get secondary level schooling can lead to higher levels of corruption in significance of 10%. In the model (1), (2), (4) Table 4, the variable of secondary education do not significance in increasing the corruption variable. Therefore, it concluded that the variable of secondary education do not effect the corruption variable.

The high gross fixed capital formation (% of GDP) has a significant positive effect on corruption. This shows that a higher gross fixed capital formation (% of GDP) can lead to lower corruption. A higher population growth can have a significant effect, lowering the level of corruption. High FDI values can have a significant effect, causing high levels of corruption in Asia. Furthermore, improved governance systems can reduce the level of corruption in Asian countries.

The analysis of the effect of income inequality on the level of corruption using the OLS and Tobit methods concludes that income inequality has a significant negative impact on the level of corruption. This shows that a higher level of income inequality can lead to higher levels of corruption in Asian countries. The results of the analysis in this study conclude that the trap of income inequality and corruption does exist, that is, corruption can affect income inequality and income inequality can affect corruption. The results of this study support You & Khagram (2005), Apergis, Dincer & Payne (2010), Uslaner (2007, 2011).

To conduct a more in-depth analysis, the research attempts to identify the relationship between corruption and income inequality using a Two-Stage Least Square (2SLS). This is because the results of You & Khagram (2005) and Uslaner (2007, 2011) indicate a mutual influence between corruption and income inequality, which may lead to a potential bias. Therefore, this study attempted to use the variables of the instruments of the ethnic fractionalization index against the corruption variables as used by Dincer & Gunalp (2008) and You & Khagram (2005). However, this study attempts to add a new instrument variable, which is the religion fractionalization index. According to Treisman (2000), the religion variable can influence the corruption level of a country. The result of the analysis using the 2SLS method to identify the effect of corruption on income inequality is as in Table 5.

Table 5. *The Influence of Corruption on Income Inequality in Asia Using the 2SLS Method*

Variable	(1)	(2)	(3)	(4)	(5)
Corruption (IV= ethnic, language and religion fractionalization index)	-14.961**	-9.976***	-10.058***	-10.233***	-10.368***
	(6.076)	(2.702)	(2.708)	(3.030)	(2.890)
Unemployment	0.159	-0.262	-0.254	-0.253	-0.253
	(0.141)	(0.168)	(0.168)	(0.171)	(0.173)
Ln_GDP per capita	4.478	9.690***	9.524***	9.746***	9.917***
	(2.721)	(1.916)	(1.909)	(2.251)	(2.011)
Primary education	-0.156	0.306***	0.292***	0.305**	0.315***
	(0.139)	(0.109)	(0.109)	(0.126)	(0.113)
Secondary education	-0.135	-0.094	-0.097	-0.105	-0.111
	(0.096)	(0.084)	(0.084)	(0.095)	(0.089)
Tax revenue	-0.042	-0.274	-0.280	-0.246	-0.222
	(0.358)	(0.320)	(0.319)	(0.366)	(0.338)
Health expenditure	2.045*	-0.887	-0.774	-0.772	-0.779
	(1.104)	(0.708)	(0.719)	(0.730)	(0.739)
Share capital	0.569***	0.319**	0.304**	0.314**	0.324**
	(0.216)	(0.127)	(0.127)	(0.142)	(0.131)
Population growth	6.654***	4.366***	4.365***	4.415***	4.455**
	(2.245)	(1.226)	(1.224)	(1.290)	(1.271)
FDI	-1.129**	-1.012***	-1.039***	-1.047***	-1.052***
	(0.487)	(0.275)	(0.279)	(0.292)	(0.292)
Democracy	0.045	-0.171	-0.201	-0.162	-0.134
	(0.388)	(0.278)	(0.280)	(0.313)	(0.286)
Governance	27.091***	15.143***	15.914***	15.69***	15.509***
	(10.103)	(4.205)	(4.326)	(4.333)	(4.378)
Trade		0.019	0.016	0.017	0.019
		(0.031)	(0.031)	(0.033)	(0.032)
Capital growth			0.040	0.018	
			(0.041)	(0.092)	
GDP per capita growth				0.067	0.109
				(0.253)	(0.117)
Constant	56.092**	-26.707	-22.924	-26.195	-28.708
	(23.158)	(18.190)	(18.425)	(23.441)	(18.933)
Wald	25.55**	136.5***	137.2***	133.9***	130.12***
Wu-Hausman	18.45***	31.80***	31.99***	29.03***	31.21***
Weekness instrument	2.753**	3.603**	3.498**	2.852**	3.265**
Sargan Test	4.354	3.432	3.426	3.354	3.288
N	83	56	56	56	56

Note: standard error in parentheses
*** p<0.01, ** p<0.05, * p<0.1.
Source: author's calculation (2017)

The result of the analysis with 2SLS shows that the instrument variables consisting of ethnicity, language and the religion fractionalization index have been qualified as good instruments. Therefore, this study concludes that variable corruption significantly affects income inequality in Asia. The negative sign indicates that a lower level of corruption triggers a lower level of income inequality. Other robust variables significantly affecting income inequality in Asia are: Per capita income, the gross enrollment rate for primary education, gross fixed capital formation (% of GDP), population growth, FDI, and governance.

The higher per capita income tends to lead to higher levels of income inequality. A higher gross enrollment rate in primary education can have a significant effect by increasing the level of income inequality. Similarly with population growth; a higher population growth can lead to a higher rate of income inequality. The high gross fixed capital formation (% of GDP) has a significant positive effect on income inequality. This shows that a higher gross fixed capital formation (% of GDP) can lead to higher income inequality. Furthermore, a high value for a country's FDI tends to affect the level of income inequality, which becomes lower. However, a better level of governance can actually have a significant effect on the higher income inequality.

Further identification of the effects of income inequality on corruption using the 2SLS method has still not shown econometrically sound results. This is because the instrument variable (mature cohort size) used to measure income inequality was rejected by the endogeneity test. The results of the endogeneity test show that the income inequality variable is categorized as an exogenous variable in the model, so it is not necessary to use the instrument variables in identifying the effect of income inequality on corruption. Therefore the conclusion of the study of the influence of income inequality on corruption refers to the results of the analysis with the OLS and Tobit methods. Therefore, it is maybe necessary to look for an alternative instrument variable for further research.

5. Conclusion

Several studies have shown that corruption is detrimental to economic growth (Bardhan, 1997; Dzhumashev, 2014; Mauro, 1995; Meon & Sekkat, 2005; Mo, 2001; Shleifer & Vishny, 1993). On the other hand, corruption can also lead to higher levels of income inequality (Batabyal & Chowdhury, 2015; Dincer & Gunalp, 2008; Gyimah-Brempong, 2002; Gupta, Davoodi & Alonso-Terme, 2002; Mo, 2009). In fact, some researchers conclude that there is a mutual influence between corruption and income inequality (Uslaner, 2007, 2011; You & Khagram 2005).

The results of the analysis using the OLS, Tobit, and 2SLS regression methods show that the variable of corruption has a robust and significant effect on income inequality in Asia. The results conclude that a lower level of corruption triggers a lower level of income inequality. In other words, a higher level of corruption can lead to higher levels of income inequality.

Other variables that affect income inequality in Asia are per capita income, the gross enrollment rate in primary education, gross fixed capital formation (% of GDP), population

growth, FDI, and governance. High per capita income can lead to a higher income inequality. A high gross enrollment rate in primary education can significantly influence the high level of income inequality. A higher gross fixed capital formation (% of GDP) can lead to higher income inequality, as seem as the rate of population growth; a higher population growth can lead to a higher rate of income inequality. Furthermore, a high FDI value for a country tends to lead to a lower income inequality. The better the governance of a country is, this can actually have a significant effect on the high income inequality.

It has also been identified that a high level of income inequality can lead to higher levels of corruption. High per capita income can lead to lower levels of corruption. The greater the number of people who receive a primary school education can cause the level of corruption to lower. A higher gross fixed capital formation (% of GDP) can lead to lower corruption. A higher population growth can lead to a lower level of corruption. High FDI values can trigger high levels of corruption in Asia. Furthermore, improved governance systems can reduce the levels of corruption in Asian countries. Nevertheless, this research could contribute to the literature related to the theoretical modeling of the effect of corruption on income inequality, using the development of the Ramsey model. Furthermore, this study also proves a mutual influence between corruption and income inequality in Asia, known as the corruption-inequality trap. Therefore, more efforts are needed for the eradication of corruption. The further research, there needs to be using a different and more comprehensive research objects.

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Appendix 1.

Variables Identification

Variable	The Meaning of Variables	Reference	Source of Data
Inequality	Income inequality is measured by the Gini index, the higher it is, the higher income inequality is	Theoretical model You and Khagram (2005), Apergis, Dincer & Payne (2010)	World Bank
Corruption	Corruption is proxyed with the Corruption Perceptions Index, in which a higher index indicates a lower level of corruption	Theoretical model, You & Khagram (2005), Apergis, Dincer, & Payne (2010)	Transparency International
Unemployment	Unemployment Rate	Apergis, Dincer, & Payne (2010)	World Bank
Ln_GDP per capita	Real income per capita as a reflection of capital per capita	Theoretical model	World Bank
Primary education	Gross enrolment rate in primary education	Apergis, Dincer, & Payne (2010)	World Bank
Secondary education	Gross enrolment rate in secondary education	Apergis, Dincer, & Payne (2010)	World Bank
Tax revenue	Tax revenue (% of GDP)	Ramsey model development	World Bank
Health expenditure	Health expenditure, total (% of GDP)	Ramsey model development	World Bank
Expense	Expense (% of GDP). Expense is cash payments for operating activities of the government in providing goods and services.	Apergis, Dincer, & Payne (2010)	World Bank
Share capital	Gross fixed capital formation (% of GDP)	Lee, Kim, & Cin (2013)	World Bank
FDI	Foreign Direct Investment, net inflows (% of GDP)	Analogy of Cuervo-Cazurra (2006)	World Bank
Capital growth	Gross fixed capital formation (annual % growth)	Theoretical model	World Bank
GDP per capita growth	GDP per capita growth (annual %)	Theoretical model	World Bank
Trade	Merchandise trade (% of GDP)	You & Khagram (2005)	World Bank
Population growth	Population growth (annual %)	Theoretical model, Barreto (2001)	World Bank
Democracy	Instutionalized Democracy		The QoG Institute
Governance	Governance index (the average of six dimensions i.e. voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, control of corruption)	Theoretical model as proxy of the law variable in the model.	Worldwide Governance Index
Variable instrument of corruption: Ethnic, language and religion fractionalization index	The probability of a country's people speaking the same language, the probability of a country's people having the same religion	Dincer & Gunalp (2008)	The QoG Institute
Variable instrument of income inequality: Mature cohort size	The ratio of the population aged 65 years and over to the population ratio aged 15 to 64 years	You & Khagram (2005)	World Bank

Source: author identification (2017)