What helps countries avoid the middle-income trap?
A study of policy and institutional determinants

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Abstract

The essay identifies the factors that help countries avoid the middle-income trap. We study the effect of institutional indicators, and the educational and technological policy variables on the income growth of the middle-income countries, with the focus on the upper-middle income countries; using the Cross-section OLS estimation and the Fixed-Effects panel estimation. For the countries that have already passed the upper-middle income threshold, the tertiary education enrolment rate and technological policy variables have a positive and significant effect on the income growth. Regarding institutional indicators, the Strong Civil Society and the Bureaucratic Quality only have a positive effect on the growth in the estimation across countries.

Keywords: economic growth, middle-income trap, institutions, education, technology policies, upper-middle income countries

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1. Introduction

Recently, the middle-income trap has become an issue widely debated among the academics and policymakers in developing countries; especially in many East Asian nations that have experienced the high rate of growth in the past. They already have progressed from the low-income countries to be the middle-income countries. Some of them even became the upper-middle income countries and start looking forward to catch up with the predecessors such as the Republic of Korea and Taiwan, China. They have escaped poverty, transformed their economic structure to an industrial one and tightly integrated themselves with the global economy. However, they have just realised that the era of high growth they had enjoyed is over. They found themselves struggling with maintaining the competitiveness, and desperately competing with the newcomers that have the lower level of development in the labour-intensive industries. At the same time, their productivity is not as high as their role model countries. They start to worry that they will follow their Latin American counterparts, the widely cited example of the countries that fell into the long-term stagnation, instead of succeeding as the next tigers. In other words, they are in the mid-life crisis.

Many studies have argued that the educational and technological policies will help the middle-income countries, especially the upper-middle ones, achieve the higher level of productivity and eventually avoid the *'trap'*. However, the implementation of good policies also needs the good institutional background. Without the good bureaucracy, the policies are hardly well delivered. Concurrently, the unaccountable executive branch of the government often have the incentive to divert from the good policy recommendation for the sake of self-interest.

This study tests the relationship between the institutional characteristics and economic growth, in addition to the educational and technological policies, with the focus on the upper-middle income countries. The study aims to identify the institutional characteristics that have a positive relationship with the growth, using the Cross-section OLS estimation and the fixed-effects panel estimation. While the study confirms the positive effect of the tertiary education and the technological policy variables on the growth, it also recognises two institutional characteristics; namely the Strong Civil Society and the Bureaucratic Quality. However, the study cannot prescribe the policymakers on the institutional characteristics that they should improve.

The next section reviews the previous literature on the definition of the middle-income trap, and then we look at the literature on the relationship between the institutional and policy variables and income growth. Thereafter, we discuss the data and methodology followed by the results. Lastly, we discuss the results and policy implication before concluding the essay.

2. Literature Review

This section outlines the definition of the middle-income trap. Thereafter, we shall move to discuss the causes of and the possible recommendation to avoid or escape the middle-income trap from the previous literature. This provides the background for study before we move on to the theory that we shall use in this paper and the formation of the research question in the next section.

2.1 What is the middle-income trap?

The term *'poverty trap'* has long been discussed among the development economists as the phenomenon that the poor countries, which usually have the higher returns to capital, cannot achieve the high growth rate and have to stay in chronic poverty. For the middle-income countries, however, they also risk falling into the *'middle-income trap'*, the term stylising the situation where the countries have escaped the poverty trap and became the middle-income countries, but are struggling to grow further and converge with the high-income countries. (Kharas & Kohli, 2011) There are some middle-income countries, especially the Latin American countries, that fell into this trap because they have the low growth rate and in some case even the reduction in the income level; while some, such as the Republic of Korea, can maintain the high growth rate, avoid the trap, and progress to the high-income level. (ibid.)

However, the specific definition of the middle-income trap remains unclear. To define the trap, we need to recognise the length of time that the country have to spend as the middle-income country in order to be considered as being fallen into the trap. Felipe, et al. (2012) used the median of the years that the countries in their sample have progressed from one World Bank's income category to another World Bank's income category. The categories consist of the low-income, the lower-middle income, the upper-middle income, and the high-income categories. Regarding their focus on the middle-income trap, they separated the analysis between the lower-middle income trap and the upper-middle income trap. They defined the threshold of falling into the trap of 28 years for the former, and 14 years for the latter. The countries in the lower-middle income category must have an average annual growth rate at 4.7 percent to escape the lower-middle income trap; while the upper-middle income countries have to sustain an average annual growth rate at 3.5 percent.

Eichengreen, et al. (2012) used the growth slowdown framework to identify the possible middle-income trap. There are three conditions for the growth slowdown. First, the average growth in the seven-year period prior to the slowdown is higher than 3.5 percent per annum. Second, the average growth difference between the seven-year periods preceding and following the point of the slowdown is higher than 2 percent per annum. Lastly, the income per capita is higher than 10,000 US Dollar in 2005 constant international PPP prices. They found that the growth slowdown occurs once the country progress to the income level roughly at 16,000 US Dollar. In their updated work

(Eichengreen, et al., 2013), they identified another slowdown point at 11,000 US Dollar. So the slowdowns occur as steps.

Im & Rosenblatt (2013), however, have a different position on the existence of the middle-income traps. They studied the probability that the countries in different income levels will stay in or make a transition to other author-defined income categories. The finding is that, while the countries in the low-income group have very high probability (> 0.9) to remain in the same income group, the probability of the countries in the higher income level to stay in the same income group is gradually reducing as they progress the development path. They concluded that there is no concrete evidence of the middle-income trap, in the same fashion as the poverty trap, as the middle-income countries are more likely to progress the path up than the low-income countries. They also noted the higher growth volatility among the middle-income countries. This implies that the middle-income countries' growth is not trapped, but they are more vulnerable to the negative shocks especially macroeconomic shocks such as the 1997 Asian Economic Crisis. However, they still realised that the very high growth rate is necessary for the middle-income country to achieve the United States' income level. They acknowledged the fact that it is far-reaching to expect all countries to finally achieve the same income level but it is possible for most countries to progress to the high-income level, which is about 60 percent of the United States' income level. From their argument, we may still use the middle-income trap argument to help focus the policy discussion on the success of development outliers such as the newly industrialised countries in East Asia.

2.2 What cause the middle-income trap, and how to avoid them?

Kharas & Kohli (2001) argued that the low- and middle- income countries have different channels of growth. For the low-income countries; the movement of factors, especially the labour, from the lower productivity to the higher productivity activities, specifically the export sector, is adequate to boost the growth. The role of government is only to provide market supporting infrastructure. Capital accumulation is relatively easy as it only requires good financial market. However, the middle-income countries are facing tougher task. The factors have already moved to the higher productivity activities, which lowered the return to capital. The demand side policy became the importance. The middle-income countries have to produce higher quality products that attract consumers in the global market. At the same time, they have to focus on the domestic market. At this moment, the income distribution is crucial because income growth is dependent on demand of lower- and middle- classes. To avoid the middle-income trap, they suggested the countries to transform their economy through three channels; finding specialisation in the industries that the country do best in order achieve the scale and offset the negative impact from the higher wage, supporting the higher education and innovation to boost the growth through the Total Factor Productivity (TFP), and to decentralise the government so that the decision-making can response to the economic incentive in the

local level. They also suggested the middle-income countries to focus on the income redistribution, and on the institutional development to support the higher education and good governance.

Eichengreen, et al. (2012) argued under their growth slowdowns framework that the main causes of the slowdown is from the fall of the capital stock share and, more importantly, the fall in the proportion of the Total Factor Productivity (TFP) share in the growth equation. Their updated work further explained several determinants of avoiding the growth slowdown. These includes the higher number of secondary and tertiary schools graduates, the higher technology export content. The democratisation, however, increase the chance of a slowdown in some case. Their explanation is that democracy can increase wages due to more labour movement participation. (Eichengreen, et al., 2013)

Aiyar, et al. (2013) also discussed the middle-income trap under the growth slowdown framework. They argued that the middle-income countries experienced the slowdowns more often than the countries in the other income groups. They tested the possible determinants of the slowdowns among the middle-income countries and have the following arguments. First, institutions affect the ability of the private sector to do business. They emphasised two institutional characteristics. One is the smaller government size, which helps the countries avoid the slowdown through limiting the government's involvement in the economy. Another is the light regulation, which has more effect once the countries move closer to the technological frontier. Second, the development in infrastructure helps reduce the probability of the slowdowns. Third, the regional integration also helps reduce the probability of the slowdowns. Lastly, the diversification of output and trade (in contrast to the specialisation) do not reduce the probability of the slowdown in the case of the middle-income countries; which agrees with Kharas & Kohli (2001).

Warr (2011) discussed the causes of the middle-income trap and the suggestion specifically for the case of Thailand. He argued that the growth collapse after the Asian Financial Crisis lowered the investment rate due to dampened confidence. This led to the decrease in Aggregate Demand in the short run, and the decrease in the capital formation rate, which affected the growth in the longer run. Thailand is facing a higher wage, which affects the return to capital and hence the rate of investment. To escape the trap, Thailand has to improve labour productivity through the investment in human capital, especially on the quality aspect of education. He argued that the bureaucratic complications in the ministry of education is one of the reason for the low quality of Thai education

3. Theory and Research Question

In this section, we shall look at the previous literature discussing the effect of the policy and institutional factors on the economic growth. We connect this literature to the question of avoiding the middle-income trap by relating these factors to the growth of the countries that have already progressed to the middle-income countries and now aims for catching up with the high-income countries. We conclude by formulating the research question that will lead us to the estimation methodology in the next section.

3.1 The relationship between institutional characteristics and income level

Recently, the relationship between the institutions and development has become the topic of interest among the researchers. For the middle-income countries, the good policies that respond to the challenges they are facing have been argued as the binding constraints of avoiding the middle-income trap. In this study, we want to find out whether the institutions also have the effects on the growth of the middle-income countries as the policy has.

Rodrik, et al. (2004) argued that the institutional quality is the most important factor in determining the cross-national income. They tested their argument against the two other competing ideas that support the importance of geography and trade openness. They used the instrumental variables for the institution and the trade openness variables due to the variables' endogenous nature. The proxy they used for the institution is the Rule of Law, with the settler mortality as the instrumental variable following Acemoglu, et al. (2001). They also considered the interaction between the institutions, geography, and the trade variables as the indirect effect. Because these factors, except geography, are endogenous. However, they acknowledged that they could not confirm the causal relationship from the use of instrumental variables. The institutions can mutate over time, and the use of geographically related variable as the instrument for the institutions denies this mutability.

Campos & Nugent (1999) looked at different institutional characteristics to examine their effects on the developmental aspects; specifically the income per capita, the adult illiteracy rate, and the infant mortality rates. They identified ten institutional indicators, which represents five institutional characteristics. Using Spearman rank correlation coefficients, they grouped the indicators that have high correlation together. Then, they picked the four institutional indicators that have low correlation so they represent different things. These are the Accountable Executive, the Strong Civil Society, the Bureaucratic Quality, and the Rule of Law. They tested them using the Cross-section estimation to find the relationship between the indicators and development aspects. Using income per capita as the dependent variable, they found that the Strong Civil Society has a positive and significant relationship with income per capita in East Asian countries sample; while the Bureaucratic Quality and the Rule of Law perform best for the Latin American countries.

3.2 The relationship between policy variables and income level

Islam (1995) proposed the use of panel data to identify the determinants of economic growth. He started with the Solow growth model, which composed of the accumulation of capital and labour, and the Total Factor Productivity (TFP) that the latter is the part of growth that cannot be explained by the two former determinants. Using panel data with the fixed effects estimator, this unexplained part of growth can be explained by using the policy variables. In his work, he used the average schooling year – secondary and the all levels of schooling – to identify their effect on the growth through the TFP part of the Solow's equation.

Lee & Kim (2008) examined the effect of the institutions and the economic policies on the growth of countries in different income levels. They used the executive constraint indicator from the Polity IV database as a proxy for institutions, while identified the educational and technological indicators of the countries for the policy variables. They tested the relationship between these variables and income separately for the countries in the lower and the higher income level. What they found is that the institutional variable has a positive relationship with the growth in both country groups. However, the effect is stronger for the lower-income countries group. In the higher income countries group, the ones that already have passed the upper-middle income threshold and looking forward to be the high-income countries; the higher level of education and technological policy variables became crucial to the growth.

3.3 Research Question

The purpose of this essay is to study the policy and institutional factors that affect the growth of the countries in different income groups, with the focus on the countries that already have progressed to be the upper-middle income countries using the World Bank classification. These countries already have escaped the poverty and are trying to converge to the high-income countries. We have discussed the possible cause of falling into the middle-income trap. It is that they are unable to change their policy to cope with the challenges they are facing, specifically their inability to compete with the lower income countries due to their higher wage while still lacking the high productivity to compete with the high-income countries. The possible strategy to avoid the middle-income trap is to sustain the high level of growth. We want to study the factors that enable this, with the focus on the policy and institutional determinants. Hence, our research question is

"What kind of policies and institutional characteristics help the upper-middle income countries to sustain a high growth rate and avoid the middle-income trap?"

4. Data and Methodology

This section will first discuss the description and the rationale for the choice of data used. The descriptive statistics of the data will provide the overview and the difference among different groups of country. Then, we shall outline the methodology we use to estimate what we want to study, specifically the effect of policy and institutions on economic growth.

4.1 Data

4.1.1 Country and period of study

The countries used in our study mainly follow Campos & Nugent (1999). We are interested in two regions, specifically Latin America and East Asia, because the data from these regions is widely available, and most of the countries have already escaped the poverty trap and progressed to be middle-income countries. Many Latin American countries are notable cases of being caught in the middle-income trap. Some East Asian countries have become success stories of catching up, while others are trying to avoid the middle-income trap. In contrast, African and South Asian countries are poorer, and their data is harder to find. Middle-Eastern countries have the development pattern distinct from countries in other regions, especially oil exporting countries.

We classify countries into two income groups. Our assumption is that the countries that have developed and just joined the middle-income group will need different factors to maintain growth rate and avoid the middle-income trap. The criteria we use is the World Bank classification for upper-middle income countries in 2012, which provides a reasonable threshold for the development level. The threshold is the 2012 current price Gross National Income (GNI) per capita at 3,976 US Dollar, using the Atlas method. Although the World Bank income classification uses only income, other development indicators such as infant mortality and poverty are also taken into account when they set the threshold income level. Countries with a certain income level mostly have a corresponding level in other indicators. Though the current price GNI is used, the World Bank adjust the thresholds for the inflation every year. The Atlas method also reduces the effect from exchange rate fluctuation in short-term. Therefore, the classification represents the fixed level of development over time. (Felipe, et al., 2012) According to the World Bank (1989), there is difficulty and the methodology issues in using Purchasing Power Parity (PPP) income for international comparison. For example, the PPP method can estimate the quantities of goods and services, but there is a serious problem on the quality difference across countries. The consumer preference also affects the validity of PPP. We classify all countries with GNI above the threshold as higher income countries, and classify the rest as lower income countries.

Table 4.1 lists the countries used in our study. Our country samples largely follow Campos & Nugent (1999). However, we drop Jamaica and Taiwan, China because the data is missing. We also add two countries, specifically China (People's Republic of) and Vietnam, due to their transition to market economy and increasing integration with the global economy in recent years. The samples consist of 29 countries. 11 countries is in lower income group, while 18 countries is in higher income groups.

Table 4.1: List of countries in the study

Lower income		**Higher income**	
Latin America	**East Asia**	**Latin America**	**East Asia**
Bolivia	Indonesia	Argentina	China*
El Salvador	Philippines	Brazil	Hong Kong SAR, China
Guatemala	Vietnam*	Chile	Republic of Korea
Guyana		Colombia	Malaysia
Haiti		Costa Rica	Singapore
Honduras		Dominican Republic	Thailand
Nicaragua		Ecuador	
Paraguay		Mexico	
		Panama	
		Peru	
		Uruguay	
		Venezuela	

* denotes additional countries from Campos & Nugent (1999) samples.

The period of study is from 1995-2012. We use a period later than the previous works due to two reasons. First, several countries have just passed the upper-middle income threshold; for example Brazil, Colombia, Thailand. We want to prove whether their growth determinants are the different one from lower income countries. Using historical data from earlier time, when they were lower income countries, might not reflect the pattern in recent years well. Second, the data on institutional indicators for recent years has become widely available.

4.1.2 Data sources and discussion on the choice of data

The income and policy variables data is from the World Bank's World Development Indicators (WDI), with one exception. The institutional variables data is from Polity IV project and Political Risk Services' (PRS) International Country Risk Guide (ICRG). The data from PRS is obtained via the World Bank's Worldwide Governance Index (WGI) as secondary source, because the primary source is only available commercially.

Dependent variable

The dependent variable is Gross Domestic Product (GDP) per capita. The choice of data we use is GDP per capita in constant 2005 US Dollar. The reason we do not use PPP adjusted GDP is the limitations abovementioned. However, instead of using current US Dollar GDP per capita, we use constant US Dollar GDP per capita because it is adjusted for inflation; in other words, it is the real income variable. Therefore, in the *level* cross-section estimation where we have to use average GDP per capita over years, the variable is not biased because of inflation rate. At the same time, in the *change* cross-section Ordinary Least Square (OLS) and Fixed Effects panel estimations, the growth rate is real and the bias from inflation is eliminated. The source of data is the World Bank's WDI.

Control variable

We use population growth rate as a control variable for the *change* estimations. It is *time-variant*. So we also have to control it in Fixed Effects panel estimation. The source of data is the World Bank's WDI.

Policy variables

The policy variables used in this study follows Lee & Kim (2008). The focus are the variables related to education and technological development, while the trade variable is included because of several authors' discussion the effect of trade openness and liberalisation on economic growth. (see Romer & Frankel (1999) or Wacziarg & Welch (2003) for example) However, Lee & Kim (2008) hypothesis is on the effect of the former on the economic growth. Our study uses a newer dataset to test whether their argument is still valid. We add institutional variables to test whether they also affect growth. The source of data for all policy variables, except patent applications, is the World Bank's WDI. Data for some countries in some years is missing. However, the use of average in the estimation dramatically reduces missing data. The policy variables are as follows.

First, Secondary school enrolment. We use gross enrolment ratio. It is the ratio of total enrolment to the population in official secondary education age. (World Bank, 2015) The source of data is the World Bank's WDI.

Second, Tertiary school enrolment. We use gross enrolment ratio. It is the ratio of total enrolment to the population in five-year age group after finishing secondary education. (World Bank, 2015) For example; if the age of finishing secondary education is 18 years old, then the five-year age group will be between 19-23 years old. The source of data is the World Bank's WDI.

Third, Number of the US patent applications per million population. We treat the variable as a proxy for technological development. The country that has a higher level of the technological development probably has a larger number of the patent applications. The use of the US patent applications removes the variation of the proxy's representativeness across countries. We use the

number of utility patent applications filed in the United States, by the country of origin. (US Patent and Trademark Office, 2015) The source of data is the US Patent and Trademark Office (USPTO). We divide the total number of applications by the population in millions from the same year, to obtain the number of applications per million populations. The source of population data is the World Bank's WDI.

Fourth, the Research and Development (R&D) expenditure as percentage of GDP. The source of data is the World Bank's WDI.

Fifth, the trade as percentage of GDP. It accounts for both imports and exports, of goods and services. (World Bank, 2015) Therefore, it is the openness index. The source of data is the World Bank's WDI.

Institutional variables

The four institutional characteristics capture different dimensions of governance institutions. These different institutional characteristics are complementary. However, the effects they had on the development objective are possibly not to the same extent, which Campos & Nugent (1999) tried to find out in their article. For example, they found that only the Strong Civil Society has a significant and positive relationship with income in East Asia; while the Bureaucratic Quality and the Rule of Law have a significant and positive relationship with income in Latin America. In this paper, we will use the same institutional variables they used as follows, though some limitation on the data force us to adopt the closest alternatives in some case, specifically the Law and Order.

First, the Accountable Executive indicator captures the extent that the government executive are responsible for its decision-making. (Campos & Nugent, 1999) Two indexes from Polity IV project measure two different aspects of this accountability. One is the executive constraint, which measures the limit on decision-making power that executive branch are subject to. It is ranked from 1, where executive branch have unlimited power, to 7, where the legislative or ruling parties have to appoint and provide the support to the executive. Another is the regulation of executive recruitment, which measures the degree that the selection of executive are subject to predetermined rule, either by birthright or by election. It is ranked from 1, which is for the unregulated recruitment such as a coup, to 3, which is for the regime with institutionalised recruitment process where it is hard for the ruling power to alter the rule. (Marshall, et al., 2013) The different dimensions of the Accountable Executive are interacted and expressed in single index. This is because the country with constraint but no regulation do not have a well-established constraint that prevent current ruler to change the rule to maintain their power perpetually, in other words, the constraint can be annulled easily. In contrast, the country without a constraint do not have the accountable executive in its own right, whether the regulation is well defined or not. To achieve the high score in the "Accountable Executive" require

the regime have both constraint and recruitment regulation on the executive. These indexes are interacted by multiplying each other, and then rescaled from 1-10.

Second, the Strong Civil Society indicator measures the extent public can participate and check the decision-making process. (Campos & Nugent, 1999) Two indexes from Polity IV project measure two different aspects of this characteristic. One is the competitiveness of political participation, which measures the opportunity that the alternative set of policies other than the prevailing one can compete in the politics. It is ranked from 1, where no opposition is allowed, to 5, where there is a regular competition between political groups in the national level. Another is the regulation of political participation, which measures whether the rule of participation is well established, either it is the totalitarian state where it is generally accepted that the participation is not allowed at all, or the western democracy where political groups are stable and compete under defined rule. It is ranked from 1, where there is no regulation at all, and political groups can evolve all the times, to 5, where political groups are stable. (Marshall, et al., 2013) The different dimensions of the Strong Civil Society are interacted and expressed in single index. The country with high score on the competition but low score on the regulation will has low level of the interacted "Strong Civil Society", because the competitiveness their political process has is unstable or alterable easily. In contrast, the country with low score on the competition but high score on the regulation has low level of the interacted "Strong Civil Society", because it is a well-established totalitarian state. These indexes are interacted multiplying each other, and then rescaled from 1-10.

Third, the Bureaucratic Quality index from International Country Risk Guide (ICRG) measures the extent bureaucracy are independent from politics and have stable recruitment process. High score means that the governance will not interrupt from political change; and the policy and administration are insulated from government change. The original index scaled from 0-4. (The PRS Group, Inc., 2012) However, we use secondary source from the World Bank's WGI, published as a rescaled index from 0-1 because the original index is only available commercially. We then rescale it again to 0-10.

Fourth, the Law and Order index from International Country Risk Guide (ICRG) measures the quality of legal system. Campos & Nugent (1999) used the indicator for Rule of Law Tradition from ICRG. However, it is not available in the current publication and the closest available is the indicator for the Law and Order. It measures two dimensions at the same time. The first one measures whether the law is strong and impartial. The second one is whether the law is observed in reality, in other words, whether judicial system works. The original index is scaled from 0-6 as a sum of each dimensions scaled from 0-3. (The PRS Group, Inc., 2012) However, we use secondary source from the World Bank's WGI, published as a rescaled index from 0-1 because the original index is only available commercially. We then rescale it again to 0-10.

The World Bank's WGI also represents the institutional characteristics close to what we use in our study. Their Government Effectiveness Index can represent the Bureaucratic Quality, while their Rule of Law Index can represent the Rule of Law. However, the pairwise correlation between both WGI's indexes is very high (>0.90). So they effectively capture the same factor underlying the institutional characteristics. The WGI is calculated by combining several institutional indexes published by other institutions. The World Bank published raw data they used to calculate their index, and several of them are the indexes from International Country Risk Guide (ICRG). We decide to use WGI's raw data as the secondary source for ICRG's indexes.

Regarding the ICRG's indicators, the year 1997, 1999, and 2001 are missing because WGI was published every two years before 2002. However, this does not pose any problem to our analysis because of two reason. First, the estimation use average level of variables, either for the whole period or for three-year span. Second, the institutional variables change slowly over time. Using variables from a year before or after will only affect the result little.

All institutional indicators are rescaled from 1-10, so we can compare the magnitude of coefficient easily. The coefficient means the change of dependent variable when the indicator increase by 1 out of 10, or by 10 percentage points.

4.1.3 Descriptive statistics

Here we discussed the general characteristics of the independent variables of our interest. We first look at the policy variables and thereafter move on to the institutional variables. Table 4.2 shows the means of policy variables, and the means differences between country groups. It can be seen that the value of variables are different between regions and between countries with different income levels. Considering the latter as it is our main interest in this study, all variables are significantly different. The difference between income groups of almost all variables are significant at 1 percent level. Only the difference of trade to GDP is significant at 5 percent level. The general picture is that the countries in higher income group have higher level of policy variables. Please note, however, that this comparison is highly endogenous; because countries with higher income level will also have better education and technological indicators. Education indicators can be viewed as the result of development success along with income level. In other words, we cannot determine the direction of effect. The difference in policies variables entices us to study whether policy variables still have the same effect once countries progress to be higher income countries. In this study, more emphasis is given to institutional variables, because this is our extension from Lee & Kim (2008) analysis, which mainly focused on policy variables. Table 4.3 shows the means of institutional variables, and the means differences between country groups. It can be seen that the lower and higher income group have roughly the same level of the Accountable Executive indicator. Regarding other variables, the differences between income groups are significant at 1 percent level. As expected, higher income

countries have better institutional characteristics. We also includes the data during 1982-1995 from Campos & Nugent (1999) for comparison. The characteristics of institutional variables between regions remain the same for both periods. Latin American countries have higher level of the Accountable Executive and the Strong Civil Society indicators; while East Asian countries have higher level of the Bureaucratic Quality, and the Law and Order (or Rule of Law) indicators.

Table 4.2: The means and means differences of policy variables

Period	**1995-2012**			
Region	**Latin America**	**East Asia**	**Lower income**	**Higher income**
Secondary school enrolment rate, in percentage	73.70 (0.99) 261	74.86 (1.39) 111	66.18*** (1.40) 124	77.98*** (0.89) 248
Tertiary school enrolment rate, in percentage	32.46 (1.21) 197	33.45 (2.13) 129	19.73*** (0.77) 121	40.59*** (1.46) 205
Patent applications per million populations	1.34*** (0.09) 293	68.44*** (9.97) 158	0.24*** (0.02) 128	34.59*** (5.21) 323
R&D expenditure, as percentage of GDP	0.32*** (0.02) 155	1.29*** (0.10) 93	0.11*** (0.01) 43	0.80*** (0.06) 205
Trade, as percentage of GDP	69.51*** (2.09) 353	157.91*** (9.27) 162	86.80** (2.89) 191	103.53** (5.62) 324

1. *,**,*** denote significance of the difference between the regions or income groups at 0.1, 0.05 and 0.01, respectively.
2. The standard deviation is in parenthesis. The number of observations is in the third line.

Table 4.3: The means and means differences of institutional characteristics

Period	**1982-1995**		**1995-2012**			
Region	**Latin America**	**East Asia**	**Latin America**	**East Asia**	**Lower income**	**Higher income**
Accountable Executive	50.87	42.05	8.10*** (0.09)	5.35*** (0.25)	7.27 (0.17)	7.32 (0.15)
Strong Civil Society	40.73	33.48	3.93* (0.15)	2.59* (0.08)	2.58*** (0.05)	4.15*** (0.17)
Bureaucratic Quality	3.89**	6.01**	4.74*** (0.12)	6.70*** (0.15)	4.48*** (0.17)	5.88*** (0.12)
Rule of Law	4.33**	6.38**				
Law and Order			4.41*** (0.09)	6.67*** (0.16)	4.33*** (0.13)	5.59*** (0.13)

1. *,**,*** denote significance of the difference between the regions or income groups at 0.1, 0.05 and 0.01, respectively.
2. The data from 1982-1995 is from Campos & Nugent (1999)
3. The interaction variables “Accountable Executive” and “Strong Civil Society” in our study are rescaled from 0-100 to 0-10. In contrast, Campos & Nugent (1999) study, which is assumed to rescaled from 1-100
4. The different across periods cannot be tested, as we do not have the raw data for the period 1982-1995.
5. The standard deviation is in parenthesis.

Next, we consider the correlation coefficients between the institutional indicators. High correlation between the institutional indicators means that they represent the same institutional characteristics; while low correlation means that they represent different characteristics. The choice of the indicators we use should have low correlation with each other, which means that they complement each other rather than substitute. In other words, we should not include two variables that represents the same things. Table 4.4 shows pairwise correlation coefficients. We can see that the Accountable Executive has small, negative, significant correlation with the Bureaucratic Quality and the Law and Order. Moreover, the pairs of indicators from the same sources have higher and significant correlation, specifically a pair of the Accountable Executive and the Strong Civil Society indicators, and a pair of the Bureaucratic Quality and Law and Order. However, the size of correlation coefficients is not high. Therefore, we can conclude that the choice of institutional variables represents different characteristics and is proper for further analysis.

Table 4.4: The correlation coefficients, p-values, and number of observations of the institutional characteristics

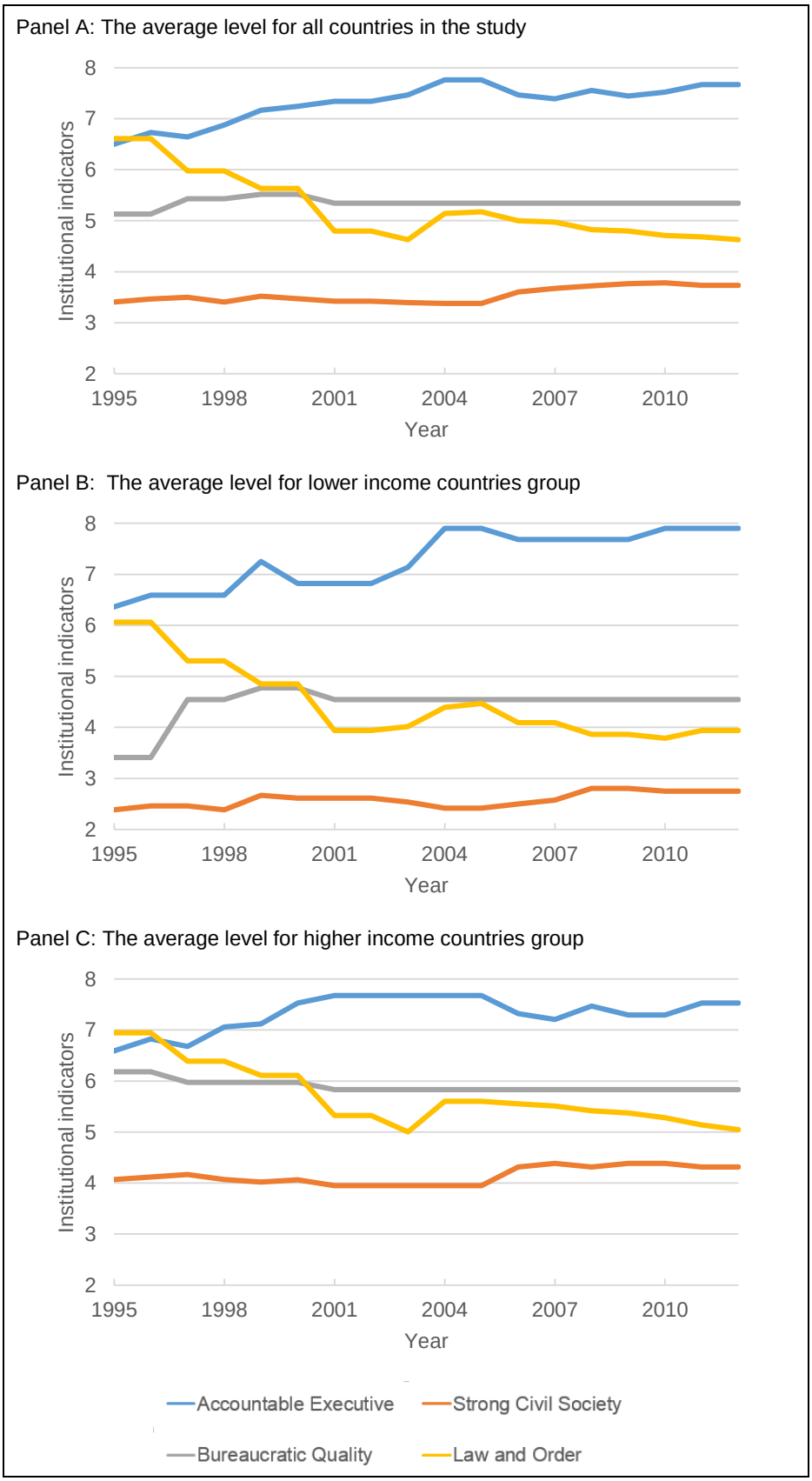
	Accountable Executive	Strong Civil Society	Bureaucratic Quality	Law and Order
Accountable Executive	1.0000			
	386			
Strong Civil Society	0.3883***	1.0000		
	0.0000			
	386	386		
Bureaucratic Quality	-0.1131**	0.0461	1.0000	
	0.0263	0.3662		
	386	386	386	
Law and Order	-0.2001***	0.0707	0.3673***	1.0000
	0.0001	0.1658	0.0000	
	386	386	386	386

1. *,**,*** denote significance level of correlation coefficients at 0.1, 0.05 and 0.01, respectively.

Lastly, we look at the change in the institutional indicators over the period of study, shown in figure 4.1. Panel A, B and C show the change of average level of indicators for all countries, lower income countries and higher income countries, respectively. While the level of indicators are different between income groups, the trend across time is quite the same. What we can say is that the institutional indicators we use are not *time-invariant*; they change over time. The level of Accountable Executive indicator was increasing over time in all countries groups. The level of Law and Order indicator was dramatically decreasing. The level of Strong Civil Society indicator was slightly increasing. Lastly, the level of Bureaucratic Quality indicators is worth special mentioning. Before 2001, the level was increasing in lower income countries group, while slightly decreasing in higher income countries group. However, the level remained constant afterwards in all countries groups. The secondary source of data for the Bureaucratic Quality indicator we use, the World Bank's WGI, has

been rechecked to ensure that it is not our calculation mistake. We confirm that the published raw data remained constant. We investigate further by using free sample ICRG table published by PRS. The only month available in the free sample is January 2015. We rescale back the Bureaucratic Quality indicator to the original scale (because we use the rescaled value published in WGI in our study) and compare the values. What we found this that the level for almost all countries in January 2015 remains as same as the level in 2002 and 2012. Only two countries, namely Bolivia and Mexico, have different level and they only changed slightly.

Figure 4.1: Change of the average institutional indicators over time



4.2 Estimation Methodology

The estimation strategy in this work will follow Campos & Nugent (1999) and Lee & Kim (2008). The techniques used are cross-section Ordinary Least Square (OLS) estimation and Fixed Effects panel regression.

The aim of estimation is to test the relationship between policy and institutional characteristics and economic growth of developing countries, especially for the ones that already have passed the upper-middle income threshold.

4.2.1 Cross-Section Ordinary Least Square (OLS) estimation

First, we shall estimate only the relationship between institutional variables and income level using the model follow Campos & Nugent (1999). Thereafter, we move on estimating the relationship that the policy and institutional variables have with the income growth rate follow Lee & Kim (2008).

Campos & Nugent (1999) classified countries by the regions, Latin America and East Asia. However, to fit the purpose of this study, we reclassified it by income level. Their cross-section OLS specification relates the relationship between income level (GDP per capita) and institutional characteristics. They did not study the effect institutional characteristics has on the growth rate. Therefore, this cannot imply that country with higher level of statistically significant institutional characteristics will achieve faster growth and avoid the middle-income trap. What we can see is only the relationship, for example, the country with higher or lower level of institutional characteristics usually have higher income level. We first use the following specification.

$$Y_i = \alpha_1 + \gamma_1 INST_i + \varepsilon_i \qquad (1)$$

Where Y_i is the average level of GDP per capita for the country *i* across the period of our interest. $INST_i$ is the average level of institutional variables for each country *i* across the period. What we can draw from the result is that the coefficients can tell the estimated average income level difference when the country have higher score on the institutional indicator by 10 percentage points. We first estimate only institutional variables themselves, and then we add the interaction terms between each institutional variables into the model to see whether there are substitutability and complementarity between variables. To calculate the interaction term, we pair two institutional variables and multiply one variable with another within the same pair, and then rescale the resulted value back to 0-10 scale. When institutional variables are substitutable, the coefficient of the interaction term will be negative. This means that one institutional variable creates the same effect as another. Having just one of them is enough and having both of them does not mean that the effect will be as high as the separate effect of each variables. When the institutional variables are

complementary, the coefficient of the interaction term will be positive. This means that both variables have an extra effect when they exist together.

The next cross-section OLS specification used follows Lee & Kim (2008). We run estimation for the countries in different income categories separately. Dependent variable is the growth of income level (GDP per capita) during the period of study. We introduce the policy variables to the model along with the institutional variables. Moreover, we also include population growth rate as a control variable, which is widely known to affect the growth; so the omitted variable bias reduces. Now the estimation directs to our study, specifically the effect of both policy and institutional determinants on the *growth*. The specification is as follows.

$$y_{it} - y_{i0} = \alpha_2 + \theta_2 y_{i0} + \lambda_2 PGROW_i + \delta_2 POL_i + \gamma_2 INST_i + \varepsilon_{it} \qquad (2)$$

In the cross-section OLS estimation, there is no time variable as the analysis is across the countries. Hence, the variables are mostly the average or the difference across the period of study. The dependent variable is the total growth rate across the period. y_{it} is the country *i*'s natural log of GDP per capita in the last year (year *t*) of the period, while y_{i0} is the country *i*'s natural log of GDP per capita in the beginning year of the period. $y_{it} - y_{i0}$ is hence interpreted as the country *i*'s total growth of GDP per capita from the beginning until the end of the period, because the difference of the natural log terms from different points in time is understood as the growth rate. To control for the difference in the initial income across countries, we include the beginning year natural log of GDP per capita, y_{i0}, as a control variable. $PGROW_i$ is the country *i*'s average population growth rate. POL_i is the country *i*'s average policy variable, while $INST_i$ is the country *i*'s average institutional variable.

Lee & Kim (2008) estimated by adding the policy variables one by one in each regression, and also conducted the estimation with all variables included. Regarding the education variables, they also tried using the initial value when they add the variables one by one. We follow their approach. However, our emphasis is on the estimation with all variables included due to better goodness of fit.

As most dependent variables are in the form of rate or index, interpretation is quite straightforward. For example, the coefficient for secondary education enrolment rate implies the difference of the growth rate across period when the country has higher average enrolment rate by one percentage point. In the same way, the coefficient for the strong civil society indicator implies the difference of the growth rate when the country has higher average level of the indicator by 10 percentage points. (Because the institutional variables are scaled from 1-10)

The OLS estimation is a simpler model, which provide us with a broad picture of the relationship between variables. However, the relationship cannot direct to causal effect between the variables of interest. The OLS estimation is under the assumption that the error terms are independent and normally distributed. There should be no correlation between the error terms and the independent

variables, in other words, no endogeneity. However, the variables omitted from the model often affect both independent and dependent variables at the same time. Moreover, independent variables often correlate with each other. To lessen the problem, the model have to be controlled. However, controlling involves the inclusion of more variables and it is far reaching to do it completely. Another solution is to use Instrumental Variable (IV); by using another variable that is surely exogenous and its relationship with independent variable of our interest is known. The variable with this characteristic is often historical or geographical one. This means that the study of variable that changes across the time is often not possible. The undeniable consequence of using these kinds of exogenous variable is that we have to assume that the independent variable of our interest is predetermined. In other words, we are forced to deny that the independent variable can evolve over time. From these limitations, we decide to use more advance technique, so called the Fixed Effects panel regression.

4.2.2 Fixed Effects panel estimation

Panel regression takes into account both time and cross-section dimensions of the data. The first consequence is that the sample size is larger, making the result more reliable. The Fixed Effects panel regression also considers the time-invariant characteristics of each sectional. This helps reduce the omitted variable bias. Though endogeneity is not completely eliminated, the model removes *time-invariant* endogeneity. To do this, the model includes the fixed effects term of each countries. The variables such as the initial level of education, geography and initial income level are automatically controlled. In other words, the countries are not assumed homogenous anymore.

To convert the data into the panel, Lee & Kim (2008) divided the whole period of study into the five-year spans. We use the three-year spans from 1995-2012 instead due to the shorter period of interest. The model is estimated separately for the groups of countries in different income levels. The dependent variable is the average *level* of natural log of GDP per capita for the three-year span, denoted y_{it}. The reason for the choice of dependent variable is that the Fixed Effects estimator takes the initial level natural log of GDP per capita as the fixed effects term. The Fixed Effect estimator uses the technique called 'demeaning', where the values of variables in each observation are subtracted by the average value of the variables. For example, $y_{i0} - \bar{y}_{i0}$ which equals zero because y_{i0} is *time-invariant*. When we use the *difference* between the initial level natural log of GDP per capita and the level in the year of observations as a dependent variable, with the initial level as a control variable on the right hand side; the coefficient of the initial level drops from the model because it is *time-invariant*. Moreover, all coefficients of independent variables are as same as in the specification with the average *level* of natural log of GDP per capita for the three-year sub period as a dependent variable. Only the constant term, and presumably the fixed effects terms, lowers; in order to reflect the fact that the dependent variables is just the level of natural log of GDP per capita

deducted by the constant initial level of natural log of GDP per capita. (So the *constant* initial level is excluded from the constant and the fixed-effect terms)

Even though the dependent variable is the *level* of income, the coefficient of independent variable implies the difference of dependent variable with respect to the independent variable. For example; when the strong civil society indicator is higher by 1 point (10 percentage points), the *level* of natural log of GDP is predicted to change by the size of its coefficient. Ceteris Paribus. The fixed effects model focuses on the *within* sectional difference. It demeans the variables across time, not the sections. Hence, even though the assumption of the coefficient is that it can explain the same change of dependent variables, whether it is the change across *time* or *section*; it can explain the variation across the time better than the variation across the section. (Verbeek, 2013) While the Cross-section estimation in the previous specification estimates the difference in the income *growth* across the countries; the fixed effects estimation better explains the difference in the income *level* across *time, while acknowledging the difference across section as per the assumption of panel estimation,* with respect to the independent variables. The difference in the income *level* across time implies the *growth* (or decline), hence the coefficients of the policy and institutional variables in the fixed effects estimation implies the *growth* of the income, when we give more concern on the time dimension. The change in the natural log term already implies the *rate of change*, or the *rate of growth*. We are not discussing the particular period of growth. The fixed effects estimation predicts the change of income level or the growth, with respect to the change of policy and institutional variables, either across the three-year sub period or across the longer period (or even across the sections, while acknowledging the limitation of the fixed effects estimation on the explanation of the change in this dimension).

This differentiates our analysis from the cross-section estimation in the previous specification, which consider the relationship between the *growth* of income and the *level* of policy and institutional variables *across countries.* In contrast, this fixed effects estimation considers the relationship between the *level* of the income and the *change* of policy and institutional variables, with the emphasis on the *time* dimensions. The study of the *level* over *time* is essentially the study of the *change* or the *growth*.

We use the following specification.

$$y_{it} = \alpha_3 + \theta_3 y_{i0} + \lambda_3 PGROW_{it} + \delta_3 POL_{it} + \gamma_3 INST_{it} + \mu_i + \varepsilon_{it} \qquad (3)$$

The term y_{i0}, which represents initial level of income, will drop because it is included in fixed effect terms. $PGROW_{it}$ is country *i*'s average population growth rate in three-year span. POL_{it} is country *i*'s average policy variable in three-year span, while $INST_{it}$ is country *i*'s average institutional variable in three-year span. μ_i is country *i*'s fixed effect. We use the first lag of education and institutional variables to reflect that educational and institutional improvement takes time to affect

income growth. As in the cross-section estimation, we add the variable one by one to each estimation, and include all variables in single estimation. We give emphasis on the latter.

We interpret the coefficient of *time-variant* variables as the *difference in the level* of income with respect to the variable. For example, the coefficient of strong civil society indicator is the difference or the *change* of the estimated *level* of income, in any time span or between any sections, when the one-lag value of the indicator increases by 10 percentage points in the corresponding time span.

5. Estimation Results

We first discuss the results, their statistical implication and possible bias of cross-section Ordinary Least Square (OLS) estimation. We thereafter continue to Fixed Effects panel estimation. The first cross-section estimation aims to identify the institutional indicators that relate to income *level* across the countries. However, it is not the focus of our discussion and we instead include it in Appendix 1. The second cross-section estimation considers the relationship of the *level* of both policy and institutional variables on the *change* of income level across the countries. The Fixed Effects panel estimation controls for time-invariant variables; and it considers the relationship of the *level* of both policy and institutional variables and the *level* of income *across both time and countries*, which can be partly interpreted as the study of the *change* of the *level* across time. In this estimation, lag education and policy variables are used instead of the current level. Time-invariant factors are controlled.

The estimation results report uses variable codes. See Appendix 3 for the variable list and respective coding for estimations.

5.1 Cross-section Ordinary Least Square (OLS) estimation results

In this study, our focus is on the effect of both policy and institutional variables. The specification (1) discuss only the relationship between the institutional indicators and income level, while incorporating interaction terms to see the complementarity and substitutability between the institutional indicators. As it is not our main discussion, we put the results in Appendix 1.

We now focus on the main discussion of this paper. We use the Cross-section estimation, where the dependent variable is the *change* of GDP per capita in 2005 constant US Dollar, between the beginning and the end of our period of interest; following specification (2) in the previous section. We add the policy variables into the analysis. All variables are the average across the whole period. The initial level of education variable is also used. Now, we have a dependent variable as the *change*, while we have independent variables as the *level*. Hence, we cannot say that an *increase* in the *level* of independent variables will lead to a higher or lower rate of *change* of dependent variables. We can only say that the *higher level* will lead to higher or lower rate of *change*. This also implies that the initial condition of countries is not controlled. We run estimation by adding each independent variable once; and run the estimation with all independent variables included. Some policy variables, such as the number of US patent applications per million populations and R&D expenditure to GDP, have high correlation coefficients (0.85 and significant at 1 percent). Hence, the use of separate estimation provides clearer picture on the relationship between the policy variables and dependent variable. The results for all countries, lower income, and higher income country groups are shown in the Table 5.1, 5.2, and 5.3 respectively.

For all countries estimation, R&D expenditure to GDP has positive, significant coefficients in the estimation with only one policy independent variable and the estimation with all variables. In the former, one percent higher R&D expenditure to GDP relates to 26 percent higher growth for the period of 1995-2012; while in the latter, it relates to 48 percent higher growth for the period. The number of US patent applications per million population has small, negative and significant coefficient in the estimation with all variables. This is probably because of its high correlation with R&D expenditure. Regarding institutional variables, the Accountable Executive has the significant, negative relationship with the growth in both estimations. The size is roughly about 0.06, which implies that the growth during the whole period is predicted to be lower by 6 percent when the average level of Accountable Executive is higher by 10 percentage points. The Strong Civil Society only has the significant, positive relationship with the growth in the estimation with all independent variables. The size is 0.04, which means that the higher level of Strong Civil Society indicators by 10 percentage points can predict 4 percent higher growth rate for the whole period. The Law and Order indicator's coefficient is positive and significant in the estimation with only an institutional variable, and insignificant in another estimation.

We shall not discuss the estimation results from the lower income country group in detail. Due to the smaller size of sample, we cannot determine the significance level for the estimation with all independent variables. Regarding the estimation with each independent variables. All significant coefficients have wrong sign and we cannot interpret the economic implications.

Considering the higher income countries group estimation, the trade openness variable (Trade to GDP ratio) is significant in the estimation with only one independent variable and also in the estimation with all independent variables. However, the sign of coefficients in both estimation are different. The size is small though, so it is not our focus. The number of US patent applications per million populations has positive, significant coefficient in both estimation with an independent variable and with all independent variables. The size of coefficients in the latter estimation is about 0.01. The country with higher average number of patent applications per million population by one patent is predicted to have higher growth rate by 1 percent for the whole period of study. The R&D expenditure to GDP has significant coefficient only in the estimation with an independent variable. The insignificance coefficient in another regression is expected to be the result of high correlation with the number of patent applications. Regarding institutional variables, the Accountable Executive indicator has a negative, significant coefficient in the estimation with one independent variables; while the coefficient is still negative but insignificant in the estimation with all independent variables. The Strong Civil Society indicator has positive coefficients in both estimation, but only significant in the estimation with all independent variables. The Bureaucratic Quality has positive, significant coefficients in both estimations. However, the size is much larger in the estimation with all independent variables. It is 0.73, versus 0.08 in another estimation. This means that the country that

has the higher level of Bureaucratic Quality by 10 percentage points is predicted to have a higher growth rate for the whole period of study by 73 percent. The Law and Order indicator has positive and significant coefficients in the estimation with only one independent variable, while the coefficient is negative and significant in another estimation. This is probably the result of the interaction effect between the Bureaucratic Quality and the Law and order, discussed in the Appendix 1. We expect the interaction effect to make the size of the coefficient of Bureaucratic Quality in the estimation with all independent variables very high.

Table 5.1: The cross-section estimation results using the change of GDP per capita as dependent variable for all countries

	Dependent variable: the difference between the natural log of GDP per capita in 2012 and 1995											
lny0	-0.127	-0.067	-0.097	-0.128	-0.102	-0.149	-0.065	-0.035	-0.052	-0.079	-0.109	-0.165
	(1.88)*	(1.03)	(1.01)	(1.55)	(1.64)	(2.78)**	(1.15)	(0.70)	(0.85)	(1.33)	(2.63)**	(2.48)**
avpopgr	-0.207	-0.223	-0.192	-0.182	-0.134	-0.141	-0.161	-0.167	-0.144	-0.138	-0.106	-0.053
	(1.90)*	(2.09)**	(1.84)*	(1.97)*	(1.63)	(1.87)*	(1.88)*	(2.22)**	(1.63)	(1.64)	(1.64)	(0.75)
secenr0	0.003											
	(0.69)											
avsecenr		-0.002										0.001
		(0.43)										(0.21)
terenr0			0.001									
			(0.20)									
avterenr				0.004								0.001
				(0.82)								(0.14)
avpatpm					0.001							-0.003
					(1.57)							(2.18)*
avrdex						0.258						0.475
						(3.20)***						(2.80)**
avtrade							0.001					-0.001
							(0.91)					(1.38)
avae								-0.063				-0.058
								(3.05)***				(2.11)*
avcs									0.008			0.043
									(0.35)			(2.60)**
avbq										0.037		0.003
										(1.16)		(0.09)
avlo											0.102	0.041
											(4.40)***	(1.52)
_cons	1.590	1.444	1.441	1.582	1.410	1.713	1.125	1.420	1.032	1.054	0.930	1.744
	(2.96)***	(2.62)**	(2.13)**	(2.77)**	(2.87)***	(4.05)***	(2.50)**	(3.37)***	(2.17)**	(2.47)**	(2.87)***	(3.08)**
R^2	0.29	0.21	0.19	0.23	0.21	0.45	0.16	0.38	0.14	0.18	0.52	0.89
N	23	26	23	26	28	25	28	27	27	28	28	22

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The t-value is in parenthesis

Table 5.2: The cross-section estimation results using the change of GDP per capita as dependent variable for lower income countries

	Dependent variable: the difference between the natural log of GDP per capita in 2012 and 1995											
lny0	-0.392	-0.405	-0.371	-0.366	-0.360	-0.386	-0.425	-0.302	-0.377	-0.365	-0.257	
	(4.28)**	(5.63)***	(3.68)**	(3.75)***	(4.81)***	(4.34)***	(5.44)***	(3.11)**	(2.45)**	(3.70)**	(1.82)	
avpopgr	-0.152	-0.117	-0.069	-0.068	-0.130	-0.159	-0.133	-0.041	-0.072	-0.067	-0.053	-0.017
	(1.93)	(2.06)*	(0.94)	(0.90)	(2.03)*	(2.27)*	(2.11)*	(0.61)	(0.90)	(0.87)	(0.75)	
secenr0	-0.001											
	(0.36)											
avsecenr		-0.006										0.005
		(2.37)*										
terenr0			0.001									
			(0.16)									
avterenr				-0.000								-0.008
				(0.04)								
avpatpm					-0.219							
					(2.05)*							
avrdex						-0.111						
						(0.20)						
avtrade							-0.002					-0.002
							(2.15)*					
avae								-0.032				-0.037
								(1.39)				
avcs									0.012			-0.128
									(0.09)			
avbq										0.004		0.060
										(0.12)		
avlo											0.051	0.082
											(1.01)	
_cons	3.428	3.795	3.043	3.029	3.150	3.344	3.728	2.762	3.075	2.994	2.003	0.333
	(4.54)**	(6.45)***	(4.41)***	(4.42)***	(5.98)***	(5.03)***	(6.13)***	(4.42)***	(3.53)**	(4.04)***	(1.68)	
R^2	0.87	0.86	0.73	0.73	0.84	0.86	0.85	0.79	0.73	0.73	0.77	1.00
N	8	10	10	10	10	9	10	10	10	10	10	9

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The t-value is in parenthesis

Table 5.3: The cross-section estimation results using the change of GDP per capita as dependent variable for higher income countries

	Dependent variable: the difference between the natural log of GDP per capita in 2012 and 1995											
lny0	-0.262	-0.176	-0.303	-0.210	-0.306	-0.236	-0.280	-0.143	-0.163	-0.256	-0.254	-1.915
	(2.09)*	(1.63)	(1.89)*	(1.87)*	(3.25)***	(3.09)***	(3.11)***	(1.79)*	(1.61)	(2.57)**	(4.29)***	(12.31)*
avpopgr	-0.143	-0.293	-0.172	-0.231	-0.058	-0.048	-0.200	-0.198	-0.099	-0.107	-0.078	0.023
	(0.92)	(1.84)*	(1.09)	(1.79)*	(0.60)	(0.51)	(1.97)*	(1.88)*	(0.79)	(1.03)	(1.04)	(0.94)
secenr0	0.004											
	(0.62)											
avsecenr		-0.006										0.001
		(0.61)										(0.37)
terenr0			0.003									
			(0.29)									
avterenr				-0.000								-0.005
				(0.08)								(4.05)
avpatpm					0.002							0.014
					(2.60)**							(8.77)*
avrdex						0.240						-0.784
						(2.89)**						(6.09)
avtrade							0.002					-0.003
							(2.49)**					(7.75)*
avae								-0.072				-0.019
								(2.76)**				(1.32)
avcs									0.002			0.172
									(0.06)			(12.82)**
avbq										0.078		0.726
										(1.81)*		(10.53)*
avlo											0.113	-0.119
											(4.49)***	(7.78)*
_cons	2.605	2.803	3.169	2.573	3.065	2.398	2.927	2.487	1.982	2.339	2.100	12.331
	(3.32)***	(3.44)***	(2.77)**	(3.14)***	(4.10)***	(3.96)***	(4.00)***	(3.75)***	(2.47)**	(3.39)***	(4.68)***	(13.22)**
R^2	0.41	0.45	0.44	0.43	0.49	0.54	0.47	0.53	0.25	0.38	0.69	1.00
N	15	16	13	16	18	16	18	17	17	18	18	13

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The t-value is in parenthesis

5.2 Fixed Effects panel estimation results

Now we consider our last specification. We use the Fixed Effects panel model to eliminate time-invariant endogeneity. The analysis focuses on the *level* of dependent variable – specifically, the level of GDP per capita during three-year sub period – as the relationship with the *level* of the *time-variant* policy and institutional independent variables. The contribution from the *level* of all *time-invariant* independent variables to the dependent variable, specifically the income *level*, is included in the fixed-effects term. Hence, the coefficients can be interpreted as the contribution to the income *level* from the *level* of independent variables in our interest. We give more emphasis on the *time* dimension, while acknowledging the change across the *section*, due to the Fixed Effect estimator's *demeaning across time* technique. The *change* of the *level* of the policy and institutional variables over *time* translates to the *change* of the *level* of income over time; which means the *growth*. We use one lag variables for education and institutional variables to acknowledge that the effect takes time to materialise. As in the previous specification, we run estimation by adding each independent variable once; and run the estimation with all independent variables included. The estimation follows the specification (3) from the previous section. The results for all countries, lower income, and higher income country groups are shown in Table 5.4, 5.5, and 5.6 respectively.

We first look at the estimation results for all countries sample. Regarding policy variables, all of them – the Trade to GDP ratio, the one lag of secondary education enrolment rate, the one lag of tertiary education enrolment rate, the patent applications per million populations, and the R&D expenditure to GDP – have positive coefficients, significant at 1-percent level when we add only one policy independent variable in each estimations. However, the value for the patent applications' coefficient is small. We can conclude that the *difference* of each policy variables' *level*, without adding other variables for controlling purpose, have a positive relationship with the *difference* of the income *level*. Focusing on the *time* dimensions, the positive *change* of the *level* of policy variables over *time* relates to the *growth*. In the estimation with all variables included, the secondary education enrolment rate does not have the effect on the income; while the tertiary education enrolment rate has positive relationship. The one percentage point increase in the tertiary education enrolment rate in lagged three-year sub period can predict higher GDP per capita by 1.1 percent. The R&D expenditure to GDP also has the significant, positive coefficients. The one percent increase in the R&D expenditure to GDP can predict the higher GDP per capita by 55 percent. The coefficient of the patent applications is significant and slightly negative. This is probably the result of its high correlation with the R&D expenditure. Regarding institutional variables, one lag of the Accountable Executive indicator and one lag of the Law and Order indicator are significant in the estimations with only each institutional independent variable; though the latter has negative sign. None of institutional variables is significant in the estimation with all independent variables. Controlling for policy variables, we cannot draw the relationship between institutional indicators and income level.

We move on to the estimation for the lower income country group. In this countries sample, we cannot estimate the relationship when all variables is included in single estimation because of the small sample size. When we estimate each policy or institutional variable once at a time, the coefficients of one lag of secondary education enrolment, one lag of Accountable Executive, and one lag of the Bureaucratic Quality are significant and positive. What we can draw from this is that the countries in the lower income group that have experienced an increase in these variables during the previous three-year sub period should have a higher level of income. However, we cannot determine whether all of the policy and institutional variables are the determinants of higher income because we do not know whether there are omitted variables that affect our independent and dependent variables at the same time. One lag of Law and Order indicator has a negative, significant coefficient in the estimation with only the population growth as a control variable and one lag of Law and Order indicator as an independent variable.

Lastly, we consider the estimation results from the higher income country group. All policy variables have positive and significant coefficients in the estimation with only one independent variable. In the estimation with all independent variables, one lag of tertiary education enrolment and the R&D expenditure to GDP still have positive, significant coefficients. One percent increase in the tertiary education enrolment rate from the previous three-year sub period can predict 1.2-percent increase in the level of GDP per capita for the current three-year sub period. At the same time, one percent increase in the R&D expenditure to GDP in three-year sub period can predict 60 percent increase in the level of GDP per capita. The coefficient for the patent applications is slightly negative and significant. We expect this to be the effect from its high correlation with the R&D expenditure. Regarding institutional variables, one lag of Law and Order has the negative and significant relationship in the estimation with only one institutional independent variable, while become insignificant in the estimation with all independent variables. One lag of Strong Civil Society indicator has negative and significant coefficient in the estimation with all independent variables, while the coefficient is insignificant in another estimation. The increased level of Strong Civil Society indicator by 10 percentage points in the previous three-year sub period can predict 1.7-percent decrease in the level of GDP per capita during the current sub period.

Table 5.4: The fixed effects panel estimation results for all countries

	Dependent variable: average level of natural log of GDP per capita for the three-year sub period										
popgr	-0.211	-0.179	-0.318	-0.293	-0.191	-0.097	-0.154	-0.159	-0.154	-0.117	-0.142
	(1.95)*	(1.81)*	(3.57)***	(2.67)**	(1.72)*	(1.15)	(1.05)	(1.07)	(1.08)	(1.02)	(1.09)
trade		0.003									0.002
		(2.78)***									(0.79)
L.secenr			0.007								-0.000
			(3.05)***								(0.07)
L.terenr				0.010							0.011
				(3.84)***							(5.10)***
patpm					0.001						-0.002
					(4.09)***						(2.97)***
rdex						0.526					0.546
						(3.19)***					(2.37)**
L.ae							0.026				0.009
							(2.39)**				(0.93)
L.cs								0.008			-0.009
								(0.35)			(1.38)
L.bq									0.001		-0.004
									(0.12)		(0.22)
L.lo										-0.046	0.006
										(3.56)***	(0.42)
_cons	8.356	8.046	8.032	8.102	8.382	8.156	8.027	8.192	8.277	8.483	7.610
	(53.72)***	(39.28)***	(37.02)***	(43.27)***	(50.22)***	(48.89)***	(33.86)***	(35.96)***	(40.47)***	(76.68)***	(19.44)***
R^2	0.18	0.28	0.43	0.54	0.26	0.52	0.14	0.09	0.08	0.19	0.76
N	173	171	117	109	161	112	140	140	145	145	65

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The t-value is in parenthesis

Table 5.5: The fixed effects panel estimation results for lower income countries

	Dependent variable: average level of natural log of GDP per capita for the three-year sub period									
popgr	-0.397	-0.326	-0.283	-0.341	-0.419	-0.368	-0.395	-0.439	-0.414	-0.373
	(3.21)***	(2.55)**	(2.58)**	(2.47)**	(3.17)***	(2.50)**	(2.45)**	(2.70)**	(2.44)**	(2.45)**
trade		0.003								
		(1.15)								
L.secenr			0.007							
			(2.51)**							
L.terenr				0.011						
				(1.47)						
patpm					0.174					
					(1.56)					
rdex						0.202				
						(0.32)				
L.ae							0.039			
							(3.95)***			
L.cs								-0.022		
								(0.65)		
L.bq									0.025	
									(2.35)**	
L.lo										-0.030
										(2.37)**
_cons	7.719	7.362	7.256	7.494	7.768	7.860	7.426	7.829	7.630	7.812
	(40.10)***	(19.90)***	(30.16)***	(26.14)***	(35.19)***	(39.45)***	(29.74)***	(31.48)***	(27.03)***	(30.05)***
R^2	0.36	0.47	0.56	0.50	0.43	0.43	0.44	0.29	0.31	0.36
N	65	63	40	44	53	26	55	55	55	55

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The t-value is in parenthesis

Table 5.6: The fixed effects panel estimation results for higher income countries

	Dependent variable: average level of natural log of GDP per capita for the three-year sub period										
popgr	-0.186	-0.161	-0.325	-0.269	-0.160	-0.080	-0.129	-0.131	-0.121	-0.090	-0.192
	(1.66)	(1.56)	(2.69)**	(1.99)*	(1.45)	(1.01)	(0.88)	(0.89)	(0.88)	(0.84)	(1.15)
trade		0.003									0.004
		(2.72)**									(1.59)
L.secenr			0.007								-0.003
			(1.88)*								(0.90)
L.terenr				0.010							0.012
				(3.53)***							(4.22)***
patpm					0.001						-0.003
					(4.08)***						(4.04)***
rdex						0.538					0.601
						(3.15)***					(2.90)**
L.ae							0.019				-0.003
							(1.24)				(0.34)
L.cs								0.012			-0.017
								(0.50)			(2.23)**
L.bq									-0.017		0.005
									(1.18)		(0.31)
L.lo										-0.053	0.019
										(3.24)***	(0.78)
_cons	8.879	8.570	8.422	8.520	8.803	8.368	8.607	8.696	8.918	9.088	7.843
	(58.34)***	(41.89)***	(22.78)***	(38.66)***	(55.50)***	(46.64)***	(35.84)***	(38.86)***	(47.05)***	(109.55)***	(20.64)***
R^2	0.16	0.24	0.41	0.56	0.25	0.54	0.09	0.07	0.07	0.17	0.80
N	108	108	77	65	108	86	85	85	90	90	50

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The t-value is in parenthesis

6. Result Discussion and Policy Implications

In this section, we discuss the economic implications of the estimation results for policy-making. We shall also mention the limitations of the results caused by the methodology. We first discuss the policy determinants and then move to the institutional determinants of growth.

6.1 The policy determinants of growth

Our study focuses on the educational and technological policy determinants of growth following Lee & Kim (2008). Our results agree with them. In the Cross-section estimation for the higher-income countries group, the patent applications per million population and the R&D expenditure have the positive and significant relationship with the growth rate; while none of them has a significant relationship in the estimation for the lower income countries group. This implies the clear relationship between the technological development and growth, when we study the effect across the higher-income countries. Among the countries that already have passed the upper-middle income threshold, the country with a higher level of policy variables regarding technological development will experience higher growth rate.

The result is even more solid in the Fixed Effects panel estimation, where both educational and technological policy determinants have a positive and significant relationship with the income *level*. In the higher-income countries estimation, the tertiary school enrolment rate, in addition to technological policy determinants, is another important determinant. In contrast, only the secondary school enrolment has a positive and significant relationship with the income *level* in the estimation for the lower-income countries group.

We can conclude that the tertiary education and technological policy determinants become more crucial once the countries have passed the upper-middle income threshold. The country with the higher level of these determinants will have the higher *level* of income when comparing to other countries. At the same time, when we focus on the effect across *time*, the country that manages to increase the level of tertiary school enrolment and technological policy determinants will have the higher level of income, or have the *growth*. This is what the middle-income countries have to focus on in order to achieve the higher level of income and eventually catch up with the high-income countries.

6.2 The institutional determinants of growth

The main purpose of this study is to identify the institutional characteristics that affect the growth of the middle-income countries, by incorporating the institutional indicators identified by Campos & Nugent (1999) into Lee & Kim's (2008) model.

Using the Cross-section estimation, the Strong Civil Society and the Bureaucratic Quality indicators have the positive and significant relationship with the growth rate in the higher-income countries group. None of the institutional indicators has significant relationship with the growth rate for lower income countries, which is probably due to the small sample size.

Using the Fixed Effects panel model, only the Strong Civil Society has the negative and significant relationship with the level of income in the higher-income countries estimation, with all policy and institutional independent variables included. Even though we cannot estimate the model with all independent variables for the lower income countries, the models using each independent variable at a time suggest that the Accountable Executive and the Bureaucratic Quality have positive and significant relationship with the income level.

The result for lower income countries may reflect that the institution is more important for economic growth when the income level is low; once the income level is higher, the good policy is crucial. Poorer countries only need the good authority to protect the property rights and enforce the contracts. This agrees with Barro (1998), which argued that the improvement in democracy will promote the growth for poorer countries, while negatively affects the growth when the countries have been developed to some degree.

The difference between the results from the Cross-section and the Fixed Effects estimations can be explained by the difference between their methodologies. For the Cross-section estimation, the *growth* rate is estimated across countries, with the average level of the institutional indicators for the whole period as the independent variables. The country with the higher *average level across the period of study* of institutional variables, says the Strong Civil Society and the Bureaucratic Quality, is more likely to experience the higher growth rate than the country with the lower level of the variables. However, the Fixed Effects model explains the change across the *time* dimension better, due to the technique of *demeaning* within the section (across time); though we still have to acknowledge the assumption that the panel data's parameter should explain the change across the section as well as the change across time.

This led us to two statements. First, the countries that already have the higher level of institutional variables such as the Strong Civil Society will have a higher growth rate, while the country that have just experienced the improvement in the Civil Society possibly has to face with the lower income (over time), or the negative contribution to the *growth* rate from the improved Civil Society. The possible explanation is that the Strong Civil Society allows broader participation in the politics that helps better policy to materialise, in contrast to the dictatorship who often uses the power for personal interest. However, the improvement in the Civil Society is often not smooth. It involves policy changes and uncertainty among the investors that dampen the growth. Second, our estimation possibly does not use enough lags, as the institutional determinants may affect the growth in longer

run. For the lower income countries, however, the sudden improvement in the institutional characteristics will improve the income dramatically as the binding constraints such as the secure property rights became guaranteed.

6.3 The policy implications for the middle-income countries

From the estimation results, we can see that the tertiary education and technological policies have significant effects on the growth of income level, either the effect across the countries or the effect across time. What country should do is to promote the higher education; and implement the policies that make the environment favourable to Research and Development

However, this study has a limitation. Using the Tertiary School enrolment rate does not incorporate the quality of higher education; while the patent applications and the R&D expenditure seems to be the straightforward measures for technological development. While our study confirms the positive relationship between the Tertiary School enrolment rate and the growth, our recommendation is not just to increase access to the education without quality. When we conduct the estimation, we assume other factors other than what we are interested constant. However, the reality is obviously different from what we assume. Therefore, our suggestion is to improve access to the Tertiary education; at the same time, we also have to ensure that the quality of education is aligned with the international standard. Regarding technological policy, it is important for the state to provide additional support because of its positive externality nature. The positive and significant coefficients of these variables in both the cross-section and the Fixed Effects panel estimations imply that the country with the higher level of tertiary education enrolment and technological indicators can achieve the higher growth rate, whether we look at the effect across the countries or across time.

The effect of institutional factors on economic growth is more complicated to consider. While we identify the institutional characteristics that positively related to the growth across the countries, the result from the Fixed Effects panel estimation does not provide the support for the positive impact of the institutional indicators on the income level and growth. Giving policy recommendation is even harder, because the policymakers cannot create good institutions by themselves. Instead, the institutional change often involves the conflicts between the interest groups and is not very smooth. The ongoing political conflict in Thailand is one of the examples of the institutional change.

Hence, once the country has progress to the upper-middle income country, we do not recommend the policymakers to focus on the institutional issue. Instead, the policy focusing on education and technology is the important issue. There are also several examples where the country became more democratic – reflected primarily on the Accountable Executive and the Strong Civil Society, after they had grown until one point. These includes Taiwan, China and the Republic of Korea. Once they nearly progress to high-income countries, they become the democratic countries and

also experience the slower growth at the same time. This is because they were closer to the frontier; and this might explains why the Civil Society have negative relationship with the income level.

The policy is often the result of the institutions that promoting it. While the common belief is that the high level of the institutional indicators we studied will lead to good policy, there are the cases that the strong, authoritarian government can also make the good policy that affects the growth positively. These includes the Republic of Korea before late 1980's, Singapore, and Chile during Pinochet's era. The widely held prescription is probably not the only prescription.

However, our suggestion is that once the course of the history for the country necessitates the institutional change, for example, when people feel that their country needs the reform of the political institution; what policymakers should do is to encourage the improvement in the Accountable Executive and the Bureaucratic Quality characteristics of the institutions. Possible actions are to promote the political system that strengthens the power of legislature to check the executive branch; and to promote the bureaucratic system that recruits people by merit, and that sets up the rule to protect the bureaucracy from political intervention. This will help the countries to have the higher growth rate relative to other countries. With the higher growth rate, they are more probable to escape the middle-income trap. Malaysia is one of the examples of the countries that are struggling with the lower growth because of their low level of institutional characteristics. (Woo, 2009)

7. Conclusion

Many middle-income countries, especially the upper-middle income ones that are closer to the development frontier, are aspiring to catch up with the high-income countries. At the same time, they are worried that they will 'miss the train' and fall into the long period of stagnation known as the middle-income trap. This study aims to identify the institutional characteristics that promote the growth for the middle-income countries, especially the ones that have already passed the upper-middle income threshold; using the Cross-section OLS estimation and the Fixed Effects panel estimation. At the same time, we incorporate educational and technological variables, widely discussed as the determinants of growth for the middle-income countries to retest their validity.

The results confirm the relationship between the growth and the policy variables; including the tertiary education enrolment, and the technological policy using the number of the US patent applications per million populations and the R&D expenditure to GDP as proxy variables. This is the clear prescription for the policymakers. Regarding the institutional variables, the country with the higher level of Strong Civil Society and Bureaucratic Quality is more likely to experience the higher growth rate when we consider the effect across countries. However, we cannot determine the positive effect of the institutional variables on the growth when we consider the effect primarily across time. In some case, improving the institutional characteristics even brings the negative effect on the growth across the shorter period of time. Nevertheless, when the course of history necessitates the institutional reform, the two institutional characteristics abovementioned should be the priority for the policymakers.

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Appendix 1. The cross-section estimation results using average level of GDP per capita as dependent variable and only the institutional indicators as independent variables

This appendix is the discussion of the results from the specification (1), which is the relationship between the institutional indicators and the income level, with the interaction terms to see the complementarity and substitutability between the institutional indicators

First, we consider the estimation using the average *level* of GDP per capita as dependent variable, with only institutional indicators as independent variables. It follows the specification (1) discussed in Section 4.2. There are two sub-specifications, specifically with and without institutional interaction terms. We discuss the latter first, with the results shown in Table A1.1. For all countries sample, the Bureaucratic Quality and the Law and Order indicators are significant and positive. The country that has a higher level of the Bureaucratic Quality indicator by 10 percentage points is predicted to has a higher level of the average GDP per capita in constant 2005 US Dollar by 1,225. The same goes for the Law and Order, where the country that has a higher level of the indicator by 10 percentage points is predicted to have a higher level of the GDP per capita by 1,079 US Dollar. For higher income countries sample, only the Bureaucratic Quality is significant. The additional 10 percentage points of indicator predict a higher level of the average GDP per capita by 1,982 US Dollar. No variable is significant for the lower income countries group, which is possibly because of the small sample size.

Next, we consider the estimation using sub-specification with the institutional interaction terms. Using the interaction terms, we consider the complementarity and substitutability between the institutional indicators. The results show in Table A1.2. Consider all countries sample, the Law and Order has a negative and significant coefficient, while the interaction term between the Law and Order and the Bureaucratic Quality has a positive and significant coefficient. The 10 percentage points increase in the Law and Order indicator predict lower GDP per capita by 4,774 US Dollar. At the same time, the 10 percentage points increase in the interaction term between the Law and Order and the Bureaucratic Quality predict higher GDP per capita by 9,932 US Dollar. The absolute size of the interaction term's coefficient is larger than the absolute size of both components' coefficients combined, even though Bureaucratic Quality's coefficient is insignificant. What we can conclude is that the Law and Order and the Bureaucratic Quality jointly predict the increase in GDP per capita in all countries sample. The worth noting point is that a point increase (out of the total of ten) in each components of the interaction term does not translate to a point increase in the level of interaction term. For example; when the country has quite low level of interaction components, says 2 points, the increment of both indicators by a point will increase the interaction term from 0.4 to 0.9, which is 0.5 point (or 5 percentage points) increment. (We calculate the interaction terms by multiplying the

component with each another, and divide the result by 10 to rescale it from 0-100 to 0-10) However, when the country has a higher level of interaction components, says 5 which is roughly the mean of the Law and Order and the Bureaucratic Quality, the increment of both indicators by a point will increase the interaction term from 2.5 to 3.6, which is 1.1 points (or 11 percentage points) increment.

While none of the coefficients in the lower income countries group is significant, several coefficients are significant in the higher income countries group. The ten percentage points increase in the Bureaucratic Quality predict lower GDP per capita by 7,046 US Dollar; while the ten percentage points increase in the Law and Order predict lower GDP per capita by 6,595 US Dollar. However, the ten percentage points increase in the interaction terms between these two indicators predicts higher GDP per capita by 15,570 US Dollars. The size of interaction term's coefficient is larger than the size of the sum of both indicators' coefficients. This means that Bureaucratic Quality and Law and Order jointly predicts the higher GDP per capita. The coefficient of the interaction term between the Bureaucratic Quality and the Strong Civil Society is significant and negative. It predicts the lower GDP per capita by 9,229 US Dollar. Taking the size of insignificant Strong Civil Society's coefficient into account, the total effect is still negative. This means that the Bureaucratic Quality and the Strong Civil Society jointly predicts lower GDP per capita. Both indicators are substitute, and the increase in the Strong Civil Society when the Bureaucratic Quality indicator is in high level will predict the lower GDP per capita.

Table A1.1: The cross-section estimation results using average level of GDP per capita as dependent variable, without interaction terms

Dependent variable: average level of GDP per capita across the whole period			
	1	2	3
Accountable Executive (ae)	-336.193	46.682	-426.320
	(0.69)	(0.42)	(0.54)
Strong Civil Society (cs)	254.147	391.175	102.658
	(0.61)	(0.72)	(0.19)
Bureaucratic Quality (bq)	1,225.042	63.997	1,982.127
	(2.56)**	(0.65)	(2.30)**
Law and Order (lo)	1,079.011	-72.916	697.956
	(1.76)*	(0.36)	(0.69)
_cons	-5,676.334	17.053	-5,796.480
	(1.15)	(0.01)	(0.70)
R^2	0.49	0.35	0.57
N	28	11	17

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The model 1, 2, and 3 represent all, lower, and higher income countries respectively
3. The t-value is in parenthesis

Table A1.2: The cross-section estimation results using average level of GDP per capita as dependent variable, with interaction terms

Dependent variable: average level of GDP per capita across the whole period			
	1	2	3
ae	478.921	7,059.455	-733.899
	(0.32)		(0.37)
cs	2,488.009	7,755.878	4,171.623
	(1.00)		(1.55)
bq	-1,422.251	2,092.132	-7,046.681
	(0.90)		(2.19)*
lo	-4,773.913	6,208.396	-6,594.741
	(1.97)*		(2.11)*
Interactions terms			
bq_lo	9,932.163	-4,977.218	15,570.179
	(5.79)***		(4.99)***
bq_cs	-3,372.614	-3,525.394	-9,229.102
	(1.01)		(2.30)*
bq_ae	-1,613.810	685.847	4,829.575
	(0.86)		(1.41)
lo_cs	-2,970.400	12,349.331	204.236
	(1.17)		(0.07)
lo_ae	1,413.250	-9,400.273	-2,748.404
	(0.52)		(0.76)
cs_ae	744.314	-13,111.570	503.915
	(0.27)		(0.17)
_cons	7,554.314	-50,444.002	30,668.219
	(0.60)		(1.62)
R^2	0.88	1.00	0.95
N	28	11	17

1. *,**,*** denote significance level at 0.1, 0.05 and 0.01, respectively.
2. The model 1, 2, and 3 represent all, lower, and higher income countries respectively
3. The t-value is in parenthesis

Appendix 2. List of abbreviations

GDP	Gross Domestic Product
GNI	Gross National Income
ICRG	International Country Risk Guide
OLS	Ordinary Least Squares estimation
PPP	Purchasing Power Parity
R&D	Research and Development
TFP	Total Factor Productivity
USPTO	United States Patent and Trademark Office
WDI	World Development Indicators
WGI	Worldwide Governance Indicators

Appendix 3. The variable list and respective coding for estimations

Specification (1) Cross-section estimation with the average level of GDP per capita in constant 2005 US Dollar as dependent variable

Variable codes	Description
ae	Accountable Executive indicator
cs	Strong Civil Society indicator
bq	Bureaucratic Quality indicator
lo	Law and Order indicator
bq_lo	Interaction term between Bureaucratic Quality and Law and Order indicators
bq_cs	Interaction term between Bureaucratic Quality and Strong Civil Society indicators
bq_ae	Interaction term between Bureaucratic Quality and Accountable Executive indicators
lo_cs	Interaction term between Law and Order and Strong Civil Society indicators
lo_ae	Interaction term between Law and Order and Accountable Executive indicators
cs_ae	Interaction term between Strong Civil Society and Accountable Executive indicators

Specification (2) Cross-section estimation with the difference, between the level in 2012 and 1995, of the natural log of GDP per capita in constant 2005 US Dollar as dependent variable

Variable codes	Description
lny0	Natural log of GDP per capita in constant 2005 US Dollar, in 1995
avpopgr	Population growth rate, average value from 1995-2012
secenr0	Secondary education enrolment rate, gross percentage, in 1995
avsecenr	Secondary education enrolment rate, gross percentage, average value from 1995-2012
terenr0	Tertiary education enrolment rate, gross percentage, in 1995
avterenr	Tertiary education enrolment rate, gross percentage, average value from 1995-2012
avpatpm	Number of US patent applications per million populations, average value from 1995-2012
avrdex	Research and Development expenditure as percentage of GDP, average value from 1995-2012
avtrade	Trade as percentage of GDP, average value from 1995-2012
avae	Accountable Executive indicator, average value from 1995-2012
avcs	Strong Civil Society indicator, average value from 1995-2012
avbq	Bureaucratic Quality indicator, average value from 1995-2012
avlo	Law and Order indicator, average value from 1995-2012

Specification (3) Fixed Effects panel estimation with the average level, for the three-year sub period, of the natural log of GDP per capita in constant 2005 US Dollar as dependent variable

Variable codes	**Description**
popgr	Population growth rate, average value for three-year sub period
trade	Trade as percentage of GDP, average value for three-year sub period
L.secenr	One sub period lag of Secondary education enrolment rate, gross percentage, average value for three-year sub period
L.terenr	One sub period lag of Tertiary education enrolment rate, gross percentage, average value for three-year sub period
patpm	Number of US patent applications per million populations, average value for three-year sub period
rdex	Research and Development expenditure as percentage of GDP, average value for three-year sub period
L.ae	One sub period lag of Accountable Executive indicator, average value for three-year sub period
L.cs	One sub period lag of Strong Civil Society indicator, average value for three-year sub period
L.bq	One sub period lag of Bureaucratic Quality indicator, average value for three-year sub period
L.lo	One sub period lag of Law and Order indicator, average value for three-year sub period