Inequality, the middle class and economic growth in Indonesia: Evidence from cross province analysis

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List of Acronyms

AB	Arellano-Bond
ADB	Asian Development Bank
AR	Autoregressive
ARDL	Autoregressive Distributed Lag
BE	Between Estimator
BPS	Badan Pusat Statistik (Statistics Indonesia)
FE	Fixed Effect
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GMM	Generalized Method of Moments
GNP	Gross National Product
GRDP	Gross Regional Domestic Product
ISS	Institute of Social Studies
OECD	Organization of Economic Cooperation and Development
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
RE	Random Effect
SUSENAS	Survei Sosial Ekonomi Nasional (National Socioeconomic Survey)
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
USD	US Dollar
VAR	Vector Autoregression
VECM	Vector Error Correction Model

Abstract

There have been numerous studies conducted to investigate the link between inequality and economic growth. However, typically, these studies only relate inequality and economic growth to poverty. They do not consider another factor, such as the middle class which has vital roles, especially economic roles where for example it can be potential consumers for goods and services. Especially in the case of Indonesia, there is no study that takes into account the middle class as one of determinants of economic growth. Considering this lack of study and potentially important role of the middle class, this paper tries to contribute by including the size of the middle class as one of variables while examining the inequality-growth relationship. By utilizing a panel data set from 31 provinces in Indonesia covering the years 2005 to 2010, this paper aims to examine the link between inequality and economic growth as well as between the middle class and growth across provinces in Indonesia. To meet these objectives, pooled OLS, fixed effect panel data model and dynamic panel data model are applied.

Based on a dynamic panel model which is the main specification on which this paper relies, the results show that there is a positive relationship between inequality and economic growth in Indonesia, implying higher level inequality can lead to higher economic growth. On the other hand, the result does not indicate that the middle class has an effect on economic growth in Indonesia. In addition, the result also supports the empirical evidence that a large population can be detrimental for achieving higher economic growth. Nevertheless, these results must be treated with caution due to the sensitivity of the results to choice of lag length and model specification in dynamic panel data model.

Relevance to Development Studies

Inequality is known as one important factor in determining economic growth. However, nowadays, not only inequality which is considered as important factor, but the middle class also has important roles on growth. The inclusion of the middle class variable in inequality-growth relationship can be beneficial for literature improvement, in particular for Indonesian case. The study of the link between inequality and growth; and the effect of the middle class on economic growth has important implication for policy maker as well in formulating strategies in order to meet its development goals, in particular to achieve higher economic growth.

Keywords

Inequality, the middle class, economic growth, dynamic panel, Indonesia.

Chapter 1
Introduction

1.1 Background

Why are there differences across countries in terms of their economic performance? This question has been a long debate among researchers in development studies since decades ago. It has also been a research focus in economic development. For instance, Alesina and Rodrik (1994), Pritchett (1997) and Ravallion (2005) have conducted studies to answer this particular question. According to some theories and researches, there is a view that these differences are due to differences in their saving rates or capital accumulation, both physical and human capital. This view, in particular, is drawn from the Harrod-Domar growth model. In this model, economic growth of a country is determined by saving rates and capital output ratio. Specifically, a higher saving rate is associated with higher growth rate, whereas a higher capital output ratio results in lower growth. Nevertheless, others argue that differences in resources endowments across countries do matter as well. Besides, as time goes by, there is also a view that differences in economic performance across countries can be a result of other determinants, such as geography, institutions, and culture.

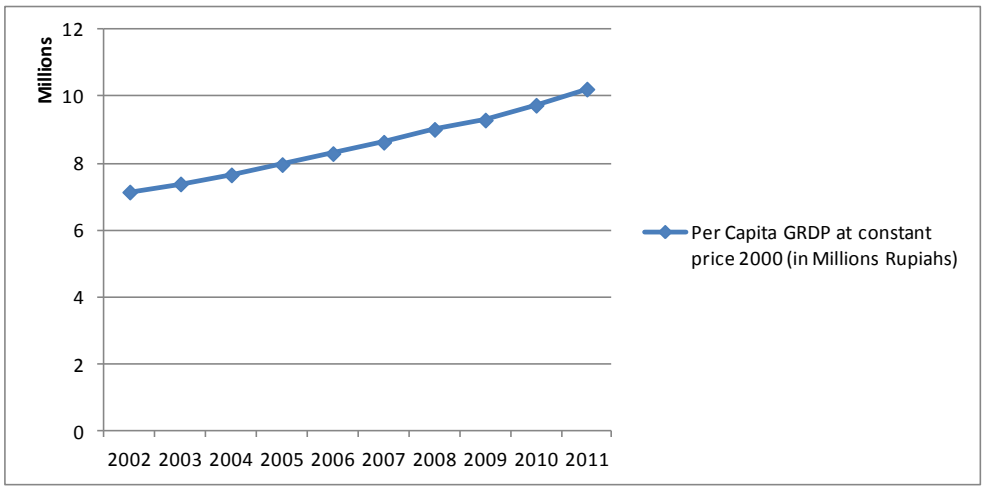
Furthermore, beside the factors mentioned above, there are also some studies conducted with the aim to examine the determinants of economic performance by including inequality condition among other determinants. This is because there is a belief that inequality does matter for economic growth of a country or a region. These kind of studies, particularly, have been conducted by Panizza (2002) and Chen (2003). By using different data set and different methodology, these studies have led to a variety of results. Some results support a negative relationship between inequality and growth, such as by Alesina and Rodrik (1994) as well as Persson and Tabellini (1994), while others show that inequality can boost economic growth, such as by Forbes (2000) and Partridge (2005).

Indonesia, as an archipelago country which consists of 33 provinces and around 17,000 islands, has some advantages. One of the advantages is it has natural resources which spread in almost all islands that can be beneficial for development process if they are used appropriately. Meanwhile, the aim of development in Indonesia, in general, is to achieve welfare of its society and to achieve equality among its citizens across provinces. In order to achieve these objectives, the government creates policies which support development in all regions with an aim to reach higher economic growth for Indonesia as a whole. Therefore, in 2001, the government implemented decentralization where according to this policy, each local government has autonomy to manage its own budget with an aim to create efficiency. Besides, each region also has autonomy to manage its resources, including natural resources that are used for supporting development process of each region.

According to figure 1 and figure 2, it can be clearly shown that during the period 2002 to 2011, in general, there is an upward trend in Indonesia per capita income although the increase is small. However, during the same period,

it depicts that the trend of inequality in Indonesia rose as of 2004 even though it was slightly fluctuated afterward and it experienced an upward trend again after period 2009.

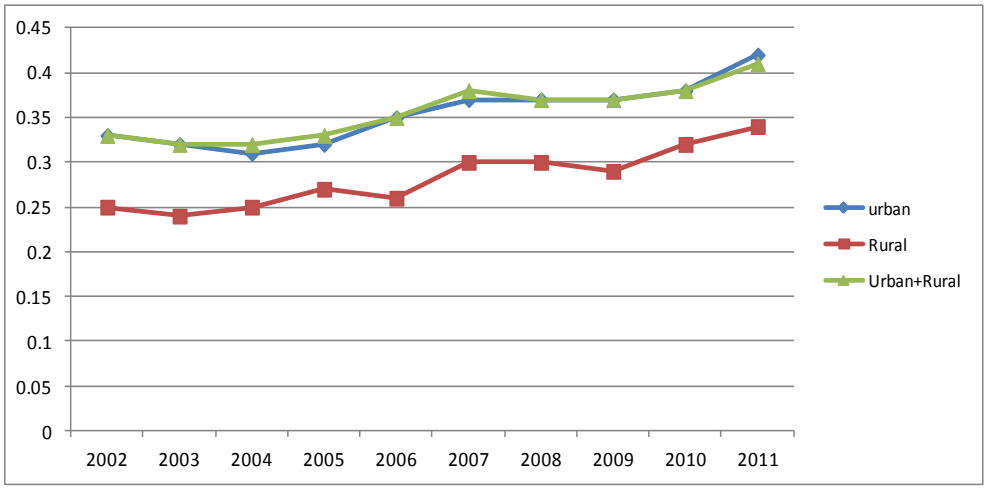
Figure 1. The trend of per capita income Indonesia at constant price 2000 from period 2002 to 2011



Source: Statistical Yearbook of Indonesia, 2004-2012

Furthermore, from figure 2, it is also clear that inequality in Indonesia is mainly driven by inequality in urban areas which causes the gap between urban and rural areas becomes wider. These conditions can be an indication that the policies imposed related to development process in Indonesia has not been met the objectives yet.

Figure 2. The trend of inequality in Indonesia from period 2002 to 2011



Source: Statistical Yearbook of Indonesia, 2004-2012

Meanwhile, in Indonesia, related to inequality and economic performance, there have been some studies conducted to relate these two variables. These studies, for example, have been done by Hajiji (2010) as well as Eka Raswita and Utama (2013). Nonetheless, these studies only focused mainly on inequality, growth and relate these to poverty in Indonesia, but they did not include another variable, such as middle class as one of the variables in which it is also possible to have a link with inequality and economic growth. For example, in his study, Hajiji (2010) examined the link between income inequality, economic growth and poverty in Riau province from period 2002 to

2008 by applying panel data analysis. The finding of this study revealed that an increase in income inequality from 0.273 in 2002 to 0.306 in 2008 has hindered economic growth in Riau province and has caused poverty reduction to be less effective (Ibid.:101). Furthermore, another study has been conducted by Eka Raswita and Utama (2013) with an aim to examine the pattern and the structure of economic growth as well as income inequality in Gianyar regency by employing data from period 1993 to 2009. By implementing Klassen Typology, Williamson Index and regression curve estimation as their methodology, the finding concluded that income inequality from 1993 to 2000 in that regency increased[1]. Besides, the result also confirmed that regarding the relationship between inequality and growth, there was an evidence that an inverted U-shaped relationship between those two variables as stated by Kuznets hypothesis prevailed during period 1993-2009 (Ibid.:127).

In addition, as mentioned by Boushey and Hersh (2012:2), economic growth theories typically only relate economic growth to capital stock or infrastructure as its determinants, but they do not build a model of economic growth in relation to the presence of a middle class. Potentially, the emergence, creation and presence of a middle class have important roles, especially for the development of a country. Not only contribute in creating political stability, but it can also contribute in economic improvement of a country since it can create comprehensive economic institutions. This is because the middle class can be potential consumers for goods and services available in an economy. In other words, it can trigger consumption in a country so that it can spur economic growth. Besides, nowadays, the middle class becomes an interesting discussion topic since there is a different view related its relation with economic growth. On the one hand, there is a view that the middle class is a result of economic growth; on the other hand, there is also an argument that economic growth of a country can be determined by the presence of the middle class.

Another reason, in fact, in Indonesia, the size of middle class is increasing. Between the period 2003 and 2010, about 55 millions people became the middle class in Indonesia (as shown by table 1). This fact is also strengthen by the statistics released by the Central Bank which shows that the size of middle class in Indonesia, based on the 2011 survey that was held by the Central Bank, accounts for about 60.9 percent of the population in Indonesia[2]. That is why it is important to consider the presence of middle class when examining the relationship between inequality and economic growth.

Meanwhile, most of the studies are conducted to examine the relationship between inequality and economic growth between countries. However, it is also important to examine this relationship within countries. This is because assessing intra-country inequality is related to policy implementation, in which

[1] Klassen Typology is a method to examine the pattern and the structure of economic growth of a region. This method classifies a region based on two main indicators, namely, regional growth and regional income per capita. In the mean time, Williamson index is used to measure disparity between regions, where it relates regional income per capita and population number in each region. Based on Williamson Index, the bigger the index, the higher the inequality in a region is.

[2] This statement is declared by Yunita Resmi Sari, the Deputy director of the Central Bank's banking research and regulation department that was published in the Jakarta Post newspaper. Available online on 23 July 2012 at www.thejakartapost.com.

specifically, it is related to the policy constructed by the government in order to achieve the growth which is more pro-poor. Besides, as stated by De Dominicis et.al (2008:654), as their recommendation based on their study results using meta-analysis, "...it will be particularly useful to increasingly focus research on determining the impact of income inequality on economic growth using single-country data at the regional level, or a relatively homogeneous set of countries with adequate controls for country-wide differences in economic, social and institutional characteristics".

Table 1. The change in the size of the middle class in Indonesia between period 2003 and 2010[3]

	Per capita expenditure (Rp/month)	Population (millions)		Change 2003-3010 (millions)
		2003	*2010*	
Lower-middle	*360 thousands – 720 thousands*	*77*	*119*	*42*
Upper-middle	*720 thousands – 3,6 millions*	*3,5*	*15*	*11,5*

Therefore, to fill the gap and to contribute to the inequality and growth literature, especially for the Indonesian context, this paper examines the role of the middle class beside inequality and other factors in determining economic growth. In addition, instead of looking at one country as the unit of analysis, this paper mainly tries to analyze the different impact of inequality and the size of middle class on economic growth between provinces. The reason behind this lies due to the fact that there are differences among provinces in Indonesia in terms of their inequality level and their economic growth.

1.2 Research Questions

Based on the introduction above, this paper proposes to deal with the following research questions:

1. What is the link between inequality and economic growth across provinces in Indonesia?
2. What is the effect of the middle class on economic growth in Indonesia?

[3] This table is taken from the Indonesian Economic Discussion material which was presented by Prof. Didik J. Rachbini on 22 March 2013 in Den Haag.

Chapter 2
Theory and existing empirical evidence

Economic growth is a key element in explaining why there is a difference between rich and poor countries in terms of their standard of living. In general, economic growth can be defined as the improvement of economic condition of a country to a better condition which can be measured by the percentage increase in real Gross Domestic Product (GDP) or real Gross National Product (GNP)[4]. Furthermore, the literature on economic growth shows that economic growth has a link to other aspects, such as poverty and inequality aspects. In relation with the first aspect, it is shown that economic growth is negatively related with poverty. Higher economic growth leads to reduction of poverty. Particularly, this evidence has been shown by studies conducted by Bourguignon (2000) as well as Dollar and Kraay (2002).

Meanwhile, regarding the second aspect, the study about the relationship between economic growth and inequality has been a key come a key concerns amongst researchers for several decades. On the one hand, recently, there are also some studies in this particular area examining that inequality is the result of economic growth. For instance, this result is confirmed by the work done by Angeles-Castro (2006) who implemented unbalanced panel of 116 countries and balanced panel of 31 countries covering both developed and developing countries from 1970 to 1998. The result of the study shows that initially economic growth triggers a decline in inequality and it then leads to an increase in inequality. In other words, there is a U-shaped relationship between economic growth and inequality. Besides, a similar direction of causal relationship between economic growth and inequality was obtained by Perez-Moreno (2009), where by using panel data in Spanish regions, he found less income inequality in Spanish regions is resulted from higher growth of Gross Domestic Product (GDP). On the other hand, there are also many studies which postulate that inequality is able to affect economic growth. This linkage is based on the result of studies, either between countries or within country studies conducted by researchers, in particular by Panizza (2002) and Chen (2003). Based on these two results, it is clear that there are two direction of the linkage between economic growth and inequality. However, in this paper, I will focus only on the second type of relationship between economic growth and inequality, that is the effects of inequality on growth. In the mean time, since there is a potential endogeneity between the two variables, this paper will take this into account when examining that relationship.

2.1 The relationship between inequality and economic growth

According to Van der Hoeven's explanation, inequality is a relative concept, where it does not measure the level of absolute income of a person, but it measures the income of people relative to other's income[5]. Furthermore,

[4] This definition is provided by the World Bank in its official website: http://www.worldbank.org/depweb/english/beyond/global/glossary.html

[5] The concept is explained by Rolph Van der Hoeven in Growth, Inequality and Poverty's lecture in the ISS The Hague, 2013.

according to the theory, it is mentioned that inequality has a link with economic growth. The hypothesis describing the relationship between inequality and economic growth was firstly introduced by Simon Kuznets in 1955. Based on his argument, there is an inverted U-shaped relationship between these two variables. The explanation of this argument is that the level of inequality is low in the early stages of development and it becomes higher in the next stage of development. The reason behind this argument is because there is a reallocation process of labor and other resources from sectors which experience low productivity to the sectors which have higher productivity; thus, this process leads to more advantages gained by the middle and the upper income classes rather than advantages gained by the lower income classes, which in turn this condition leads to wider gap between income classes and results in more unequal distribution of income[6].

Moreover, as stated by Cornia and Court (2004), there is a non-linear relationship between inequality and economic growth, where the negative relationship between these two occurs in low and high inequality level, while a certain range of inequality then becomes effective for a growth. They explained that the negative association between these two appears in the very low and very high level of inequality. In this case, very low level of inequality leads to some problems, such as incentive traps, free-riding and labor shirking behaviour, which in turn hinder economic growth; as well, if the inequality is very high, both the short-term and the long-term economic growth of a country can be negatively affected since it also triggers several problems, in particular incentive traps, political instability, and social tensions problems which in turn these problems become the constraints in achieving secure property rights as one of the factors to attract investments (Ibid.:23).

Nevertheless, as the pioneering work, Kuznets hypothesis was only based on the traditional argument of the implications of economic growth on inequality. Therefore, this has been challenged by some empirical studies which argued that there are also the implications of inequality on growth.

2.2 Empirical evidence on the relationship between inequality and economic growth

There are a number of studies that have examined the relationship between inequality and economic growth. These studies have been conducted by employing different types of data, such as cross-country data, within country data or panel data. The results of these studies vary, where the relationship between inequality and economic growth can be either positive or negative.

Firstly, based on the types of data used, cross-country analysis was applied by some researchers in examining the link between inequality and economic growth. These particular studies, for instance, have been conducted by Alesina and Rodrik (1994), Persson and Tabellini (1994), Alesina and Perotti (1996), Perotti (1996), Chambers and Krause (2010), Castelló-Climent (2010) and Forbes (2000). In general, most results of studies confirm that the link between

[6] This argument is based on the page 14 of article "Growth with Equity: An Overview of Policy Lessons from the Experiences of Selected Asian Countries", which is available on the website of www.unescap.org.

inequality and economic growth is negative. This negative association means that low level inequality can promote economic growth, whereas high level inequality can hinder economic growth. Exceptionally for studies conducted by Persson and Tabellini (1994) and Forbes (2000), they found that there is a positive relationship between inequality and economic growth. Meanwhile, even though the results from the studies are similar, they examined different channels in the link between inequality and economic growth. Besides, they also used different data set and different methodology, including different concepts of inequality.

Alesina and Rodrik (1994) used distributive policy as a channel to examine the link between inequality and growth. Through this channel, specifically measured by capital taxation, the result depicted that it causes distortions which in turn reduces economic growth. Moreover, by employing endogenous growth model and two stages least square technique for cross-country data covering OECD and developing countries, they also found that subsequent growth is adversely affected by inequality in income and land distribution (Ibid.:485). Similarly, Alesina and Perotti (1996) also used distributional channel in examining the association between income distribution and investment where they used political instability channel. They applied simultaneous equation technique by employing cross-section data for 71 countries during period 1960-1985. Based on the result, it is revealed that the more stable the political condition, the more equal the income distribution; and this condition increases the investment (Ibid.:1225). Meanwhile, political instability channel was also used by Perotti (1996) to examine the link between inequality and growth, where the the finding supports the adverse link between inequality and growth. Additionally, in his study, he also included specific channels of inequality affecting growth, such as fertility rate and return of investment on education; and the results confirm that in society which is more unequal, the fertility rate is higher and the return of investment on education is lower so that these lead to lower growth rate (Ibid.:182).

Furthermore, a negative link between inequality and economic growth was also reported by Chambers and Krause (2010) and Castellò-Climent (2010). No distinct result was found by these two studies even though they used different methods and data set. Beside these differences, both studies have a similarity in which they included human capital in their models. Chambers and Krause (2010) investigated the link between inequality and economic growth by employing semiparametric model. While their result shows that a reduction in economic growth over the next 5 years occurs when there exists a higher income inequality, that inequality even becomes more dangerous to growth if there is an increase in the return to human capital relative to physical capital (Ibid.:153). For the time being, by applying dynamic panel data model for different regions worldwide, Castellò-Climent (2010:315) concluded that in most world's regions, a higher inequality in human capital triggers a lower growth, but this relationship is not clearly found in higher-income countries sample. In addition, based on his study, he also found that in the less developed countries, a higher income inequality negatively affects economic growth (Ibid.).

Meanwhile, even though Persson and Tabellini (1994) also included distributional channel, they found opposite result from what was obtained by

Alesina and Rodrik (1994). Through employing historical panel data of nine developed countries as well as postwar cross-section data for developed and less developed countries, they applied general equilibrium model. The finding concluded that an increase in equality constitutes an increase in economic growth, where this result is significant (Ibid.:612). Another positive relationship between inequality and economic growth based on cross country analysis was also found by Forbes (2000). In her study, by using Deininger and Squire's new data set compilation, she took into account for the short and medium term in her methodology. According to the result after using GMM technique, it is revealed that in the short and medium term, an increase in overall inequality is not detrimental to economic growth of a country (Ibid.:885).

Secondly, within country analysis was also implemented to assess the inequality-growth nexus by other researchers, such as Panizza (2002), Partridge (1997 and 2005), Frank (2009). According to within country analysis results, in general, the link between inequality and economic growth is positive, except the result of work done by Panizza (2002) where he found that there is an adverse link between those two variables.

Partridge (1997) explored the relationship between income inequality and economic growth by employing U.S. states panel data and by applying endogenous growth model in which the specification is similar to that used by Persson and Tabellini (1994) as well as Alesina and Rodrik (1994). Even though the specification used is similar to their studies, Partridge's study employed states panel data, instead of cross-country data. Besides, this study was also different from those studies because it included institutions factor in examining the inequality-growth relationship. According to the result, it is shown that more unequal states experience higher rate of economic growth or in other words, it can be said that there is a positive link between income inequality and economic growth (Partridge 1997:1022).

Afterward, in 2005, Partridge continued his research in assessing the relationship between inequality and growth also by employing U.S. states panel data for period 1960-2000. What makes it different from his previous study is that he takes into account short and long-run responses in examining the link between two variables. Based on the result after allowing different effects, it is clear that there is a positive relationship between overall income inequality and economic growth, where more than 40 percent of the variation in the growth rate can be explained by inequality. In addition, based on different models employed, including OLS, RE, BE, and FE, the results confirm that the coefficient of inequality is positive and significant. It means that greater inequality raises long-run economic growth. (Partridge 2005:363 & 373-388).

According to these explanations, it seems that the work done by Partridge (2005) is more credible compared to other studies since beside including short-run effect, it also take into account long-run effect which might be present in inequality-growth relationship so that dynamic effect is also considered. Therefore, this study is more comprehensive. Nonetheless, from methodology side, there is a shortcoming. Since this work applied fixed effect and between estimators to estimate the coefficient, it requires external instruments in order to cope with endogeneity problem. In fact, in practice, it is difficult to find appropriate external instruments.

As a consequence, by utilizing a panel data of 48 U.S states as used by Partridge, Frank (2009) improved the methodology in assessing the effect of inequality on economic growth. However, the data period is different from what was used by Partridge since Frank employed data covering the postwar period 1945-2004. By applying Autoregressive Distributed Lag (ARDL) dynamic panel or dynamic panel error-correction estimators method, he found that long run economic growth is positively affected by income inequality; and the concentration of income within the upper end of income distribution is the main source of this positive relationship between inequality and economic growth (Ibid.:65).

According to the results of several studies explained above, it can be concluded that an increase in inequality can result in different effects on economic growth. It can either negatively or positively affect the growth rate of a country. Nevertheless, there is also evidence which displays an ambiguous relationship between inequality and economic growth. Such evidence was obtained by Kula and Millimet (2010) when they examined that relationship by employing cross-country data set. By introducing fiscal policy approach into the model and relaxing the political-set up, they found that inequality can both positively and negatively affect economic growth. In the presence of uncertainty, the model can result in a negative relationship between inequality and economic growth in the long-run, while can also allow for a possible positive association between the two variables in the short-run (Ibid.:427). This evidence shows that the link between inequality and economic growth still remains become a puzzle depending upon some conditions, for example depending on a certain assumption or different channel used when examining this relationship. Therefore, that ambiguous result becomes an inspiration for this paper to assess the exact relationship between those two variables.

2.3 Determinants of economic growth

Beside studies which have examined the causal relationship between inequality and economic growth, a number of studies have also assessed factors which influence eonomic growth of a country. In general, there is a common view in macroeconomic theory that the main determinants of growth are capital and labor. Nonetheless, some evidence account for many other factors beside those two.

The literature on growth departs from the so-called Solow growth model. In this model, the production function of output consists of the stock of capital and labor force and it is assumed that the production function has constant returns to scale. Related to growth, this model states that the change in capital stock causes economic growth (Mankiw 2003:184). In addition, Solow growth model also explains the relationship between saving rate and growth. In this model, saving rate can lead to higher economic growth, but this is only a temporary condition, where it only leads to economic growth until it reaches a new steady state level (Ibid.:189-190). Nevertheless, a sustained growth cannot be explained by the basic Solow model. Thus, to account for this case, the model is expanded by introducing two factors determining economic growth, namely population growth and technological progress; however, based on this model, population growth cannot lead to a sustained increase in standard of

living, but it only leads to a sustained increase in the level of output (Ibid.:199-205). The only factor that can determine sustained growth persistently is technological progress (Ibid.:210). Nonetheless, this technological progress in Solow growth model is considered as exogenous..

Meanwhile, considering the exogeneity of technological progress in the Solow groth model, a new class of growth model was developed. That model is called as endogenous growth model. In this model, there is no longer assumption of decreasing returns to capital. Moreover, this model states that the factors determining economic growth are endogenous to the model, meaning those factors are determined within the model. Besides, in this model, capital is viewed in a broder definition where it includes both physical and human capital. Specifically, this human capital can be one of the alternatives to improve technology that will promote long-run growth rate. Another source of technological progress, based on the endogenous growth model, is from research and development process (Barro and Sala-i-Martin 1995, Mankiw 2003).

In addition, those factors above (capital, labor, population growth and technological progress) are considered as proximate determinants of growth; however, to explain those, it is required to discuss what underlies those determinants as well. To do this, it can be done by looking at the deep determinants of growth which consist of geography, institutions, and openness[7].

2.4 Empirical evidence on determinants of economic growth

There are several studies conducted to examine the determinants of economic growth. The results of these studies vary and depend upon the growth model applied and the coverage of the data used in the studies as well as other factors. This section discusses about the determinants of economic growth resulted by several studies, including human capital accumulation, geography and population.

Regarding human capital accumulation, one of the evidence supporting this result was provided by Gundlach (1995). In his research, he applied the augmented Solow growth model and used average years of schooling as a proxy for stock of human capital per worker. The result of his study confirms that the share of human capital in income is higher, where human capital formation has twice the impact on growth compared to physical capital formation (Ibid.:1&12). Likewise, the same proxy of human capital -years of schooling- was also used by Cohen and Soto (2007) in their work on examining factors influencing economic growth. By utilizing a new data set from OECD database and from surveys disseminated by UNESCO, they observed that in the standard regression model, the variable years of schooling is found to be a significant determinant of growth across countries; besides, that same variable also significantly affects economic growth when it is used in a more advanced panel data regression (Ibid.:24).

[7] This explanation was presented by Lorenzo Pellegrini in the lecture of Growth, Inequality and Poverty in ISS The Hague, 2013.

For the time being, slightly different from Gundlach (1995) as well as Cohen and Soto (2007), Freire-Seren (2001) investigated the reverse causality between human capital and economic growth. By employing data across countries and by applying joint estimation, she found that there is evidence supporting the positive impact of the level effect of education on economic growth; and she also found that level of income positively and significantly influences the process of human capital accumulation (Ibid.:593-594).

Next, other factors determining economic growth are related to geography. As the geography hypothesis states, the difference in economic growth across countries can be caused by geography, climate or ecological differences (Acemoglu, Johnson and Robinson 2002:1232). Empirical evidences on the relationship between geography and economic growth also show that geographic conditions do matter for economic development. This argument, for instance, is confirmed by Gallup and Sachs with Mellinger (1999). According to them, economic growth is affected by the climate and the location along sea coastline. Specifically, the location along the sea coastline is beneficial since it is related to transportation costs. In addition, they also revealed that tropical areas can hinder economic growth. It is because in the tropical areas disease burdens are greater and agricultural productivity is lower (Ibid.). The relation between geography and economic growth is also supported by evidence of within country model. The evidence depicts that the coastline location in the USA is one of the determinants which stimulate the growth rate of the city (Rappaport and Sachs 2001 as cited in Henderson 2003:40-41).

Beside geography, another factor determining economic growth of a country or a region according to some studies is population. Based on empirical evidence, the nexus between population and economic development is still not clear. Some results in positive relationship and others find that the relationship between these two variables is negative. For instance, a study has been conducted by Savas (2008) to relate these two variables. By employing data from Central Asian Economies and by applying autoregressive distributed lagged model, the result confirms that there is an evidence to support the argument that large population size can drive economic growth. Next, a positive link between population and growth was also found by Thuku et.al (2013) based on their study result. In their study, they employed annual time series data from Kenya during period 1963 to 2009 and implemented vector auto regression (VAR). According to the result of their study, it clearly can be seen that higher population growth can lead to an increase in economic growth of Kenya (Ibid.:58). The result of these two studies shows that even though the model specification and data set used are different, the conclusion remains the same and it might show that larger population number can be a source of labor as well as source of consumption which can trigger higher growth. Furthermore, the results support the theory in the growth model that population growth influences economic growth. Nonetheless, it seems that the study done by Thuku et.al (2013) has a drawback since this study only employed time series data set and did not take into account the difference which might be present between regions; thus, it only described the impact of population on economic growth over time. In contrast, Savas (2008) presented a more thorough result because it also considered country specific effects so

that it can describe the influence of population on economic growth over time as well as across country.

Another study has been conducted by Atanda et.al (2012) with an aim to examine the role of population on economic growth by comparing developing and developed countries. Based on the trend analysis, they found that in developing countries, higher growth rate of population causes lower growth since it creates dependency in the economy, whereas in developed countries, high population size constitutes higher real income (Ibid.). Meanwhile, another negative relationship between population and economic growth was also provided by Wako (2012). In assessing the link between demographic variables, in particular population on economic growth, he applied vector error correction model (VECM) for the case of Ethiopia. Based on his study, the result revealed that lower growth of population is beneficial to promote higher economic growth (Ibid.:250).

Therefore, those evidence show that the population has a potential role in determining economic growth rate, including in developing countries.

2.5 The middle class and economic growth

Middle class has become a topic of discussion for many economists. This is because in general the number of the middle class is increasing around the world, particularly in Asia. The emergence of middle class occurs due to the growth of service jobs and industrialization process (Hattori and Funatsu 2003:152).

Another reason, it is interesting to discuss about the middle class because it has potentially important roles for the economy of a country or region. According to Hughes and Woldekidan (1994), the middle class has a role in promoting economic development since it has specific social, political and economic characteristics which may enhance economic development and growth. In detail:

1. Related to economic role, the middle class can be potential consumers for goods and services which are available in the economy. Specifically, if it is compared to poorer people, the middle class people tend to spend more on non food commodity (e.g: health care, education and housing) and tend to increase its private saving. Thus, it can enhance economic development of a country or region.
2. The middle class can also be a source of human capital which is one of determinants of economic growth of a country or region. This is because the middle class usually has specific educational levels, such as secondary and tertiary education which are as sufficient qualifications for management jobs in both public and private sectors. Besides, these specific educational levels also become a vital component for social lifestyles of the middle class.
3. The middle class can also create political stability in a country or region which is important to create better environment for investment. Thus, investment in a country or region will increase and then will lead to higher economic growth.

Nevertheless, there are various definition of middle class. One definition of middle class is given by Davis and Huston (1992), where they define middle

class as the families which have incomes between 50 and 150 percent of median income in the current year. Another definition, Thurow (1984) as cited in Hughes and Woldekidan (1994) describes the middle class as 'household with incomes between 75 and 125 percent of median household income'. As well, Asian Development Bank (ADB) also has different definition of middle class. In detail, ADB defines middle class as 'those who spend USD 2-20 per person per day' (Andrew and Yali 2012:2). Nevertheless, there is no specific definition of the middle class used in Indonesia. Typically, it follows the general definition provided by ADB which relies on the range of consumption per person per day.

Meanwhile, related to economic role of the middle class, recently, there have been a number of studies which have examined the link between middle class and growth. In fact, the arguments are puzzling among researches, where on the one hand, the emergence of middle class is said to be the result of economic growth; on the other hand, it is stated that an increase in economic growth is determined by one factor called as middle class beside other determinants. In other words, middle class is the result of economic development; however, it also contributes in sustaining economic development in the long run. This is because the middle class is influential group of consumers towards good quality goods and services available in the market (Ibid.).

There are some studies which include the middle class as one of the variables affecting economic growth, such as by Perotti (1996), Alesina and Perotti (1996), and Partridge (2005). However, for their studies, they used different definition of middle class and different data sets, but the finding of their study confirm the same result. In these studies, Perotti (1996) as well as Alesina and Perotti (1996) used similar definition of middle class: the share of income of the third and the fourth quintiles of population (Q3 and Q4), whereas Partridge (2005) defined the middle class as the share of middle-quintile income (Q3). Besides, Perotti (1996) used sociopolitical instability and education/fertility decision as the channels to relate between middle class and economic growth, while Alesina and Perotti (1996) only used sociopolitical stability as the channel. Regarding sociopolitical instability channel, according to Perotti's result, middle class has negative relationship on sociopolitical instability which in turn leads to higher growth rate (Perotti 1996:174). Likewise, the finding of the study conducted by Alesina and Perotti (1996) shows that, based on the simultaneous equation technique, the increase in the share of middle class triggers a decline in political instability and this decline leads to higher economic growth. The positive relationship between middle class and economic growth was also obtained by Partridge (2005). He concluded that there is a consistent pattern where the long-run economic growth is positively affected by the share of the middle class (Ibid.). This is because a strong middle class can create greater incentives to work best.

Another study has also been conducted by Easterly (2001) and Ravallion (2010). In his study, Easterly (2001) examined the relationship between middle class consensus and economic growth. In that case, he defines middle class consensus as 'a high share of income for the middle class and a low degree of ethnic divisions' (Ibid.:317). The result reveals that economic growth is higher in countries which have middle class consensus. It is because in middle class

societies, accumulation capital (both human and physical capital) is higher, political instability is lower, and national economic policies (such as financial depth and trade openness) are better (Ibid.:332). In addition, another finding revealing that expanding middle class is beneficial for economic growth was delivered by Ravallion (2010). That study, specifically, also assessed the role of the middle class on poverty reduction. The result of his study confirms that expanding middle class leads to higher economic growth (Ibid.:445). As we know, endogeneity problem might occur when modelling the link between the middle class and economic growth. This problem also appears in two studies above. To cope with that problem, both studies used external instrumental variables which is different between these two studies. Easterly (2001) used tropics dummy as instrument variable and applied three stages least squares to estimate the model, whereas Ravallion (2010) used the growth rate in private consumption per capita as the instrument variable.

Solimano (2009) has also conducted a study with an aim to examine the relationship between the middle class and economic development by employing dataset covering 129 countries. In his study, he defines the middle class by following a broader definition including the income share of deciles 3 to 9 deciles, where 3 to 6 for the lower-middle class, and decile 7 to 9 for the upper-middle class (Ibid.:31). According to his result, it is found that the relative share of income of the middle class is beneficial for economic development which is described by income per capita (Ibid.:46). As well, León (___) has done the study to analyze the rise of middle class in Brazil for the last hundred years and to assess the impact of the rise in the middle class on economic development. Unlike other definitions used by previous researches, she proposed different definition of middle class, where she defined middle class based on the income coming from the work returns (Ibid.:4). According to her study, it can be shown that in the last decade, there is upward trends of the middle class and economic growth in Brazil (Ibid.:6). In addition, the study also concludes that the middle class plays an important role in achieving higher economic growth in Brazil. Likewise, the same relationship has also been confirmed by Birdsall (2010) based on her study, where she found that there is a high correlation between the middle class and average income per capita. However, in her study, she defines the middle class in developing countries based on local and global threshold. She used $10 a day (in 2005 PPP terms) for local threshold and 95th percentile for the global threshold (Ibid.:4).

In the meantime, another work by Chun et.al (2011) has also been done to examine the role of middle class on economic development in cross-country context. By assessing panel data of 72 developing countries from 1985 to 2006, they tried to analyze the presence of direct and indirect effects of the middle class on economic growth which is described by consumption growth. In their study, they define the size of the middle class based on three concepts: an absolute concept-"the share of the population living on $2-$10 per day in 2005 PPP"-; a relative concept-"the share of the total consumption expenditure accruing to the middle 60% of the expenditure distribution"-; and a relative measure median -"the share of population that has expenditures at least above $2 a day and within 0.75% and 1.25% of the median expenditure of the country"- (Ibid.:11). By estimating econometric specification which is based on the Solow growth model, they found that only the relative concept, that is

middle 60% variable which significantly and positively affects consumption growth, whereas the other two concepts are found to be insignificant in affecting consumption growth. These results reveal the direct effect of the middle class on economic growth, which means a higher share of consumption accruing to the middle 60% of the consumption distribution increases the productivity (Ibid.:17). In addition, regarding the indirect effect, the finding shows that the middle class influences consumption growth through factor inputs channels, mainly through human capital (Ibid.:32).

Based on the results of studies explained above, it seems that the role of middle class on economic growth is positive. It means that the emergence of middle class can promote economic development of a country or a region. Nevertheless, the link between the middle class and economic growth can be the other way around, where the emergence of the middle class is the result of economic development. Therefore, to deal with this two-way relationship, various studies used instrumental variable estimation technique to resolve the endogeneity problem. However, those studies mainly depend on the external instrument which is in fact difficult to find since it has to be correlated with the instrumented variable and not correlated with the disturbance term. Due to this reason, later, this paper will not rely on external instrument to solve the endogeneity problem, rather it will use internal instrument which is easier to find since it only uses lagged of explanatory variables as instrumental variables.

Chapter 3
Methodology and data

3.1 Methodology

In this paper, I start from the basic Solow growth model and treat output as a function of capital and labor. Based on this model, I first estimate the following equation by using pooled OLS in order to assess the effect of these two factor inputs on growth:

$$y_{i,t} = \alpha + \beta lcapital_{i,t} + \delta llabor_{i,t} + \varepsilon_{i,t} \quad (1)$$

where the dependent variable is $y_{i,t}$,, that is the log of per capita income for province i at time period t. The independent variables in this equation consist of *lcapital*, that is the log of capital stock for province i at time t and *llabor* which represents the log of the number of workers for province i at time t.

Meanwhile, considering the main objective of this paper, that is to examine the link between inequality and economic growth; and between the middle class and economic growth, I include these two variables in the basic model in addition to capital and labor. The inclusion of the inequality variable is based on the argument that inequality influences economic growth, for example, as studies conducted by Alesina and Rodrik (1994) and Panizza (2002). Another factor included in the model is a proxy for the size of the middle class. This is because according to existing empirical evidence, this variable influences economic growth. This evidence, for instance, was provided by Perotti (1996), Partridge (2005) and Chun et.al (2011). Thus, based on these considerations, I estimate the following specification:

$$y_{i,t} = \alpha + \beta lcapital_{i,t} + \delta llabor_{i,t} + \theta gini_{i,t} + \sigma lmidclass_{i,t} + \varepsilon_{i,t} \quad (2)$$

In this specification, the additional explanatory variables consists of $gini_{i,t}$, that is gini coefficient used to capture income inequality in province i at time period t, and $lmidclass_{i,t}$ (the log of the size of middle class for province i during period t)[8]. Finally, $\varepsilon_{i,t}$ is the error term. According to equation (2), in order to have impact on growth, the coefficient of gini variable is expected to be negative and significant because we expect that lower level of inequality is associated with higher growth. Meanwhile, for the *lmidclass* variable, we expect a positive sign since we expect that the larger the size of the middle class, the higher the growth rate of a region.

In addition, based on theory and empirical work, there are some factors determining economic growth besides inequality and the size of the middle class. Therefore, equation (2) can be expanded by including other factors as suggested by the literature. Due to this expansion, we form vector $\mathbf{X}_{i,t}$ which

[8] The definition of *lmidclass* variable follows Thurow's (1984) definition. Specifically, it is defined as 'household with incomes between 75 and 125 percent of median household income'. This paper uses this definition in order to make the result comparable to other studies that have been previously conducted. Another reason to use this definition is because there is no specific Indonesian definition of the middle class available. Finally, due to the availability of the data set that we would employ in this paper, it is only possible to measure the size of the middle class based on income definition.

includes more variables in addition to $lcapital_{i,t}$, $llabor_{i,t}$, $gini_{i,t}$ and $lmidclass_{i,t}$. The variables which form vector $\mathbf{X}_{i,t}$ are mean years of schooling *(mys)* which is used to represent education as suggested by Gundlach (1995) as well as Cohen and Soto (2007) where we expect the coefficient of this to be positive, and temperature *(temp)* which represents climate variable which does matter for growth as stated by Acemoglu, Johnson and Robinson (2002). Besides, the log of the number of crimes *(lcrimes)* is also included as one of explanatory variables to capture political instability as suggested by Perotti (1996) as well as Alesina and Perotti (1996) and the coefficient is expected to be negative. Finally, population variable as represented by the log of population number *(lpop)* is included as well to control for province characteristics. The inclusion of population is based on the literature, in particular provided by Savas (2008) and Wako (2012). Thus, with the inclusion these additional variables, the specification in equation (2) is expanded to:

$$y_{i,t} = \alpha + \beta lcapital_{i,t} + \delta llabor_{i,t} + \theta gini_{i,t} + \sigma lmidclass_{i,t} + \gamma' \mathbf{X}_{i,t} + \varepsilon_{i,t} \quad (3)$$

In additional specifications, the squared of gini variable *($gini^2$)* is included in equation (3) with an aim to take into account non-linearity that might appear in relation between inequality and economic growth, as stated by Kuznets hypothesis and Cornia and Court (2004). In addition, to test the consistency of the result due to a change in concept of the middle class, in pooled OLS regression model as described in equation (3), we replace *lmidclass* variable with *lmidclass2*[9].

However, there are shortcomings from equation (1) to (3). First, these equations would result in biased and inconsistent estimates since some of the explanatory variables may be correlated with the error term, $\varepsilon_{i,t}$. Secondly, this model may also suffer from omitted variable bias due to omission of some variables which might also have a bearing on income. For example, as we know that there are differences across provinces in Indonesia, in particular geographical differences. This differences cannot be controlled for by using pooled OLS regression. Hence, the coefficients become biased.

Therefore, to deal with some of these concerns, we exploit the panel nature of the data set and control for province fixed effects. As a consequence, the model is modified as follow:

$$y_{i,t} = \alpha + \beta lcapital_{i,t} + \delta llabor_{i,t} + \theta gini_{i,t} + \sigma lmidclass_{i,t} + \gamma' \mathbf{X}_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t} \quad (4)$$

where

μ_i = the time-invariant fixed effect for province i
τ_t = the province-invariant fixed effect for time t, and
ε_{it} = idiosyncratic error term

By estimating equation (4), we would still result in biased and inconsistent estimates due to endogeneity problem. For example, this endogeneity problem is caused by the variable $gini_{i,t}$ and $lmidclass_{i,t}$ which might be correlated with the

[9] The definition of lmidclass2 variable follows Davis and Huston (1992). According to them, the middle class is defined as the families which have income between the range 50 to 150 percent of median income.

disturbance term. As revealed by some literature, such as by Alesina and Rodrik (1994) the inequality variable is likely to be endogenous. Besides, the estimates might be biased as we do not consider reverse causality problem which usually prevails in the inequality and growth relationship. Therefore, to solve these endogeneity and reverse causality problems, we need to use instrumental variables.

To solve these problems simultaneously, this paper follows the dynamic panel model as a standard model which relates inequality and economic growth as proposed by Frank (2009) and Castelló-Climent (2010) where the model includes lagged values of the dependent variable as explananatory variables. The application of dynamic panel data is beneficial since it allows for fixed effects and endogeneous regressors while avoiding dynamic panel bias (Nickell 1981 as cited in Roodman 2009). Besides, the advantages of inclusion the lagged dependent variable are twofold. First, it can be used to solve the problem of reverse causality. Second, it can also be used to capture the convergence process. However, the only difference between the model used in this paper from standard models is that we include the middle class variable in the model as captured by *lmidclass*. The basic dynamic panel model used in this paper is based on equation (5) below:

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \mathbf{X}_{i,t}\gamma + \mu_i + \tau_t + \varepsilon_{i,t} \quad (5)$$

where:

i = the number of provinces (1,2,...,N)
t = the number of time periods (1,2,...,T)
$y_{i,t}$= the log of real income per capita for province i during time t
$\mathbf{X}_{i,t}$= vector of independent variables for province i at time t. This is similar to what explained in equation (3), except here we also include *lcapital*, *llabor*, *gini* and *lmidclass* variables in this vector.
μ_i = the time-invariant fixed effect for province i
τ_t = the province-invariant fixed effect for time t
ε_{it} = idiosyncratic error term

By rearranging, equation (5) can be stated as:

$$y_{i,t} = \theta y_{i,t-1} + \mathbf{X}_{i,t}\gamma + \mu_i + \tau_t + \varepsilon_{i,t} \quad (6)$$

where $\theta=\alpha+1$.

Meanwhile, estimation of equation (6) does not mean without any problem. If the variables in the right hand side of equation (6) are correlated with province fixed effects (μ_i), the application of OLS technique to this model will result in inconsistent estimates. These inconsistent estimates are sourced from:

$$E(\mu_i, y_{i,t-j}) \neq 0$$

Besides, inconsistent estimates are also caused by the violation of strict exogeneity for explanatory variables assumption. This could happen if there is a correlation between explanatory variables and the idiosyncratic error terms (Wooldridge 2002:254). This condition can be stated as:

$$E(\mathbf{X'}_{it}\, \varepsilon_{it}) \neq 0$$

Therefore, to solve these problems, we need estimation technique that can accomodate endogeneity and correlation problems. That estimation technique is Generalized Method of Moments (GMM) as proposed by Arellano and Bond (1991). This technique is implemented by eliminating province fixed effects through first differencing process; thus, it is called as difference GMM (Roodman 2006:16). The transformation leads to the following specification:

$$\Delta y_{i,t} = \theta \Delta y_{i,t-1} + \Delta \mathbf{X}_{i,t}\gamma + \Delta \tau_t + \Delta \varepsilon_{i,t} \quad (7)$$

In difference GMM, lagged levels are used as instruments for first differences variables in equation (7). Meanwhile, the moment condition in the difference GMM can be written as:

$$E[(\varepsilon_{i,t} - \varepsilon_{i,t-1})W_{i,t-s}] = 0 \quad (8)$$

with $s \geq 2$, where s is the number of lags; $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$ is the transformed error term and W=[y **X**]. In the mean time, the moment condition in equation (8) has an assumption that there is no second order serial correlation in the error term and explanatory variables are weakly exogenous.

However, in practice, there are still weaknesses of applying difference GMM technique. In this technique, even though the fixed effects has been eliminated, there still appears endogeneity problem, where the lagged dependent variable is still correlated with the error term in difference equation; thus, we also need instrumental variable to instrument the lagged dependent variable. As well, there is also possibilty for pre determined variables in X to be endogenous since they are correlated with the component of transformed error term (Ibid.:18). Therefore, to solve this problem, we apply system GMM as proposed by Arellano and Bover (1995) as cited in Roodman (2006:18). The main principle of this technique is by subtracting the average of all future available observations of a variable (Ibid.). Furthermore, system GMM combines moment condition in equation (8) and other moment conditions for the equation in levels as stated in equation (9) which would result in more efficient and consistent estimates than difference GMM (Castellò-Climent 2010:299).

$$E\left[\left(\Delta W_{i,t-s}(\mu_i + \varepsilon_{i,t})\right)\right] = 0 \quad (9)$$

with s=1. Equation (9) has an assumption that there is no correlation between first differenced of explanatory variables and the specific fixed effects.

Later, Sargan test, Hansen test and Difference-in-Hansen test are also performed in order to check the validity of over identifying restrictions in the moment conditions and to check the exogeneity assumption of the instruments. In other words, these tests are used to test the suitability of instruments used in the model. These tests are based on the correlation between the residuals and the set of exogenous explanatory variables. The dynamic panel data model uses lagged values as instruments because it is assumed that the lagged values of instrumented variable are correlated with endogenous regressors, but they are uncorrelated with the outcome variable. Thus, they are suitable as instrument. Besides, it is assumed that good instruments are not available outside the data set. Therefore, this model

assumes only lagged values of instrumented variable are suitable as internal instruments (Roodman 2006:14). In order to be suitable as instrument, in the Sargan test and Hansen test, we expect not to reject the null hypothesis stating that over-identifying restrictions are valid. As well, we also expect not to reject the null hypothesis of Difference-in-Hansen test of exogeneity instruments. Nevertheless, due to small number of observations in this paper, we need to use adjusted robust standard errors. The advantage of using adjusted standard errors, especially in one-step estimation is we would produce estimates which are consistent in the presence of any autocorrelation and heteroskedasticity patterns within panels (Mileva 2007:7). Therefore, in applying robust one-step GMM, later we would rely on the p-value of Hansen test, instead of Sargan test. This is because Hansen test statistic is consistent.

Meanwhile, in applying GMM technique for the dynamic panel data model, the important thing to take as consideration is we have to consider the lag structure used in the model in order to obtain efficient estimates. According to Roodman (2009), in choosing the length of lags that would be included in the model as internal instruments, we need to consider the number of observations that we include in the model. Furthermore, if the sample is small, too many instruments can cause problems, where they can overfit endogenous variable which results in biased coefficients and they can also produce imprecise estimates (Ibid.:141). Due to this trade-off and the availaibility of sample size in this paper, we only use two lags of the variables to be instrumented as instruments so that we do not lose efficiency and information of the dataset. In our dynamic panel data model, we instrument for *gini* and *lmidclass* variables which are endogenous. In addition, later, in order to check the validity of using two lags as instrumental variable, we would evaluate the values of Arellano-Bond tests for autocorrelation assumption, either for autocorrelation of order 1 (AR(1)) or autocorrelation of order 2 (AR(2)). These two tests are under the null hypothesis of no autocorrelation and are employed to differenced residuals (Mileva 2007:7). Therefore, in order to have two lags as valid instruments, we expect to reject the null hypothesis of no autocorrelation for order 1 and not to reject the null hypothesis of no autocorrelation for order 2. Finally, the use of second lagged of the dependent variable would also be introduced in the model in order to examine whether the results are different between the model with one lagged and two lagged of dependent variable.

In addition, in order to check the robustness in terms of the size of middle class measurement, we would also conduct a sensitivity analysis. In this analysis, we include variable *lmidclass2* relying on an alternative concept of the middle class as explained by Davis and Huston (1992). According to them, the middle class is defined as 'the families which have incomes between 50 and 150 percent of median income'. The specification that would we use in this analysis is similar to what we explained in equation (6).

Regarding the results, they are said to be robust if there is a consistency between the result from previous specification and the result from specification that we use here. In other words, it means that a small change in input value of the model does not cause significant change in its output (Hamby 1994:137).

3.2 Data and variables

3.2.1 Data

In this paper, I use secondary data that are compiled from several sources of publications, such as Statistical Yearbook of Indonesia which is published by BPS-Statistics Indonesia. Specifically, the data employed in this paper consists of:

1. Real Gross Regional Domestic Product (GRDP) per capita for Indonesia by provinces from period 2005 to 2010, which is used to measure economic growth. These data are sourced from the Statistical Yearbook of Indonesia which is published by BPS-Statistics Indonesia.
2. Gross fixed capital formation (GFCF) by provinces from 2005 to 2010 to measure capital stock. These data are provided by BPS-Statistics Indonesia.
3. The number of workers by provinces from 2005 to 2010 which is used to represent labor. The data are gathered from Statistical Yearbook of Indonesia publication.
4. Gini coefficient by provinces from period 2005 to 2010 that is used as a measure of income inequality. These particular data are gathered from the publication of Sustainable Development Indicators which is published by BPS-Statistics Indonesia.
5. Raw data of Social Economic Survey (SUSENAS) from period 2005 to 2010, which is used to calculate the size of the middle class in each province in Indonesia. These data are provided by BPS-Statistics Indonesia.
6. Mean years of schooling data by provinces from 2005 to 2010 as an approximation for education. These data are collected from publication of Human Development Index published by BPS-Statistics Indonesia.
7. Climate data by provinces from 2005 to 2010, where in this case they are approximated by temperature data to measure geographical condition. These data are also available in the Statistical Yearbook of Indonesia.
8. The number of crimes by provinces from period 2000 to 2010 as an approximation of political instability. These data based on the publication from BPS-Statistics Indonesia.
9. Other data to describe chracteristics of each province, such as the number of population by provinces from 2005 to 2010. These data are gathered from the Statistical Yearbook of Indonesia.

In general, the data covers 31 provinces in Indonesia from period 2005 to 2010. This paper only covers 31 provinces because SUSENAS data for the year 2005 is available for 31 provinces. Besides, the crimes data is also available only for 31 provinces. This is due to organization structure of police office which consists of 31 offices in 31 provinces, where two provinces are joined (West Sulawesi and South Sulawesi as one province as well as Papua and West Papua as one province). Meanwhile, other data are available for 33 provinces, instead of 31 provinces; thus, I do merge these data into 31 provinces.

3.2.2 Variables

The variables that would be used in this paper can be summarized as the table below:

Table 2. List of variables

Variables	Variable Names	Indicators
Dependent variable	Growth *(y)*	Log of real GRDP per capita
Independent variables		
1. Priority variables	a. Inequality *(gini)*	Gini Ratio
	b. Middle class *(lmidclass)*	The size of the middle class by provinces, which is defined as Thurow's (1984) definition: 'household with incomes between 75 and 125 percent of median household income'. This variable is in the log form.
2. Control variables	a. Capital stock *(lcapital)*	Log of gross fixed capital formation (GFCF)
	b. Labor *(llabor)*	Log of the number of workers
	c. Education *(mys)*	Mean years of schooling
	d. Climate *(temp)*	Temperature
	e. Political Instability *(lcrimes)*	Log of the number of crimes
	f. Province characteristics *(lpop)*	Log of the number of population

Regarding the variables used in this paper, table 3 reports descriptive statistics of variables. Based on this table, it can be seen that, in general between period 2005 and 2010, on average, there was an increase in real GRDP per capita in Indonesia.

Table 3. Descriptive statistics of variables

Variables	2005		2010		t-test	
	Mean	Std. Deviation	Mean	Std. Deviation	Difference	p-value
grdp	8,625.61	8,013.04	9,885.31	8,599.21	-1,259.70	0.5529
gimi	0.3205	0.0387	0.3579	0.0376	-0.04	0.0003
midclass	648,575.80	1,003,711.00	667,377.10	964,328.70	-18,801.30	0.9408
mys	7.6761	0.9266	8.1145	0.8328	-0.44	0.0547
temp	27.0745	0.9988	26.9490	1.0773	0.13	0.6361
labor	3,062,843.00	4,449,303.00	3,490,573.00	4,759,692.00	-427,730.00	0.7160
capital	11,500,000.00	20,000,000.00	16,200,000.00	26,800,000.00	-4,700,000.00	0.4355
crimes	8,275.58	11,570.08	10,725.48	11,601.53	-2,449.90	0.4084
pop	7,060.23	9,978.36	7,666.17	10,490.86	-605.94	0.8165
N	31		31			

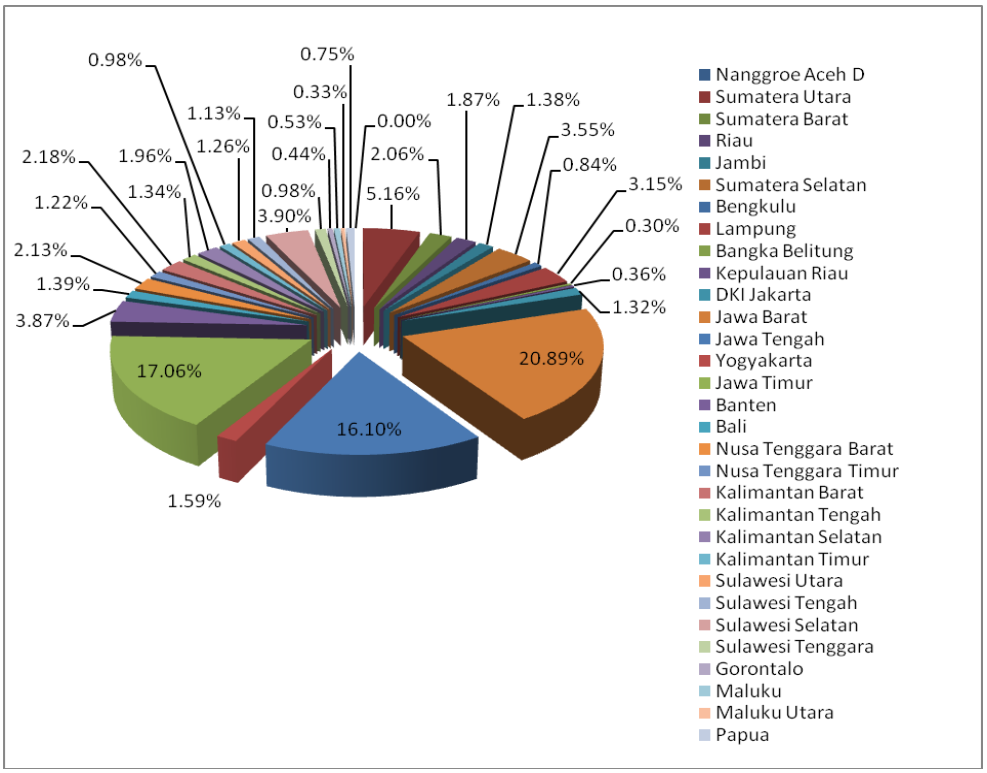
Source: Based on author's calculation

However, the average increase of this variable was only relatively small. Another feature, we see that inequality and the size of the middle class increased as well over time. Besides, we also see that on average, there was an

upward trend for mean years of schooling, labor, capital and the number of crimes variables. In contrast, table 3 depicts that from 2005 to 2010, on average population number as well as temperature in Indonesia declined. Meanwhile, if we look at the last column of table 3, it can be seen that only the mean of *gini* variable which is statistically significant different over time since its p-value is less than 0.05. In contrast, for other variables, differences in means are found to be not statistically significant different over time.

Next, considering the main objective of this paper, it is important to explore the evolution of inequality and the middle class variables across provinces. Based on the figure A1 in the appendix, it can clearly be seen that the trend of inequality was fluctuated in most of provinces even though in general it increased in 2010 compared to 2005. Specifically, the figure shows that the biggest fluctuation in inequality occurred in provinces located in Sulawesi region. In the mean time, figure A2 in the appendix presents the evolution of the middle class across provinces in Indonesia between period 2005 and 2010. Based on this figure, we can see that the size of the middle class was relatively stable in all provinces. The only fluctuation in the size of the middle class only appeared in Papua province, but this fluctuation was only small.

Figure 3. Distribution of the middle class year 2005



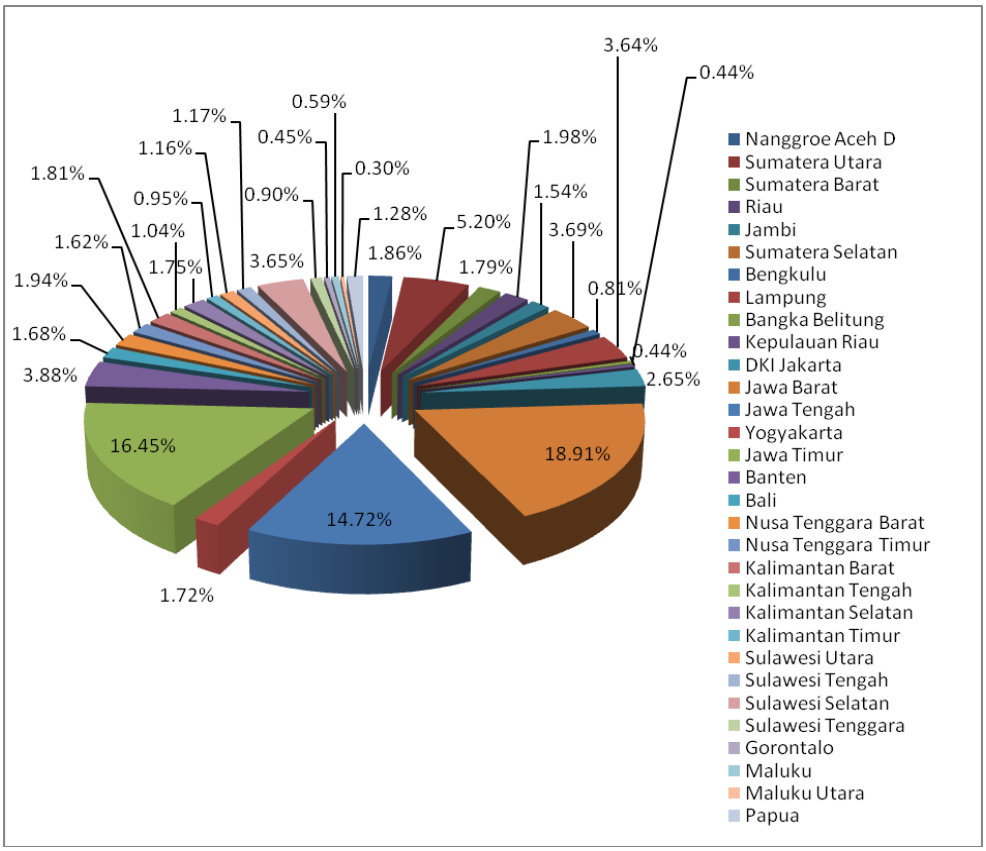
Source: Based on author's calculation

Furthermore, figure 3 and figure 4 describe the distribution of the middle class across provinces between period 2005 and 2010. According to figure 3, we can see that the biggest proportion of the middle class is concentrated in provinces which are located in Java Island. In detail, in period 2005, the largest proportion of the middle class is located in West Java province which constitutes 20.89 percent of total middle class in Indonesia. Meanwhile, the second and the third provinces with the biggest proportion of the middle class

are East Java and Central Java provinces. Here, the middle class accounts for about 17.06 percent and 16.10 percent of total middle class in Indonesia, respectively. On the other hand, the figure depicts that there is only quite small proportion of the middle class which spread outside Java.

Nevertheless, if we look at figure 4, we see that there is a slight difference in distribution of the middle class across provinces in Indonesia in period 2010 compared to 2005. Even though three provinces with the biggest proportion of the middle class remain the same as in 2005, we can see that the proportion declines. Specifically, in West Java, the proportion of the middle class decreases from 20.89 percent in 2005 to 18.91 percent in 2010. Similarly, there is also a 0.61 percent decline in the proportion of the middle class in East Java. In contrast, we see that, in general, the proportion of the middle class outside Java goes up in 2010 compared to period 2005. These descriptions show that the presence of the middle class in Indonesia becomes more spread across provinces.

Figure 4. Distribution of the middle class year 2010



Source: Based on author's calculation

Chapter 4
Results

This chapter presents the empirical findings of the relationship between inequality, the middle class and economic growth across provinces in Indonesia. This chapter consists of three parts. The first part discusses the results from a static analysis of the relationship between inequality, the middle class and economic growth. The second part discusses estimates based on a dynamic model. Finally, in the third part we examine the sensitivity of the estimates.

4.1 Static analysis of the relationship between inequality, the middle class and economic growth

The basic Solow growth model as stated in equation (1) is applied and is estimated by implementing pooled OLS regression. The estimation result is provided in table 4.

Column (1) of table 4 provides estimation results when we include only capital and labor variables in the specification as in the basic Solow model. The result suggests that both capital and labor have a statistically significant effect on economic growth. In detail, labor negatively influences economic growth at 1 percent of siginificance level, whereas capital positively affects growth rate in which it also prevails at 1 percent of significance level.

Next, in order to answer the research questions, column (2) presents estimation results after we include inequality and the middle class variables in addition to capital and labor. In addition, another result is pointed out in column (3). In this specification, we added other variables determining economic growth as suggested by vast literature presented in chapter 2 in order to capture the possibility that economic performance in Indonesia is also driven by other factors. In the mean time, to test an inverted U-shaped relationship between inequality and economic growth, the squared term of gini is included in the model as shown by the result in column (4).

In general, the estimation results presented in column (2) to (4) are found to be slightly different from the first specification. Here, we can see that labor variable is no longer significant in determining economic growth even though the sign of coefficient remains negative. However, based on column (2) to (4), as a whole, it can be seen that the results from different specifications are quite similar. In detail, the finding shows that capital, inequality, the middle class, mean years of schooling and the number of crimes are found to be significant in affecting economic growth in Indonesia. While capital, the middle class and mean years of schooling are significant at 1 percent of significance level, the number of crimes and inequality are only significant at 10 percent of significance level. Furthermore, capital and mean years of schooling positively affect economic growth, implying that higher physical and human capital lead to higher economic growth. On the other hand, the number of crimes and inequality negatively influence growth, meaning lower crime cases and inequality level can promote higher economic growth. Exceptionally for

column (4), we do not find any evidence that inequality does matter for growth.

Table 4. Pooled OLS regression results

Variables	ln grdp				
	(1)	(2)	(3)	(4)	(5)
constant	7.9062***	7.4264***	7.5086***	6.2608***	8.5682***
	(0.3591)	(0.3476)	(1.3997)	(1.5916)	(1.3399)
lcapital	0.6259***	0.5698***	0.5407***	0.5443***	0.5219***
	(0.0280)	(0.0296)	(0.0271)	(0.0271)	(0.0262)
llabor	-0.6065***	-0.1059	-0.3431	-0.3590	-0.2623
	(0.0367)	(0.1062)	(0.2386)	(0.2345)	(0.2258)
gini		-1.2694*	-1.0895*	7.5995	-0.8181
		(0.6777)	(0.6445)	(5.1476)	(0.6179)
lmidclass		-0.4281***	-0.4049***	-0.4033***	-0.6086***
		(0.0804)	(0.0921)	(0.0913)	(0.1088)
mys			0.1217***	0.1191***	0.0895***
			(0.0328)	(0.0326)	(0.0327)
temp			0.0138	0.0127	0.0105
			(0.0186)	(0.0185)	(0.0178)
lcrimes			-0.0591*	-0.0620*	-0.0497
			(0.0348)	(0.0350)	(0.0341)
lpop			0.3142	0.3198	0.4579**
			(0.2193)	(0.2150)	(0.2099)
gini_sq				-13.0061*	
				(7.8219)	
N	186	185	185	185	185
R-squared	0.7875	0.8157	0.8422	0.8445	0.8526
F-statistics	250.82	159.89	109.22	100.81	110.57
p-value	0.000	0.000	0.000	0.000	0.000

Source: based on author's calculation

Notes:
For column (5), the specification includes lmidclass2 variable, instead of lmidclass.
lmidclass2 is defined as families with income between 50 and 150% of median income.
Robust standard errors are shown in parantheses.
*, **, *** shows that the coefficients are significant at level 10%, 5%, and 1% respectively.

In addition, column (4) also provides the estimation result when we include the squared term of gini *(gini_sq)* to test Kuznets hypothesis. The finding reveals that even though this variable is significant at significance level of 10 percent, we find that inequality *(gini)* itself is not significant. Based on this result, we can conclude that we do not have any evidence to support the non-linear relationship between inequality and economic growth. It implies that that Kuznets hypothesis does not hold in this case.

Meanwhile, in column (5) we removed the squared term of gini and use a different concept of the middle class as proposed by Davis and Huston (1992) in order to examine whether the specification is sensitive or not to changes in middle class definition[10]. Column (5) confirms that, by using pooled OLS, the results are consistent with what was obtained in column (3) in terms of significance level and the coefficient sign of the middle class variable. It means that the specification is not sensitive to concept changes. In detail, we find that the size of the middle class negatively affects economic growth in Indonesia, implying that a higher size of the middle class is detrimental for economic growth. This negative relationship challenges empirical results reported by many researches. Moreover, here we find that population number becomes significant and positively influences economic growth.

Nevertheless, according to the result of pooled OLS regressions, it seems that our specifications suffer from biased and inconsistent estimates because those specifications do not control for province fixed effects which I will do in the next stage. In other words, in pooled OLS regressions, we do not account for regional heterogeneity as we pooled poor and rich provinces together.

Therefore, with an aim to solve the problem of biased and inconsistent estimates, we tried to improve the model by controlling for difference characteristics which are present across provinces. This is done by applying and estimating fixed effect panel data model.

Controlling for province specific effects

The result of fixed effect panel data model is presented in the table 5 column (1). In this model, we control for province specific effects in order to control for some of the potential problems highlighted in the previous paragraph.

Column (1) of table 5 shows different result compared to OLS regressions. Based on the result, it can be shown that even though capital remains significant and positively affects growth, the coefficient sign of labor variable is changed into positive and it even becomes significant at 1 percent of significance level[11]. These results are in line with the theory of Solow growth model as cited in Mankiw (2003), where it reveals that one of inputs which can drive output growth is labor input.

Besides, the number of crimes becomes insignificant in determining growth and the sign of the coefficient is positive. In addition, after controlling for province specific effects, the result suggests that both coefficients of inequality and the middle class variables are changed into positive. However, these two variables are found to be insignificant in affecting growth. Even though the coefficient of inequality and the middle class are not significant, their positive signs show that an increase in inequality as well as the size of the middle class can lead to higher growth. Moreover, from the estimation result, another variable which determine growth is the number of population. In detail,

[10] In this specification, the middle class variable is defined as the families with income between 50 and 150 percent of median income.

[11] Labor variable is represented by the number of workers which is defined by BPS-Statistics Indonesia as those who worked at least one hour continously during the referecne week to earn income or profit.

population is negatively related to economic growth at 5 percent of significance level. It means that an increase in population number will cause lower growth, where a 10 percent increase in population number constitutes with around 5 percent decline in economic growth. This evidence supports the empirical finding of study conducted by Atanda et.al (2012) and Wako (2012) revealing that large population number can hamper economic growth.

While the fixed effects estimates control for some potential sources of bias, the estimates may still suffer from endogeneity bias which is a common problem when we model economic growth relationships. For instance, this endogeneity problem prevails when the variable of inequality and the middle class are correlated with the error term. Therefore, we need to counter this problem by introducing instrumental variables into the model. Besides, biased and inconsistent estimates might be resulted from the model because we do not take into account the dynamic effect which usually appears in inequality-growth model.

As a consequence, to deal with those two problems, in the next step, we apply dynamic panel data model which has some advantages compared to the fixed effect model.

4.2 The dynamic effect in the relationship between inequality, the middle class and economic growth

In this part, we take into account the dynamic effect of the variables on economic growth by including the lagged dependent variable as one of explanatory variables. This model has some advantages compared to the fixed effect model that we have just seen before. First, by allowing dynamic effect in the model, we can avoid endogeneity problem which occurs due to correlation between independent variables and the disturbance term. Next, by including lagged dependent variable, we can also prevent the problem of reverse causality[12]. For instance, there is a possibility that not only inequality affects growth, but it can also be the case that inequality is as a result of economic growth. Therefore, by dynamic panel data, this problem can be avoided.

The results of dynamic panel model are provided in the table 5 from column (2) to column (5). In column (2) and (4) we applied one-step difference GMM technique to produce the estimates, whereas for the rest of columns we implemented one-step system GMM. The results in column (2) and (3) are based on using one period lagged dependent variable while for column (4) and (5) we use two periods lagged dependent variable as part of the explanatory variables. Furthermore, in these specifications, in general we use two lags as the instrument variables for inequality and the middle class variables which are assumed to be endogenous.

[12] Endogeneity and reverse causality problems, in this case, can be avoided by introducing instrumental variables and applying GMM estimation technique. In GMM technique, first difference method is used to eliminate province fixed effects which is correlated with the lagged dependent variable. However, this method still poses a problem where the lagged dependent variable and a new transformed error term are correlated. Therefore, it needs proper instrumental variables. These proper instrumental variables are internal instruments which are derived from lagged values of independent variables because these instruments are strongly correlated with endogenous regressors and uncorrelated with error term.

Table 5. Econometric results (fixed effect and dynamic panel data model)

Variables	ln grdp				
	(1)	(2)	(3)	(4)	(5)
ln grdp (-1)		0.9093***	0.9886***	0.0775	1.1045***
		(0.1063)	(0.0362)	(0.2706)	(0.2843)
ln grdp (-2)		-	-	0.7128**	-0.1075
		-	-	(0.2693)	(0.2681)
lcapital	0.2098***	0.0052	0.0076	-0.0156	-0.0002
	(0.0581)	(0.0454)	(0.0199)	(0.0801)	(0.0117)
llabor	0.3353***	0.0569	0.0120	-0.1678*	0.0366
	(0.1167)	(0.0863)	(0.0319)	(0.0840)	(0.0276)
gini	0.2025	-0.2889	-0.0478	0.1322	0.2533**
	(0.1597)	(0.1987)	(0.1409)	(0.3138)	(0.1036)
lmidclass	0.0369	0.1579**	0.0944**	0.0048	0.0227
	(0.0340)	(0.0678)	(0.0417)	(0.0470)	(0.0363)
mys	0.0646	0.0702	0.0096	0.0149	0.0002
	(0.0460)	(0.0487)	(0.0068)	(0.0283)	(0.0038)
temp	-0.0147	-0.0049	0.0029	-0.0042	0.0005
	(0.0088)	(0.0069)	(0.0024)	(0.0071)	(0.0031)
lcrimes	0.0025	-0.0127	0.0059	-0.0049	0.0049
	(0.0230)	(0.0090)	(0.0093)	(0.0113)	(0.0089)
lpop	-0.5013**	-0.2535	-0.1133*	0.5678*	-0.0591*
	(0.2050)	(0.2059)	(0.0567)	(0.2947)	(0.0352)
constant	4.2874**		-0.5984		-0.4044
	(1.7143)		(0.4390)		(0.2881)
N	185	124	155	93	124
R-squared within	0.5488	-	-	-	-
F-statistics	9.98	58.94	4221.33	25.12	8236.85
p-value	0.000	0.000	0.000	0.000	0.000
p-value of AB test for AR(1)	-	0.011	0.045	0.707	0.004
p-value of AB test for AR(2)	-	0.163	0.334	0.056	0.544
p-value of Sargan test	-	0.209	0.006	0.270	0.006
p-value of Hansen test	-	0.397	0.221	0.417	0.248
p-value of Difference-in-Hansen test	-	0.281	0.135	0.602	0.724

Source: based on author's calculation

Notes:
Column (1) shows the specification by applying fixed effect panel data model. Column (2) to (5) are different specifications by applying dynamic panel data model. Column (2) and (4) apply one-step difference GMM technique with one and two lagged of dependent variable respectively. Column (3) and (5) implement one-step system GMM technique with one and two lagged of dependent variable respectively. Robust standard errors are shown in parentheses
*, **, *** shows that the coefficients are significant at level 10%, 5%, and 1% respectively.

Based on the result in column (2), we lose 62 observations because we include one lagged dependent variable in the model and we use difference values in applying one-step difference GMM technique. Moreover, we can see that there are only two variables which are statistically significant in determining economic growth. Those two variables are the lagged of log GRDP *(ln grdp(-1))*, and the middle class *(lmidclass)*, where these two variables are significant at 1 percent and 5 percent of significance level, respectively. In detail, the result shows that we do not find any evidence of convergence process in the growth

rate in Indonesia since the coefficient sign of *ln grdp(-1)* is positive. In addition, the result also reveals that an increase in the size of the middle class leads to higher economic growth. In addition, if we compared to the result of fixed effect model, we see that the coefficient sign of inequality variable *(gini)* is changed into negative and it is insignificant. Besides, the coefficient of another variable, namely the number of crimes *(lcrimes)* also has different sign compared to fixed effect model even though this variable is not significant in one-step difference GMM. This different result shows that we have to examine further about the requirement of the assumptions underlying the model.

Regarding the assumption issue, the result of Hansen test and Difference-in-Hansen test in column (2) reveals that the assumption of over identifying restrictions and exogeneity of instruments are valid since the p-value of these tests are high. The Hansen test is used instead of Sargan test because when we use adjusted robust standard error, the result of Hansen test is consistent compared to Sargan test. Moreover, if we look at the value of Arellano-Bond (AB) test, this result is free from autocorrelation problem of order 2, where the p-value of AB test for AR(2) is higher than 0.05. This result implies that the use of second lag as instrumental variable is valid. However, even though the requirement of assumptions is fulfilled, this specification still has a problem. This is because the use of lagged levels as instruments is poor for first differenced variables. Therefore, we need another technique the so-called system GMM which includes both lagged levels and lagged differences as instrumental variables.

In addition, we also apply one-step system GMM technique by including one period lagged dependent variable as the results are obtained in column (3). Based on the column (3), it can clearly be seen that the result is different from when we apply one-step difference GMM technique. In this case, we use one-step system GMM in order to improve the efficiency of our model with an aim to make the results meaningful. Based on the result, we see that the lagged of log GRDP and the size of the middle class remains significant, where these two variables are significant at 1 percent and 5 percent of significance level, respectively. What makes it different from the previous result is that the population variable becomes significant and there are changes in coefficient sign of some variables, such as temperature and the number of crimes which become positive. As in fixed effect model, population variable is negatively related to economic growth.

In the mean time, if we check for the fulfillment of assumption, this model does not suffer from autocorrelation problem This can be seen from the p-value of Arellano-Bond test for AR (1) which is less than 0.05 and AB test for AR(2) which is higher than 0.05. Therefore, it means that the use of second lag for instrumental variable is valid. Besides, we also see that over identifying restrictions assumption is valid since we fail to reject the null hypothesis of Hansen test as well as we fail to reject the null hypothesis of Difference-in-Hansen test of exogeneity instrument.

However, we also tried to include the second lag of dependent variable into the model in order to see whether the result is different from including only one lagged dependent variable in the model. The result of this specification is described in the column (4) and (5), where column (4) is resulted from one-step difference GMM and column (5) is obtained from one-step system GMM

technique, respectively. Since we include the second lag of dependent variable, in one-step difference GMM we lose 93 observations so that we proceed with only 93 observations. Based on column (4), there appears three significant variables in the model, namely the second lag of dependent variable *(ln grdp(-2))* which is significant at 5 percent, labor and population which are significant at 10 percent of significance level. Another feature from the model is we can see that there appears a change in the coefficient sign of some variables, such as labor, the number of crimes and population number. Furthermore, the result from difference GMM shows that the model violates the assumption of autocorrelation of order 1 since the p-value of AB test for AR(1) is greater than 5 percent.

Therefore, in order to solve that autocorrelation problem and to improve the efficiency, we apply one-system GMM as its result is provided in column (5). From this result, it can be seen that there is no violation in assumption of autocorrelation of order 1 as indicated by the p-value of AB test for AR(1) which constitutes 0.004. Besides, the specification is also free from problem of autocorrelation of order 2 since the p-value of AB test for AR(2) is very high. Meanwhile, the assumption of over identifying restrictions and exogeneity of instruments is also valid because we failed to reject the null hypothesis of the Hansen test and Difference-in-Hansen test, implying that the use of second lag of inequality and the middle class variables as instrumental variables is valid.

Besides, the result confirms that the growth is determined by the growth in the previous year, inequality and the number of population since three variables are significant at 1 percent, 5 percent and 10 percent of significance level, respectively. Moreover, it can be seen that the number of population has a negative impact on growth, meaning the more population leads to lower economic growth. This negative relationship is in line with a research done by Wako (2012), where in his study, he found that per capita income increases if the population grows slower. Meanwhile, positive relationship is shown by inequality variable. The result describes that higher inequality can trigger higher economic growth in Indonesia. In fact, this positive relationship does not support the common empirical evidence which states that the lower inequality is better for economic growth. In contrast, this evidence of positive link between inequality and economic growth strengthens the evidence found by Partridge (1997 and 2005) and Frank (2009) in which we are similar to them in terms of using panel data.

Finally, based on the result in column (5), we do not find any evidence that the size of the middle class does matter for economic growth in Indonesia since we find that the coefficient of this variable is not significant. This result is found to be different from what resulted by vast studies in the relationship between the middle class and economic growth where they found that the middle class positively affects economic growth, such as by Alesina and Perotti (1996) as well as Easterly (2001). This insignificant coefficient also shows that in Indonesia, the role of the middle class on economic growth is not effective yet. This is because rising in its size does not lead to higher economic growth. However, in general, the model in column (5) produces the sign of estimates which are as we expected and are in line with the underlying theory even though some variables are found to be insignificant.

4.3 Sensitivity Analysis

In order to check the robustness of the result, we conduct a sensitivity test by incorporating different definition of the middle class variable. By estimating the model in equation (6) as presented in chapter 3 and replacing the *lmidclass* variable with *lmidclass2* variable as well as employ both one-step difference and one-step system GMM, we result in estimates as reported in the table 6.

According to table 6, it can be seen that the result from one-step difference GMM still violates assumption of autocorrelation of order 1 as depicted by the p-value of AB test for AR(1). Meanwhile, when we apply one-step system GMM, we find different result. In this case, our model no longer suffers from autocorrelation problem and over identifying restrictions as well as exogeneity of instruments assumption are valid. Regarding the coefficients, we find that the results are not consistent with the model in which we use *lmidclass* variable. In detail, we can see that even though the effect of inequality remains positive and significant at 5 percent of significance level, we find that the sign of capital and the middle class coefficients becomes negative. Besides, we also find that population variable is no longer significant even though its coefficient sign remains negative. This result is different from what we obtained in previous specification.

Based on these explanations, it can be said that our specification in relating inequality and the middle class on economic growth is not robust and not consistent to the use of different concept of the middle class. This non robust result might occur because the application of dynamic panel data is very sensitive to choice of model specification and lag length.

Table 6. Sensitivity test results

Variables	ln grdp	
	(1)	(2)
ln grdp (-1)	0.0745	1.0367***
	(0.2578)	(0.2999)
ln grdp (-2)	0.7218***	-0.0605
	(0.2535)	(0.2773)
lcapital	-0.0184	0.0092
	(0.0786)	(0.0148)
llabor	-0.1678*	0.0377
	(0.0854)	(0.0340)
gini	0.1347	0.3162**
	(0.3187)	(0.1361)
lmidclass2	-0.0015	-0.0066
	(0.0567)	(0.0554)
mys	0.0135	0.0015
	(0.0288)	(0.0035)
temp	-0.0037	-0.0006
	(0.0076)	(0.0034)
lcrimes	-0.0052	0.0040
	(0.0114)	(0.0085)
lpop	0.5830**	-0.0377
	(0.2835)	(0.0404)
constant		-0.1774
		(0.3697)
N	93	124
F-statistics	24.70	9376.68
p-value	0.000	0.000
p-value of AB test for AR(1)	0.693	0.003
p-value of AB test for AR(2)	0.055	0.943
p-value of Sargan test	0.299	0.005
p-value of Hansen test	0.466	0.184
p-value of Difference-in-Hansen test	0.512	0.696

Source: based on author's calculation

Notes:
lmidclass2 is the middle class variable as defined by Davis and Huston (1992).
Both column (1) and (2) implement two lagged of dependent variable. Column (1) applies one-step difference GMM, whereas column (2) employs one-step system GMM technique.
Robust standard errors are shown in parentheses.
*, **, *** shows that the coefficients are significant at level 10%, 5%, and 1%, respectively.

Chapter 5
Conclusion

This paper contributes to and expands the debate on the inequality-growth nexus by examining the size of the middle class as one of variables determining economic growth. The motivation behind this is the potentially important role that may be played by the middle class in influencing economic growth. Besides, especially for Indonesian context, the middle class becomes an interesting topic since the statistics show an upward trend in the number of the middle class, but there is still a lack of work which relates the size of the middle class to economic growth. Hence, this paper aims to investigate the link between inequality and growth as well as to examine the effect of the middle class on economic growth across province in Indonesia.

To meet the objectives of this paper, I construct a data set of 31 provinces compiled from various publications covering the period 2005 to 2010 and conduct static and dynamic panel data analysis. The static analysis is done by implementing pooled OLS and fixed effect panel data model. After controlling for variables, such as capital, labor, mean years of schooling, temperature, the number of crimes and population as well as province specific effects, the result of static analysis confirms that inequality and the middle class do matter for growth. Besides, I also do not find any evidence to support the Kuznets hypothesis in the relationship between inequality and economic growth.

Nevertheless, due to endogeneity and autocorrelation problems that occur in pooled OLS and fixed effect specifications, I conduct dynamic panel analysis by including the dynamic effect which is represented by the lagged dependent variable. Furthermore, I also introduce internal instruments to instrument inequality and the middle class. Meanwhile, to estimate the model, I use both one-step difference GMM and one-step system GMM techniques. The final result of the dynamic panel data reveals that inequality is positively related to economic growth in Indonesia. This result implies that higher level of inequality is associated with higher growth. In contrast, there is no evidence to claim that the size of the middle class matters for growth. In addition, another variable which influences growth is population, where higher population number leads to lower growth. Finally, based on the result of sensitivity analysis, we find the evidence that the finding is not consistent if we use different concepts of the middle class. As a final remark, the results from this paper must be treated with caution since the application of dynamic panel data model is very sensitive to the choice of lag length and model specification.

In conclusion, this paper does not find a clear effect of the size of the middle class on economic growth. Based on the dynamic panel data analysis the effect is positive but not statistically significant at conventional levels. Thus, while there are potentially several reasons why the emergence and creation of a middle class should enhance economic growth, I do not find it in this paper. Perhaps, data over a longer time period is needed to identify such an effect.

References

Acemoglu, D., S. Johnson and J.A. Robinson (2002) 'Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution', *The Quarterly Journal of Economics* 117(4): 1231-1294.

Alesina, A. and D. Rodrik (1994) 'Distributive Politics and Economic Growth', *The Quarterly Journal of Economics* 109(2): 465-490.

Alesina, A. and R. Perotti (1996) 'Income Distribution, Political Instability, and Investment', *European Economic Review* 40(6): 1203-1228.

Andrew, M. and P. Yali (2012) 'The Rise of the Middle Class in Asian Emerging Markets'. Accessed 19 January 2013 <www.kpmg.com/cn/en/IssuesAndInsights/ArticlesPublications/Documents/Middle-Class-Asia-Emerging-Markets-201206-2.pdf>.

Angeles-Castro, G. (2006) 'The Relationship between Economic Growth and Inequality: Evidence from the Age of Market Liberalism'.

Arellano, M. and S. Bond (1991) 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations', *The Review of Economic Studies* 58(2): 277-297.

Atanda, Akinwande A., Salaudeen B.Aminu and O.Y.Alimi (2012) 'The Role of Population on Economic Growth and Development: Evidence from Developing Countries'. *MPRA Paper* No. 37966.

Barro, R.J. and X. Sala-i-Martin (1995) 'Economic Growth'. London, England: The MIT Press.

Birdsall, N. (2010) 'The (Indispensable) Middle Class in Developing Countries; Or, the Rich and the Rest, Not the Poor and the Rest', *EQUITY IN A GLOBALIZING WORLD, Ravi Kanbur and Michael Spence, eds., World Bank, Forthcoming.*

Bourguignon, F. (2000) 'The Pace of Economic Growth and Poverty Reduction', *Delta.*

Boushey, H. and A. Hersh (2012) 'The American Middle Class, Income Inequality, and the Strength of our Economy', *Washington: Center for American Progress.*

BPS-Statistics Indonesia (2005-2012) 'Statistical Yearbook of Indonesia', Jakarta, Indonesia.

Castelló-Climent, A. (2010) 'Inequality and Growth in Advanced Economies: An Empirical Investigation', *The Journal of Economic Inequality* 8(3): 293-321.

Chambers, D. and A. Krause (2010) 'Is the Relationship between Inequality and Growth Affected by Physical and Human Capital Accumulation?', *The Journal of Economic Inequality* 8(2): 153-172.

Chen, B. (2003) 'An Inverted-U Relationship between Inequality and Long-Run Growth', *Economics Letters* 78(2): 205-212.

Chun, N., R. Hasan and M. Ulubasoglu (2011) 'The Role of the Middle Class in Economic Development: What do Cross-Country Data show?', *Asian Development Bank Economics Working Paper Series* (245).

Cohen, D. and M. Soto (2007) 'Growth and Human Capital: Good Data, Good Results', *Journal of economic growth* 12(1): 51-76.

Cornia, G.A. and Julius Court (2004) *Inequality, Growth, and Poverty in an Era of Liberalization and Globalization*. Vol. 74. Oxford University Press Oxford.

Davis, J.C. and J.H. Huston (1992) 'The Shrinking Middle-Income Class: A Multivariate Analysis', *Eastern Economic Journal* 18(3): 277-285.

De Dominicis, L., R.J. Florax and H.L. De Groot (2008) 'A meta - analysis on the Relationship between Income Inequality and Economic Growth', *Scottish Journal of Political Economy* 55(5): 654-682.

Dollar, D. and A. Kraay (2002) 'Growth is Good for the Poor', *Journal of economic growth* 7(3): 195-225.

Easterly, W. (2001) 'The Middle Class Consensus and Economic Development', *Journal of economic growth* 6(4): 317-335.

Eka Raswita, Ngakan Putu Mahesa and M.S. Utama (2013) 'Analisis Pertumbuhan Ekonomi Dan Ketimpangan Pendapatan Antar Kecamatan Di Kabupaten Gianyar', *E-Jurnal Ekonomi Pembangunan Universitas Udayana* 2(3).

Forbes, K.J. (2000) 'A Reassessment of the Relationship between Inequality and Growth', *American economic review* : 869-887.

Frank, M.W. (2009) 'Inequality and Growth in the United States: Evidence from a New state - level Panel of Income Inequality Measures', *Economic inquiry* 47(1): 55-68.

Freire-Seren, M.J. (2001) 'Human Capital Accumulation and Economic Growth', *investigaciones económicas* 25(3): 585-602.

Gallup, J.L., J.D. Sachs and A.D. Mellinger (1999) 'Geography and Economic Development', *International regional science review* 22(2): 179-232.

Gundlach, E. (1995) 'The Role of Human Capital in Economic Growth: New Results and Alternative Interpretations', *Weltwirtschaftliches Archiv* 131(2): 383-402.

Hajiji, A. (2010) 'Keterkaitan Antara Pertumbuhan Ekonomi, Ketimpangan Pendapatan, Dan Pengentasan Kemiskinan Di Provinsi Riau 2002-2008'.

Hamby, D. (1994) 'A Review of Techniques for Parameter Sensitivity Analysis of Environmental Models', *Environmental monitoring and assessment* 32(2): 135-154.

Hattori, T. and T. Funatsu (2003) 'The Emergence of the Asian Middle Classes and their Characteristics', *The developing economies* 41(2): 140-160.

Henderson, J.Vernon (2003) 'Urbanization, Economic Geography and Growth'. Draft chapter prepared for Handbook of Economic Growth Vol.1 in P.Aghion and S.Durlauf (eds.), North Holland.

Hughes, H. and B. Woldekidan (1994) 'The Emergence of the Middle Class in ASEAN Countries', *ASEAN Economic Bulletin* : 139-149.

Kula, M.C. and D.L. Millimet (2010) 'Income Inequality, Taxation, and Growth', *Atlantic Economic Journal* 38(4): 417-428.

León, M.G. 'The Rise of the Middle Classes and the Economic Growth in Historical Perspective: The Brazil's Experience in the XX Century'.

Mankiw, N. Gregory. (2003) *Macroeconomics*. 5th Edition. Worth Publishers: New York and Basingstoke, the United States.

Mileva, E. (2007) 'Using Arellano-Bond Dynamic Panel GMM Estimators in Stata', *Economic Department, Fordhan University, July* 9.

Panizza, U. (2002) 'Income Inequality and Economic Growth: Evidence from American Data', *Journal of Economic Growth* 7(1): 25-41.

Partridge, M.D. (1997) 'Is Inequality Harmful for Growth? Comment', *The American Economic Review* 87(5): 1019-1032.

Partridge, M.D. (2005) 'Does Income Distribution Affect US State Economic Growth?*', *Journal of Regional Science* 45(2): 363-394.

Pérez-Moreno, S. (2009) 'An Assessment of the Causal Relationship between Growth and Inequality in Spanish Regions', *European Planning Studies* 17(3): 389-400.

Perotti, R. (1996) 'Growth, Income Distribution, and Democracy: What the Data Say', *Journal of Economic growth* 1(2): 149-187.

Persson, Torsten and G. Tabellini (1994) 'Is Inequality Harmful for Growth?', *The American Economic Review* 84(3): 600-621.

Pritchett, L. (1997) 'Divergence, Big Time', *The Journal of Economic Perspectives* 11(3): 3-17.

Ravallion, M. (2005) 'Inequality is Bad for the Poor', *World Bank Policy Research Working Paper* (3677).

Ravallion, M. (2010) 'The Developing world's Bulging (but Vulnerable) Middle Class', *World Development* 38(4): 445-454.

Roodman, D. (2006) 'How to do xtabond2: An Introduction to Difference and System GMM in Stata', *Center for Global Development working paper* (103).

Roodman, D. (2009) 'A Note on the Theme of Too Many Instruments*', *Oxford Bulletin of Economics and Statistics* 71(1): 135-158.

Savaş, B. (2008) 'The Relationship between Population and Economic Growth: Empirical Evidence from the Central Asian Economies', *Orta Asya ve Kafkasya Araştırmaları* (06): 135-153.

Solimano, A. (2009) 'Stylized Facts on the Middle-Class and the Development Process', *Stuck in the Middle: Is Fiscal Policy Failing the Middle-Class*.

Thuku G.K, Gachanja Paul and Obere Almadi (2013) 'The Impact of Population Change on Economic Growth in Kenya', *International Journal of Economics and Management Sciences* 2(6): 43-60.

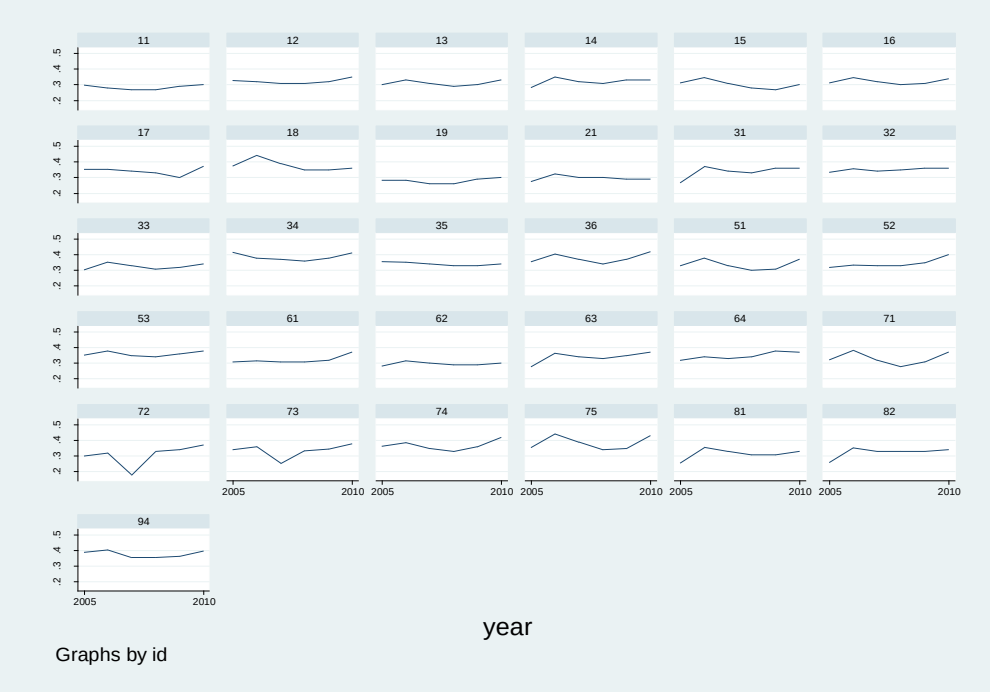
Wako, H.A. (2012) 'Demographic Changes and Economic Development: Application of the Vector Error Correction Model (VECM) to the Case of Ethiopia'*, Journal of Economics and International Finance* 4(10): 236-251.

Wooldridge, J.M. (2002) *Econometric Analysis Cross Section Panel.* MIT Press.

Appendix

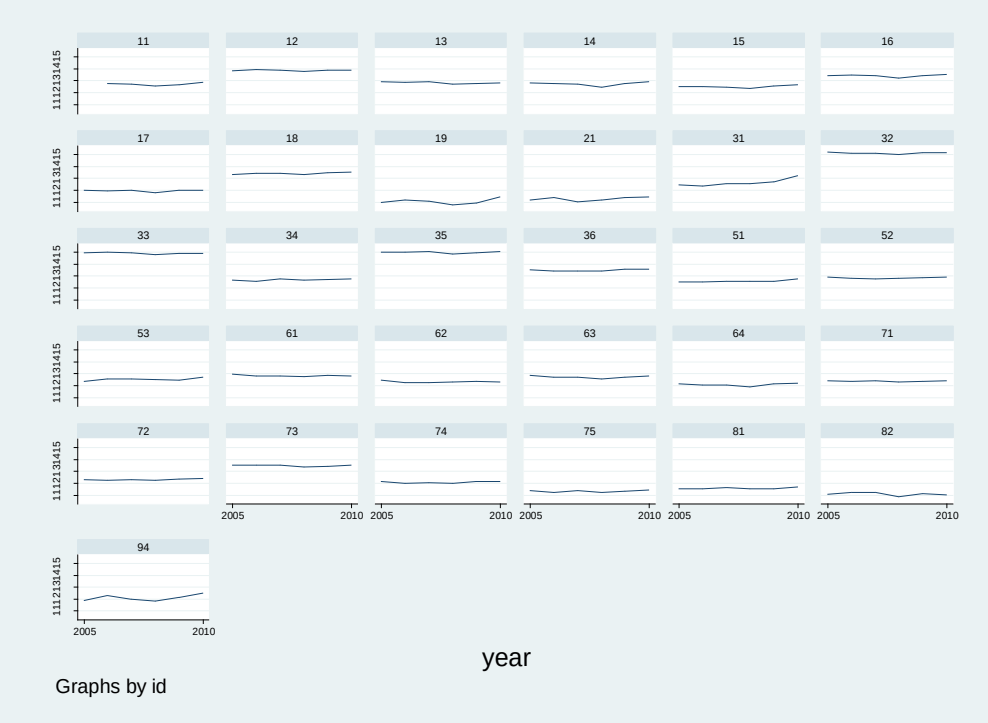
A. The evolution of inequality and the middle class

Figure A1. The evolution of inequality by provinces



Source: Based on author's calculation

Figure A2. The evolution of the middle class by provinces



Source: Based on author's calculation

B. Correlation between variables

Table B1. Correlation matrix

	lgrdp	gini	lmidcl~s	mys	temp	manuf	llabor	lcapital	lcrimes	lpop
lgrdp	1.0000									
gini	-0.1140	1.0000								
lmidclass	0.0429	0.1445	1.0000							
mys	0.4894	-0.0992	-0.2286	1.0000						
temp	0.1743	0.0950	-0.0632	0.0193	1.0000					
manuf	0.4557	-0.0308	0.4056	0.1268	-0.1237	1.0000				
llabor	0.1786	0.1444	0.9667	-0.1528	0.0167	0.4471	1.0000			
lcapital	0.6842	0.0609	0.6847	0.1411	0.1174	0.5613	0.7790	1.0000		
lcrimes	0.4033	0.0850	0.6552	0.1067	0.1540	0.1984	0.7341	0.7726	1.0000	
lpop	0.1874	0.1331	0.9678	-0.1300	-0.0018	0.4783	0.9942	0.7783	0.7273	1.0000