國立政治大學國家發展研究所

博士論文

中國大陸的所得分配與經濟成長

Income Distribution and Economic Growth in China

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摘要

自 1978 年採行改革開放政策以來，中國經濟取得了舉世矚目的成就。然而，中國經濟的快速成長伴隨所得分配的急劇惡化。在過去幾十年中，中國是所有大國中所得不均成長速度最快的國家。中國所得不均以極不尋常的速度在短期內快速增加，加深了社會與政治不穩定的風險，中國所得分配對經濟成長的影響是一相當值得探討的議題。

由於衡量中國所得分配資料的不足，因此，本文首先分別計算 1995~2013 年各省城鎮、農村及全省的基尼係數。結果顯示，全省的基尼係數高於各省城鎮及農村的基尼係數，經比較不同來源的城鎮基尼係數，本文計算之城鎮基尼係數的均值變動趨勢與其他來源之城鎮與全國的基尼係數一致。

其次，本文分析中國所得分配不均的因素，發現可歸納為經濟、社會、政策、及政治因素。在經濟因素方面，高度依賴國際貿易與國外直接投資、通貨膨脹、城鎮失業率上升、技術進步、金融資源分配不均、信貸市場低度發展、及個人所得稅率與移轉支付的所得重分配效果不彰等，均使得所得分配在經濟成長過程中惡化。

在社會因素方面，由於中國實行有利於城鎮居民的戶籍制度、政府教育支出較多數已開發國家為低，導致所得不均擴大。在政策因素方面，改革初期中國實施不平衡的經濟發展策略、最低工資、及偏低的政府社會保障支出水平，也不利於所得分配的改善。在政治因素方面，專制政治體制乃產生非法收入與腐敗的重要來源，而政府對國有企業的頻仍干預也加劇了所得不均。

最後，本文採用一般化動差法 (GMM) 估計所得分配與經濟成長之間的非直線性關係，實證結果顯示，中國所得分配與經濟成長存在多重門檻，分別為基尼係數 0.225、0.315、及 0.345。當基尼係數較低 (小於或等於 0.225) 時，基尼係數每增加 1%將使經濟成長降低 0.27%；當基尼係數介於 0.225 與 0.315 之間時，基尼係數每增加 1%將刺激經濟成長 0.14%至 0.15%；當基尼係數高於 0.315 或 0.345

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時，基尼係數每增加 1%將分別使經濟成長降低 0.05%及 0.38%。因此，不同的所得分配水準，對經濟成長將產生不同影響，過高或過低的所得不均對於經濟成長為負面影響，適度的所得不均將有助於刺激經濟成長。此外，經濟改革初期中國採取沿海省份優先的不平衡發展策略，實證結果顯示內陸地區與沿海地區所得不均程度對於經濟成長的影響不同，相較於內陸（較貧窮）地區，沿海（較富裕）地區所得不均過高或過低，對經濟成長的負面影響較不明顯。

在中國經濟發展的過程中，温和的所得分配不均推升了經濟成長，然而過高的所得分配不均却對經濟成長產生負面的影響。就政策的觀點，中國政府應致力於將沿海富裕地區經濟成長果實分享至內陸落後地區，降低所得不均對經濟成長的負面影響，強化投入資源於人力資本的累積，並進一步改革完善相關制度及政策逐步縮小所得差距，以有利於經濟的持續成長。

關鍵詞: 所得分配 門檻效果 經濟成長

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Abstract

Since the economic reforms in 1978, China's economy has made remarkable achievement. However, the rapid economic growth has been accompanied by a sharp increase in income inequality. China as the fastest income-inequality increase of any large country over several decades. Inequality increase so fast in such a short time is quite unusual in the historical viewpoint, which has raised the social and political instability risk, and it is meaningful to study the relationship between income distribution and economic growth in China.

Data insufficiency is the main factor affecting research on income distribution in China, therefore, in this paper we firstly calculate each provincial Gini coefficients for urban, rural and all residents. The results show the each provincial Gini coefficients for all residents have always been higher than the each provincial Gini coefficients for rural residents and urban residents. Comparison of the different sources of Gini coefficients based on provincial data, the mean value of our urban Gini coefficients shows the same trend with other sources of urban and national Gini coefficients.

Second, this paper analyzes the factors affect China's income inequality. We find that income inequality in China is not only driven by economic factors, but also effects by social factors, policy factors, and political factors. With respect to economic factors, high dependence on international trade and FDI, inflation, the increase of urban unemployment, technological progress, inequality in access to certain financial services, credit market underdevelopment, and the limited role of personal income tax and transfer payments to reduce income inequality all are likely to worsen income inequality in the process of economic growth.

As to social factors, income inequality is likely to worsen by China's hukou-related urban biases policy, the public expenditures on education do not keep up with the GDP growth. Policy factors including China's unbalanced regional development strategy at the early reform period, the limited role of the minimum wage regulation, social-security expenditures level remained lower than most of developed countries, those are unfavorable to narrow income inequality. Regarding to political factors, income inequality is likely to worsen by corruption, strong government intervention in SOEs, and authoritarian regime generates the opportunities to acquire illegal income.

In order to find out whether a threshold effect of income distribution on economic growth exists in China, this paper uses the generalized method of moments (GMM) estimator to test the nonlinear relationship between income distribution and economic

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growth in China. The empirical results show that there exists multiple income distribution thresholds at Gini coefficients of 0.225, 0.315, and 0.345. This implies that the effect of income distribution on national economic growth will change with different Gini coefficients. When the Gini coefficient is less than or equal to 0.225, a 1% increase in the Gini coefficient will impede economic growth by 0.27%; when it is between 0.225 and 0.315, a 1% increase in the Gini coefficient will stimulate economic growth by between 0.14% and 0.15%; and when it is higher than 0.315 or 0.345, a 1% increase in the Gini coefficient will reduce economic growth by 0.05% and 0.38%, respectively. These findings indicate that low or high income inequality in China will harm economic growth, and that moderate income inequality will benefit economic growth. In addition, in comparison with inland (poorer) regions, we find that the detrimental impact of inequality on growth is less pronounced at low or high income inequality levels in the coastal (richer) regions.

In China, the increase in inequality from a low level provides enhanced incentives for growth. However, the trend in income inequality has not significantly reversed with rapid economic growth, and a sustained increase in income inequality will hamper further growth. From the policy point of view, China's government should focus its efforts on sharing the fruits of growth in the coastal regions with the less-developed inland regions, put more emphasis on the accumulation of human capital, and further improve relevant institutions and policies to reduce the high income inequality in favor of sustained economic growth.

Keywords: Income Distribution Threshold Effect Economic Growth

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Chapter 1 Introduction

China's economic reform in 1978 accompanied by notable economic growth with dramatic income inequality. Since initiating opening up and market reforms in 1978, the average GDP growth rate is nearly 10%. However, income inequality measured by the Gini coefficient rose from around 0.30 in the early 1980s to 0.468 in 2018. Such a change has marked China as one of the countries with the highest income inequality in the world.

According to the Kuznets' hypothesis (Kuznets, 1955, 1963), rising inequality seems unavoidable in the early phases of economic development and later falls as the economy becomes more developed. China has experienced a sharp increase in income and inequality over several decades. However, the trend in income inequality has not significantly reversed with rapid economic growth. Within China, inequality are among the most important social and economic problems, policy-makers are increasingly concerned about inequality and possible adversely affect long-term economic growth.

The theoretical literatures on the effect of income distribution on economic growth through different channels, mainly are fiscal-economic channels, socio-political channels, and credit market imperfections. This paper base on endogenous economic growth theory by incorporating income distribution into the production function to study the effect of income distribution on China's economic growth. Previous literatures mainly study the effect of income distribution on economic growth using cross-sectional data, and few is done to investigate the nonlinear relationship between income distribution and economic growth.

The main challenge of the early studies on income distribution is lack of long time-series data and the quality of the available data on inequality in China. Gini coefficient is the most popular used to measure income inequality. The household surveys by NBS provide comprehensive data over a long period to calculate Gini coefficient. However, China is one of the few countries in which rural and urban household surveys were separately implemented, there is no official income data for overall China's residents. Therefore, in the first part of this dissertation, we will collect data from the *China Yearbook of Rural Household Survey* and provincial statistical yearbook, and use hierarchical weighted method to integrate household survey data of urban and rural residents to calculate the provincial Gini coefficient.

With China's economy becomes more developed, the trend in income inequality

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has not significantly reversed with rapid economic growth. The Kuznets curve did not explain the observed variation of income inequality in China. Since national characteristics could be relevant to the explanation of differences in the income distribution, some variables that are hard to measure and could affect estimates of the relationship between income distribution and growth, therefore, in the second part of this dissertation, we will use qualitative method to analyze the possible factors affecting China's income inequality.

Although a lot of theoretical and empirical literatures attempted to study whether inequality is positive or negative on growth, a consensus is still lacking. In spite of some inequality is important to the effective functioning of a market economy and the incentives needed for investment and growth. But too much inequality might be destructive to growth. Some researchers believe the nonlinearities inequality-growth relationship might in fact exist. The ensuing debates have motivated us to examine the nonlinear effects of inequality on growth in China. Due to income inequality data limited, less attention have received in the empirical literatures to examine the threshold effect in China. In the third part of this dissertation, we will use the GMM estimator with the calculated urban Gini coefficients by us, to proceed empirical analysis and explore the possible threshold effect of income distribution on economic growth in China.

The structure of this dissertation will be as follows. Chapter 2 will calculate each provincial Gini coefficients for urban, rural and all residents. Chapter 3 will analyze the possible factors for China's income inequality. Chapter 4 will use the generalized method of moments (GMM) estimator to empirically test the impact of income distribution on economic growth, by focus on the income distribution threshold effect in China. The results and policy implications are summarized in Chapter 5.

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Chapter 2 Income Distribution in China

2.1 Introduction

Since the economic reforms and opening up in 1970s, the rapid economic development accompany with the increasing income inequality in China. According to National Bureau of Statistics (NBS), national Gini coefficients have reached above 0.47 since 2003, which were above the warning level of international standard and became the focus of attention.

The most widely used single measure of inequality is the Gini coefficient (Haughton and Khandker, 2009), which a higher Gini coefficient means higher inequality. However, China is one of the few countries in which rural and urban household surveys were separately implemented, there is no official income data for overall China's residents (Zhang and Wang, 2011). In early 2013, China's government released national Gini coefficient estimates for the years 2003-2011. However, China's NBS did not release the provincial Gini coefficient. Data insufficiency has become the main factor affecting research on income disparity in China (Chen et al., 2015).

The household surveys by NBS provide appropriate data for study income distribution in China due to they are the only source of comprehensive data over a sufficiently long period (Yang, 1999). However, *China Statistical Yearbook* does not provide integrated samples for all residents before 2014. Only limited group data for rural and urban habitants are provided (Chotikapanich, 2007b; Huang, 2013).

Due to the limitations of data sources, some scholars narrow their research range and focus on rural or urban areas (Chen and Hou, 2008). Some researchers gave the estimated values of Gini coefficient according to several annual surveys, sometimes what method they used is unknown (Chen and Zhou, 2005). It is difficult to analyze the changing trend of income distribution in China with a few years' data. In terms of national Gini coefficient, because of the limitation of methods and data, there are few researches focus on overall inequality of national resident based on statistical and time-series data in China (Chen and Zhou, 2005).

In China, various provinces have different development stages. The non-even economic restructuring process to be accompanies by increasing inequality between the rural and urban, and between different regions (Chotikapanich et al., 2007a). As a basic tool for analyzing China's income distribution, the collection of sufficient data on income distributions spanning a long period is a major research problem. Although there are many methods have been proposed to calculate the Gini coefficient, there is still lacking of a widely accepted calculation method for the China's provincial Gini coefficient.

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In this chapter, we will use each provincial data to calculate Gini coefficient from 1995 to 2013 for urban, rural and all residents, because in this period China's economy grew rapidly, however, its income inequality widened. The rest of this paper is organized as follows: Section 2 introduces the methods of calculating China's Gini coefficient. Section 3 presents the calculating process and results of China's Gini coefficient, including urban, rural and all residents based on province-level data. Section 4 analyzes the limitations and shortcomings in calculating China's Gini coefficient, and Section 5 provides some conclusions.

2.2. Methods of Calculating China's Gini coefficient

Gini coefficient is often derived from the Lorenz curve, but can also be derived directly (Deaton, 1997). Generally, there are two ways to calculate income Gini coefficient, one is the direct method (Deaton, 1997), and the other one is indirect method (Thomas et al., 2001). According to Xu (2004), the methods for computational Gini coefficient include the geometric approach, Gini's mean difference approach (or the relative mean difference approach), covariance approach, and matrix form approach.

The Direct Method

The direct method states that the income Gini coefficient is defined as "the ratio to the mean of half of the average over all pairs of the absolute deviations between people" (Deaton, 1997). Due to the publicized China's income data are not the original ones, they were divided into groups based on income level. The Gini coefficient accuracy cannot be assured since there are only a few groups (Chen et al., 2010).

The Indirect Method

The indirect method is based on the Lorenz Curve to calculate Gini coefficient, which is defined as the ratio of the area between the diagonal and the Lorenz curve to the area of the whole triangle under the diagonal.

Figure 2-1 shows that if the area between the line of perfect equality and Lorenz curve is A, and the area under the Lorenz curve is B, the Gini coefficient is defined as A/(A + B), where A and B are the areas shown in the Figure.

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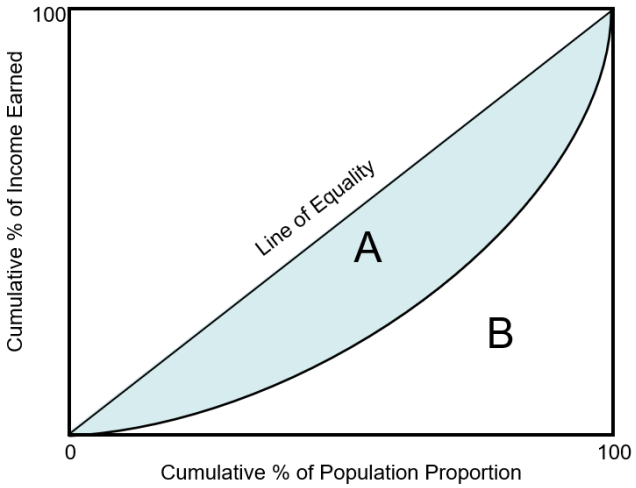

Figure 2-1: The Gini coefficient and Lorenz Curve

2.2.1 Calculating China's Gini Coefficient Using the Trapezoidal Rule[1]

As mentioned above, numerous methods have been proposed to calculate the Gini coefficient. The one that we chose to calculate China's Gini coefficient is the trapezoidal rule, using income distribution data available in grouped form in China. Trapezoidal rule is to compute Gini coefficient geometrically, which would calculate the areas of several triangle and trapezoids and adding them up.

Let X_i be a point on the x-axis, and Y_i a point on the y-axis. If (X_i, Y_i) are the known points on the Lorenz curve, with the X_i indexed in increasing order ($X_{i-1} < X_i$), so that:

- X_i is the cumulated proportion of the population variable, for i = 0,..., n, with X_0 = 0, X_n = 1.
- Y_i is the cumulated proportion of the income variable, for i = 0,..., n, with Y_0 = 0, Y_n = 1.
- Y_i should be indexed in non-decreasing order ($Y_i > Y_{i-1}$).

According to the trapezium rule, the estimated area under the Lorenz curve is (Fellman, 2012):

$$\frac{1}{2}\sum_{i=1}^{n}(X_i - X_{i-1})(Y_i + Y_{i-1}). \quad (2\text{-}1)$$

If the Lorenz curve is approximated on each interval as a line between consecutive points, then the area B (Figure 2-1) can be approximated with trapezoids (Haughton and Khandker, 2009), and Gini coefficient is as follow:

$$\text{Gini coefficient} = 1 - \sum_{i=1}^{N}(X_i - X_{i-1})(Y_i + Y_{i-1}), \quad (2\text{-}2)$$

[1] The trapezoidal rule is used for calculation Gini coefficient of national income by the NBS (Wang, 2013).

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when there are *N* equal intervals on the *X*-axis, equation (2-2) can be simplifies to (Haughton and Khandker, 2009):

$$\text{Gini coefficient} = 1 - \frac{1}{N}\sum_{i=1}^{N}(Y_i + Y_{i-1}). \quad (2\text{-}3)$$

This method is accurate for ungrouped data and accuracy increases with the number of classes in grouped data (Abounoori and Mccloughan, 2003).

Ten Thousand Parts

Ten thousand parts method is named by Chen (1994), which is summarized from Bronfenbrenner (1976) to estimate Gini coefficient. Let GC denote Gini coefficient and S is the summation of areas double those of the triangles and trapezoids, and subtracting the sum from 10,000 (double the area of the triangle under line of equality). Division of the difference by 10,000 gives an estimation of GC ; then the model can be written as follows (Bronfenbrenner, 1976; Chen, 1994):

$$\text{GC} = \frac{10{,}000 - S}{10{,}000}\ , \quad (2\text{-}4)$$

where $\text{S} = \sum_{i=1}^{n} P_i \text{x}\, V_i, i = 1,2,\ldots,n,\ V_i = U_{i-1} + U_i,\ U_i = \sum_{i=1}^{i} Y_i,$

$$P_1 + P_2 + \cdots + P_n = 100,$$

$$P_i = \frac{p_i}{\sum_{i=1}^{n} p_i}, \quad (2\text{-}5)$$

$$Y_1 + Y_2 + \cdots + Y_n = 100, \text{ and}$$

$$Y_i = \frac{y_i}{\sum_{i=1}^{n} y_i}, \quad (2\text{-}6)$$

where n is the total number of observations, y_i is income of the i^{th} group, p_i is population of the i^{th} group,[2] U_i is accumulative proportion of income of the i^{th} group, P_i is population proportion of the i^{th} group, and Y_i is income proportion of the i^{th} group.

Practical Applications Formula

To overcome the problems caused by the unevenly and evenly group income data in China, Chen (2007) used the following formula to calculate 21 provinces' Gini coefficient of urban, rural and all residents on provincial-level data from 1995 to 2004.

$$\text{Gini coefficient} = \sum_{i=1}^{n} W_i Y_i + 2\sum_{i=1}^{n-1} W_i(1 - V_i) - 1, \text{ and} \quad (2\text{-}7)$$

$$V_i = Y_1 + Y_2 + Y_3 + \cdots + Y_i,$$

[2] The population in each group estimate from the total number of households surveyed, the proportion of household surveyed in that group, and the average number of persons per household in that group.

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where n is the total number of observations, W_i is i^{th} group population to total population, Y_i is the i^{th} group income proportion to total income, V_i is accumulative proportion of income of the i^{th} group.

2.2.2 Calculating Overall Income Inequality of China's Provincial Residents

China Statistics Yearbook of province only provides very limited grouping data to calculate Gini coefficients. Moreover, the format in which income group is reported in the *China Statistical Yearbook* for rural and urban residences is quite different. For urban areas, the average per capita annual income or disposable income for different percentiles of households are reported. For rural areas, the percentages of households grouped by per capita annual net income are reported (Chotikapanich et al., 2007a). In addition, grouped data of rural residents' income for various years in the yearbook are not uniform. For example, in Anhui, total households are unevenly divided into ten groups by income level in 1996, but in 2006 more than twenty unequal groups are divided by income level.

To solve the problem causing by separate urban and rural samples, Chen (1994) used "hierarchical weighted method" to combine income data of rural and urban region, which first gave different weights to rural and urban samples, based on the actual population ratios, and then combined them together to calculate China's national Gini coefficient. As above mentioned, the reported manner for income grouped data in *China Statistical Yearbook* for urban and rural residents is very different. Hence, this study uses trapezoidal rule with hierarchical weighted method to calculate China's provincial Gini coefficient. The steps are as follows:

First, we apply the formula of ten thousand parts method to calculate income proportion and population proportion of each stratum which can be used to calculate provincial Gini coefficient of urban areas and rural areas.

Second, to calculate provincial Gini coefficient of urban and rural separately by using the above calculated population proportion and income proportion data. After calculation the rural and urban Gini coefficient, then we use "hierarchical weighted method" to combine the income data of rural and urban region to form an integrated provincial income data.

Finally, we use the trapezoidal rule formula with above calculated relevant data to calculate each provincial Gini coefficient.

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Hierarchical Weighted Method[3]

Chen and Zhou (2005) provided details steps of hierarchical weighted method: (1) rural and urban data are integrated directly by re-ranked income groups (i. e. the income data of urban and rural is sorted according to an ascending order); (2) according to actual urban and rural population, they give different weights to urban and rural samples and integrate two samples; (3) calculate provincial income proportion of each group or stratum by using per capita income and population proportion of each group or stratum; and (4) calculate income Gini coefficient of provincial residents by using population proportion in (2) and income proportion in (3). The details of hierarchical weighted method are as follows:

$$P_i = P_{Ai}\mathrm{x}\overline{P}_A + P_{Ni}\mathrm{x}\overline{P}_N,\ \mathrm{i} = 1, 2, \ldots, \mathrm{n};$$
$$P_1 + P_2 + \cdots + P_n = 100;$$
$$y_i = \frac{Y_{i\times}P_i}{\sum_{i=1}^{n} Y_i \times P_i};$$
$$y_1 + y_2 + \cdots + y_n = 100;$$
$$Y_i = Y_1, Y_2, \ldots, Y_n;\ and$$
$$Y_1 \le Y_2 \le Y_3, \ldots, \le Y_n.$$

The above Y_i is average income of each group or stratum and ranked wholly in province's residents, y_i is the income proportion of each group or stratum, P_i is the population proportion of each group or stratum, P_{Ai} is the population proportion of each stratum in rural areas, P_{Ni} is the population proportion of each stratum in urban area, $\overline{P}_A$ is average population proportion in rural area, $\overline{P}_N$ is average population proportion in urban area, and n is the number of stratum ranked in Y_i.

2.3 Calculating Process and Results of China's Gini Coefficient

Due to Chinese urban-rural dual structure, China's household surveys has been divided into the urban area and the rural area. In addition, comparing with the data of urban income distribution, data of income group of rural residents are relatively incomplete and lack of data for calculating rural Gini coefficient directly. To overcome the problems, Chen (2007) used the data in *China Yearbook of Rural Household Survey* and provincial statistical yearbook to calculate rural Gini coefficient, and used the data of provincial statistical yearbook to calculate urban Gini coefficient.

[3] Beside hierarchical weighted method, Chen and Zhou (2005) also used urban/rural weighted method to calculate Gini coefficient of national residents, and found that the results of two methods are similar and existing little difference (Chen and Zhou, 2005). However, comparing the results of overall Gini coefficient on provincial-level calculated by Chen (2008) and Tien (2012) with hierarchical weighted method and urban/rural weighted method (proposed by Sundrum, 1990) respectively, it exists the quite difference in some provinces.

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2.3.1 China's Urban Gini Coefficient

Based on the provincial statistical yearbook in China, the income of urban households is grouped by annual per capita disposable income and divided into seven levels: lowest, lower, lower middle, middle, upper middle, higher, and highest income. In calculating inequality in urban of China, data on the households are converted into the persons by using data on household size within each income group (Chotikapanich et al., 2007a).

The data of average per capita disposable income by level of income, number of households surveyed and the proportion of households by level of income, average number of persons per household can be obtained from China's provincial statistical yearbook. The steps for calculating urban residents' Gini coefficient are as follows:

First, the amount of (total) income in each income group was estimated by multiplying per capita disposable income in each income group by the total number of persons in that group. The total number of persons in each group was estimated from the total number of households surveyed, the proportion of household surveyed in that group, and the average number of persons per household in that group. Next, with the above calculated data, urban residents' Gini coefficient was calculated by using the formula (2-2) or (2-7). Table 2-1 shows the calculated results of China's urban Gini coefficient by province from 1995 to 2013.

2.3.2 China's Rural Gini Coefficient

In order to calculate provincial Gini coefficient of china's rural residents, we also need to convert the data on the households into the persons, by using data on household size within each income group for calculating rural Gini coefficient. According to the provincial statistical yearbook, the income of rural households in China is divided into 8 to 20 groups based on level of per capita net income. However, China's provincial statistics yearbook only provides quite limited grouping data to calculate rural Gini coefficients. Statistical yearbook of province is lack of the data of per capita net income of every group and number of persons per household of every group, which is need to calculate Gini coefficient.

Hence, we followed Chen (2007), the data calculating rural Gini coefficient are from various issues of *the Yearbook Rural Household Survey* and provincial statistical yearbook. *China Yearbook of Rural Household Survey* provides both basic indicators of rural households, average number of permanent residents per household corresponding to the groups and average per capita net income of rural household corresponding to the groups. As to the number of households surveyed and the proportion of rural household grouped by per capita annual net income can be acquired from provincial statistical yearbook. We apply the formula (2-5) and (2-6) with the

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above data to calculate the population and income proportion of every group. The steps are as follows:

First, the amount of (total) income in each income group was estimated by multiplying per capita net income in each income group by the total number of people in that group. The total number of people in each group was estimated from the proportion of rural household surveyed in that group multiplies the total number of households surveyed, the average number of persons per household in that group.

Second, according to the amount of (total) income in each income group and the total number of people in each group calculated above, and then adding these results together to acquire total surveyed population and total surveyed net income, we can further calculate the population and income proportion of every group (Chen and Zhou, 2005).

Finally, apply the formula (2-2) or (2-7) with above data to calculate Gini coefficient of China's rural residents from 1995-2013. Table 2-2 shows the calculating results of China's rural Gini coefficients by province from 1995-2013.

2.3.3 Provincial Residents' Gini Coefficient

In order to combine income data of rural and urban region, this study uses hierarchical weighted method which is named by Chen (1994) to integrate household survey data of urban and rural areas to calculate the provincial Gini coefficient. The method is summarized from specialists of World Bank (World Bank, 1983) to compute the national Gini coefficients in China. The detailed calculation steps are as follows:

First, each province's urban and rural data need to be re-ranked according to income level.

Second, giving different weights to rural and urban samples, based on the actual population ratios, and then combine them together.

Finally, using the combined urban-rural income ratio and population ratio, apply the formula (2-2) or (2-7) with above data, to derive provincial Gini coefficient.

Due to many provinces' historical data cannot be obtained or inconsistent, we can only calculate the provincial Gini coefficient from 1995-2013 for 21 provinces using the above methods (Table 2-3).

2.3.4 Comparison of the Different Gini Coefficient Based on Provincial Data

To compare the results in Table 2-1, Table 2-2, and Table 2-3, the each provincial Gini coefficients during 1995~2013 for all residents have always been higher than the each provincial Gini coefficients for rural residents and urban residents.[4] Due to severe

[4] Since the income data prior to 2012 originate from Urban Household Survey and Rural Household Survey separately, the Gini coefficients for rural residents and urban residents do not capture urban-rural

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shortage or incomplete of the key data to calculate Gini coefficients for rural and all residents, we are unable to obtain a long time-series data in some provinces (For example, Tianjin, Yunnan, Henan, Hunan, and Heilongjiang). In addition, in comparison the results with Chen (2007) using the similar method based on the same data sources, our results are similar and little difference in urban residents, but it exists differences for rural and all residences.[5]

We also calculate the mean values of urban Gini coefficient from the selected provinces (Table 2-1). Figure 2-2 shows the trends of average urban Gini coefficients to go up continually with fluctuations from 1995~2008, and declines from 2009 to 2013. Our urban Gini coefficients are close to Chang and Li (2012), and marginally lower their results after 2002 but show the same trend.[6] In addition, the tendency of our calculation is consistent with other sources of national Gini coefficients, therefore, we believe that the urban Gini coefficients calculated by us are reliable and can be used for empirical analysis of income distribution in China.

income differences. In this study, each province's urban and rural data need to be re-ranked according to income level and then giving different weights to rural and urban samples, based on the survey population ratios to compute the provincial Gini coefficients. Hence, the higher provincial Gini coefficient than the Gini coefficients for rural residents and urban residents may reflect the existence of urban-rural income disparity.

[5] Chen (2007) used a similar method to calculate Gini coefficient for China's residents from 1995 to 2004. We assume the differences may cause by incomplete rural data in *China Statistics Yearbook* and *China Yearbook of Rural Household Survey.*

[6] One possible explanation is the urban survey only covered residents with formal urban residency certificates (hukou) before 2002. However, starting from 2002, NBS engaged a program in collaboration with the World Bank to expand the definition of urban residents (Jin et al., 2014). Since migrant households are substantially underrepresented in NBS's urban dataset (Cai et al., 2010; Chi, 2012), the true Gini coefficients in urban China may be higher than the calculated by officially annual reported figures since 2003.

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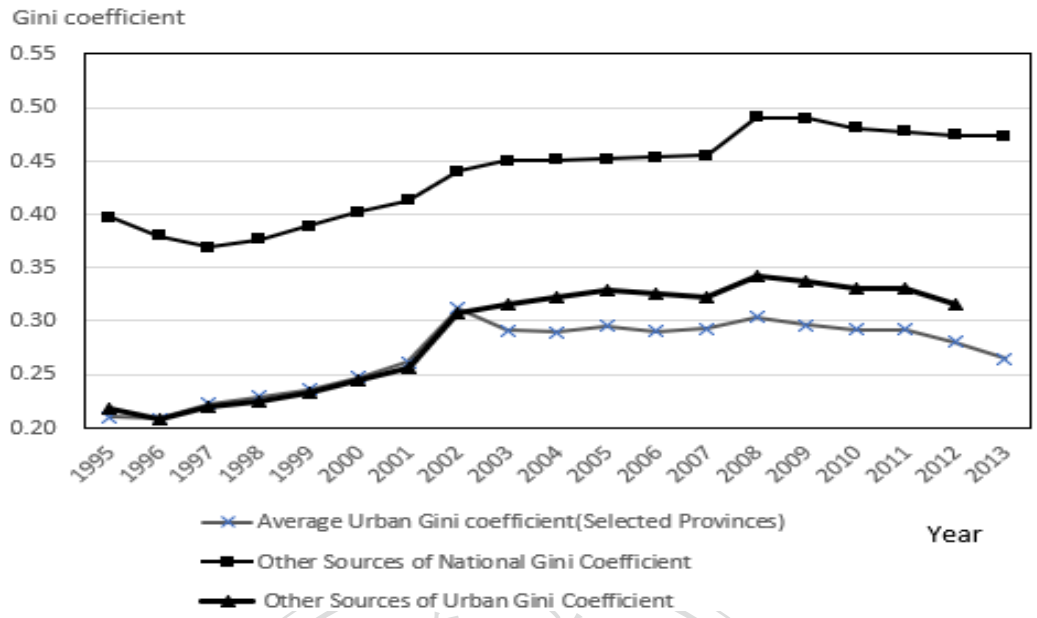

Sources: 1. Average urban Gini coefficient (selected provinces) are calculated by author.
2. Other sources of urban Gini coefficient: 1995-2007 is from Chang and Li (2012); 2008-2012 is from Hu (2016).
3. Other sources of national Gini coefficient: 1995-2007 is from Chang and Li (2012); 2008-2012 is from the National Bureau of Statistics of China.

Figure 2-2: The Comparison of Different Gini Coefficients

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Table 2-1: Estimated Urban Gini Coefficients in China—1995~2013

	Eastern Zone						Western Zone							Middle Zone						Northeast Zone		Average (Selected Provinces)	Other Sources of Urban Gini Coefficient	Other Sources of National Gini Coefficient
Year	Tianjin	Shanghai	Jiangsu	Zhejiang	Fujian	Guangdong	Guangxi	Chongqing	Yunnan	Shaanxi	Qinghai	Xinjiang	Inner Mongolia	Shanxi	Anhui	Jiangxi	Henan	Hubei	Hunan	Heilongjiang	Liaoning			
1995	0.2246	0.2149	0.1960	0.2038	0.1929	0.2077	0.2130	0.1810	—	0.2109	0.2194	0.2782	0.2137	0.2041	0.1892	0.2108	0.2032	0.1886	0.1964	0.2613	0.1971	0.2103	0.2180	0.3970
1996	0.2320	0.2130	0.1966	0.2040	0.1992	0.2253	0.1929	0.1636	—	0.2052	0.2261	0.2858	0.2158	0.2199	0.1819	0.2040	0.1919	0.1972	0.1923	0.2124	0.2064	0.2083	0.2080	0.3800
1997	0.2437	0.2077	0.2174	0.2110	0.2120	0.2399	0.2170	0.1843	—	0.2162	0.2301	0.2892	0.2470	0.2589	0.1965	0.1720	0.2096	0.2092	0.2178	0.2443	0.2202	0.2222	0.2190	0.3690
1998	0.2516	0.2069	0.2283	0.2218	0.2230	0.2435	0.2244	0.1955	—	0.2355	0.2369	0.2819	0.2412	0.2506	0.1998	0.2080	0.2165	0.2094	0.2308	0.2412	0.2354	0.2291	0.2250	0.3760
1999	0.2546	0.2312	0.2490	0.2288	0.2210	0.2414	0.2303	0.2215	—	0.2355	0.2416	0.2537	0.2424	0.2422	0.2144	0.2236	0.2277	0.2259	0.2417	0.2440	0.2372	0.2354	0.2330	0.3890
2000	0.2605	0.2127	0.2587	0.2449	0.2375	0.2544	0.2481	0.2184	—	0.2667	0.2331	0.2762	0.2583	0.2717	0.2507	0.2165	0.2622	0.2427	0.2423	—	0.2507	0.2477	0.2450	0.4020
2001	0.2860	0.2487	0.2779	0.2569	0.2505	0.2587	0.2683	0.2532	—	0.2732	0.2567	0.2585	0.2437	0.2762	0.2454	0.2494	0.2612	0.2501	0.2812	0.2775	0.2502	0.2612	0.2560	0.4130
2002	0.2928	0.2626	0.3537	0.2723	0.2798	0.3824	0.3451	0.2997	—	0.3275	0.3240	0.2993	0.2481	0.3386	0.3065	0.3128	0.3175	0.3118	0.3245	0.3227	0.3131	0.3117	0.3070	0.4400
2003	0.2929	0.2923	0.3373	0.2940	0.2755	0.3640	0.3482	0.2316	0.2560	0.2644	0.3203	0.2771	0.3166	0.2712	0.2743	0.2649	0.2712	0.2993	0.2731	0.3055	0.2820	0.2910	0.3150	0.4500
2004	0.3040	0.2973	0.3476	0.3100	0.2802	0.3570	0.2860	0.2521	0.2780	0.2727	0.2859	0.2870	0.2900	0.2797	0.2678	0.2766	0.2760	0.2550	0.2758	0.3140	0.2870	0.2895	0.3230	0.4510
2005	0.3147	0.2946	0.3440	0.3079	0.2804	0.3518	0.3114	0.2591	0.3054	0.2723	0.3157	0.3000	0.2845	0.2820	0.2574	0.2660	0.2369	0.2612	0.3250	0.3372	0.3002	0.2956	0.3290	0.4520
2006	0.2914	0.2972	0.3424	0.3142	0.2679	0.3493	0.3040	0.2459	0.3013	0.2751	0.3241	0.2844	0.2809	0.2785	0.2432	0.2636	0.2277	0.2791	—	0.3310	0.2972	0.2899	0.3260	0.4530
2007	0.2951	0.2864	0.3450	0.3149	0.2857	0.3447	0.3110	0.2497	0.3108	0.2818	0.3425	0.2675	0.2610	0.2843	0.2519	0.2577	0.2651	0.2739	—	0.3290	0.2985	0.2928	0.3230	0.4550
2008	0.2968	0.2859	0.3618	0.3231	0.2960	0.3488	0.2882	0.2430	0.3164	0.2895	0.3693	0.2819	0.3053	0.2879	0.2838	0.2528	0.2758	0.2945	—	0.3425	0.3289	0.3036	0.3415	0.4910
2009	0.2820	0.2775	0.3326	0.3212	0.2939	0.3412	0.2829	0.2311	0.2982	0.2867	0.3642	0.2593	0.2942	0.2896	0.2788	0.2637	0.2803	0.3044	—	0.3296	0.3122	0.2962	0.3372	0.4900
2010	0.2749	0.2683	0.3290	0.3147	0.3021	0.3356	0.2720	0.2319	0.2950	0.2768	0.3502	0.2627	0.2921	0.2893	0.2832	0.2567	0.2736	0.3145	—	0.3154	0.3098	0.2924	0.3311	0.4810
2011	0.2710	0.2647	0.3109	0.3101	0.3096	0.3298	0.2872	0.2433	—	0.2602	0.3497	0.2653	0.3073	0.2955	0.2737	0.2753	0.2736	0.2852	—	0.3154	0.3127	0.2916	0.3301	0.4770
2012	0.2645	0.2685	0.3005	0.3022	0.2928	0.3078	0.2768	0.2323	—	0.2596	0.3553	0.2448	0.2894	0.2942	0.2470	0.2621	0.2687	0.2760	—	0.2960	0.2888	0.2804	0.3154	0.4740
2013	0.2576	0.2712	0.3184	0.2778*	0.2860	—	0.2962	0.2448	—	—	—	0.3097	0.3190	—	0.2986	0.2417	0.2809	0.2706	—	—	0.3125	0.2648	—	0.4730

Notes: 1. Except for the two last column, all figures are calculated by the author, based on the data provided by the China *provincial Statistical Yearbook* in 1996-2014.

2. * is urban Gini coefficients calculated by five (quintile) income group data in *Provincial Statistical Yearbooks*, National Bureau of Statistics.

3. '—' data is not available.

Sources: Other sources of urban Gini coefficients: 1995-2007 is from Chang and Li (2012); 2008-2012 is from Hu (2016). Other sources of national Gini coefficients: 1995-2007 is from Chang and Li (2012); 2008-2012 is from the National Bureau of Statistics of China.

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Table 2-2: Estimated Rural Gini Coefficients in China—1995~2013

	Eastern Zone						Western Zone							Middle Zone						Northeast Zone		Other sources of Rural Gini Coefficient
Year	Tianjin	Shanghai	Jiangsu	Zhejiang	Fujian	Guangdong	Guangxi	Chongqing	Yunnan	Shaanxi	Qinghai	Xinjiang	Inner Mongolia	Shanxi	Anhui	Jiangxi	Henan	Hubei	Hunan	Heilongjiang	Liaoning	
1995	0.2435	0.2521	0.2540	0.2888*	0.2512	0.2176	0.2708	0.3026	—	0.2557	0.2449	0.4048	0.2656	—	0.2693	0.2926	0.3440	0.3285	0.2386	0.3134	0.3143	0.3420
1996	—	0.2548	—	0.2894	0.2206	—	0.2823	—	—	0.2517	0.2535	0.3876	0.2508	—	—	—	—	—	—	—	—	0.3230
1997	—	0.2538	—	0.3164	0.2162	—	0.2871	—	—	0.2735	0.2496	0.3438	0.3030	—	—	—	—	—	—	—	—	0.3290
1998	0.2583	0.2557	—	0.3237	0.2239	—	0.2447	0.3427	—	—	0.2731	0.3801	0.2727	—	0.2347	0.2792	0.2645	0.2720	0.2572	0.2663	0.2978	0.3370
1999	0.2685	0.2723	0.3106	0.3198	0.2434	0.2703	0.2426	0.3421	—	0.2892	0.2775	0.3654	0.2862	0.2135	0.2220	0.2672	0.2681	0.2694	0.2566	0.2955	0.3164	0.3360
2000	0.2895	0.2569	0.3147	0.3035	0.3108	0.2755	0.2636*	0.2838	—	0.3126	0.3097	0.4225	0.3368	0.3140	0.2434	0.2709	0.2274	0.2757	0.2825	—	0.3453	0.3540
2001	0.2807	0.2531	0.3171	0.3093	0.3005	0.2841	0.2588*	0.2848	—	0.3031	0.3281	0.3898	0.3736	0.3318	0.2411	0.2744	0.2614	0.2900	0.2873	—	0.3394	0.3600
2002	—	0.2566	0.3233	0.3211	0.3104	0.2999	0.2661*	0.2756	—	0.2903	0.3174	0.3824	0.3556	0.3281	0.2646	0.2776	0.2815	0.2908	0.2993	—	0.3410	0.3650
2003	—	0.2723*	0.3215	0.3296	0.3305	0.3107	0.2711*	0.2819	0.3660	0.3117*	0.3091	0.3897	0.3601	0.3326	0.2674	0.2802	0.2710	0.3061	0.3024	0.3399	0.3640	0.3680
2004	—	0.2619*	0.3200*	0.3187*	0.2812	0.3170*	0.2716*	0.2930*	0.3457	0.2764*	0.3406	0.3790	0.3340	0.2812	0.2812	0.259*	0.29*	0.3150	0.3186	0.3439	0.4295	0.3690
2005	—	0.2699*	0.2760*	0.3202*	0.3016	—	0.2438*	0.2550*	0.3348	0.2959	0.3243	0.3855	0.3341	0.3190	0.3184	0.2836	0.2803*	0.3766	0.3046	0.3406	0.3115	0.3750
2006	—	0.2657*	0.3116*	0.3198*	0.2849	—	0.2673*	0.2614*	0.3169	0.2635	0.3368	0.3857	0.2526	0.3275	0.3144	0.2807*	0.2815*	0.3143	—	0.3620	0.3144	0.3740
2007	—	0.2579*	0.2751*	0.3301*	0.2602	0.3078*	0.2785*	0.2697*	0.2595	0.2757	0.3558	0.3836	0.2331	0.2107	0.3203	0.2859	0.2803*	0.3059	—	0.3410*	0.2757	0.3740
2008	—	0.2603	0.3506*	0.3289	0.3171*	0.2996*	0.2915*	0.2896*	—	0.2863	0.3487	0.3498	0.1992	0.3223	0.3116	0.3153	0.2920*	0.3072	—	0.3457*	0.2624	0.3780
2009	—	0.2567	0.3307*	0.3302	0.2284*	0.3029*	0.277*	0.2965*	—	0.2987	0.3835	0.3434	0.2804	0.3060	0.3087	0.3109	0.3071*	0.2947	—	0.3521*	0.2559	0.3812
2010	—	0.2482*	0.3311*	0.3373	0.2561*	0.3003*	0.2838*	0.2754	—	0.2831	—	0.3383	—	0.3227	—	0.3034*	0.3072*	—	—	0.3420*	—	0.3757
2011	—	0.2377*	0.3414*	0.3366*	0.3039*	0.3140*	0.2846*	0.2759*	—	0.2837	—	0.3207	—	0.3387	—	0.3080*	0.3042*	—	—	0.3914*	—	0.3806
2012	—	0.2314*	0.3402*	0.3401	0.3017*	0.2914*	0.3095*	0.2998*	—	0.2616	—	0.2935	—	0.3226	—	0.3097	—	—	—	0.3425*	—	0.3808
2013	—	0.2237*	0.3331*	0.3268*	0.3086	—	0.2985*	0.2773	—	—	—	—	0.4158	—	—	0.3258*	—	—	—	—	—	

Notes: 1. Except for the last column, all figures are calculated by the author, based on the data in the China *Provincial Statistical Yearbook* 1996-2014 and *Yearbook of the Rural Household Survey* 2000-2010.

2. * is rural Gini coefficient calculated by five (quintile) income group data in the China *Provincial Statistical Yearbook*.

3. '—' is data not available.

Sources: Other sources of rural Gini Coefficient listed in the last column: 1995-2008 is from Chang and Li (2012); 2009-2012 is from Chen et al.(2015).

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Table 2-3: Estimated Provincial Gini Coefficients in China—1995~2013

	Eastern Zone						Western Zone							Middle Zone						Northeast Zone		Other Sources of National Gini Coefficient
Year	Tianjin	Shanghai	Jiangsu	Zhejiang	Fujian	Guangdong	Guangxi	Chongqing	Yunnan	Shaanxi	Qinghai	Xinjiang	Inner Mongolia	Shanxi	Anhui	Jiangxi	Henan	Hubei	Hunan	Heilongjiang	Liaoning	
1995	0.2840	0.2586	0.2592	0.3117	0.3053	0.3431	0.3475	0.3735	—	0.4113	0.3307	0.4638	0.3116	0.2780	0.3564	0.4722	0.3440	0.3510	0.3615	0.2806	0.2797	0.3970
1996	—	0.2664	—	0.3254	0.2876	—	0.4064	—	—	0.3850	0.3641	0.4921	0.3013	0.3330	—	—	—	—	—	—	—	0.3800
1997	—	0.2642	—	0.3320	0.3020	—	0.3474	—	—	0.3962	0.3686	0.4467	0.3518	—	—	—	—	—	—	—	—	0.3690
1998	0.2924	0.2653	—	0.3416	0.2888	—	0.3281	0.3487	—	0.3577	0.3859	0.4503	0.3374	—	0.3304	0.4641	0.3316	0.3251	0.3367	0.2449	0.2992	0.3760
1999	0.3063	0.3094	0.3373	0.3469	0.3193	0.3664	0.3276	0.3402	—	0.4096	0.4002	0.4550	0.3550	0.2875	0.4047	0.4653	0.3356	0.3372	0.3424	0.2866	0.3160	0.3890
2000	0.3279	0.3017	0.3748	0.3468	0.4045	0.3792	0.3925	0.3188	—	0.4434	0.3572	0.6248	0.3922	0.3805	0.3609	0.4369	0.3750	0.2393	0.3691	—	0.3333	0.4020
2001	0.2901	0.3221	0.3572	0.3604	0.3490	0.3900	0.4128	0.3242	—	0.4477	0.3757	0.4958	0.3991	0.4083	0.3642	0.4169	0.3823	0.3602	0.3824	—	0.3426	0.4130
2002	—	0.3258	0.3960	0.3729	0.3807	0.4478	0.4517	0.3937	—	0.4615	0.4418	0.5274	0.4222	0.4255	0.3986	0.4008	0.4229	0.3963	0.3735	—	0.3834	0.4400
2003	—	0.3466*	0.3929	0.3848	0.3873	0.4644	0.4588	0.3149	0.4580	0.4571	0.4325	0.5150	0.4542	0.4200	0.4140	0.4014	0.4464	0.3897	0.4164	0.3956	0.3780	0.4500
2004	—	0.3140	0.3993	0.4030	0.3758	0.4520	0.3712	0.3703	0.4725	0.2959	0.3406	0.4621	0.4470	0.4294	0.3707	0.3360	0.4087	0.3000	0.3260	0.4070	0.3684	0.4510
2005	—	0.3480	0.3919	0.4032	0.3509	0.4188	0.4306	0.3728	0.4781	0.4022	0.4671	0.3642	0.4356	0.4206	0.4185	0.4753	0.3603	0.3186	0.4106	0.4180	0.3808	0.4520
2006	—	0.3490	0.4065	0.4238	0.3723	0.4160	0.4392	0.4153	0.4710	0.4473	0.4549	0.4517	0.4035	0.4256	0.4163	0.4505	0.3593	0.3838	—	0.3980	0.3694	0.4530
2007	—	0.3540	0.4019	0.3844	0.3756	0.4140	0.3951	0.4151	0.4552	0.4438	0.4647	0.4249	0.3980	0.4239	0.4347	0.3302	0.3569	0.3764	—	0.4100	0.3611	0.4550
2008	—	0.3473	0.4266	0.4165	0.3931*	0.4438	0.3815	0.4159	—	0.4535	0.4873	0.4448	0.4201	0.4305	0.4144	0.3276	0.3619	0.3884	—	0.3926	0.3779	0.4910
2009	—	0.3510	0.4113	0.3986	0.3881	0.4404	0.3815	0.4164	—	0.4591	0.4866	0.4297	0.4111	0.4353	0.4087	0.3369	0.3634	0.3619	—	0.4012	0.3687	0.4900
2010	—	0.3306	0.4058	0.3946	0.3883*	0.4317	0.4410	0.3927	—	0.4421	—	0.4185	—	0.4244	—	0.3207	0.4073	—	—	0.3950	—	0.4810
2011	—	0.3378	0.4012	0.3801	0.3995	0.4132	0.3918	0.3872	—	0.4479	—	0.3994	—	0.4356	—	0.3818	0.3487	—	—	0.4062	—	0.4770
2012	—	0.3345	0.3943	0.3785	0.4069*	0.4002	0.3696	0.3882	—	0.4445	—	0.3882	—	0.4314	—	0.3262	—	—	—	0.3694	—	0.4740
2013	—	—	0.3936	—	0.3878	—	0.4277	—	—	—	—	—	0.4181	—	—	0.3817	—	—	—	—	—	0.4730

Notes: 1. Except for the last column, all figures are calculated by the author, based on the data provided by the China *Provincial Statistical Yearbook* 1996-2014 and *China Yearbook of Rural Household Survey* 2000-2010.

2. ‘—’ is data not available.

Sources: Other sources of national Gini Coefficient: 1995-2007 is from Chang and Li (2012); 2008-2012 is from the National Bureau of Statistics of China.

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2.4 Limitations and Shortcomings

The data from China's rural and urban household survey are important for researches on income distribution (Fang et al., 1998).[7] However, there are still some limitations and shortcomings in accessing and using the household survey data to calculate China's Gini coefficient.

2.4.1 Inconsistent Statistic Yearbook Data

In China's provincial statistical yearbook, the data format of urban and rural households' income grouped for various years are inconsistent. Moreover, rural households' income grouped in provincial statistical yearbook are also inconsistent with *China yearbook of Rural Household Survey* for some provinces. Such as in Fujian, the rural residents' income before 2001 are grouped according to a certain income interval, after 2001 were divided into five equal groups by income level. The urban residents' income are divided into unevenly seven groups by income levels after 1987 (Tien, 2012).

For example, in Guangxi, the rural households' income before 2000 are grouped according to a certain income interval. After 2000, the income of rural household was divided into five equal groups but also provided the grouped data according to a certain income interval. Beside, some years of income group data in provincial Statistical Yearbook are inconsistent with *China Yearbook of Rural Household Survey*. As to the urban households, income groups were divided into unevenly seven groups by income level since 1995. However, urban households have been divided into just five groups since 2013.[8]

In cases of inconsistent income group data, the figures of five (quintile) group data are used (if have). If the income group data for the same year is different between *China Yearbook of Rural Household Survey* and provincial Statistic Yearbook, we merge the net income and average population per household data of rural residents in *China Yearbook of Rural Household Survey* to acquire the corresponding income groups in provincial statistical yearbooks (such as in Jiangsu, Chongqing, Zhejiang, Henan, Jiangxi, and Guangdong, etc.).

2.4.2 Incomplete Information for Calculating Gini Coefficient

Due to grouped income data are not published every years and do not contain the same contents across years in some provinces, these provinces were excluded due to

[7] Chen et al. (2015) also indicated NBS provide a lot of samples since China's reform and open up. Therefore, the NBS data is a suitable source to analyze income distribution in China. However, the grouped data using mean values which neglect income inequality within the group and underestimate income disparity.

[8] See Guangxi Statistic Yearbook (2014).

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lack of complete information to calculate Gini coefficient. The problem is more serious for rural households survey data. Therefore, it is difficult to find a long time series for calculating rural Gini coefficient in some provinces. For example, Hunan province since 2006 and Heilongjiang in 2013 did not provide groups' per capita net income of rural household or average income in different quintile groups. Also, Tianjin did not provide rural households grouped income data since 2002.

Also, a number of household survey data did not published for all years in some provinces. Such as Fujian province did not provide household survey data in 1997-2004, we used year 1996 (or previous year) instead. Moreover, some provincial Statistical Yearbooks did not provide average population per household for different income groups. In case where lack of population per household data, the total average population per household is used (for example, Yunnan province since 2008) .

In addition, *China Yearbook of Rural Household Survey* was first published in 1992, and consecutively published since 2000. After 2010, the National Bureau of Statistics did not publish *China Yearbook of Rural Household Survey*. Since 2012, the *China Yearbook of Rural Household Survey and China Urban Life and Price Yearbook* merged into the *China Yearbook of Household Survey* (Chen et al., 2015). In *China Yearbook of Rural Household Survey*, rural households are divided by level of per capita net income. In 2014, *China Yearbook of Household Survey* divided rural resident samples into five groups equally only, which are inconsistent with provincial statistic yearbooks for some provinces since 2010.

As above mentioned, due to limited group income data are provided in some provinces which are necessary to calculate Gini coefficient, and different format of grouped income data of the rural and urban households. We can only obtain Gini coefficient for 21 provinces, cities and autonomous regions.

2.4.3 Inconsistence of Income Definitions for Urban and Rural Areas

There was some differences in the definition of income indicators for urban residents and rural residents, in which the income indicators are the disposable income of urban residents, and net income of rural residents. Therefore, the corresponding data results are not entirely comparable (Zhang and Wang, 2011).

In addition, net income was composed with four income sources, including wage income, net business income, property income, and transfer income. For rural residents in China, net business income is the main income source of the total income, and net income of household business mainly from farming. The net business income including income in kind and income in cash (Zhang and Wang, 2011), it involves self-production and self-consumption of agriculture products, which is difficult to calculated accurately. But Yang (1999) claimed the data shortcomings such as certain incompatible definitions

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of income across the urban and rural investigation probable did not introduce bias to study the changes of income inequality over time. Therefore, it may not bring biases to the study of tendency changes in intra-rural and intra-urban for income distribution over time in our study.

2.4.4 The Inconsistent Problem of Income Definition

Income indicators with the changes of definition make it become difficult to find a reliable long enough time series for analysis. With the change in statistical methods, income indicators and definitions changed, there are inconsistent existing with the data provided. Such as two essential variables, income and population, are to calculate the Gini coefficient. However, the yearbook does not provide consistent statistics standards for income and population (Chen et al., 2010).

For instance, before 1997 urban income indicator is defined as living income per capita in the statistic yearbook of Liaoning, Tianjin, Shanxi, and Inner Mongolia. Since 1997, urban household income indicators became disposable income. Also, such as Shanghai's rural household income grouped indicators are different from other provinces since 2001. Before 2001, the indicators of rural household were grouped by per capita net income. Since 2001 and after the indicators of rural household were grouped by average per capita disposable income.

In addition, because migrant workers' average per capita income is under the urban average, the omission of migrant workers will lead to an under-estimation of urban inequality. However, if the urban survey included the migrant workers, it would raise the intra-urban income inequality and therefore increases the overall Gini coefficient. On the other hand, it would narrow the income gap between urban and rural, thereby reducing the overall Gini coefficient. Hence, the overall effect would be ambiguous. In contrast, if we measured the large subsidies for urban residents accurately, the entire urban–rural gap would be larger (Bramall, 2001).[9]

2.4.5 Accuracy and Quality of the Household Survey Data

The data published by China's statistic department are not very accurate. Chen and Zhou (2005) indicated the reasons are as follows: (1) the imperfection of accounting and revenue system; and (2) the imperfection of statistics departments. In addition,

[9] Before 2002, the urban survey only covered residents with formal urban hukou. Since 2002, all living in urban areas are covered in the sample. Therefore, the urban surveys before and after 2002 differ in the coverage of migrant households. The change of survey coverage may cause data inconsistency before and after the year 2002. The true Gini coefficients in urban China may be higher than official reported (Jin et al., 2014). However, Cai et al. (2010) found the proportion of migrant households included to the surveys in 2002 and 2003 was only 1.09% of the whole sample, so remained under-sampling of migrant households. Hence, the inconsistent problem of data is insignificance due to the small fraction of migrant population in the sample.

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statisticians in rural China are general low in quality, 70% of them only with junior middle school and lower of educational level. It is a hard to engage or to train a great number of people to meet requirement of survey and on-site interview. Beside, some sources of (agriculture output) rural household income will be difficult (or failed) to include in the NBS survey of rural household income (for instance, farmers' self-sufficiency), causing the under-valuation of self-consumed production (Zhang and Wan, 2008). Hence, rural household income are not accurate enough.

As mentioned above, we found China's provincial statistical yearbook have some noticeable mistakes. For example, in *Hunan Statistical Yearbook* 2003, urban disposal incomes for lowest, lower, and lower middle level are 1752.84, 3032.52, and 4275.96 yuan respectively. However, the disposal income for middle, upper middle, high, and highest level is 502.55, 684.91, 936.10, and 1769.02 yuan respectively. The numbers of household surveyed were inconsistent in different Tables in *Hunan Statistical Yearbook* 2004 . For example, Table 7-3 and Table 7-5 showed households surveyed data is 1,000 households and 12,000 households in 2003, respectively.

2.4.6 Integration of Survey for Rural Household and Urban Household

From the fourth quarter of 2012, the National Bureau of Statistics integrated of rural household and urban household survey, and changed the definition of urban and rural, disposable income, and sample coverage. National Bureau of Statistic adjusted the net income of rural resident to disposable income (Zhang and Wang, 2011).[10] In 2013, China's government released national Gini coefficients for the years 2003-2011, which were calculated using new standards, new caliber, and old data (Chen et al., 2015). [11] We found that the official national Gini coefficient was marginally higher than estimation by Chang and Li (2012) in the period from 2003 to 2007. Since 2014, many provinces have formally released the data on the integrated survey of urban and rural residents' income.

Hence, the data based on the integration of urban and rural residents' income and expenses are not comparable with the data released before 2013 (Guangxi Statistical Yearbook, 2014). After the integration of urban and rural residents' survey, it became unnecessary for researchers to adopt a specific method to integrate the Urban and Rural Household Survey published by the National Bureau of Statistics (Xie, 2016). Nevertheless, how to reconcile new rural data with historical data to push forward

[10] In addition, urban population included migrant workers employed for more than half a year (Chen et al., 2015).

[11] Chen et al. (2015) pointed out the NBS adjusted income distribution of high income group, the certain factors cause a slightly higher Gini coefficient when using NBS' new data.

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research on China's income distribution will be a challenges.[12]

In order to simplify the analysis and avoid Gini coefficient to exceed the range between 0 to 1, in case of negative income of lowest income in *China Yearbook of Rural Household Survey*, we imputed zero income for negative income.[13]

2.5 Summary

Using income distribution data available in grouped form provided by provincial statistical yearbook and *China Yearbook of Rural Household Survey*, we calculate provincial Gini coefficients from 1995 to 2013 for urban and rural residents as well as all residents in China.

Comparison of the different Gini coefficient based on provincial data, our results show the each provincial Gini coefficients during 1995~2013 for all residents have always been higher than the each provincial Gini coefficients for rural residents and urban residents. Our urban Gini coefficients are similar with Chen (2007) using the similar method based on the same data sources. The mean values of our urban Gini coefficients are close to Chang and Li (2012), and marginally lower than their results after 2002 but show the same trend. In addition, the tendency of our urban Gini coefficient is consistence with other sources of national Gini coefficient.

Using the data collected by NBS to calculate Gini coefficient have some limitations and shortcomings. These include inconsistent statistic yearbook data, incomplete information for calculation Gini coefficient, lack of accuracy and quality for the household survey data. These problems are more serious for rural households survey data. In addition, inconsistence of income definitions for urban and rural areas, and the inconsistent problem of income definition, which may induce data comparable problem.

Despite these limitations and shortcomings, the data of China's rural and urban household survey are important sources for researchers to calculate continuous time series of Gini coefficient. The data limitation and shortcoming, inconsistence of income definitions between urban and rural areas, may not bring biases to the study of tendency changes in intra-rural and intra-urban for income distribution over time in our study. However, the accuracy and quality of Gini coefficient of rural and all residents cannot be compared with the urban Gini coefficient, we believe that the calculated urban Gini

[12] Hu (2016) based on the new 20 grouped income data and estimated the Gini coefficients of China for the year 2005, and 2009 to 2012. The results showed urban Gini coefficients had little difference with the past grouped data, while it overestimated the rural Gini coefficient with the past grouped data because of missing lots of information about highest income group. Therefore, adjusting the statistical standard may lead to a lower rural Gini coefficient.

[13] We excluded small proportions of families which did not report a positive income when calculating Gini coefficients.

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coefficients by us are reliable and can be used for empirical analysis of income distribution in China.

Due to China's statistical department provide income data for all China's residents since 2014. The data based on the integration of urban and rural residents' income is not comparable with the data released before 2014. National Bureau of Statistic adjusted the net income of rural resident to disposable income. How to reconcile new rural data with historical data to push forward research on China's income distribution will be a challenge.

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Chapter 3 Analysis of Income Inequality in China

3.1 Introduction

Since Kuznets (1955) claimed that there is an inverted U-shaped curve phenomenon between economic growth and income distribution, most theoretic debate has focused on the economic factors of rising inequality (Hacker and Pierson, 2010). Kaelble and Thomas (1991) ever summarized the empirical results of the Kuznets hypothesis and found only a small part of the change of the inequality can be explained by income levels. This implies that national characteristics (including economic structure, political institutions, socio-cultural heritage, and so forth) play an main role in determining level of inequality. Aigner and Heins (1967) pointed out that development unavoidable brings many noneconomic changes, except the state of development, social and cultural attributes and political factors have impact on income distribution. For example, Hou (2004) argued that income inequality is closely related to China's political system.

Although a lot of papers discussed on China's inequality, but most of them mainly focused on rural-urban and regional inequality, lacked of analysis on the overall inequality in China. In addition, most of papers studied the factors of income inequality concentrated on either a single factor or a few factors (Kaasa, 2005). Economic development process is associated with economic and social effects upon the income distribution. The following factors are possible to either increase or decrease the overall inequality. Due to income inequality has increased substantially in the process of economic development of China, therefore, in this chapter, we will focus on the possible factors to worsen China's income inequality.

3.2 Economic Factors

Economic factors are important to explain the income inequality. The economic factors considered in this study are economic growth, international trade and FDI, inflation, unemployment, financial development, tax policy, technological progress, and marketisation.

3.2.1 Economic Growth

Economic growth is considered as a factor of income inequality. Kuznets (1955) presented a hypothesis—it is called Kuznets' hypothesis, that is an inverted U relationship between economic growth and income inequality, as economic growth, inequality will first increase and then will start to decrease. Chang and Ram (2000) pointed out a faster economic growth makes the incomes concentrate to the rich who

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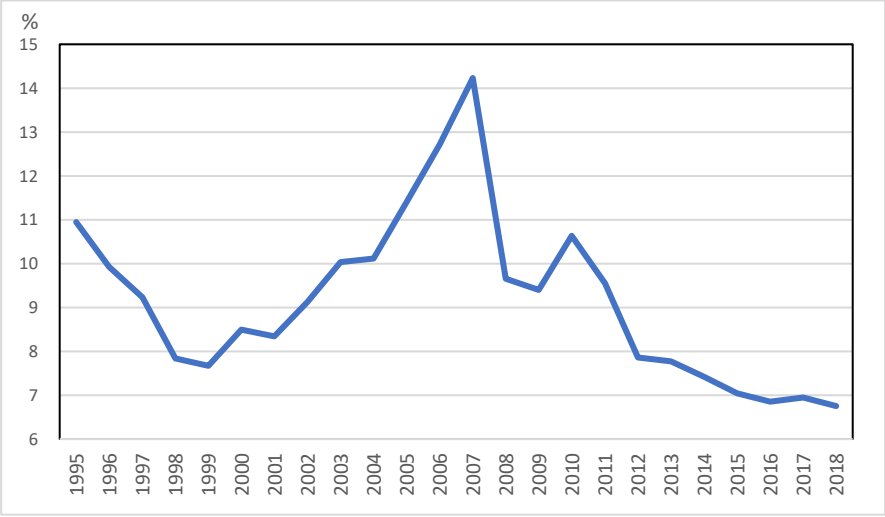
can invest and benefit from economic growth. In general, high income persons save more, they would take an increasing higher share of the total income over time (Cheng and Wu, 2017). Therefore, in the early stages of economic development, the rich accumulate higher proportion of assets tends to widen inequality. In the later stages, savings concentration decrease by income redistribution policies, the increasing importance of services sector, and the diversification of a growing economy that offers more opportunities to all individuals. Income inequality becoming stabilized and then narrowing (Cheng and Wu, 2017). In addition, some previous studies indicated inequality and growth can affect each other. It means growth affects distribution and distribution affects growth (Zhou and Song, 2016).

Since economic reform policies in 1978, China has been one of the fastest growing economies in the world. Figure 3-1 shows the economic growth rate increased from about 7% in 1999 to 14% in 2007. The per capita GDP has grown at an average rate of around 9% in the period of 1995-2018. However, the increased economic growth has been accompanied with a rapid increase in income inequality. China's Gini coefficient increased from about 0.397 in 1995 to 0.491 in 2008 before declining marginally to 0.462 in 2015, then it began to slight upward fluctuations reaching Gini coefficient 0.468 in 2018 (Figure 3-2). The significant rise income inequality became a main issue of the China's economy because of their close relation to the economic growth (Zhou and Song, 2016).



Source: World Bank. Retrieved from https://data.worldbank.org/indicator.

Figure 3-1: Economic Growth Rate in China—1995~2018

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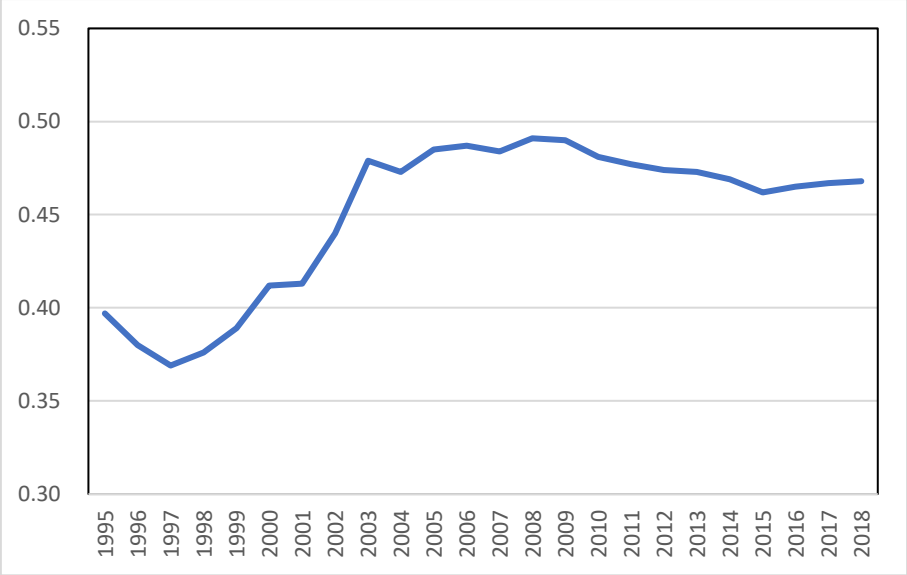

Sources: Gini coefficients of 1995-1999 and 2001-2002 are from Chang and Li (2012); 2000 and 2003-2018 are from National Bureau of Statistics (NBS).

Figure 3-2: Income Distribution in China—1995~2018

3.2.2 International Trade and FDI

According to the Heckscher–Ohlin model, trade liberalization will shift income towards a country's abundant factor. As developing countries are labor abundant, trade will increase exports of labor-intensive products. Thus, liberalization will mainly benefit the abundant unskilled labor, which will reduce wage dispersion and within-country income inequality. However, Spilimbergo et al. (1999) said that governments are not probable to redistribute income if countries engaged in trade have laissez faire system. If the gains of trade are not distributed evenly, then these countries would experience increasing income inequality. In addition, trade may increase disparities in returns to education and skills, which worsens the income equality (Stiglitz, 1998).

The degree of openness (the sum of imports, exports and FDI divided by GDP) in China rapidly increased in the period 1995~2006. Figure 3-3 shows the degree of openness share was 40% in 1995 and grew to 69% in 2006. Trade liberalization affected some countries much more than others (Han et al., 2012). Because China's regions differ in their exposure to international trade and foreign investment, the trade openness gains have not been evenly distributed across regions thus enlarge inland-coastal income disparity.

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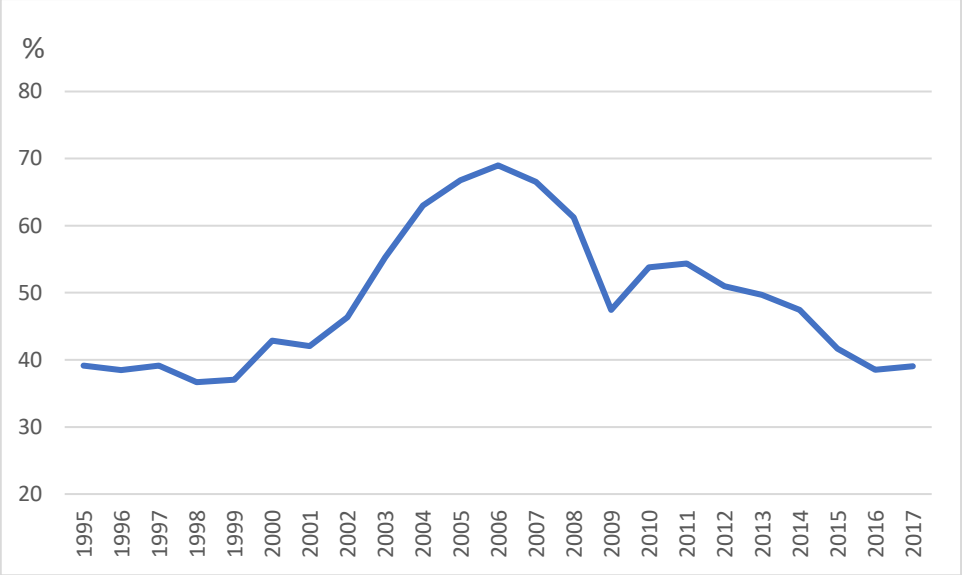

Source: Same as Figure 3-1.

Figure 3-3: The Degree of Openness in China

As the coastal regions in China gained more than the inland regions (urban benefit more than rural areas) from the openness policies (Fujita and Hu, 2001), contributing to the rapidly increase in inland–coastal disparity. According to Yin (2004), in 1999 the degree of openness, was 64.47% for the 11 coastal provinces, but less 10% for the 8 central and 12 western provinces. Moreover, higher salaries usually offer in FDI firms, thus FDI causes the wage difference (Wu, 2005; Tian et al., 2011).

Wan et al. (2007) found international trade accounted for 12% of regional inequality in the late 1980s and grew to more than 14% in early 2000s, the FDI contribute to regional inequality rose from 5% to almost 7% for 1987 to 2001.[1] As trade openness is one of the causes of income inequality in China, Wang (2003) suggested a more equitable income distribution policy could promote international trade while compensating the losers from trade openness.

3.2.3 Inflation

In general, inflation redistributes incomes as incomes rise relatively slowly in response to inflation to income rise more rapidly (Bach and Ando, 1957). According to Palmer and Barth (1977), inequality may affect by inflation by way of cost-of-living effects, wealth effects, and effects on income sources.

In the views of cost-of-living effects, inflation may have distribution effects when price changes vary across goods, and different income groups buy different kind of

[1] Han et al. (2012) indicated two trade liberalization shocks, Deng Xiaoping's Southern Tour in 1992 and China's accession to the World Trade Organization (WTO) in 2001, both dramatically increased the openness of China economy.

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goods, but the effect direction is ambiguous (Parker, 1999). Low income households could affect more from inflation, when inflation is higher in basic goods and services (O'Farrell et al., 2016). As to wealth effects, inflation redistributing net wealth from creditors to debtors and punishing receive fixed income (Parker, 1999). When lower income households keep higher part of financial assets in cash, inflation can redistribute wealth (Mulligan and Sala-i-Martin, 2000). Inflation caused by monetary expansion would worsen inequality by redistributing wealth from the poor to the rich (Cheng and Wu, 2017). It means that high inflation may increase wealth inequality. In contrast, because of reduction of value of nominal assets and liabilities, inflation is possible to reduce wealth inequality by transferring wealth from lenders to borrowers (Nakajima, 2015).

In China, the poor affect more than the rich and the powerful from inflation. The assets of the rich and the powerful are more diversified, while the urban poor and the state sector employees depend largely on salary and pension income, which are adjusted slowly to the inflation rate (Xu and Zou, 2000). Because the rich is easier access to credit, Cheng and Wu (2017) found inflation benefited the rich and privileged more than the poor in China.

Figure 3-4 shows CPI inflation rose since the early 2000, reaching a high in 2004 and again a peak in 2008 in China, most likely because of investment increases in these periods (in particular, for the real estate market). This implies that high inflation may increase wealth inequality. The deflation in 2009 was mainly caused by the 2008 global financial crisis. At the same time, China's overall income inequality started to rise rapidly since 1997, reaching a first high of Gini coefficient 0.479 in 2003, then it began to slight upward fluctuations reaching a record high of Gini coefficient 0.491 in 2008. Whereas inequality in China has been steadily declining since 2009. The NBS estimates that the country's Gini coefficient has steadily declined since 0.491 in 2008, to 0.462 in 2015 (Figure 3-2). Therefore, the increasing trend of inflation in the year 1999-2008 may worse income inequality in China.

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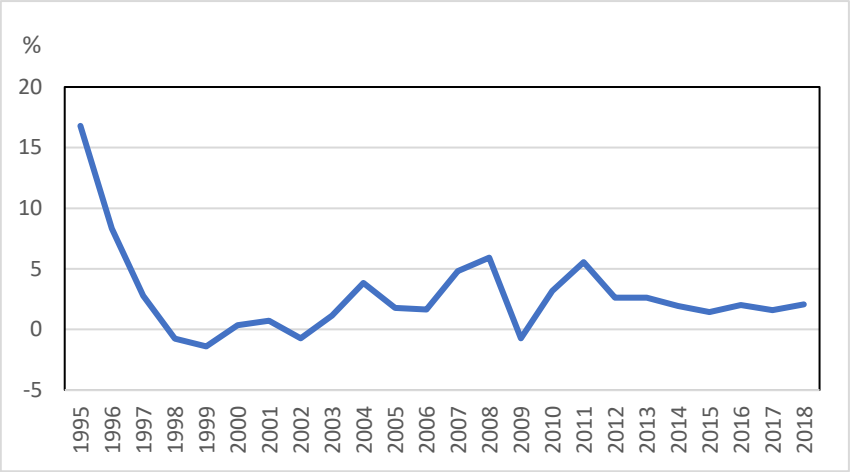

Source: Same as Figure 3-1.

Figure 3-4: Growth Rate of Consumer Price Index in China

To sum up, while the theories do not give a clear forecast about inflation's net effects on income distribution, some empirical results support inflation in China benefited the rich and privileged more than the poor, thus widening income inequality.

3.2.4 Unemployment

Mendershausen (1946) pointed out unemployment might raise earnings inequality by following reasons. First, higher unemployment would increase the degree low incomes. Next, the low skilled are the most vulnerable. In addition, unemployment bring pressure on wages of the lowest income. As unemployment may damage opportunities for obtaining job experience and on-the-job training, which may have negative impact on long-term distribution (Okun, 1973). Parker (1999) found positive relationship between the cyclical fluctuations of unemployment and income inequality. During recessions the lowest income are excessively laid-off, thus increasing income inequality.

In China, since the mid-1990, economic restructuring in urban areas has accelerated in state owner enterprise reform. Consequently, the state and collective employment share has declined from 76% of total urban employment in 1995 to 49 % in 1999 and has significantly increased in unemployment rate (Meng, 2006).

Figure 3-5 shows unemployment rate in urban area has increased significantly from 2.9% in 1995 to 4.3% in 2009. The rapid increase in urban inequality was closely associated with the massive downsizing of SOE (state owner enterprise) workers in the 1990s (Fan et al., 2013). According to National Bureau of Statistics, employment in the SOEs in urban employment decreased from 31.7% in 2001 to 20.1% in 2008 (Figure 3-6), which could contribute to the increased of urban inequality.

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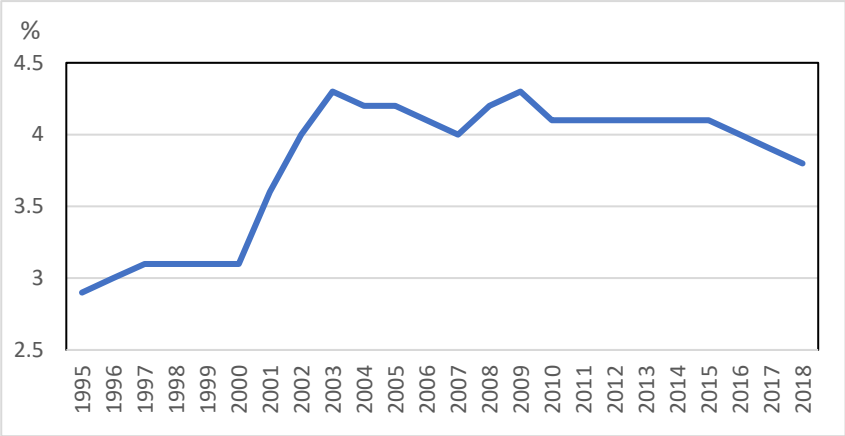
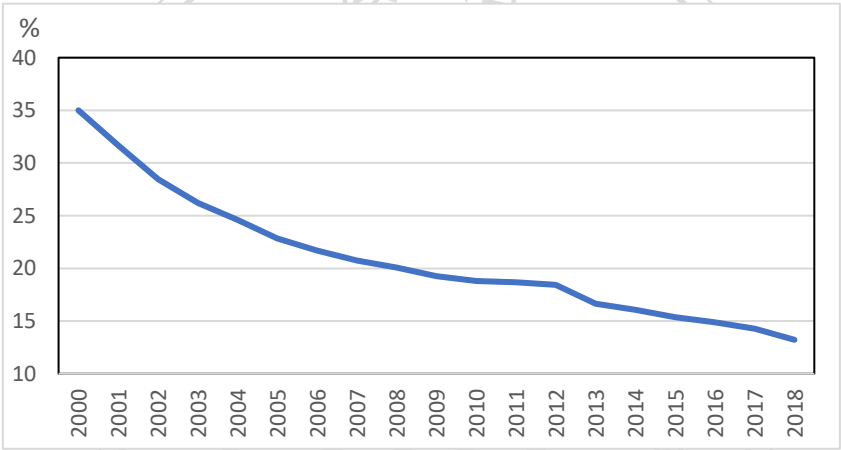


Source: Same as Figure 3-1.

Figure 3-5: Urban Unemployment Rate in China－1995~2018



Source: The National Bureau of Statistics, https://data.stats.gov.cn.

Figure 3-6: Urban Employment Share of SOEs in China

In addition, cyclical joblessness originating from the 2008 global economic crisis and recession, caused millions of migrant workers were laid-off with economic slowdown (Fix et al., 2009). As a result, increasing urban unemployment in 2008 and 2009. In recessions, the low income employees are more possible to be laid-off, thus may lead to increase income inequality.

In sum, the theoretical relationship between income distribution and unemployment are relatively weak (Buse, 1982). Nevertheless, the massive downsizing of SOE workers in the 1990s and cyclical jobless on the 2008 global economic crisis and recession, which can become the significant source of worsening urban inequality in China.

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3.2.5 Financial Development

Theories on the effect of financial development on income distribution provide contradictory expectations: one is an inverted-U relationship, the other is a linear relationship (Naceur and Zhang, 2016). Greenwood and Jovanovic (1990) predict finance and inequality is a nonlinear relationship, and the distributional effect of financial development depends on economic development level. Only the rich can access financial services due to the fixed cost of using the financial service, widen income inequality at early stages of development. With the economy develops, the financial service becomes more accessible and affordable to the poor lead to reduce of income inequality.

Galor and Zeira (1993) and Galor and Moav (2004) claim a linear relationship between financial development and income distribution. As financial deepening eases credit constraints, which benefits low-income groups by human capital and capital accumulation. However, Rajan and Zingales (2003) argue that financial intermediaries service only with the rich while the poor are excluded due to lack of collateral. Even with development in the financial sector, the rich would still have superiority in the financial transactions, which further widens the gap between the rich and the poor.

In contrast, Chen and Jin (2017) indicated access to credit enables low income groups to use opportunities that not able to be obtained. Due to access to credit enables the poor to create income and improve the opportunity to acquire education (Hudon, 2007). Also, cross-country evidence from Beck et al. (2004, 2007), and Rajan and Zingales (2003) argues that private credit development can stimulate income increase for the poorest groups thus reduce inequality.

China's has experienced rapidly economy growth. However, the credit market continues underdeveloped (Sparreboom and Duflos, 2012). Compared to major advanced economies, China still behind in important financial inclusion dimensions including borrowing and some transaction services. Jain-Chandra et al. **(**2018) indicated about 41 % of China's population saved at a financial institution, but only 10 % borrowed from a financial institution and 17 % obtained wages from financial institution account in 2014.[2] According to World Bank, the formal credit use (use of credit cards and bank loans) is far lower in China's 7% compared to other major emerging economies. Hence, China still faces considerable inequality in opportunity to access certain financial services which can increase income inequality (Chen and Jin, 2017). Although there are various empirical studies focused on the influence of financial development on the urban–rural income gap in China, however, the relationship between financial development and income inequalities are inconclusive and mixed

[2] See Global Findex Database, World Bank 2014, main advanced countries are Japan, France, Germany, Italy, Canada, US, and UK.

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(Rahman et al., 2019).

In summary, there are no generalized conclusions on whether financial development can reduce income inequalities. As China still faces considerable inequality in access to certain financial services and credit market underdevelopment, which may wider income inequality.

3.2.6 Tax Policy

Tax effect on inequality can be through different channels. Taxes redistribute income by decreasing the gap of disposable income. Taxes can also provide incentives to save for retirement, thus contribute to redistribute income across individuals' lifecycles. In generally, taxes increase revenues used for finance public programs, some of these programs are designed to reduce inequality (Brys and Bradbury, 2016).

Different tax structures have different effect on income distribution. Indirect taxes are regressive, as the rich or the poor pay the same rate for consumption expense. Since the poor pay a higher proportion of their income as tax, indirect tax hence has the effect of increasing income inequality. In contrast, direct taxes tends to be more fair. As taxes on income rises as income increases, thereby, direct taxes are progressive, leading to a reduction in income inequality. Hence, direct taxes enhances the redistribution function of taxation to facilitate reduction income inequality (Saez, 2004).

In China, average tax rates are quite low for all income groups (no more than 3%) between 1997 and 2005, either compared with the statutory tax rates or average tax rates in other industrial countries (Lin and Zeng, 2010). In addition, Perlberg (2013) pointed out China's tax structure somehow has widen income gap as China relies more on indirect or transaction-based taxes (such as business tax and consumption tax), [3] this imposes a higher tax rate on the lower-income groups, because they spent most of their incomes on consumption, leading to increase income inequality.

The limited role of personal income taxes in improving income distribution in China. In 2013, China's total revenue of personal income tax only accounted for about 1.5% of GDP. Also, studies pointed out the very limited redistribution effect of the personal income tax in China (Zhuang and Li, 2016; Li et al., 2015, 2014). In 2017, personal income tax only amounted to 8% of total tax revenue in China, compared with average 24% in the OECD countries (Lin and Zeng, 2010).

In summary, through tax redistribution can adjust the pattern of income distribution, and achieve more fairness. Despite of personal income tax is a commonly used public policy instrument to change after-tax income distribution. However, the redistribution effect of personal income tax is limited in China. With a period of rapid economic

[3] In 2012, around 50% of the tax base in China rely on indirect tax, and less than 20% in many developed countries (Perlberg, 2013).

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growth in China, income inequality significantly reduce may require personal income tax and transfer payments to play a better redistribution function over time.

3.2.7 Technological Progress

According to endogenous growth theory, technological progress is a major driving force for economic growth. From Schumpeterian view, more innovation-oriented growth should increase shares of top income and affect social mobility. Hence, innovation not only important in the economic growth of developing countries, but can also affect income distribution (Aghion et al., 2015).

Liu and Lin Lawell (2015) pointed out the four mechanisms by which innovation can impact skill premia are also effects on income inequality. First, higher skilled workers tend to work in higher innovation areas to earn higher returns. Due to high skilled workers tend to benefit more from innovations than low skilled workers do, innovation might lead to worsen in income distribution. Secondly, through knowledge spillovers may cause the lower skills workers to learn from the highly skilled ones and raise their productivity (Glaeser, 1999), which is favorable to decrease income inequality.

Third, by the spatial agglomeration effects, innovation are probably to attractive those working in innovative sectors (Van Reenen, 1996; Echeverri-Carroll and Ayala, 2009), leading to labor migration. The effect of migration on overall inequality is not clear. Fourth, technological progresses may change the employment shares and wages for the different skill worker. Skill-biased technological progress will cause reducing employment shares for the low skilled worker and their wages, while increasing wages and employment shares for the highly skilled worker, which might lead to increase in income inequality.

In recent years, technological progress and innovation are important for promoting economic growth in China. Hence, China has invested large amount in innovation activities. Figure 3-7 shows China residents' patent applications have significant growth from 10,011 in 1995 to 1,393,815 in 2018. Research and development expenditure as a share of GDP from 0.56% in 1995 to 2.18% in 2018 (Figure 3-8). In addition, Liu and Lin Lawell (2015) found there is a large gap of innovation levels between the central－western regions and the eastern regions. Since high skilled labor working in innovative coastal (eastern regions) areas tend to benefit more, thus innovation might increase coast-inland income disparity.

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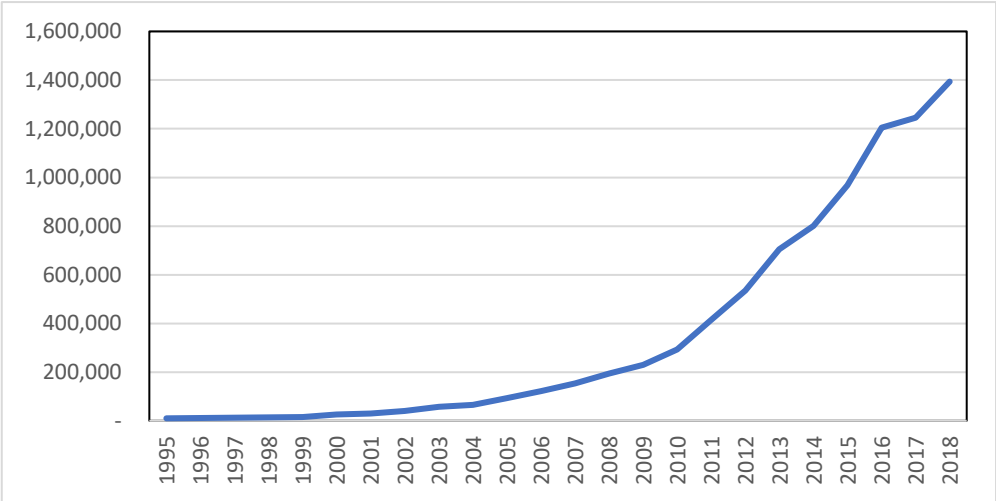
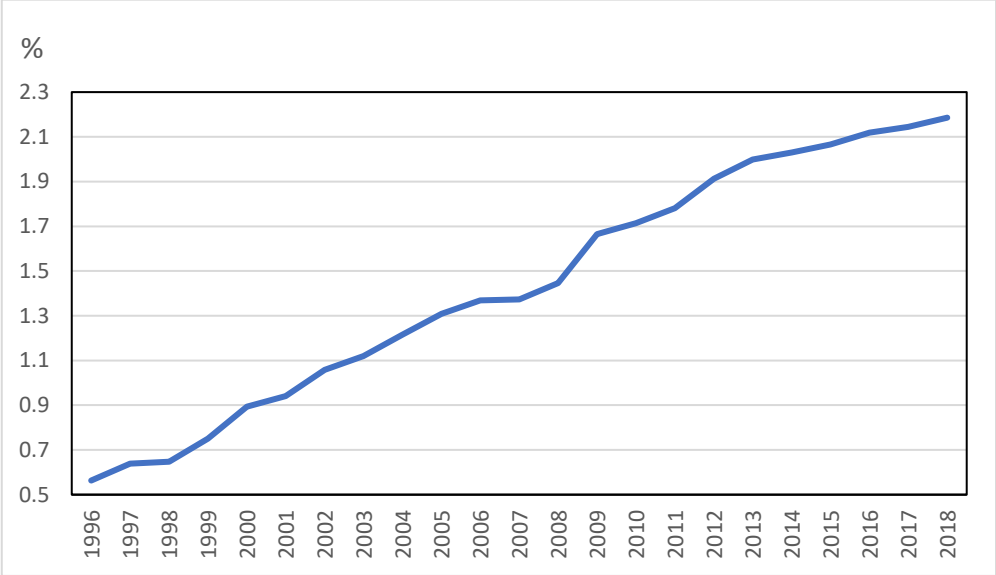


Source: Same as Figure 3-1.

Figure 3-7: Patent Applications of Residents in China



Source: Same as Figure 3.1.

Figure 3-8: Research and Development Expenditure (% of GDP) in China

To summarize, it is possible for innovation to either increase or decrease the overall inequality. China has regarded innovation as source of economic growth, but can also affect income distribution, it will be important for the policy makers to pay attention to the effect of innovation on income distribution.

3.2.8 Marketisation

Marketisation is the processes which market mechanisms replace state-planned economic activities and allocation of resources (Wu and Xie, 2000). Market transition

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theory suggests that when income levels increase in the private sector and decrease in the state sector, the overall income inequality will be decline. However, Bandelj and Mahutga (2010) claimed that privatisation is often associated with greater individual differentiation and overall income inequality.

Privatisation has been a central aspect of the reform processes in China. It primarily refers to state-owned enterprises passing under private ownership (Jefferson and Su, 2006). With an increase in private sector, income inequality in China has increased substantially in the economic reform period (Bakkeli, 2017). In 2000, China government initiated a western development program to reduce local and regional inequality. Privatisation has been a central component of the program (Bakkeli, 2017). Mao (2011) found western development program has significantly reduced income inequality in China's western region. But the overall effect of privatisation still be ambiguous.

With the market economic development, market mechanisms will gradually replace political mechanisms to the distribution of income (Nee, 1989). However, privatisation and market process may not be the only factor for income differences (Bakkeli, 2017). Since market reforms in China are initiated and regulated by the state, market cannot be separated from state intervention. Therefore, political and institutional circumstances should also be taken into account when analyzing the impact of the marketisation on income inequality.

3.3 Social Factors

One would expect that social factors such as cultural and environmental attributes have their impact on the distribution of income. In addition, education is often seen as a driver of social mobility. This section will analyze the effect of urbanization and education on the income distribution

3.3.1 Urbanization

Urbanization is the population living in urban areas. Urbanization is usually to be a main driver of inequality (Behrens and Robert-Nicoud, 2014), and inequality and urbanization has an inverted U-shape relationship (Rauch, 1993).

Chen et al., (2016) pointed out Kuznets' inverse-U shaped curve hypothesized (Kuznets, 1955), which implies the rural-to-urban population migrate in the development processes. With more people move from the lower-income rural sector to the higher-income urban sector, the overall income inequality will first raise and then decline. Income inequality rises because the rural workers who migrate to cities make more money than those left in rural. The urban share raises while urbanization continues, changing both in between and within urban and rural inequalities, and finally inequality

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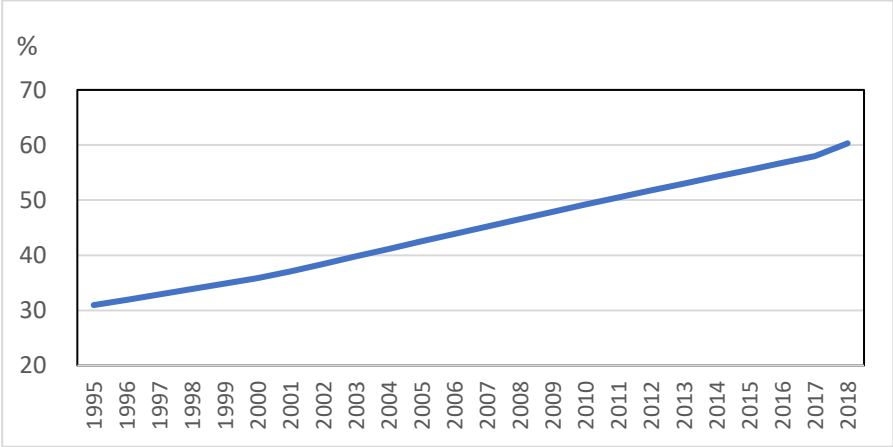
begins to decrease as a large proportion of people earn relatively high urban wages (Kopf, 2017). Fewer workers left in the rural areas start to get more paid, because of reducing the labor supply and improving labors' bargaining power. Hence, mobility tends to diminish both interregional and intraregional inequality in incomes.

In China, urban inhabitants have increased since the economic reform in 1978 (Chen et al., 2016). Figure 3-9 shows the population living in urban areas rose from 30.96% in 1995 to 60.31% in 2018. This change occur simultaneously with a widening income disparity between rural and urban residents (Boffy-Ramirez and Moon, 2017). It means the urbanization process may enlarge income inequality in China.



Source: Same as Figure 3-1.

Figure 3-9: Share of Urban Population in China—1995~2018

Although urbanization create opportunities for labor mobility, thus speed up urbanization aids to reduce urban-rural income gap in China. However, due to the limitation of China's hukou system, urbanization can increase income inequality (Liu and Lawell, 2015). China's hukou system, making it difficult for rural workers to enter the urban labor market and enjoy the welfares of urbanization, and therefore the marginalization of a rural migrant further widens urban income inequality (Au and Henderson, 2006; Chen et al., 2016). Although China speeds up hukou reform since 2014,[4] it still challenges to implement real urbanization to reduce income inequality, which require supportive policies and appropriate funding.

3.3.2 Education

Because higher education level should obtain a higher income, higher education

[4] Since 2014, China government has been gradually phasing out the distinction between agricultural and urban hukou. The ultimately aim of hukou reforms to reduce the inequities between different types of hukou holders and improve labor mobility in the economy. Retrieved from https://www.china-briefing.com/news/chinas-hukou-system/.

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inequality would be related to higher income inequality (Kaasa, 2005). Therefore, education expansion is an important policy instrument for improving rising income inequality (Coady and Dizioli, 2017). Education expansion is not only important for promoting economic growth (Barro, 2013; Hanushek, 2013), but also assist to get high educational returns, to reduce inequality of opportunity and break intergenerational transmission of poverty (Corak, 2013), so that reduces the ensuing income inequality.

Despite development of education is a basic policy in China, the ratio of public expenditures on education does not keep up with economic growth rate. The ratio of government expenditures on education remain low (for example, between 1997 to 2008, lower than 3% in most years). Comparing to most OECD countries in 2008, government expenditure on education institutions is about 6.1% of GDP (Yang et al., 2014).

Sicular et al. (2008) found that more than 25% of China's urban–rural income disparity can be explained by education. Hukou status determines by place of birth and influences individual's opportunities for a good education. The rural labor force has four years an average less schooling than the urban labor (Heckman, 2005). Liu (2005) found that individuals with agricultural hukou status would have relatively few years of education and thus find relatively low pay in rural areas (Fu and Ren, 2010). Hence, eliminating hukou institutional barriers, allocated more educational investment to disadvantaged groups are likely to improve urban–rural income disparity.

Because of unbalanced economic development between different areas in China, eastern provinces are able to invest more resources in education. Regional difference in human capital are large (Wang et al., 2014). In China, 5.98% of population with college or higher degrees in the eastern regions in 2000, compared with only 2.97% in the western regions. In addition, in 1999, 7.4% of employees were illiterate in the eastern regions, far lower than the 16.25% in the western regions (Yin, 2004).

In summary, the ratio of public expenditures on education does not keep up with the GDP growth rate in China. In addition, hukou status and regional differences influence individual's chances for a good education. Therefore, the educational inequality between rural and urban areas, and educational gaps between regions which could increase income inequality in China.

3.4 Policy Factors

Policy choices played a role in explaining the income distribution differences among countries. For example, Zhuang and Li (2016) pointed out the decline in China's overall income inequality since 2008, part of the decline is policy induced. Boffy-Ramirez and Moon (2017) indicated that hukou system is an important factor of the urban-rural income disparity. Also, according to the experiences of developed countries, public polices, such as labor market policies reforms, can be used to countering

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increasing inequality (Lin and Yun, 2016). Thus, specific policy reforms are likely to widen income inequality in China. Since the early 2000s, China has promulgated a series of policies, such as minimum wage regulations, rural minimal social security to response rising inequality.

In this section, we will discuss the effects of policies including unbalanced development policy, hukou system, minimum wage regulations, and rural social security policy, and infrastructure investments on China's income distribution.

3.4.1 Unbalanced Development Policy

According to unbalanced growth theory, economic growth will not occur simultaneously in all regions if underdeveloped regions lack of funds and industrial sources. Thus, social economic development should be based on objective differences in regional development, and focus on selected priority sectors or strategic sectors and depends on local conditions (Liang and Cai, 2011). In order to speed up integration with the world markets since "South China Tour" by Deng Xiaoping in 1992, China's government has chosen a coastal-biased unbalanced development strategy, as developed by Hirschman (1958), such as establishing special economic zones in coastal cities and providing favorable tax deduction to coastal provinces. Consequently, growth was uneven across provinces in China, in the early stage of reform, economic growth in the eastern (coastal) region was higher than the western (inland) region, this cause increasing regional disparity.

As China has implemented uneven development policies at the early reform period, that effectively favor coastal regions over inland. Hence, coastal regions have more policy and agglomeration benefits in the early economic development stage. Despite part of the population which rose out of poverty, the reform policies in China led to unequal regional development. Therefore, the reform policies will result in worsening regional inequality.

3.4.2 Hukou System

Kravis (1960) suggests barriers to mobility could be expected to effect on the income distribution. In China, the hukou system suppresses labor mobility and segregates the labor force (Boffy-Ramirez and Moon, 2017). The hukou system divides the residents into rural hukou and urban hukou. Rural hukou holders are mainly peasants living in the countryside or peasant-workers temporarily living in the cities, who are excluded from urban citizenship (Hou, 2004).

The hukou system division that distinguishes urban residents from rural residents, and ensures that the urban residents acquire more privileges than rural residents. The hukou-related urban biases mean another determining factor of inequality (Yang, 1999).

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There are many inequalities related to the hukou system. The agricultural-nonagricultural division plays a crucial role in determining access to social benefits (such as education and health care) and others welfare rights (Fu and Ren, 2010). Rural residents obtained much less transfers and subsidies than urban residents.[5] As China's hukou system avoids migrants to share the growth fruits in urban or coastal areas (Zhao, 1999), thus could lead to enlarge urban-rural income gaps in the transition process of China.[6]

3.4.3 Minimum Wage Regulations

The minimum wage can be used as an important public policy for decreasing inequality. However, lack of consensus if the minimum wage can reduce inequality (Neumark and Wascher, 2008).

China has experienced both increasing inequality and raising minimum wage (Lin and Yun, 2016). Since the 1990s, minimum wage regulations have existed in China, but only with low standards and insufficient enforcement (Li et al., 2019). According to Minimum Wage Regulations law issued by the Ministry of Labor and Social Security in 2004, provinces should adjust minimum wage at least every two years to fit local living standards. Since then, around 60% of cities adjusted minimum wage standards each year during 2004 to 2012 (except for 2009). After a pause in 2009, significant annual hikes in minimum wages restarted in 2010. During 2004 to 2009, the real minimum wage rates almost doubled, the average noncompliance rate reduced from 8.9 to 7.6 % (Li et al., 2019). Lin and Yun (2016) found that increasing the minimum wage reduces inequality from 2004 to 2009 in China, particularly at the bottom end of the distribution. However, Jain-Chandra et al. (2018) indicated the limited effect of minimum wage regulation in improving wage inequality. Therefore, lack of consensus if the minimum wage can reduce inequality.

3.4.4 Rural Social Security Policy

According to the experience both the developed and the developing countries, show that public transfers, through social security expenditures as a main government instrument to improve income redistribution. Cai and Yue (2017) analyzed the relationship between the ratio of social security expenditures to GDP in 56 countries and regions in 2012, finding social security expenditures will increase as GDP increases.

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[5] Tax and subsidy payments still favor urban residents even removing the agriculture tax in 2006 (Wang and Piesse, 2010).

[6] From the fourth quarter of 2012, the National Bureau of Statistics integrated of rural household and urban household survey, which were calculated using new standards, NBS adjusted the classification of rural migrant worker. According to the new standards of NBS, the migrant workers employed for more than half a year are classified as urban population (Chen et al., 2015), which will be favorable to reduce the effect of hukou system.

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In China, social security expenditures are below the developed countries' average, even considering China's economic development stage. According to the Ministry of Finance Social Security Task Group (2007), the ratio of China's social-security expenditure to GDP maintained between 5.41% and 5.60% from 2002 to 2006, lower than the developed countries and some developing countries (Cai and Yue, 2017).[7]

During the reform period, China's public policy had been heavily biased to the urban area at the early reform stage to enhancement economic development and transition. In additional, the structural changes in the rural economy, income inequality also rising in rural areas (Hoken and Sato, 2017). How to narrow the urban–rural income gap effectively is a major challenge. To reduced urban–rural income disparities, China implemented pro-rural public policies between 2002 and 2013, which in favor of increasing rural income and reducing urban–rural income disparity (Li et al., 2013).[8] Due to the traditional antipoverty measures faced challenges, China government implemented targeted poverty alleviation (TPA) since 2013, which is helpful to raise rural income and reduce urban–rural income disparities.[9]

Although social security expenditures play a main role in improving income distribution, China's public policy, had been heavily biased to the urban area during the reform period which enlarge urban–rural income gaps. In addition, China's social-security expenditures level remained lower than developed countries and some developing countries in the transition period. Nevertheless, China's government policy actions in supporting rural peasants may contribute to rising rural income and reducing urban–rural income disparity.

3.4.5 Infrastructure Investments

Economic growth theory suggests that enhancements in transport infrastructure are closely related to economic development (Barro, 1990). According to Kuznets' hypothesis, economic growth is one of the important factor affect income distribution. Since transportation can change economic geography and thereby affect economic outcome, it is one important factor affecting the balance of regional economic development and reshaping income distribution (Li and DaCosta, 2013).

Empirical results for the effect of public transportation investment on income

[7] According to ADB (2019), in 2015, China's social protection expenditure as a share of aggregate GDP is 7.7%, lower than East Asia countries' 11.5%.

[8] China's government policy in supporting rural peasants, including investment in rural infrastructure, improvement in social security, and anti-poverty programs (Li et al., 2013). Wang (2010) examined the redistributive effect of pro-rural policies, found the income redistribution mitigated rural income inequality and decreased urban–rural income disparity.

[9] TPA emphasizes targeted measures according to the causes of poverty, it has become the guiding antipoverty strategy in rural China since 2013.The poverty situation in China's rural area has been further improved by TPA (Guo et al., 2019).

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inequality has been mixed. Li and DaCosta (2013) studied the relationship between various types of transportation modes and income inequality in China in the period between 1978 and 2007, found that most transportation modes are negatively associated with income inequality in urban areas while the coefficients are positive for rural areas,[10] and suggested policymakers should focus on the income redistributive effects of transport infrastructure, especially on underdeveloped areas.

In principle, the opening of high-speed rail can accelerate the speed of inter-regional elements flowing, especially for the labor resources (Yu and Yao, 2019). In the past decade, China's high-speed railway has developed rapidly. Chen et al. (2018) examined the impact of high-speed railway development on the income gap between urban and rural residents from 2007 to 2014, and found the development of high-speed rail is conducive to the narrowing of the income gap between urban and rural residents in China. Li et al. (2020) also found the construction of high-speed railway has effectively narrows the urban-rural income gap in China.

According to Vandycke (2012), infrastructure investments as being the main driver to increase economic growth. Between 1990 and 2005, China invested approximately US$600 billion to upgrade its road system and connect all of its larger cities. It is estimated that aggregate China's real income is approximately 6% higher than it would have been in 2007 if the expressway network had not been built. Therefore, infrastructure investments have promoted growth and likely reduced income disparities.

In addition, China government has proposed a series of informatization development strategies such as "Internet plus" and "Digital Village," aiming at promoting of China's economy and society development through the popularization and application of information technology (Li et al., 2020).[11] During past decades, the diffusion of the internet and communication technology (ICT) in rural areas has provided new opportunities for rural inhabitants to increase their income and thus reduce urban-rural income gap (Gao et al., 2018).[12]

In summary, infrastructure investments is an important factor affecting the balance of regional economic development and reshaping income distribution, lack of investment in infrastructure may be one explanation which inequality hurts growth in the early reform stage of China. Since 2000, China government's emphasis on infrastructure spending in the poorer inland areas for controlling the rising regional

[10] Li and DaCosta (2013) found that rail, water and petroleum pipelines played an important roles in accounting for the income disparity in rural areas.

[11] Li et al. (2020) pointed out that e-commerce has developed rapidly in rural China, and it has become an important way to increase farmers' income and to integrate urban and rural development.

[12] Global village theory argues that despite of the high cost of providing and using the internet in remote rural areas, the marginal income of using the internet there is high. Because the internet can reduce communication cost and coordination in doing business, and overcome obstacles such as geographical distance and economic scale (Forman et al., 2005).

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inequality, and promoting informatization development strategies in rural areas. There is growing evidence that development of public infrastructure investments does affect income inequality, and is likely to narrow the income gap between urban and rural residents in China.

3.5 Political Factors

Politics and governance is crucial to the increase of winner-take-all inequality (Hacker and Pierson, 2010). This section focuses on the effect of political factors, including corruption, share of government sector, and political regimes on income distribution in China.

3.5.1 Corruption

Corruption is not only a social issue but also contributes to the increasing income inequality (Yang, 2002). Corruption increases income inequality through tax-biased benefiting the rich and good social relationship; poor targeting of social programs; the rich use wealth to lobby government official for favorable policies that maintain inequality in asset ownership; unequal acquire education opportunity (Gupta et al., 1998). Thus, the increased inequality resulted from corruption worsens the position of the poorest by reducing available resources for social spending (Zúñiga, 2017). Gupta, et al. (1998) found a positive and linear relationship between corruption and income inequality.[13]

The Corruption Perception Index (CPI), published by Transparency International, aggregates a diverse range of surveys to assess the perceived level of corruption within a country. The 2018 CPI ranked China 87 out of 180 countries with a score of 39. [14] In the 2017 Global Corruption Barometer, 73% of Chinese respondents answered that corruption had increased over the last three years.[15] In addition, Hou (2004) pointed out that illegal income led to a 30% rise in inequality in the 1980s. Some estimates suggest that corruption may cost the China economy 4% of GDP. Figure 3-10 shows the corruption control rank of China, the average percentile rank from 1996 to 2018 is 41%.[16] China still failed to control corruption effectively.

[13] Despite several cross-country studies have demonstrated that corruption led to income inequality. However, there are some studies which have different views. In the Latin American, Dobson and Ramlogan (2009) found lower corruption is associated with higher income inequality. Using cross-country data, Li et al. (2000) found a positive relationship between corruption and income inequality in high-income countries and a negative relationship in low-income countries.

[14] The CPI index, which ranks 180 countries and territories by their perceived levels of public sector corruption, uses a scale of zero to 100, where zero is highly corrupt and 100 is very clean (Transparency International, 2020).

[15] See https://chinapower.csis.org/china-corruption-development.

[16] The higher rank correspond to better governance.

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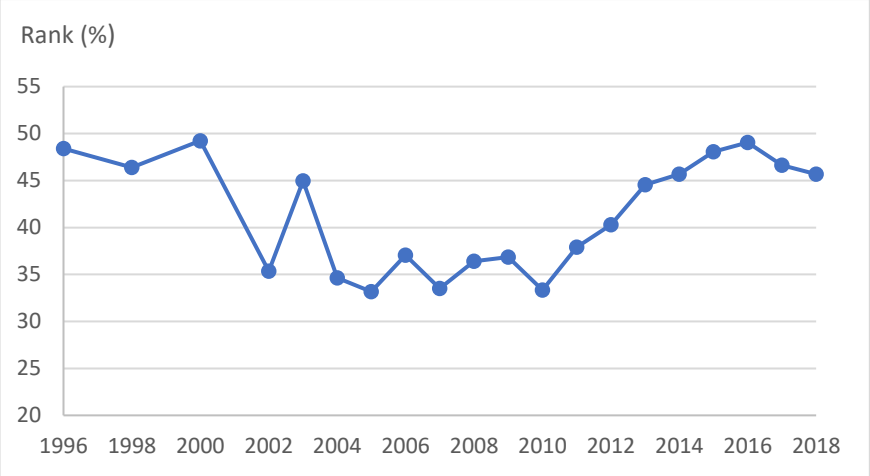

Note: Percentile rank (0-100) indicates rank of country among all countries.

Source: World Bank (Worldwide Government Indicators).

Retrieved from http://info.worldbank.org/governance/wgi.

Figure 3-10: Corruption Control Rank of China—1996~2018

In order to anti-corruption, China launched the Sky Net operation in April 2015 to capture corrupt officials who have fled abroad. In 2018, over 1,000 China fugitives who fled abroad were returned to China and over US$519 million of ill-gotten earnings was recovered. A four year campaign to return white collar criminals and recover assets has captured over 5,000 fugitives in total. In domestic, 621,000 persons suffered punishments for corruption, including 51 officials at or above the provincial and ministerial level.[17] One report by Global Financial Integrity estimates that between 2000 and 2011, China had lost US$3.79 trillion in money smuggled out of the country.[18] In 2012, a survey by the Pew Research Center's Global Attitudes Project reported that 50% of respondents answered that corruption is a serious problem (rise from 39% in 2008).[19] According to China's anti-corruption watchdog reported, 106,000 officials were found guilty for corruption in 2009.[20] The government corruption limits competition and weakens the efficient allocation of resources and ability to decrease the income gap in China.

In summary, most studies highlight the negative effect of corruption on economic growth, as it is possible that corruption worsens the position of the poorest by reducing

[17] See NBC news, 11 January 2019. Retrieved from http://www.rai-see.org/chinas-anti-corruption-campaign-recovers-519-million-in-a-year/.

[18] "Dirty money cost China $3.8 trillion 2000-2011: report." October 26, 2012, Reuters. Retrieved from https://www.reuters.com/article/us-china-dirtymoney-idUSBRE89O1RW20121025.

[19] "Growing concerns in China about Inequality, Corruption," retrieved from https://www.pewresearch.org/global/2012/10/16/growing-concerns-in-china-about-inequality-corruption.

[20] "Corruption Up among China Government Officials," January 8, 2010, BBC News. Retrieved from http://news.bbc.co.uk/2/hi/asia-pacific/8448059.stm.

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the available resources for social expenditure. China government has made numerous efforts to eliminate corruption, the state of corruption has not significant improved, which is likely to be one of the sources to the income inequality.

3.5.2 Share of Government Sector

There are two possible mechanism for the government sector to reduce inequality (Kaasa, 2005). First, government transfers expenditure (such as pensions, subsidies, grants) has a redistributive and equalizing function. Hence, a higher share of government sector should lead to lower income inequality. Second, earnings inequality in the public sector is usually lower than in the private sector (Gustafsson and Johansson, 1999). Atkinson (2012) proposed that developed countries should accumulate more public capital to provide a buffer against shocks and generate a steady flow of government revenue (without the economic distortions caused by taxes) that can be spent on public services and redistributive transfers to reduce inequality (Meade, 1964).

In China, public ownership of enterprises far exceeds that in any developed country, accounting for 30% to 40% of gross domestic product (Kovacic et al. 2016).[21] Hou (2004) pointed out that the market economy had automatically enhanced the function of market in redistributing social asset thus weaken the administrative powers of the high-ranking political and administrative elite, but China's economy transition is characterized by continuing strong government intervention. The state-dominated policies have allowed China government to monopolize prices and maintain monopolistic profit, and pay higher wage to state sector workers than market price (Xia et al., 2014). Therefore, this hypothesis is not consistent with the reality in China.

As SOEs are different from general government institutions and enterprises, in general, their goals should be serve the public interest not to make profit. However, China's SOEs own excess profits from their administrative monopolies, including favored policies, monopolistic powers, and subsidies benefit SOEs (Sheng and Zhao, 2012). Government's fiscal subsidies, preferential financing costs on loans, and subsidized to land rents caused unfairness.[22] Moreover, the salaries and other benefits enjoyed by state-owned monopoly enterprises employees are generally higher than average, which enlarges earnings inequality of urban areas. Therefore, the empirical

[21] China's official statistics do not break down GDP by ownership (Zhang, 2019). Zhang (2019) estimated that the share of SOEs in China's 2017 GDP was about 27.5%. A study from the International Finance Corporation (International Finance Corporation, 2000), separated China's GDP in 1998 into three segments and found 37% was from the state sector. Holz (2018) estimated SOE shares in sectorial value-added and pointed out that 39% of GDP is contributed by SOEs in 2015.

[22] For example, SOEs are subsidized by preferential financing costs on loans from state banks. On average, SOEs pay 1.6% interest on loans, while the market interest rate is 4.68% (Sheng and Zhao, 2012). During 2007 to 2009, SOEs' average tax burden was 10%, while private enterprises was 24%. During 1994 and 2007, SOEs did not contribute any profits to the government. In 2009, only 6% of SOEs' profits were contributed. In 2010, this contribute decreased to 2.2% (Sheng and Zhao, 2012).

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study indicates SOEs have a negative effect on fair income distribution in China. Also, SOEs' performance is not a reflection of real performance, but the result of unfair business environment and many preferential policies. The central SOEs' contributed is mainly transferred within the central enterprise system and did not use for the public's interest. (Sheng and Zhao, 2012).

In summary, the strong government intervention SOEs may have a negative influence on income distribution in China. In response, China was released new income inequality reform plan in 2013,[23] the plan by limits excessive salaries in the state sector, requests state-owned enterprises to raise their earnings and the amount of remit back the state budget to improve income distribution (Borst, 2013, 2012).

3.5.3 Political Regimes

Market economy generate many factors influence income distribution, and it is embedded in a political system (Acemoglu et al., 2013). In view of different political regimes, authoritarian or democratic might impact on income distribution.

In general, democracy increase in social pressures for redistribution, the political power beneficial to the majority and therefore leads to policies that reduce inequality (Lenski, 1966). In a more democratic country, the poor has more political rights and more likely to achieve higher redistribution and more fairly income distribution. (Sirowy and Inkeles, 1990), thus could reduce inequality.[24]

In contrast with democracy, authoritarianism presents a national political regime is responsible for a powerful and rich minority. Hence, public policies tends to favoring the minority, which maintains or increases income inequality (Reuveny and Li, 2003). Because of authoritarianism increases the opportunities to behaviors as rent-seeking, power abuse and corruption and so on. Authoritarianism might worsen the income distribution. However, Nielsen and Alderson (1995) argued that the level of income inequality used to be smaller in the communistic countries.

China is consistently rated as not free in Freedom House's reports (Freedom House, 2019). The nature of China's economy is "bureaucratic capitalism" authoritarian-regime (Hou, 2004). The authoritarian regime generates the officers' power abuse, unequal social classes and corruption, this will widen income inequality in China.

In summary, the effect of democracy or authoritarian on income distribution is

[23] The new income inequality reform plan in 2013 listed thirty-five different goals and targets for addressing income inequality, which including salary restrictions for state-owned enterprises and state-owned enterprise earnings distribution (Borst, 2012, 2013).

[24] Standard political economic theories suggest that democratization has a moderating effect on income inequality. But the empirical literatures did not find robust relationship between democracy and inequality in a cross-country regression analysis. For example, Gradstein et al. (2001) found that in Judeo-Christian societies democratization appears to lead to lower inequality, however, in Muslim and Confucian societies, democratization has an insignificant effect.

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ambiguous depending on the features of country's political system. In China, state power structure relations make the poor have less political rights to achieve more redistribution and more even income distribution. The different opportunities generated by authoritarian regime are a factor for illegal income and corruption, which are more likely to widen income inequality in the reform period of China.

3.6 Summary

China provides a particularly important case for analysis income distribution as she experiences a period of rapid economic growth since economic transition started in 1978, and accompanied by a rapid increase in income inequality. In this chapter, we find that income inequality in China is not only driven by market economic phenomenon but also effects by the numerous factors on income distribution.

With respect to economic factors, income distribution may worsen by high dependence on international trade and FDI, inflation benefited the rich and privileged more than the poor, the massive downsizing of SOE workers in the 1990s and cyclical jobless in the 2008 global economic crisis and recession, increasing urban unemployment, technological progress, inequality in access to certain financial services, credit market underdevelopment, and the limited role of personal income tax and transfer payments to reduce income inequality all are likely to worsen income inequality in the process of economic growth.

As to social factors, because China's hukou system prevents migrants from sharing the growth fruits in urban or coastal areas, and therefore the marginalization of a rural migrant further widens urban income inequality. In addition, despite education expansion is an important policy instrument for improving rising income inequality, the ratio of public expenditures on education does not keep up with economic growth, which can also effect income distribution.

Policy factors also effect income distribution. As China has implemented uneven development policies at the early reform period, uneven regional development plays a main role in determining the widen regional disparity. China's hukou system avoids migrants to share the growth fruits in urban or coastal areas, thus could lead to enlarge urban-rural income gaps. In addition, the limited function of the minimum wage regulation in improving wage inequality. China's social-security expenditures level remained lower than developed countries and some developing countries at present, which is unfavorable to narrow income inequality.

Regarding to political factors, although China government has made numerous efforts to eliminate corruption, China's state of corruption has not significantly improved, which could contribute to the worsening income inequality. The strong government intervention in SOEs may have a negative influence on income distribution.

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In China, state power structure relations make the poor have less political rights to achieve bigger redistribution and more even income distribution. The different opportunities generated by authoritarian regime are a source for illegal income and corruption, those are more likely to widen income inequality in the reform period of China.

The rapidly worsened income distribution in China mainly causing by numerous government intervention and restrictions in various aspects in the reform period. With China has transferred from a central-planned to a more market-oriented economy, China's economy and society gradually open and adapt toward world economic, generating socioeconomic changes influence income distribution. Despite China's economic regime reform are to achieve the goal of economic development and to remain its political authority, China's political and administrative institutions reform was lagging behind. Therefore, some market economy functions such as urbanization, financial development and tax redistribution function are not compatible to the reality in China following economic growth. Also, China's social-security expenditures level and government education expenditure remained lower than most of developed countries. The different opportunities generated by China's authoritarian political regime, which may also bring more inequality from illegal income and corruption. All of those factors could influence overall income distribution in the economic transition phase of China.

The significant rise in income inequality became a main issue of China's economy. In recent years, under the background of the new economic development, China's government pays more attention to regional development and income distribution. To reduced urban–rural income disparities, China implemented pro-rural public policies and antipoverty measures since 2013. In order to reduce uneven regional development, China conducted western development program, with an emphasis on developing infrastructure investment. In addition, China's government has promoted information development strategies. Those policies directed that resources to China's interior and the western region, are also important in explaining the changes in income distribution.

According to the National Bureau of Statistics, China's Gini coefficient has shown a slight downward since 2008. China government's policies since the late 1990s to reduce urban–rural income disparity and regional inequality seem to have some initial effects. However, the level of inequality in 2018 remains above the warning level of international standards. Income inequality may still be one of the important factors that constraint China's economic development. Hence, China's government should play a critical roles to implement progressively policies and institutions reform to cope with socioeconomic transformations, and this will be benefited to promote economic growth and reduce income inequality.

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Chapter 4 Income Distribution and Economic Growth in China

4.1 Introduction

Given that economic growth and income equality are the main targets of government policy for most countries, a trade-off between efficiency and equity is one of the most important issues in economics.[1] Kuznets (1955) claimed that there was an inverted U-shaped curve phenomenon, which implied that there was a causal relationship between economic growth and income distribution. Many policy-related debates have revolved around the question of whether there is such a trade-off between inequality and growth that Kuznets implied.

Although a lot of number of theoretical and empirical studies have attempted to study whether inequality has a positive or negative effect on growth, the results so far obtained have not been consistent. In spite of some inequality being important for the effective functioning of a market economy and the incentives needed for investment and growth, too much inequality might conversely be detrimental to growth. Therefore, there are several empirical studies that have examined whether the relationship between income distribution and economic growth is nonlinear. In addition, since some researchers believe that these conflicting results seem to be explained by nonlinearities in the inequality-growth relationship, a nonlinear integrated income distribution-growth relationship might in fact exist (Banerjee and Duflo, 2003; Galor and Moav, 2004).

China has been one of the fastest growing economies in the world since the economic reforms in 1978. However, the rapid increase in income inequality has also made China one of the most unequal countries in the world. In 2014, China's Gini coefficient of 0.474 was close to those of several Latin American countries with a high degree of inequality (such as Brazil 0.49, Mexico 0.482, Nicaragua 0.471, and Chile 0.505).[2] According to the Kuznets' hypothesis (Kuznets, 1955, 1963), inequality seems to be an acceptable trade-off in developing countries, and that high/rising inequality is unavoidable in the early phases of economic development, especially when the incomes of the poor are increasing. The Chinese government's pragmatic guidelines, such as "let some people get rich first" in the process of the economic reform, might explain how rising income inequality in China has led to faster economic growth (Chan et al., 2014). However, from a socio-political point of view, inequality can cause social unrest, and then lead to a decline in investment incentives, which can limit long-run economic

[1] In general, we use per capita income as a measure of efficiency and the Gini coefficient for disposable income as an indicator of equity.

[2] The Gini coefficients for the other countries reported here are for 2014. Source: CIA World Factbook accessed in November 2020. https://www.cia.gov/library/publications/the-world-factbook/rankorder/2172rank.htm.

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growth (Alesina and Perotti, 1996).

While in a considerable number of studies there has been much interest in the relationship between income inequality and economic growth, most extant empirical studies have focused on cross-sectional growth regressions because of the lack of long time-series data on income distribution for a single country (Castelló-Climent, 2010).[3] Cross-sectional growth regressions, however, suffer from two sources of inconsistency. First, they fail to control for specific country features. Second, they do not properly address the issue that some explanatory variables need to be considered as being endogenous according to the theory.

In spite of a great deal of attention having been paid to cross-country studies, research that examines the non-linear relationship between inequality and growth in China is relatively scarce. The aim of this chapter is thus to empirically analyze the impact of income distribution on economic growth, by focusing on the income distribution threshold effect in China.[4] To find out whether a threshold effect of income distribution on economic growth exists in China, this paper will use the generalized method of moments (GMM) estimator and include an income distribution threshold dummy variable in the model to test for income distribution turning points.

The remainder of this paper is organized as follows. Section 2 reviews the related literature, Section 3 provides an overview of China's income distribution and economic growth, Section 4 describes the empirical model used in this research, Section 5 presents the empirical process and results, and Section 6 concludes.

4.2 Literature Review

The theoretical literature on the relationship between income inequality and economic growth is centered around the following three viewpoints: (1) an increase in income inequality has growth-dampening effects; (2) an increase in income inequality has growth-enhancing effects; and (3) the relationship between income distribution and economic growth is nonlinear.

Some studies based on endogenous growth models predict a negative association between inequality and growth through different channels. For example, according to the fiscal redistribution and distortion view, Okun (1975) argued that, because of fairness considerations, inequality might enhance a policy that is more biased toward

[3] For a given country, inequality is generally fairly stable over time. Hence, the estimates of the effects of inequality mainly rely on cross-country variations. However, sometimes a country's income distribution changes significantly, as in the United States, China, and a number of developing countries over the past few decades (Berg and Ostry, 2011).

[4] If there exists nonlinearity between two variables, it should in principle be possible to estimate the turning point or threshold, at which the sign of the relationship between the two variables will switch (Khan and Senhadji, 2000).

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redistribution than market-oriented, thereby reducing economic growth. According to Alesina and Rodrik (1994) and Persson and Tabellini (1994), increasing inequality leads to greater social pressure towards distribution policies, and expensive fiscal policies and excessive taxation create distortions, which retard economic growth. From the socio-political point of view, Alesina and Perotti (1996) pointed out that inequality can cause social unrest, and then lead to a decline in investment incentives, which can limit economic growth in the long run. From the credit market imperfections view, the investment in human capital depends on the individuals' assets and incomes. Galor and Zeira (1993) showed that more income inequality reduces the ability of lower income individuals to acquire education, thereby hampering human capital formation and slowing down growth.

Some studies consider the relationship between inequality and growth to be positive. Kuznets (1955) emphasized that inequality promotes growth by fostering aggregate saving. According to Kaldor's hypothesis (Kaldor, 1955), the rich have a lower propensity to consume, and thus the savings rate is higher for the rich than for the poor. Therefore, an increase in inequality will improve aggregate saving and investment, leading to a more efficient use of resources that will stimulate capital accumulation, and enhance economic growth.

Some researchers believe that these conflicting results seem to be explained by nonlinearities in the inequality-growth relationship. For instance, Galor and Moav (2004) found that the inequality-growth relationship is nonlinear and varies with economic development. In the early stages of development, physical capital accumulation is the primary source of economic growth. Consequently, inequality enhances growth by channeling resources towards individuals whose marginal propensity to save is higher. However, in the later stages of development, where human capital emerges as a prime engine of growth, greater equality alleviates the adverse effect of credit constraints on human capital accumulation and stimulates the growth process. Benhabib (2003) argued that the relationship between inequality and growth is nonlinear. The increases from low inequality provide growth-enhancing incentives, while increases in inequality beyond some turning points encourage rent-seeking which leads to lower economic growth. Hence, policies that support some modest inequality to take advantage of productivity differences will lead to the highest growth rates.

On the empirical side, with regard to the relationship between income inequality and economic growth, despite there being many studies, a consensus is still lacking. In the early 1990s, most cross-country studies supported the negative effect of income inequality on growth. For example, Persson and Tabellini (1994) used historical panel data and postwar cross-sectional data, and found evidence of a negative correlation between inequality and growth for democratic countries only. Perotti (1996) lent

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support to this argument that the negative inequality-growth correlation was statistically significant only in rich countries.

By the late 1990s, the general consensus that there was a negative inequality-growth relationship began to be challenged. For example, Forbes (2000) used a first difference GMM estimator with panel data to eliminate the country-specific effects. The results showed that there was a significant positive association between inequality and growth in both the short and medium run. Li and Zou (1998) used cross-country panel data and also found evidence of a positive effect of inequality on growth, which is stronger when fixed effects are used. Barro (2000) performed a three-stage least squares (3SLS) regression, which treated country-specific error terms as random, over the period 1960-1990, and found that income inequality had no significant relationship with subsequent economic growth. However, when the sample was divided into poor and rich countries, he reported a negative relationship between income inequality and growth in poor countries and a positive relationship in richer ones.

Panizza (2002) pointed out that the main problems affecting cross-country studies on the differences in the relationships between income inequality and growth were related to the quality and comparability of inequality data. To solve these problems, Panizza (2002) used both fixed-effects and GMM estimations based on a panel of income distribution data covering 48 states in the U.S. over the 1940-1980 period, and found some evidence supporting the negative relationship between income inequality and growth. However, the relationship was not robust. In addition, Partridge (1997) used cross-state panel data for the United States and found evidence of a negative relationship between inequality and growth when inequality is measured based on quintiles and a positive relationship when inequality is measured using the Gini index.

Recently, more and more empirical studies have found the relationship between income inequality and growth to be nonlinear. Banerjee and Duflo (2003) used nonparametric methods and cross-section data, and their results suggested that a nonlinear relationship existed between inequality and growth. Similarly, Chen (2003) also found evidence of an inverted U-shaped relationship between the initial income distribution and long-run economic growth using cross-country data. In addition, Hasanov and Izraeli (2011) used data from the 48 contiguous U.S. states over the period from 1960 to 2000 to examine nonlinearity using the GMM estimator. The results showed that the impact of inequality on growth is nonlinear.

Some empirical studies have found a threshold effect to exist between income inequality and growth. The level of the income distribution threshold, however, is still subject to debate. For example, Hasanov and Izraeli (2011) claimed that values of the Gini coefficient that are either below 0.17 or above 0.5 (higher inequality) are associated with a negative growth rate for the U.S. economy. The highest rates of

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growth occur when the values of the Gini coefficient are in the range of 0.33 to 0.35. The results provide support to arguments on both sides of the debate as to the relationship between the distribution of income and economic growth. Neither "too" much equality nor "too" much inequality is consistent with higher economic growth.

In addition, Cornia and Court (2001) claimed that there may be an inequality range that is most efficient for growth. A Gini coefficient value of between 0.25 and 0.4 has a growth-promoting effect, with 0.25 being the inequality value of a typical Northern European country and 0.4 being for countries such as China and the U.S. The precise shape of the inequality-growth relationship varies across countries depending upon their resource endowment, history, past policies regarding the distribution of physical and human capital and other factors. Liu (2009) used cross-sectional data and GMM methods based on the Ramsey model to show that the Gini coefficient has an efficient range of between 0.37 and 0.4. If the Gini coefficient is below that range, then economic growth can be improved by increasing the income inequality; otherwise, income inequality should be reduced to improve economic growth.

In the case of China, Chan et al. (2014) used the VAR and system-GMM statistical methods based on provincial panel data from 1995 to 2011 to examine the mutual impact of growth and inequality in China. The results indicated that high income inequality within the province raises the provincial growth rate. However, more rapid provincial growth has an insignificant effect in terms of reducing inequality.

To summarize, the theoretical literature has indicated that the relationship between inequality and the process of economic growth is complex. Despite there having been a considerable number of empirical studies focusing on the relationship between income inequality and economic growth, consistent results have so far not been obtained. A number of empirical studies have confirmed the existence of an income distribution threshold, and some researchers have found the Gini coefficient to have an efficient range that will lead to growth. The ensuing debates have motivated us to examine the nonlinear effects of inequality on growth in China.

4.3 China's Income Distribution and Economic Growth during 1995~2012

Prior to its economic reform, China was basically an egalitarian society. Since the economic reform in 1978, China has been among the world's fastest growing economies, and the rapid economic growth has been associated with a significant rise in inequality. After 1992, when China started to be transformed from a planned economy to a market economy, there began a period of rapid and stable growth. However, the steady increase in inequality that occurred after 1992 accompanied the aggressive market reforms that followed the well-known "South China Tour" by Deng Xiaoping in 1992.

Figure 4-1 shows the trend in income distribution and economic growth from 1995

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to 2012 in China. Income inequality in China experienced a steady increase over the entire sample period except in the years 1995-1997 and 2004, when the Gini coefficient actually declined. China's overall income inequality started to rapidly rise in 1997, with its Gini coefficient reaching a new high of 0.45 in 2003. It then began to experience upward fluctuations, reaching a record high Gini coefficient of 0.491 in 2008. At the same time, the economic growth rate in China began to continually rise in 1998, reaching a peak of 14.2% in 2007. The average growth rate of GDP from 1995 to 2012 was 9.84%. This figure somehow shows the simultaneous relationship between income distribution and economic growth before 2007. The global economic crisis that began in 2008 greatly affected China's economy. China's economic growth slowed to 9.7% in 2008, and then gradually began to decline, reaching a record low of 7.9% in 2012, its lowest rate of growth since 2000. In China, the increasing inequality seems beneficial to economic growth in the process of economic growth. With China's economy becomes more developed, the trend in income inequality has not significantly reversed with rapid economic growth, which is inconsistent with the Kuznets hypothesis—inequality will first increase and then will start to decrease with country's economic growth.

Income inequality dramatically increased during the period 1997–2008 which may also have raised the social and political instability risk. Hence, inequality has been ranked among the top three socioeconomic issues in China (Wang et al., 2014). In 2000, the Chinese government launched the Great Western Development Strategy that was aimed at resolving regional disparities. In the early 2000s, the "building a new socialist countryside" movement was launched to reduce the urban–rural gaps. In 2006, "building a harmonious society" became a main development goal in the 11th Five-Year Plan (2006–2010). In November 2013, the Third Plenum of the 18th Central Committee of the Chinese Communist Party outlined a systematic approach to improve the income distribution, including the reform of the household registration system (*hukou*), the development of the social security system, and the reform of the fiscal and tax systems of provinces, etc. Since 2000, China has changed its social and economic policy with a view to reducing disparities in income distribution. Despite official statistics showing that income inequality has been declining ever since 2008, China still faces the challenge of a high level of income inequality.

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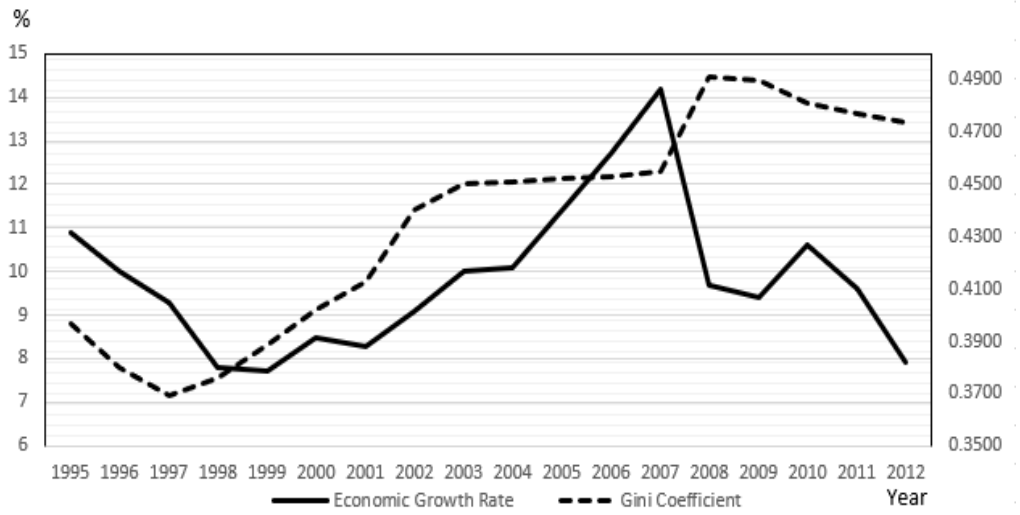

Sources: Gini coefficients for 1995-2007 are from Chang and Li (2012); while those for 2008-2012 are from the National Bureau of Statistics (NBS); the economic growth rate is from the NBS.

Figure 4-1: Income Distribution and Economic Growth in China: 1995~2012

4.4 Empirical Model

The purpose of this chapter is to test the possible threshold effect of income distribution in China. The neoclassical production function states that a country's economic growth is mainly driven by capital growth, labor growth, and technological progress. Economic growth is the result of these three determining factors. Hence, we start with the following standard linear growth equation,

$$\Delta lnY = \alpha_0 + \alpha_1(\Delta lnK) + \alpha_2(\Delta lnL) + \varepsilon, \quad (4\text{-}1)$$

where Y is output, α_0 is lnA, A is the level of technology, K is the capital stock, L is the quantity of labor, ln is the natural logarithm, Δ denotes the difference, and ε is a random error term. α_1 and α_2 stand for the product elasticities of physical capital and labor, respectively.

Base on Equation (4-1), other explanatory variables, as suggested in the literature as being important and robust determinants of growth, can be included. Regional inequality in terms of economic growth in China has led to a large floating population of migrant workers looking for better economic opportunities in faster-growing regions, migrants flow from poor inland areas to rich eastern and coastal regions, and urban areas and eastern regions also attract more multinational enterprises (MNEs) (Greaney and Li, 2017). Therefore, we use two location dummy variables in this equation to capture the possible effect of location on physical capital and labor in China. To test for

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the existence of a threshold effect and number of thresholds in the function relating income distribution to growth, we follow Sarel (1996) and use a spline function method by including an income distribution threshold dummy variable in Equation (4-1). [5] To test the nonlinear effect of income distribution on economic growth in China, we take the income distribution into account. In addition, endogenous growth theories regard the accumulation of human capital as a source of economic growth, and such an accumulation takes place mainly in schools. Therefore, we use government spending on education, culture and health as a proxy for human capital. Hence, Equation (4-1) can be rewritten as follows:

$$\Delta lnY_{i,t} = \alpha_{0i} + \alpha_1(\Delta lnK)_{i,t} + \alpha_2(\Delta lnL)_{i,t} + \sum_{j=1}^{6}\beta_j\left(X_j\right)_{i,t} + \varepsilon_{i,t}, \quad (4\text{-}2)$$

where i represents a cross-sectional index, j stands for the rest of the independent variables excluding the growth rates of physical capital and labor, and t is a time-series index. X_j includes X_1 to X_6. X_1 is the capital growth rate (ΔlnK) multiplied by the location dummy (D_L, set to one for coastal provinces, and zero otherwise), X_2 is the labor growth rate (ΔlnL) multiplied by the location dummy set in the same way as previously, X_3 is the human capital growth rate (ΔlnH), X_4 is the time trend (T, set to be positive integrals in order, using 1-18 to represent the years 1995-2012), X_5 is the Gini coefficient used as a proxy for income distribution (ID), and X_6 is the income distribution threshold effect $D^{id}(ID-ID^*)$. ID^* is the income distribution threshold, the Gini coefficient at which a turning point in the income distribution-growth relationship occurs. D^{id} is a dummy variable which equals one when $ID-ID^*$ is positive, and zero otherwise.

Finally, in order to test the sensitivity of the results, we include an extra variable —the ratio of international trade to output (TR)— in the regression, measured as exports plus imports to real GDP (i.e., the degree of external trade dependence). According to endogenous growth theory, international trade tends to professionalize production and encourage capital accumulation, and therefore has a positive effect on economic growth (Grossman and Helpman, 1990). One of the driving forces of China's fast growth has been its progressive openness through trade and foreign direct investment, culminating in 2001 with China's accession to the WTO. China's trade expansion resulted in its becoming the world's third largest trading country in 2005. To perform our sensitivity test, Equation (4-2) is modified as follows:

$$\Delta \ln Y_{i,t} = \alpha_{0i} + \alpha_1(\Delta lnK)_{i,t} + \alpha_2(\Delta lnL)_{i,t} + \sum_{j=1}^{6}\beta_j\left(X_j\right)_{i,t} + \gamma TR_{i,t} + \varepsilon_{i,t}. \quad (4\text{-}3)$$

[5] Another way of testing for threshold effects is the bootstrap method adopted by Hansen (1999, 2000).

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The income inequality threshold is the value at which the growth-promoting and growth-dampening effects change direction, a Gini coefficient value above which an increase in income inequality has a growth-promoting or income-dampening effect. To find the threshold, we follow Sarel (1996) using the spline function regression approach.[6] First, we select an appropriate Gini coefficient interval according to available Gini coefficient data, and then divide the interval into numerous tiny subsamples by knots. Then, we treat each knot as a potential income inequality threshold for China's economic growth. By subtracting every trial threshold iteratively and incrementally from the actual Gini coefficient, we work out the difference between the actual Gini coefficient and the trial threshold. In our study, the value of *ID** is obtained by estimating Equation (4-2) and choosing the value of *ID* that results in the smallest sum of squared errors or the highest goodness of fit ($\bar{R}^2$) at different Gini coefficient level intervals.

Equation (4-2) has a panel estimation structure, which combines time series and cross-section data to analyze the threshold effect of income distribution on China's growth over time. The estimation is performed by the generalized method of moments (GMM) to eliminate the country-specific effects.[7]

4.5 Empirical Process and Results

4.5.1 Data Sources and Descriptive Statistics

In the regression, output (*Y*) is real gross provincial product, physical capital (*K*) is total investment in fixed assets, and human capital (*H*) is government expenditure on culture, education, science and health care. Labor (*L*) is measured by the population of employees. The annual growth rates for these four variables are obtained by using differentiated logarithms. The urban Gini coefficient serves as a proxy for income distribution (*ID*) in this paper.[8] The urban Gini coefficient data used in this analysis are calculated from urban income data based on household surveys conducted by the National Statistical Bureau (NBS) of China (as shown in Appendix A).[9]

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[6] The spline regression involves choosing a set of knots and finding the spline over these knots that minimizes the residual sum of squares (Goepp et al., 2018).

[7] Due to China displaying enormous spatial disparities, specific provincial characteristics such as differences in resource endowments, climate or institutions, the omission of these variables may generate biased estimation results. We therefore follow Forbes (2000) to use a first-difference GMM specification, in order to eliminate the region-specific effect.

[8] Gini coefficient is a standard measure of income inequality which has ranges from zero to one. A value of zero means that income is distributed equally, and a value of one means that all of the income is obtained by the highest-income group.

[9] The two nationally representative annual surveys for China are the annual Rural Household Survey (RHS) and the annual Urban Household Survey (UHS). The reason why we use the urban Gini coefficient instead of the national Gini coefficient is because the National Bureau of Statistics (NBS) uses different survey instruments for urban and rural areas before 2013, the data comparability problem existing

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We calculate the trade-output ratio, which is measured as the ratio of real total trade (exports plus imports) to real gross provincial product. In the present paper, we adjust nominal variables to real amounts at 1994 prices that are valued in the domestic currency unit (yuan). Moreover, aside from the dummy variables and income distribution, the rest of the variables are converted to percentages to maintain consistency. Table 4-1 presents the descriptive statistics for the main variables in the sample.

The panel dataset includes 19 provinces (Appendix B) for the period from 1995 to 2012. The period has been chosen because China's economy grew rapidly in the transition period from 1995 to 2012, although its income inequality also increased. Since 1994, the System of National Accounts (SNA) has been finally adopted as China's official statistical reporting system (Hao and Wei, 2010). The changes have improved the quality of the household income surveys. However, from the fourth quarter of 2012, China's NBS has been conducting integrated surveys of urban and rural households, and changes the definition of urban and rural, disposable income, and sample coverage (Zhang and Wang, 2011). Many provinces have formally released data on the integrated survey of urban and rural residents' income since 2014.[10] Except for the Gini coefficient, data for the period 1995 to 2007 are collected from the China Compendium of Statistics 1949-2008 (NBS, 2009). Data for the period 2008 to 2012, unless indicated otherwise, are obtained from various provincial *Statistical Yearbooks* and the NBS website.

Table 4-1: Descriptive Statistics for the Main Variables

Variable	Description	Sample size	Mean (%)	Median (%)	Standard deviation (%)	Expected sign of estimated coefficient
ΔlnY	Growth of output	342	11.25	10.83	4	—
Δlnk	Growth of capital	342	14.96	14.72	9.57	Positive
ΔlnL	Growth of labor	342	1.51	1.4	2.16	Positive
$D^L(\Delta lnk)$	Coastal effect (capital)	342	5.41	0	8.89	Positive
$D^L(\Delta lnL)$	Coastal effect (labor)	342	0.76	0	1.83	Positive
ΔlnH	Human capital growth	342	13.62	13.82	9.26	Positive
ID	Income distribution*	342	0.2694	0.2719	0.0426	?
TR	Trade-output ratio	342	34.45	13	40.49	Positive

Note: * data are not in percentages.

between urban and rural areas. In addition, urban areas and their surrounding areas develop much faster than remote rural areas (Lu and Deng, 2011).

[10] The data obtained from China's rural and urban household survey are important for researchers when calculating the continuous time series of the Gini coefficient. Since the fourth quarter of 2012, China's NBS has been conducting integrated surveys of urban and rural households (World Bank, 2018), but the *China Statistical Yearbook* did not provide integrated samples for all residents before 2014. However, the data based on the integration survey of urban and rural residents' income is not comparable to the data released before 2014.

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4.5.2 Estimation of the Income Distribution Threshold

In order to test whether there exists a threshold effect in the relationship between income distribution and economic growth. First, according to the historical Gini coefficient for China, the interval for our urban Gini coefficient is between 0.16 and 0.37. To test whether the threshold effect exists or not, we divide this interval by 84 Gini coefficient knots: at the beginning the Gini coefficient is 0.16, and the increment is 0.0025 until 0.37 is reached, which divides this interval into 84 Gini coefficient knots. Then, we treat each knot as one trial point in the estimation of the income distribution threshold. We can obtain 84 sets of $(ID - ID^*)$ based on each trial threshold by subtracting the actual Gini coefficient from each knot. We obtain 84 sets of results, which means that we can collect 84 sets of $\bar{R}^2$ by substituting every set for the trial $(ID - ID^*)$ into Equation (4-2). All the $\bar{R}^2$ are plotted in Figure 4-2. In Figure 4-2, each $\bar{R}^2$ against the trial Gini coefficient threshold is estimated using Equation (4-2) based on the GMM approach. This implies estimating Equation (4-2) and computing the residual sum of squares (RSS) for the possible thresholds of income distribution by historical Gini coefficient between 0.16 and 0.37.

Using spline method sequential estimation, Figure 4-2 shows the existence of three potential turning points in the relationship between income distribution and economic growth.[11] By substituting three possible values of the Gini coefficient threshold ID^* into Equation (4-2), we can obtain the regression parameter $D^{id}(ID - ID^*)$ and ID. The estimated (slope) coefficient of the three possible Gini coefficient threshold ID^* on the spline term $D^{id}(ID - ID^*)$ gives rise to the threshold effect, a Gini coefficient value above which the growth-promoting and growth-dampening effects change direction.

Our regression estimates three turning points for $\bar{R}^2$, with each corresponding to a shift at a different Gini coefficient level interval. This chapter chooses the potential knots to avoid omit the unobserved results. The minimized residual sum of squares (or the highest goodness of fit $\bar{R}^2$) values are applied to each Gini coefficient interval separately. We find that the $\bar{R}^2$ occurs at the Gini coefficient value of 0.225, and that the estimated coefficient of ID is negative and the coefficient of $D^{id}(ID - ID^*)$ is positive. The Gini coefficients at 0.315 and 0.345, for both estimated coefficients of ID, are positive, and the estimated coefficient of $D^{id}(ID - ID^*)$ is negative. We find that the estimated coefficient on the spline term $D^{id}(ID - ID^*)$, a variable capturing the effect of excess ID beyond the threshold, for the Gini coefficient of 0.225 exhibits

[11] In general, the optimal threshold value is that which minimizes the sequence of the residual sum of squares (RSS) or equivalently maximizes the $\bar{R}^2$. However, the potential endogeneity of inequality implies that the procedure of searching for the optimal threshold value to minimize the RSS with the smallest value of RSS can omit the unobserved threshold value, while multiple thresholds exist at different Gini coefficient interval.

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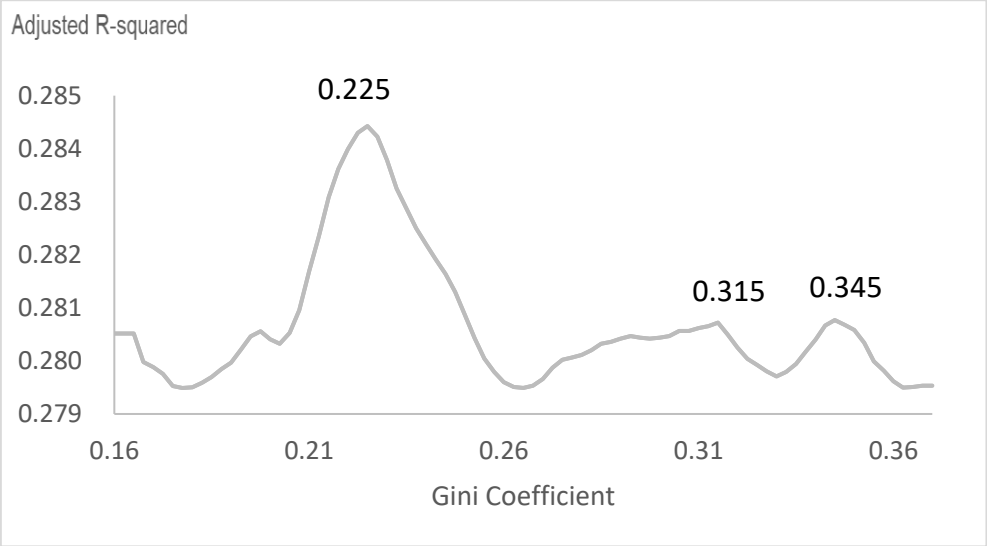
a significant positive relationship, while there is a significant negative relationship for the Gini coefficients of 0.315 and 0.345, and so we choose the three most likely Gini coefficient threshold points. As mentioned above, this shows that the spline term $D^{id}(ID - ID^*)$, which represents the turning points for the Gini coefficient threshold values, shifts over time.



Note: The three potential turning points are identified by the maximum of $\overline{R}^2$ at different Gini coefficient level intervals.

Figure 4-2: Goodness of Fit against Each Trial Income Distribution Threshold

All the $\bar{R}^2$ for the various Gini coefficient levels are shown in Appendix C. For China, the estimated thresholds show the existence of three turning points in terms of the relationship between income distribution and economic growth, for which the estimated thresholds are the Gini coefficients 0.225, 0.315, and 0.345. Therefore, in the remainder of our analysis we will work with these three thresholds.

4.5.2.1 Growth without Income Distribution and an Income Distribution Threshold

We also estimate the linear and nonlinear effects of income distribution on growth to distinguish the different results for models including and not including the threshold effect of the income distribution, where the time trend T represents the years from 1995 to 2012. The estimated results are reported with and without including the Gini coefficient and the different Gini coefficients multiplied by the income distribution threshold dummy, respectively. First of all, we estimate Equation (4-2) by excluding ID and $D^{id}(ID - ID^*)$ and obtain:

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$$\Delta lnY = 0.06 + 0.15\Delta lnk + 0.13\Delta lnL + 0.01D^{L}(\Delta lnk) + 0.10D^{L}(\Delta lnL) +$$
$$(27.4)^{***}\ (15.96)^{***}\quad (6.77)^{***}\qquad (0.80)\qquad\qquad (3.40)^{***}$$
$$0.02\Delta lnH + 0.002T, \qquad (4\text{-}4)$$
$$(2.77)^{***}\qquad (4.74)^{***}$$

where the *t*-statistics are in the parentheses, and ***, ** and * denote 1%, 5% and 10% significance levels, respectively. In Equation (4-4), all coefficients of the independent variables have the expected signs and are significant, except for the coastal effect on the capital growth rate $D^{L}(\Delta lnk)$, which is insignificant. These results show three main features of the determinants of China's economic growth. First, the positive and significant impacts of the physical capital and labor inputs on growth are consistent with economic theory. The economic growth rates are driven by physical capital and labor accumulation. The estimated coefficients of the physical capital and labor inputs are 0.15 and 0.13, respectively.

Second, geographic location differences play an important role in economic growth, which leads to higher labor productivity in coastal regions than in inland regions. High-level professionals tend to work in eastern coastal regions rather than in western areas because of disadvantages in terms of income levels, and working and living environments (Lu and Deng, 2011). Therefore, the labor growth rate (ΔlnL) multiplied by the location dummy in Equation (4-4) is found to be significant. The results show that the capital growth rate (ΔlnK) multiplied by the location dummy is insignificant. Beginning in 1978, the economic reform in China was guided by a coastal development strategy. Preferential policies such as those related to investment, structural reform and opening up enabled certain eastern coastal regions to better exploit their geographical advantage. To integrate interregional economic development, China has been increasingly concerned with the poorer western region since the late 1990s, and has initiated some development programs that focus on infrastructure investment in the western and central regions in order to address the gap in development with the eastern regions.[12] Therefore, this may result in the geographic location differences for the capital input becoming less significant.

Third, Equation (4-4) indicates that, in the long run, investment in education and other human capital, such as the creation of new knowledge, are important sources of economic growth. It shows that the estimated coefficient of 0.02 for human capital is less than the estimated coefficient of 0.15 for physical capital. According to Galor and Moav (2004), physical capital accumulation is the primary source of economic growth in the early stages of development. However, in the later stages of development, human

[12] The development programs included in the Great Western Development strategy adopted in 1999 targeted 12 provinces and autonomous regions in the central and western parts of China. The North East Revival Strategy began to be implemented in 2003, and the Rise of Central China program was enacted in 2004.

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capital emerges as the prime engine of growth. Consequently, based on the assumption that the marginal product of capital is falling, a relatively lower level of accumulation of human capital might have a relatively larger effect on economic growth in the future. Therefore, the Chinese government should place more emphasis on increasing government expenditure on education and encourage technological innovation activities to accumulate human resource to promote economic growth.

4.5.2.2 Growth with Income Distribution but without an Income Distribution Threshold

In this section, we estimate Equation (4-2) by including the income distribution, but excluding the term $D^{id}(ID - ID^{*})$. The results are as follows:

$$\begin{aligned}\Delta lnY = {} & 0.04 + 0.14\Delta lnk + 0.14\Delta lnL + 0.0007D^{L}(\Delta lnk) + 0.08D^{L}(\Delta lnL) + \\ & (7.997)^{***}\ (16.54)^{***}\quad (5.96)^{***}\quad (0.06)\qquad\quad (3.64)^{***} \\ & 0.02\Delta lnH + 0.001T + 0.105\,ID. \\ & (2.578)^{***}\quad (2.226)^{**}\quad\ (2.83)^{***}\end{aligned} \tag{4-5}$$

After adding income distribution to the regression, Equation (4-5) does not change the result of Equation (4-4) significantly. Equation (4-5) estimates the average slope over the whole income distribution spectrum, and shows that income distribution has a significant positive effect on economic growth with a coefficient of 0.105. This result indicates that income distribution is influential in explaining China's economic growth (even if the income distribution threshold effect is omitted).

4.5.2.3 Growth with Income Distribution and an Income Distribution Threshold

In this section, we include both income distribution and the income distribution threshold in our regression to test the effect of the threshold on growth. Figure 4-2 shows the existence of three possible turning points in the relationship between income distribution and economic growth. Therefore, for the remainder of the analysis, we respectively include the Gini coefficient thresholds of 0.225, 0.315, and 0.345 in the Equation (2). As mentioned in the previous section, the effect of income distribution on economic growth is given by the estimated coefficient of ID in which income distribution is less than or equal to the threshold on growth. A Gini coefficient beyond this threshold on growth is calculated by adding the estimated coefficients of ID and $D^{id}(ID - ID^{*})$.

First, by including both income distribution and the income distribution threshold of 0.225 in our regression, the result is as follows:

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$$\Delta lnY = 0.12 + 0.15\Delta lnk + 0.14\Delta lnL - 0.001D^{L}(\Delta lnk) + 0.07D^{L}(\Delta lnL) + 0.03\Delta lnH +$$
$$(10.35)^{***}\ (17.07)^{***}\quad (5.59)^{***}\quad (0.11)\qquad (3.77)^{***}\qquad (3.08)^{***}$$
$$0.001T - 0.27ID + 0.42D^{id}(ID - ID^{*}). \qquad (4\text{-}6)$$
$$(2.36)^{**}\quad (4.45)^{***}\quad (5.55)^{***}$$

Equation (4-6) confirms that both income distribution and the income distribution threshold have a significant influence on economic growth when the Gini coefficient is 0.225. When the Gini coefficient is less than or equal to 0.225, the estimated coefficient of ID drops from 0.105 in Equation (4-5) to -0.27 in Equation (4-6), and the effect changes from positive to negative. This implies that an increase in inequality has a negative impact on economic growth, in that a 1% increase in the Gini coefficient will be associated with an unfavorable effect on economic growth of 0.27%. On the other hand, when the Gini coefficient is higher than 0.225, the estimated coefficient of $D^{id}(ID - ID^{*})$ is 0.42, and the effect changes from negative to positive, so that an increase in the Gini coefficient of 1% will be associated with an increase in economic growth of 0.15% (=0.42%− 0.27%). This shows that the nonlinear influence of income distribution on growth is statistically significant.

Second, by including both income distribution and the income distribution threshold of 0.315 in our regression, the result is as follows:

$$\Delta lnY = 0.04 + 0.14\Delta lnk + 0.14\Delta lnL - 0.0001D^{L}(\Delta lnk) + 0.08D^{L}(\Delta lnL) + 0.02\Delta lnH +$$
$$(5.93)^{***}\ (16.53)^{***}\quad (5.88)^{***}\quad (0.01)\qquad (3.29)^{***}\qquad (2.56)^{***}$$
$$0.001T\ + 0.14\,ID - 0.19D^{id}(ID - ID^{*}). \qquad (4\text{-}7)$$
$$(1.97)^{*}\quad (3.67)^{***}\quad (5.36)^{***}$$

Equation (4-7) shows that the Gini coefficient of 0.315 is a threshold turning point. When the Gini coefficient is less than or equal to 0.315, the estimated coefficient of ID is 0.14. The effect is positive, and an increase in the Gini coefficient of 1% will be associated with an increase in economic growth of 0.14% (close to 0.15% for the Gini coefficient which is higher than 0.225 in Equation (4-6)). On the other hand, when the Gini coefficient is higher than 0.315, the estimated coefficient of $D^{id}(ID - ID^{*})$ is -0.19. The effect becomes negative, and an increase in income inequality has a growth-dampening effect, in that an increase in the Gini coefficient of 1% will be associated with a decline in economic growth of 0.05% (= −0.19% + 0.14%). Consequently, a moderate level of income inequality (a Gini coefficient between 0.225 and 0.315) is favorable to economic growth, and a 1% increase in the Gini coefficient will increase economic growth by between 0.14% and 0.15% (=0.42%−0.27%).

Finally, by including both income distribution and an income distribution

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threshold of 0.345 in our regression, the result is as follows:

$$\Delta lnY = \underset{}{0.04} + \underset{(5.15)^{***}}{0.14\Delta lnk} + \underset{(16.74)^{***}}{0.14\Delta lnL} - \underset{(5.78)^{***}}{0.0008D^{L}(\Delta lnk)} + \underset{(0.078)}{0.08D^{L}(\Delta lnL)} + \underset{(3.75)^{***}}{0.02\Delta lnH} + \underset{(2.66)^{***}}{0.001T} + \underset{(1.91)^{*}}{0.13\,ID} - \underset{(2.71)^{***}}{0.51D^{id}(ID - ID^{*})}. \quad (4\text{-}8)$$
$$(3.35)^{***}$$

Equation (4-8) shows that when the Gini coefficient is less than or equal to 0.345, the estimated coefficient of ID is 0.13. The effect is positive, in that an increase in the Gini coefficient of 1% will be associated with an increase in economic growth of 0.13%. On the other hand, when the Gini coefficient is higher than 0.345, the estimated coefficient of $D^{id}(ID - ID^{*})$ is -0.51. The effect thus becomes negative, in that an increase in income inequality will begin to have a growth-dampening effect, and an increase in the Gini coefficient of 1% will be associated with a decline in economic growth of 0.38% (=0.13%−0.51%) (compared to the unfavorable effect for a Gini coefficient higher than 0.315, where an increase in the Gini coefficient of 1% will be associated with a decline in economic growth of only 0.05%).

The estimated coefficients of equations (4-5), (4-6), (4-7) and (4-8) are summarized in Table 4-2. The table indicates that the relationship between income distribution and economic growth is nonlinear in China. There is a significant income distribution threshold in terms of the Gini coefficients of 0.225, 0.315, and 0.345. Due to there being three turning points, the income inequality level can be divided into four regimes: low, moderate, high, and very high income inequality. The estimated coefficient on the spline term $D^{id}(ID - ID^{*})$ is positive for the Gini coefficient of 0.225, and becomes negative for the Gini coefficients of 0.315 and 0.345. For purposes of comparison, Equation (4-5) indicates that ignoring the existence of the nonlinear relationship between income inequality and economic growth (excluding the income distribution threshold, assuming no turning point) will result in bias to the estimated effect of income distribution on growth. Equation (4-5) estimates an average coefficient over the whole income distribution range. When the income distribution threshold is included in Equation (4-6), the estimated coefficient of ID drops from 0.105 to -0.27 at a Gini coefficient less than or equal to 0.225. Therefore, by assuming that there is no turning point, when the Gini coefficient is at a low level, a large bias occurs in terms of the effect of income distribution on economic growth.

Finally, we compare the estimated results for the threshold with the trend of income distribution and economic growth from China's official statistics to verify the empirical results. Figure 4-3 shows the evolution of the urban Gini coefficient, national Gini coefficient, and economic growth rate over time from 1995 to 2012. During 1995-1998, the urban Gini coefficient is less than or equal to 0.225 (the national Gini

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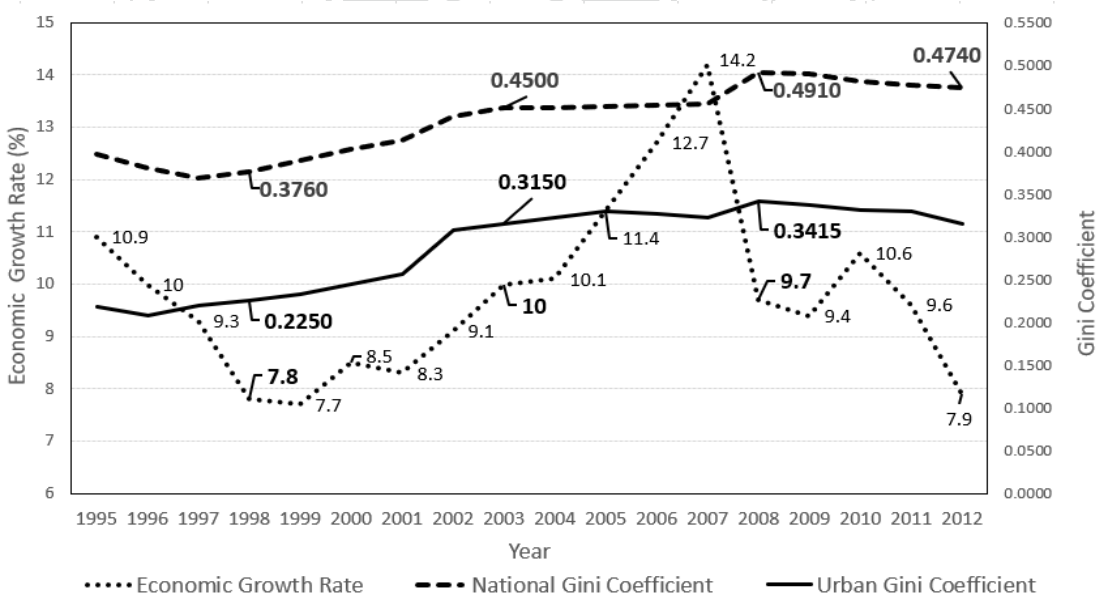
coefficient is approximately 0.376), and thus it can be found that the economic growth rate is in decline. This confirms that low income inequality (a urban Gini coefficient less than or equal to 0.225) has a negative impact on economic growth.

Table 4-2: Summary of Estimated Coefficients for Different Threshold Gini Coefficients

Variable	Assuming without Threshold Effect	Threshold Gini Coefficient		
		0.225	0.315	0.345
Income Inequality Level		Low/Moderate	Moderate/ High	High/Very High
	Equation (4-5)	Equation (4-6)	Equation (4-7)	Equation (4-8)
	Estimated Coefficient			
Δlnk	0.14 (16.54)***	0.15 (17.07) ***	0.14 (16.53) ***	0.14 (16.74) ***
ΔlnL	0.14 (5.96)***	0.14 (5.59) ***	0.14 (5.88) ***	0.14 (5.78) ***
$D^L(\Delta lnk)$	0.0007 (0.06) ***	−0.001 (0.11)	−0.0001 (0.01)	−0.0008 (0.078)
$D^L(\Delta lnL)$	0.08 (3.64) ***	0.07 (0.07) ***	0.08 (3.29) ***	0.08 (3.75) ***
ΔlnH	0.02 (2.578) ***	0.03 (3.08) ***	0.02 (2.56) ***	0.02 (2.66) **
T	0.001 (2.226) **	0.001 (2.36) ***	0.001 (1.97) **	0.001 (1.91) *
ID	0.105 (2.83) ***	−0.27 (4.45) ***	0.14 (3.67) ***	0.13 (2.71) **
$D^{id}(ID - ID^*)$		0.42 (5.55) ***	−0.19 (5.36) ***	−0.51 (3.35) ***
$\bar{R}^2$	0.282	0.284	0.281	0.281



Sources: 1. National Gini coefficient and economic growth rate are the same as Figure 4-1.

2. Urban Gini Coefficient: 1995-2007 is from Chang and Li (2012); 2008-2012 is from Hu (2016).

Figure 4-3: Income Distribution and Economic Growth (Official Statistics)

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From 1998 to 2003, urban Gini coefficients of between 0.225 and 0.315 (the national Gini coefficient was approximately 0.45) are followed by more rapid economic growth. This confirms that moderate income inequality (an urban Gini coefficient of between 0.225 and 0.315) has a growth promoting effect.

After the national Gini coefficient reached its first high of 0.45 in 2003,[13] it began to exhibit slight upward fluctuations, reaching a record high national Gini coefficient of 0.491 in 2008. In early 2004, high and rising inequality was perceived to hurt economic growth due to the sluggish domestic demand and political instability. However, during 2003-2007, despite high levels of urban Gini coefficients of between 0.315 (the national Gini coefficient was approximately 0.45) and 0.3415 (the national Gini coefficient was approximately 0.491), the economy exhibited significantly faster growth.[14]

In 2008, urban income inequality reach a peak with a Gini coefficient of 0.3415 (the national Gini coefficient was approximately 0.491), after which the annual growth rate significantly declined. The global economic crisis that began in 2007 greatly affected China's economy. China's economic growth slowed in 2008-2009, then bounced from the bottom in 2010, after which it began to decline gradually. These findings confirm that a very high level of income inequality has a negative effect on economic growth.

Overall, Figure 4-3 somehow points to the negative effect of income distribution on economic growth for an urban Gini coefficient less than or equal to 0.225 and higher than 0.3415, and a positive impact of income distribution on economic growth for Gini coefficients between 0.225 and 0.3415. Hence, our threshold estimated results (Table 4-2) are quite consistent with China's official statistics.

These results imply that the existence of an efficient inequality range of urban Gini coefficients of roughly between 0.225 and 0.315 (as in Figure 4-3, the national Gini coefficient is approximately between 0.376 and 0.45) has a growth-promoting effect in China, findings that are consistent with some previous empirical studies. For example, Cornia et al. (2001) claimed that efficient Gini coefficients were about 0.4 in China as a whole, and Liu (2009) used international cross-sectional data and found that the Gini coefficients had an efficient range from 0.37 to 0.4.

The findings show that low inequality was identified as placing a strain on economic growth, and that increasing inequality is beneficial to economic growth in

[13] We combine the NBS estimates with those of Chang and Li (2012) to form a more complete time series on China's income distribution. In 2003, a Gini coefficient of 0.45 was estimated by Chen et al. (2015) and a Gini coefficient of 0.479 was estimated by NBS.

[14] One possible explanation is the Chinese government's emphasis on infrastructure spending in the poorer inland areas for controlling the rising regional inequality since 2000. As a result, the urban areas in the poorer provinces have experienced more rapid growth.

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China at an early stage of development. However, after a sharp increase in income and inequality has been experienced for decades, a sustained increase in inequality may lower economic growth. In China, the economic development process has tended to increase inequality. However, the trend toward increased income inequality has not been significantly reversed with rapid economic growth. One possible explanation is that income levels may explain only a small part of the variance in the inequality measures. The Kuznets curve neglects the impact of other important factors on the distribution of income (Barro, 2000), and it works better for a cross section of countries at a point in time than for the evolution of inequality over time within countries (Li et al., 1998). In later stages of development, where human capital emerges as a prime engine of growth, a very unequal society prevents the lower class and possibly even the middle class from investing in education in order to accumulate human capital. Therefore, increasing income inequality might have a growth-dampening effect. As mentioned earlier, the results in Equation (4-6) confirm that the effect of human capital is still less pronounced than that of physical capital in terms of the impact on economic growth.

To summarize, the regressions show the existence of multiple income distribution thresholds for Gini coefficients of 0.225, 0.315, and 0.345. For China's economic growth, low or high levels of Gini coefficients will have a negative effect, while moderate levels of Gini coefficients will have a beneficial effect. Therefore, the impact of the threshold of income inequality on economic growth will change for different Gini coefficient levels in China.

4.5.2.4 The Regional Effect on the Regressions

China started its reform and opening up with an unbalanced development strategy. Since the early 1990s, income disparity in terms of per capita GDP between China's coastal and interior provinces has accelerated when larger scale and more intensive reforms began to take place after Deng Xiaoping's southern China tour in 1992.[15]

There are some empirical studies that have found that the effect of income inequality on economic growth may differ between poor and rich countries (Barro, 2000; Castelló-Climent, 2010).[16] Hence, it is meaningful to understand the effect of different regions' income inequality on economic growth in China. In this section, we divide the

[15] The inland–coastal gap in terms of per capita income was enormous between 1995 and 2012. For the selected provinces in our study, real per capita GDP in the inland regions was only about one half that in the coastal regions before 2012. For example, in 2010, per capita GDP in the inland regions averaged 16,556 Yuan, about half of that in the coastal regions which averaged 32,648 Yuan.

[16] Castelló-Climent (2010) found a negative effect of income and human capital inequality on economic growth, both in the sample as a whole and in the low and middle-income economies, but the effect is much smaller or even becomes positive in the higher-income countries.

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overall sample into inland (poorer) and coastal (richer) subgroups to test the threshold effect by region.

Table 4-3 shows that when we restrict the sample to the inland regions, the estimated turning points are very similar to those reported in the case of the nation as a whole (Table 4-2). The threshold estimates for the inland regions are the Gini coefficients of 0.22, 0.29, and 0.3475, which are close to the threshold estimates for the Gini coefficients for the nation of 0.225, 0.315 and 0.345. In the coastal regions, the estimated threshold Gini coefficients are 0.2025 and 0.3425 (Table 4-4), which are somewhat different from those for the inland regions and the country as a whole.

Table 4-3: Estimated Threshold Gini Coefficients for Inland Regions

Variable	Assuming Without Threshold Effect	Threshold Gini Coefficient		
		0.22	0.29	0.3475
Income Inequality Level		Low/Moderate	Moderate/ High	High/Very High
	Estimated Coefficients			
Δlnk	0.16 (25.44)***	0.16 (23.42)***	0.15 (24.12)***	0.15 (35.3)***
ΔlnL	0.21 (9.88)***	0.21 (9.08)***	0.18 (11.5)***	0.19 (11.27)***
ΔlnH	0.05 (22.49)***	0.05 (23.37)***	0.04 (11.96)***	0.05 (21.58)***
ID	0.17 (5.59)***	−0.20 (3.7)***	0.34 (16.64)***	0.21 (4.36)***
$D^{id}(ID - ID^*)$		0.42 (4.47)***	−0.56 (12.96)***	−2.29 (5.725)***
$\bar{R}^2$	0.197	0.198	0.211	0.204

Table 4-4: Estimated Threshold Gini Coefficients for Coastal Regions

Variable	Assuming Without Threshold Effect	Threshold Gini Coefficient	
		0.2025	0.3425
Income Inequality Level		Low/Moderate	Moderate and High /Very High
	Estimated Coefficients		
Δlnk	0.15 (72.6)***	0.15 (67.76)***	0.15 (68.07)***
ΔlnL	0.25 (13.15)***	0.25 (12.46)***	0.25 (12.4)***
ΔlnH	0.02 (2.93)***	0.02 (1.76)*	0.02 (2.87)**
ID	0.2 (25.65)***	1.62 (4.7)***	0.21 (31.88)***
$D^{id}(ID - ID^*)$		−1.44 (4.22)***	−0.28 (4.19)***
$\bar{R}^2$	0.419	0.418	0.416

For low income inequality, the results indicate that the effects of income distribution on economic growth are different for the country as a whole, the inland

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regions, and the coastal regions. The estimated results reveal a negative effect on the inland (poorer) regions and the country as a whole. For the inland regions, when the Gini coefficient is less than or equal to 0.22, an increase in the Gini coefficient of 1% will be associated with a reduction in economic growth of 0.2%. In the coastal (richer) regions, a negative impact is non-existent, indicating that lower income inequality is associated with a positive impact on growth. When the Gini coefficient is less than or equal to 0.2025, an increase in the Gini coefficient of 1% will be associated with an increase in economic growth of 1.62%. These results show that the effect of income distribution on economic growth depends on the regional development level, which is consistent with Castelló-Climent (2010) and Barro (2000).[17]

When there is very high income inequality, the results show that the detrimental effect on economic growth does not matter for the country as a whole, the coastal regions, or the inland regions. In the coastal regions when the Gini coefficient is higher than 0.3425, an increase in the Gini coefficient of 1% will be associated with a reduction in economic growth of 0.07% (=0.21%−0.28%). In the inland regions when the Gini coefficient is higher than 0.3475, an increase in the Gini coefficient of 1% will be associated with a reduction in economic growth of 2.08% (=0.21%−2.29%). Moderate income inequality thus has a favorable effect on economic growth, whether for the whole country, the coastal regions, or the inland regions.

To summarize, the results provide a comparison with the inland (poorer) regions, where the detrimental impact of inequality on growth less pronounced at the low or higher income inequality levels in the coastal (richer) regions. This suggests that the effects of inequality on growth are likely to vary with the regional development level. Low inequality tends to have a harmful effect on growth in the inland (poorer) regions, but it stimulates growth in the coastal (richer) regions. For all income groups, moderate income inequality is most efficient for economic growth, and very high income inequality is identified as having a negative effect on economic growth in China. This suggests that maintaining moderate income inequality is beneficial for inland economic growth. The Chinese government should thus focus its efforts on sharing the fruits of growth in the coastal regions with the inland regions as well as on lowering the concentration of resources in the coastal regions in order to enhance the development of lagging regions in favor of national economic growth.

4.5.3 Sensitivity Analysis

For the sensitivity analysis, we included the trade-output ratio (*TR*) in our regression as an additional control variable. For threshold values of 0.225, 0.315, and

[17] Barro (2000) found that higher inequality tends to retard growth in poor countries and encourage growth in richer locations. In this study, we found that lower inequality tends to retard growth in poor regions and encourage growth in richer regions in China.

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0.345, the regression results with *TR* and without *TR* are summarized in Table 4-5.

By comparing the model with *TR* and without *TR* in the regression, Table 4-5 shows that including *TR* does not significantly change the results. The threshold value remains the same after including *TR* in the regressions, but the estimated coefficients of the labor growth rate multiplied by the location dummy $D^L(\Delta lnL)$, once the *TR* variable is included in the regression, change from significantly positive to insignificant. The results show that the estimation results for the nonlinear relationship between income distribution and economic growth are robust. In addition, Table 4-5 shows that by including *TR* in the regressions, the coefficient of *TR* has the expected positive coefficient. Therefore, trade liberalization is also crucial to China's economic success, which is consistent with economic theory.

Table 4-5: Estimated Coefficients for the Sensitivity Analysis

Gini Coefficient	0.225		0.315		0.345	
Regression	Without TR	With TR	Without TR	With TR	Without TR	With TR
Δlnk	0.15 (17.07) ***	0.16 (11.21)***	0.14 (16.53) ***	0.16 (10.95)***	0.14 (16.74) ***	0.16 (10.83) ***
ΔlnL	0.14 (5.59) ***	0.16 (4.45)***	0.14 (5.88) ***	0.17 (4.75)***	0.14 (5.78) ***	0.17 (4.59) ***
$D^L(\Delta lnk)$	−0.001 (0.11)	−0.01 (1.29)	−0.0001 (0.01)	−0.01 (1.38)	−0.0008 (0.078)	−0.01 (1.36)
$D^L(\Delta lnL)$	0.07 (0.07) ***	−0.02 (0.78)	0.08 (3.29) ***	−0.02 (0.75)	0.08 (3.75) ***	−0.01 (0.46)
ΔlnH	0.03 (3.08) ***	0.03 (3.05)***	0.02 (2.56) ***	0.02 (2.7)***	0.02 (2.66) **	0.03 (2.76) ***
T	0.001 (2.36) ***	0.001 (2.2)**	0.001 (1.97) **	0.001 (1.76) *	0.001 (1.91) *	0.001 (1.72) *
ID	−0.27 (4.45) ***	−0.294 (5.48)***	0.14 (3.67) ***	0.13 (3.92)***	0.13 (2.71) **	0.11 (2.84) ***
$D^{id}(ID - ID^*)$	0.42 (5.55) ***	0.429 (5.61)***	−0.19 (5.36) ***	−0.24 (7.01)***	−0.51 (3.35) ***	−0.61 (4.54) ***
TR		0.01 (6.08)***		0.01 (9.19)***		0.01 (7.65) ***
$\bar{R}^2$	0.284	0.286	0.281	0.283	0.281	0.283

4.6 Summary

The purpose of this chapter has been to empirically test the possible threshold effect of income distribution on economic growth in China. Using the urban Gini coefficient calculated based on the provincial Annual Yearbook from 1995-2012, we examine the nonlinear relationship between income distribution and economic growth in China. The results confirm the theoretical hypothesis that there exists a nonlinear relationship between inequality and economic growth. The findings reveal the existence of multiple income distribution thresholds at Gini coefficients of 0.225, 0.315, and 0.345. The effect of income distribution on economic growth will thus change over different Gini coefficient levels in China.

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The findings indicate that a low or high Gini coefficient will have a negative effect on economic growth, but that a moderate Gini coefficient will have a beneficial effect on economic growth. The estimated coefficients in this paper indicate that low income inequality (a Gini coefficient less than or equal to 0.225) negatively affects economic growth, in that a 1% increase in the Gini coefficient will be associated with an unfavorable effect on economic growth of 0.27%. Moderate income inequality (a Gini coefficient between 0.225 and 0.315) positively affects economic growth, in that a 1% increase in the Gini coefficient will be associated with an increase of economic growth of 0.14% to 0.15%. Finally, high income inequality (a Gini coefficient higher than 0.315) or very high income inequality (a Gini coefficient higher than 0.345) negatively affects economic growth, in that a 1% increase in the Gini coefficient will impede economic growth by 0.05% and 0.38%, respectively. These results imply that the range of efficient inequality for the urban Gini coefficient lies between 0.225 and 0.315.

Due to income disparities between China's coastal and interior provinces having accelerated since the early 1990s, we examine whether the effect of inequality on growth depends on a region's development level by dividing the sample into inland regions and coastal regions. The results show that, compared to the inland (poorer) regions, the detrimental impact of inequality on growth is smaller at the low or higher income inequality levels in coastal (richer) regions, which suggests that the effect of income distribution on growth is likely to vary with the regional development level. By comparing the empirical results for the whole country with those for the regions, we are provided with a clearer picture of the inequality-growth nexus in China.

China has experienced a sharp increase in income and inequality over several decades. The increase in inequality from a low level provides enhanced incentives for growth. However, the trend in income inequality has not significantly reversed with rapid economic growth, and a sustained increase in income inequality will hamper further growth. In the later stages of development, where human capital has emerged as a prime engine of growth, a very unequal society has prevented human capital accumulation from slowing economic growth in China. Therefore, increasing income inequality might lead to a negative effect on economic growth. From the policy point of view, China's government should focus it efforts on sharing the fruits of growth in the coastal regions with the less-developed inland regions, put more emphasis on the accumulation of human capital, and further improve relevant institutions and policies to reduce the high income inequality in favor of sustained economic growth.

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Chapter 5 Conclusions

China has been one of the fastest growing economies in the world since the economic reforms in 1978. The rapid increase in income inequality has also made China one of the most unequal countries in the world. According China's official data, the level of inequality in 2018 remains above the warning level of international standards, which has raised the social and political instability risk.

Data insufficiency is the main factor affecting research on income distribution in China. First, we calculate each provincial Gini coefficients from 1995 to 2013 for urban, rural and all residents. The results show the each provincial Gini coefficients for all residents have always been higher than the each provincial Gini coefficients for rural residents and urban residents. However, the accuracy and quality of Gini coefficient of rural and all residents cannot be compared with the urban Gini coefficient. Comparison of the different sources of Gini coefficient, our urban Gini coefficients are similar with other sources of Gini coefficient. The mean values of our urban Gini coefficients show the same trend with other sources of urban and national Gini coefficients.

Second, we analyze the factors effect China's income inequality. Income inequality in China is not only driven by economic factors, but also effects by social factors, policy factors, and political factors. With respect to economic factors, high dependence on international trade and FDI, inflation benefited the rich and privileged more than the poor, the increasing urban unemployment, technological progress, inequality in access to certain financial services, credit market underdevelopment, and the limited role of personal income tax and transfer payments to reduce income inequality all are likely to worsen income inequality in the process of economic growth.

As to social factors, income inequality is possible to worsen by China's hukou-related urban biases policy, and public expenditures on education does not keep up with the GDP growth. Policy factors including China has implemented uneven development policies at the early reform period, uneven regional development widen regional inequality. In addition, the limited role of the minimum wage regulation in reducing wage inequality. Since China's social-security expenditures level remained lower than most of developing countries at present, which is unfavorable to narrow income inequality.

Regarding to political factors, although China government has made numerous efforts to eliminate corruption, China's state of corruption has not significantly improved, which could contribute to the worsening income inequality. The strong

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government intervention in SOEs may have a negative influence on income distribution. The state power structure relations make the poor have less political rights to achieve bigger redistribution and more even income distribution. The different opportunities generated by authoritarian regime are also a source for illegal income and corruption. Those are likely to widen income inequality in the reform period of China.

Finally, we use the generalized method of moments (GMM) estimator to test whether there exists a threshold effect in the relationship between income distribution and economic growth. The empirical results show that there exists multiple income distribution thresholds at Gini coefficients of 0.225, 0.315, and 0.345. This implies that the effect of income distribution on national economic growth will change with different Gini coefficients. When the Gini coefficient is less than or equal to 0.225, a 1% increase in the Gini coefficient will impede economic growth by 0.27%; when it is between 0.225 and 0.315, a 1% increase in the Gini coefficient will stimulate economic growth by between 0.14% and 0.15%; and when it is higher than 0.315 or 0.345, a 1% increase in the Gini coefficient will reduce economic growth by 0.05% and 0.38%, respectively. These findings indicate that low or high income inequality in China will harm economic growth, and that moderate income inequality will benefit economic growth.

In addition, in comparison with inland (poorer) regions, the empirically results show that the detrimental impact of inequality on growth is less pronounced at low or high income inequality levels in the coastal (richer) regions. By comparing the empirical results for the whole country with those for the regions, we provide with a clearer picture of the inequality-growth nexus in China.

In China, the increase in inequality from a low level provides enhanced incentives for growth. However, the trend in income inequality has not significantly reversed with rapid economic growth, and a sustained increase in income inequality will hamper further growth. In the later stages of development, where human capital has emerged as a prime engine of growth, a very unequal society has prevented human capital accumulation from slowing economic growth in China. Therefore, increasing income inequality might lead to a negative effect on economic growth. From the policy point of view, China's government should focus its efforts on sharing the fruits of growth in the coastal regions with the less-developed inland regions, put more emphasis on the accumulation of human capital, and further improve relevant institutions and policies to reduce the high income inequality in favor of sustained economic growth.

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Appendix A: Estimated Urban Gini Coefficients in China—1995~2012

	Eastern Zone						Western Zone						Middle Zone					Northeast Zone	
Year	Tianjin	Shanghai	Jiangsu	Zhejiang	Fujian	Guangdong	Guangxi	Chongqing	Shaanxi	Qinghai	Xinjiang	Inner Mongolia	Shanxi	Anhui	Jiangxi	Henan	Hubei	Heilongjiang	Liaoning
1995	0.2246	0.2149	0.1960	0.2038	0.1929	0.2077	0.2130	0.1810	0.2109	0.2194	0.2782	0.2137	0.2041	0.1892	0.2108	0.2032	0.1886	0.2613	0.1971
1996	0.2320	0.2130	0.1966	0.2040	0.1992	0.2253	0.1929	0.1636	0.2052	0.2261	0.2858	0.2158	0.2199	0.1819	0.2040	0.1919	0.1972	0.2124	0.2064
1997	0.2437	0.2077	0.2174	0.2110	0.2120	0.2399	0.2170	0.1843	0.2162	0.2301	0.2892	0.2470	0.2589	0.1965	0.1720	0.2096	0.2092	0.2443	0.2202
1998	0.2516	0.2069	0.2283	0.2218	0.2230	0.2435	0.2244	0.1955	0.2355	0.2369	0.2819	0.2412	0.2506	0.1998	0.2080	0.2165	0.2094	0.2412	0.2354
1999	0.2546	0.2312	0.2490	0.2288	0.2210	0.2414	0.2303	0.2215	0.2355	0.2416	0.2537	0.2424	0.2422	0.2144	0.2236	0.2277	0.2259	0.2440	0.2372
2000	0.2605	0.2127	0.2587	0.2449	0.2375	0.2544	0.2481	0.2184	0.2667	0.2331	0.2762	0.2583	0.2717	0.2507	0.2165	0.2622	0.2427	0.2608	0.2507
2001	0.2860	0.2487	0.2779	0.2569	0.2505	0.2587	0.2683	0.2532	0.2732	0.2567	0.2585	0.2437	0.2762	0.2454	0.2494	0.2612	0.2501	0.2775	0.2502
2002	0.2928	0.2626	0.3537	0.2723	0.2798	0.3824	0.3451	0.2997	0.3275	0.3240	0.2993	0.2481	0.3386	0.3065	0.3128	0.3175	0.3118	0.3227	0.3131
2003	0.2929	0.2923	0.3373	0.2940	0.2755	0.3640	0.3482	0.2316	0.2644	0.3203	0.2771	0.3166	0.2712	0.2743	0.2649	0.2712	0.2993	0.3055	0.2820
2004	0.3040	0.2973	0.3476	0.3100	0.2802	0.3570	0.2860	0.2521	0.2727	0.2859	0.2870	0.2900	0.2797	0.2678	0.2766	0.2760	0.2550	0.3140	0.2870
2005	0.3147	0.2946	0.3440	0.3079	0.2804	0.3518	0.3114	0.2591	0.2723	0.3157	0.3000	0.2845	0.2820	0.2574	0.2660	0.2369	0.2612	0.3372	0.3002
2006	0.2914	0.2972	0.3424	0.3142	0.2679	0.3493	0.3040	0.2459	0.2751	0.3241	0.2844	0.2809	0.2785	0.2432	0.2636	0.2277	0.2791	0.3310	0.2972
2007	0.2951	0.2864	0.3450	0.3149	0.2857	0.3447	0.3110	0.2497	0.2818	0.3425	0.2675	0.2610	0.2843	0.2519	0.2577	0.2651	0.2739	0.3290	0.2985
2008	0.2968	0.2859	0.3618	0.3231	0.2960	0.3488	0.2882	0.2430	0.2895	0.3693	0.2819	0.3053	0.2879	0.2838	0.2528	0.2758	0.2945	0.3425	0.3289
2009	0.2820	0.2775	0.3326	0.3212	0.2939	0.3412	0.2829	0.2311	0.2867	0.3642	0.2593	0.2942	0.2896	0.2788	0.2637	0.2803	0.3044	0.3296	0.3122
2010	0.2749	0.2683	0.3290	0.3147	0.3021	0.3356	0.2720	0.2319	0.2768	0.3502	0.2627	0.2921	0.2893	0.2832	0.2567	0.2736	0.3145	0.3154	0.3098
2011	0.2710	0.2647	0.3109	0.3101	0.3096	0.3298	0.2872	0.2433	0.2602	0.3497	0.2653	0.3073	0.2955	0.2737	0.2753	0.2736	0.2852	0.3154	0.3127
2012	0.2645	0.2685	0.3005	0.3022	0.2928	0.3078	0.2768	0.2323	0.2596	0.3553	0.2448	0.2894	0.2942	0.2470	0.2621	0.2687	0.2760	0.2960	0.2888

Notes: 1. All figures are calculated by the author, based on the data provided by the *Provincial Statistical Yearbooks* 1996-2013.

2. Two provinces (Yunnan and Hunan) and year 2013 have been excluded for empirically analysis because the Gini coefficients data are incomplete.

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Appendix B: Provinces and Cities Included in the Sample

Number	Province/City	Location	Number	Province/City	Location
1	Tianjin	Coastal	11	Xinjiang	Inland
2	Shanghai	Coastal	12	Inner Mongolia	Inland
3	Jiangsu	Coastal	13	Shanxi	Inland
4	Zhejiang	Coastal	14	Anhui	Inland
5	Fujian	Coastal	15	Jiangxi	Inland
6	Guangdong	Coastal	16	Henan	Inland
7	Guangxi	Coastal	17	Hubei	Inland
8	Chongqing	Inland	18	Heilongjiang	Inland
9	Shaanxi	Inland	19	Liaoning	Coastal
10	Qinghai	Inland			

Appendix C: Goodness of Fit against Each Trial Income Distribution Threshold

*ID**	$\bar{R}^2$	*ID**	$\bar{R}^2$	*ID**	$\bar{R}^2$	*ID**	$\bar{R}^2$	*ID**	$\bar{R}^2$
0.1600	0.2805	0.2100	0.2817	0.2600	0.2796	0.3100	0.2806	0.3600	0.2796
0.1625	0.2805	0.2125	0.2823	0.2625	0.2795	0.3125	0.2807	0.3625	0.2795
0.1650	0.2805	0.2150	0.2831	0.2650	0.2795	0.3150	0.2807	0.3650	0.2795
0.1675	0.2800	0.2175	0.2836	0.2675	0.2795	0.3175	0.2805	0.3675	0.2795
0.1700	0.2799	0.2200	0.2840	0.2700	0.2797	0.3200	0.2803	0.3700	0.2795
0.1725	0.2798	0.2225	0.2843	0.2725	0.2799	0.3225	0.2800		
0.1750	0.2795	0.2250	0.2844	0.2750	0.2800	0.3250	0.2799		
0.1775	0.2795	0.2275	0.2842	0.2775	0.2801	0.3275	0.2798		
0.1800	0.2795	0.2300	0.2838	0.2800	0.2801	0.3300	0.2797		
0.1825	0.2796	0.2325	0.2832	0.2825	0.2802	0.3325	0.2798		
0.1850	0.2797	0.2350	0.2829	0.2850	0.2803	0.3350	0.2799		
0.1875	0.2798	0.2375	0.2825	0.2875	0.2804	0.3375	0.2802		
0.1900	0.2800	0.2400	0.2822	0.2900	0.2804	0.3400	0.2804		
0.1925	0.2802	0.2425	0.2819	0.2925	0.2805	0.3425	0.2807		
0.1950	0.2805	0.2450	0.2816	0.2950	0.2804	0.3450	0.2808		
0.1975	0.2806	0.2475	0.2813	0.2975	0.2804	0.3475	0.2807		
0.2000	0.2804	0.2500	0.2809	0.3000	0.2804	0.3500	0.2806		
0.2025	0.2803	0.2525	0.2804	0.3025	0.2805	0.3525	0.2803		
0.2050	0.2805	0.2550	0.2800	0.3050	0.2806	0.3550	0.2800		
0.2075	0.2810	0.2575	0.2798	0.3075	0.2806	0.3575	0.2798		

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