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TITOLO DELLA TESI

CHINA'S INCOME DISTRIBUTION AND TRADE

RELATORE

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Abstract

After 1978 economic reform, China's economy has been keeping booming growth. Meanwhile, China's income inequality has been growing rapidly. China's Gini Coefficient was around 0.30 in 1978, it has reached over 0.40 the international alertness line since 2000, and then hit the peak 0.49 in 2009. In recent years, the Gini coefficient has been decreasing, and went down to 0.46 in 2015. It shows an incomplete reversed U shape curve. Moreover, the China's import and export trade volume have risen from 0.038 trillion dollar in 1980 to 3.95 trillion in 2015, an annual growth rate of about 14%. In the most recent years the value of import and export went down slightly. It seems that there is a relationship between China's Gini Coefficient and the value of import and export.

Based on previous studies this research illustrated the influence mechanism of effect of income inequality on import and export at provincial level. And static and dynamic regressions model were used to test the effect of income inequality on import and export. The results are significant at the 99% level, and suggest income inequality within provinces (measured by Gini coefficient) brings about trade, which means that when the Gini coefficient increases also import-export increase. Meanwhile, income inequality between provinces (measured by Theil elements) restrains import and export.

This dissertation calculated multidimensional poverty by fuzzy set at provincial level, and found there is some correlation between multidimensional poverty and import-export.

KEY WORDS: CHINA, INCOME INEQUALITY, IMPORT AND EXPORT, MULTIDIMENSIONAL POVERTY

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1. Introduction

1.1 Background

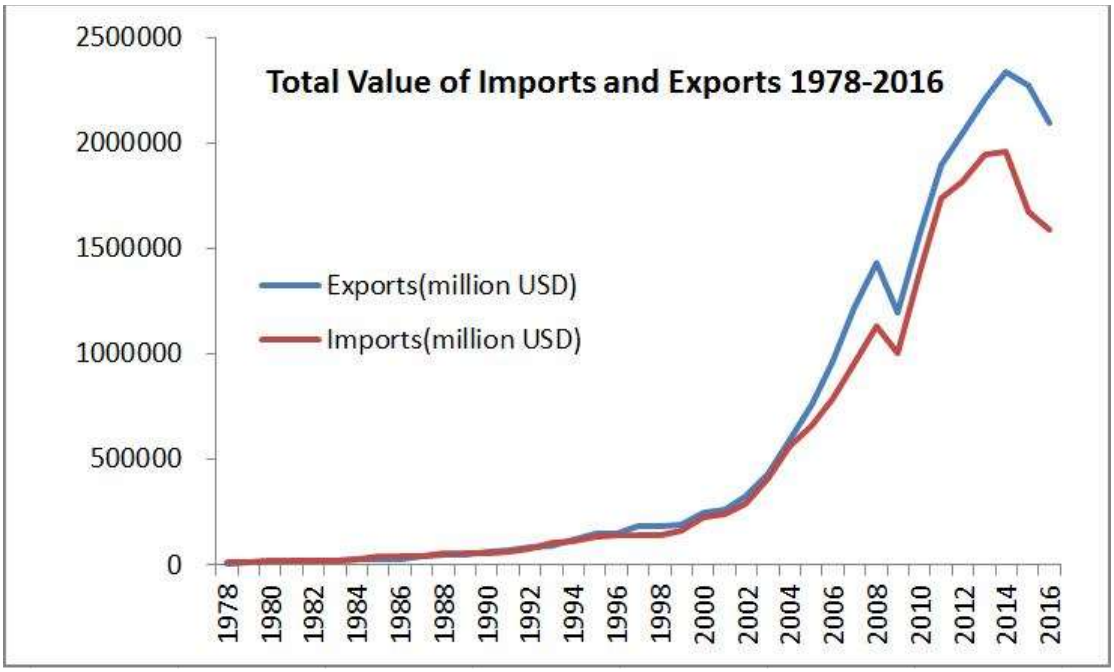
Since the late 1970s China's economic growth has been an economic miracle in the world. China's GDP were 3,678,700 million CNY in 1978. After economic reform 1978 (reform and open up; reform and openness), China's economy has been keeping booming growth rates. By 2016, China's GDP increased to 743,585,500 million CNY. The normal GDP annual growth reached 15%; even she passed through the financial crisis of 2007–2008. According to the WDI database, by 2010 China's GDP 5.93 billion USD (40.143 billion CNY) had surpassed that of Japan and became the second largest economy after the U.S. However, it was 149.54 billion USD (251.77 billion CNY) and ranked 13th in the world in 1978. According of data published by NBSC (National Bureau of Statistics of China) the Chinese Total Value of Imports and Exports have risen from 20,640 USD million (35,500 million CNY) in 1978 to 3,685,557 USD million (24,338,646 million CNY) in 2016, while the peak 4,301,527 USD million (26,424,177 million CNY) was reached in 2014. The annual growth of total value of trade is 14.6% from 1978 to 2016. China's has been the second largest importer and exporter in the world. Beside GDP and Imports and Exports, there has been growth in infrastructure, reserves, foreign direct investment, and development assistance.

But, at the same time, there has been growth in spatial divergence, and corruption, an underclass of migrant workers, environmental pollution, carbon emissions, and inequality. China only took three decades and brought her Gini coefficient to a very high 0.5 from a very low level 0.2.

China had adopted planned economy and equalitarianism over a long period since new China was established in 1949. Since 1978, China broke down equalitarianism and carried out a series of reforms to economic transition from planned economy to market economy. The inequality of China rose like trapped bird gets freedom. China's Gini coefficient took just twelve years to rise to 0.3 from 0.2. And ten years later it reached 0.4. The 0.4 is the international alertness line, according to the United Nation's definition, and a coefficient of 0.4-0.5 means high income disparity. More surprise was that in 2008 it approached 0.5 only eight years later. Even a report (China Household Finance Survey, 2013)[1] indicated China's household income inequality hit 0.6. Just 30 years after economic reform, China's inequality creased two levels from "relative equality" to "high income disparity" and jumped over the relatively reasonable level (0.3-0.4). In these ten years, the forth ten years form 1978 economic reform, China's Gini coefficient has been keeping at level of 0.4 according to NBSC. We could simply say the Gini coefficient almost reached the summit.

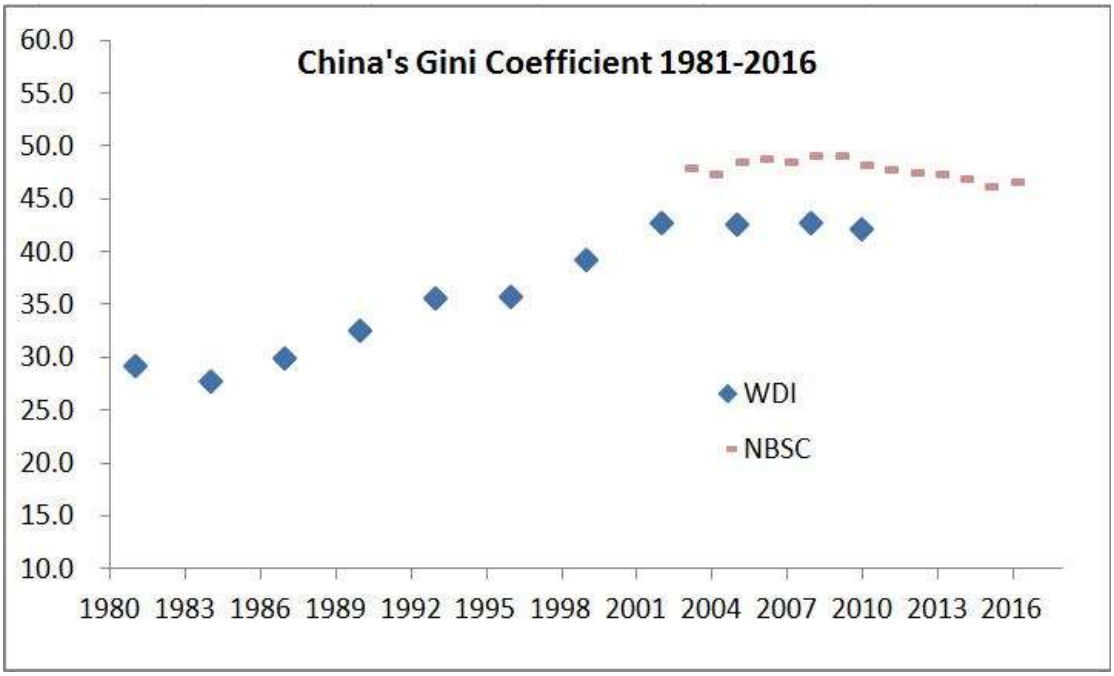
[1] China Household Finance Survey, 2013, China Household Income Inequality Report (zhongguo jiating shouru chaju baogao), *Southwestern University of Finance and Economics*

Figure 1.1 - 1. The values of import-export evolution



Data Sources：National Bureau of Statistics of China

Figure 1.1 - 2. The China's Gini coefficient evolution



Data Sources：National Bureau of Statistics of China and World Bank (WDI)

What the "Opening" has brought to China since 1978? We can say they are high level of value of trade and inequality. If we draw a diagram with the values of import-export and Gini coefficients,

we could find their trends look like similar. Since the economic reform 1978, the Gini coefficient has been rising rapidly. The values of import-export increased at the beginning slowly, and then faster around 1992, much more speedily since China's accession into WTO in 2001 as Figure 1.1 -1 and Figure 1.1 -2 show. We know their growths were synchronous, but their growth rates were different. Intuitively speaking, it seems there are relationships between import-export and income inequality.

According to the classical trade theories, trade improves income distribution, in other words, it reduces income inequality. Neoclassical international trade theory, the New Trade Theory and the new classical international trade theories, have the similar opinion on the relationship between trade and income distribution. The pattern of trade and inequality evolutions above, tell another story: trade did not improve income distribution in China. Both are growths, even synchronous. All the theories we mentioned above are unfit to explain the Chinese case. Considering how the theories, which are invalid, explained the relationship between trade and income distribution on aspects of Supply, it means the effect comes from trade to income distribution. The relationship goes probably in another way. We may say we could figure it out from opposite view, the Demand side: the effect of income distribution on trade.

The current theories on Demand side to explain relationship between trade and income distribution are not explicit about the influential mechanism. Linder (1961)[2] made the first try on it. The subsequent studies on the relationship between trade and income distribution on Demand side are all based on Linder's theory. This dissertation takes Demand side as theoretical justification, and explains the effect of income distribution on trade. We try and explain the China's case and endeavor in filling up the theoretical gap.

1.2 Contribution

For a long time, most studies on the relationship between income distribution and trade have been promoted on supply-side, which mean how trade affects income distribution. Few studies have started in the opposite, from the perspective of demand, which mean income distribution affects trade. Many researches were developed ignoring the demand-side model, but this type of analysis is undoubtedly important. This dissertation examines trade from the perspective of demand, expands the research horizon on the correlation between trade and income distribution, and further enriches the theory of demand-side. In the demand-side theory, only per capita income is used as the representative of demand. However, the total demand is not only affected by the average income level, but also affected by income distribution. This dissertation introduces income distribution indicators into the trade model to closely connect them two.

[2] Linder, S. (1961), An Essay on Trade and Transformation, *Almqvist and Wiksells*, Uppsala.

This dissertation is meaningful also in reality. At present, the income distribution disparity in China has been widening year by year, while trade has continued to prosper and China has got a Trade Surplus for a long time. Does the expansion of the income distribution gap have an impact on trade? China has become the second largest importer country. Is income distribution an important factor in China's imports? China is currently the world's largest exporter. What is the relationship between income distribution and export? Has China's trade continued to have a long-term surplus, and is it related to income distribution? Answering these questions is important for China at this stage and for other developing countries, too.

1.3 Conception

1.3.1 Income

Income is defined by NBSC in urban areas as "disposable income" including employee income (wages, salaries, and other compensation), self-employment income, property income, and transfer income from public and private sources, net of taxes and fees. The NBSC defined rural income as "net income[3]" including cash income from employment, and household business and production activities such as farming, as well as the monetary values of self-produced consumption, net of production costs, taxes and fees, depreciation of productive assets, and net private transfers. The measurement consists primarily of cash income from various sources; imputed rents on owner-occupied housing are not included. Moreover, income in-kind is not fully captured.

Khan et al. (1992)[4] pointed out two shortcomings of the NBSC's income measures. One is the exclusion of imputed rent of owner-occupied housing. Another is the understatement of consumption subsidies, mostly to urban households. In the past, consumption subsidies arose due to the provision of low-priced consumer goods and subsidized rental housing under the planned economy. Later, since 1978 economic reform, the consumption subsidies have been gradually eliminated, as well as the urban rental housing, but not completely.

In the light of Khan *et al*. (1992) considerations, we have two kinds of Income; one referred to "Income NBSC", another as "CHIP income", which is equal to NBSC income plus imputed rents on owner-occupied housing plus implicit subsidies on subsidized public urban rental housing. In this dissertation we take "NBSC income" when we explore income inequality and trade, while we use "CHIP income" when we explore multidimensional poverty.

1.3.2 Income Inequality

1.3.2.1 Why inequality is important?

[3] National Bureau of Statistics of China (2008), Zhongguo Nongcun Zhuhu Diaocha Nianjian 2008 (China Yearbook of Rural Household Survey 2008), Beijing: *China Statistics Press* (Zhongguo Tongji Chubanshe)

[4] Khan, A.R., K. Griffin, C.Riskin, and R.Zhao (1992), "Household Income and Its Distribution in China," *China Quarterly*, no. 132, 1029-1061.

Inequality is an important value in modern societies. Irrespective of economics, philosophy, religion, culture, ideology, people care about inequality. Income inequality has always been viewed as closely related to conflict. In the introduction of his celebrated book On Income Inequality, Amartya K. Sen (1973)[5] asserts that "the relation between inequality and rebellion is indeed a close one." The more serious inequality involves poverty, which makes the study of inequality more meaningful. Since economic inequality makes a material difference, at some choices on material object some people could choose, while the others could not have the same set of choices. However, resources are generally limited. For a given level of average income, education, capital, asset, land ownership etc., increased inequality of these characteristics will almost always imply higher levels of both absolute and relative deprivation in these dimensions.[6]

Inequality matters from poverty to opportunities and rights. People always fight for their own opportunities and rights. If the degree of inequality is acceptable by the majority of the population, the fighting may reduce the inequality within the society, if not, the conflict comes up. An unstable social environment leads to a more difficult economic growth because of inequality[7]. Therefore, the inequality matters for economic growth at the macro level. So, in economics, widening inequality has significant implications for growth and macroeconomic stability; it can concentrate political and decision making power in the hands of a few, lead to a suboptimal use of human resources, cause investment-reducing political and economic instability, and raise crisis risk.[8]

The economic inequality is divided in wealth inequality and income inequality. Wealth inequality is a stock concept of economic inequality, while income inequality is a flow concept of economic inequality.

1.3.2.2 What is income inequality?

Income is usually defined over household or individual disposable income in a particular year. It consists of earnings, self-employment and capital income and public cash transfers; income taxes and social security contributions paid by households are deducted. The income of the household is attributed to each of its members, with an adjustment to reflect differences in needs for households of different sizes. This is why the concept of equivalent income has been introduced.[9] Income inequality is the unequal distribution of household or individual income across the various participants in an economy.[10]

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[5] Sen, Amartya K. 1973. On Economic Inequality. *Oxford: Clarendon Press*, Chapter 1

[6] McKay, A.(2002). Defining and Measuring Inequality.*Overseas Development Institute and University of Nottingham. Briefing Paper No 1 (1 of 3). March 2002*.

[7] Alesina, A. and Perotti P. (1996). Income Distribution.*Political Instability and Investment*, EER 40(6):1203-1229.

[8] Era Dabla-Norris, Kalpana Kochhar, and Nujin Suphaphiphat.(2015).Causes and Consequences of Income Inequality : A Global Perspective. *International Monetary Fund*, June 15, P6

[9] OECD (2017), Income inequality (indicator). doi: 10.1787/459aa7f1-en (Accessed on 12 November 2017) https://data.oecd.org/inequality/income-inequality.htm

[10] What is 'Income Inequality',http://www.investopedia.com/terms/i/income-inequality.asp

The economic inequality people often talk about refers to three aspects, income, wealth and consumption. Wealth is an economic stock indicator, while income and consumption are economic flow indicators.

Income inequality is the most commonly cited measure, primarily because the data on it is the most comprehensive.[11] Income is a relatively straightforward matter of wages and compensation. However, wealth is more mercurial. It can be a physical asset like a car, house, or land. But it can also be a stock or bond or other financial asset.[12] Income decides your standard of living, but wealth gives you control over the shape and future course of the economy. Generally, wealth is the most unevenly distributed of the three, income the second, consumption the least. Wealth is an important metric since it can be inherited, unlike income. So it is a suitable variable to study Hierarchical solidification. Meanwhile, income inequality is a more suitable variable than wealth inequality to study well-being and social stability.

Consumption inequality, though harder to measure, provides a better proxy of social welfare. This is because people's living standards depend upon the amount of goods and services they consume, rather than upon how much valuable possession they are having. Consumption is also thought to have diminishing marginal utility, because of The Law of Diminishing Marginal Propensity to Consume, a poorer person will value an additional unit of consumption more than the richer person.

1.3.2.3 Levels, dimensions and variables related

Considering income inequality, one should think about levels, dimensions and variables related. Generally speaking, income inequality could be described at different aggregation levels which often result in different geographical areas. If we talk about decomposition income inequality, the Theil index could achieve it.

By measurement the Theil index, Income inequality can be decomposed at different levels of geographical aggregations. At the national level it can be decomposed into within-subgroup, between subgroup, and overlapping components. In a similar way at the international level it can be decomposed into within-country, between-country, and overlapping components. In the measurement of world income inequality, it is desirable that the unit of analysis is the citizens of the world rather than countries.

[11] A three-headed hydra, the economist, Jul 16th 2014, 10:33 BY Z.G. | LONDON, https://www.economist.com/blogs/freeexchange/2014/07/measuring-inequality

[12] Jeff Spross, Wealth inequality is even worse than income inequality, http://theweek.com/articles/717294/wealth-inequality-even-worse-than-income-inequality

Representative individual based micro data is preferable.[13] The dimensions, generally speaking at the micro-level, involve gender, education, residency, occupation and so on, and refer to the demographic aspects of the population. Meanwhile, many of the economic variables related to income inequality are available at the macro-level, imbalanced regional growth, consumption, issues on the labor market, aging, inflation, social crime, happiness, financial structure, savings, taxation, public policy, marketization, economic development, credit, international trade, education, industry, social behavior, free trade, etc.

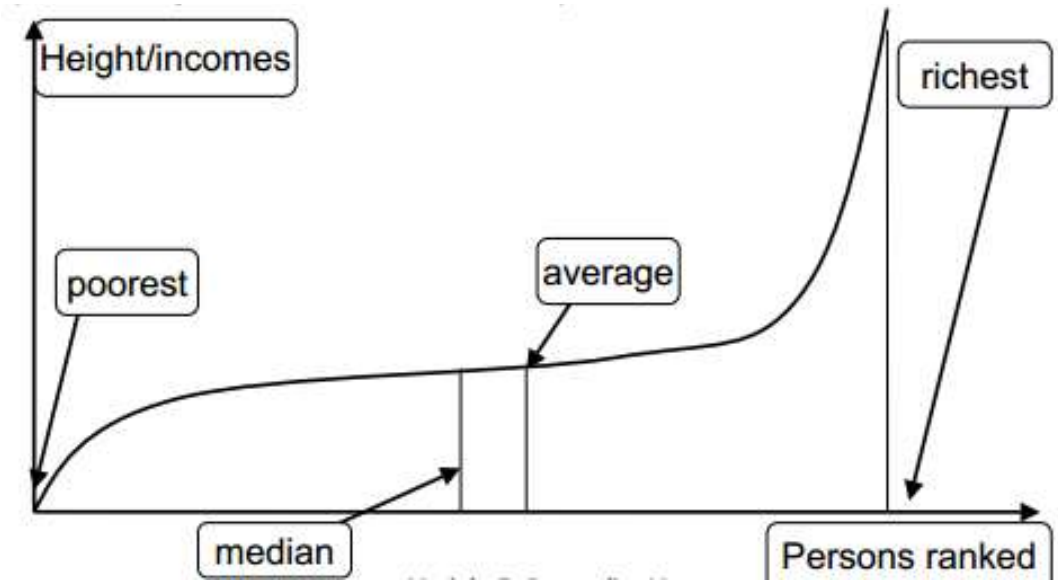
1.3.2.4 Charting income inequality

The diagrammatic form is a visual expression. If we talk about income inequality, we could chart income inequality by Pen's parade and Lorenz curve.

Pen's Parade, or the Income Parade, is a concept described in a 1971 book published by Dutch economist Jan Pen describing income distribution. The parade is defined as a succession of every person in the economy, with their height proportional to their income, and ordered from lowest to highest. The Pen's description of what the spectator would see is a parade with dwarves at the beginning, and then some unbelievable giants at the very end.[14]

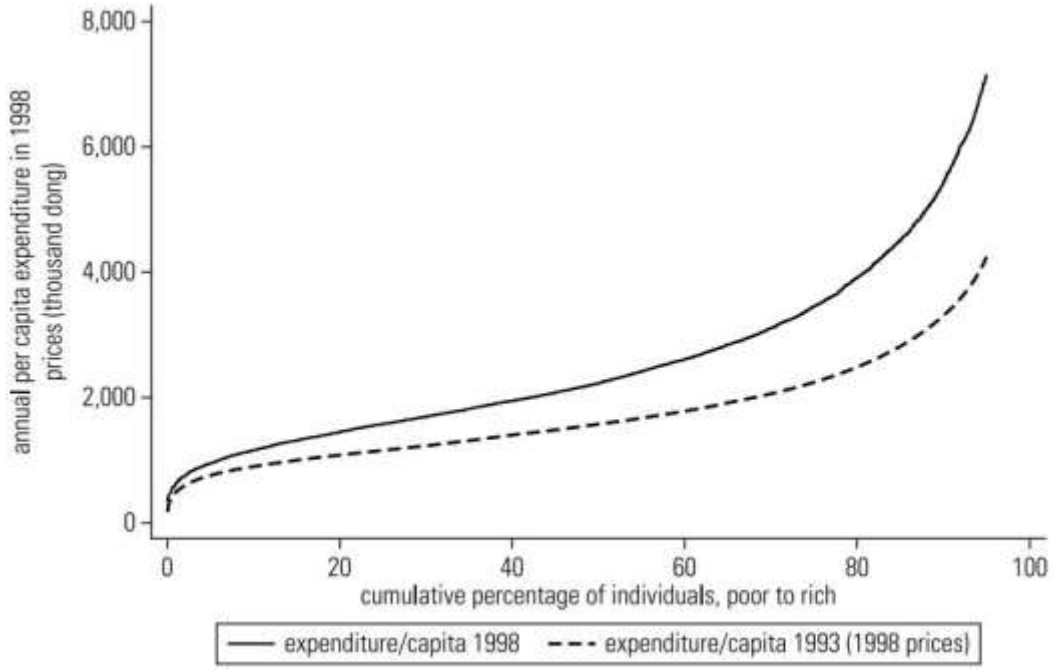
The original context of the parade is the United Kingdom, and the duration is one hour. The parade is used by economists as a graphical representation of income inequality because it's a form of quantile function and it is considered useful when comparing two different areas or periods.[15]

Figure 1.3 - 1. Pen's parade, ranking persons by their incomes



[13] Almas Heshmati. (2004).Inequalities and Their Measurement. *IZA* Discussion Paper No. 1219
[14] Crook, Clive (September 2006). "The Height of Inequality". *The Atlantic. Retrieved* 28 May 2015.
[15] Haughton and Khandker. "Inequality Measures" (PDF). *World Ban*k.

Figure 1.3 - 2. Comparing two Pen's parade curves

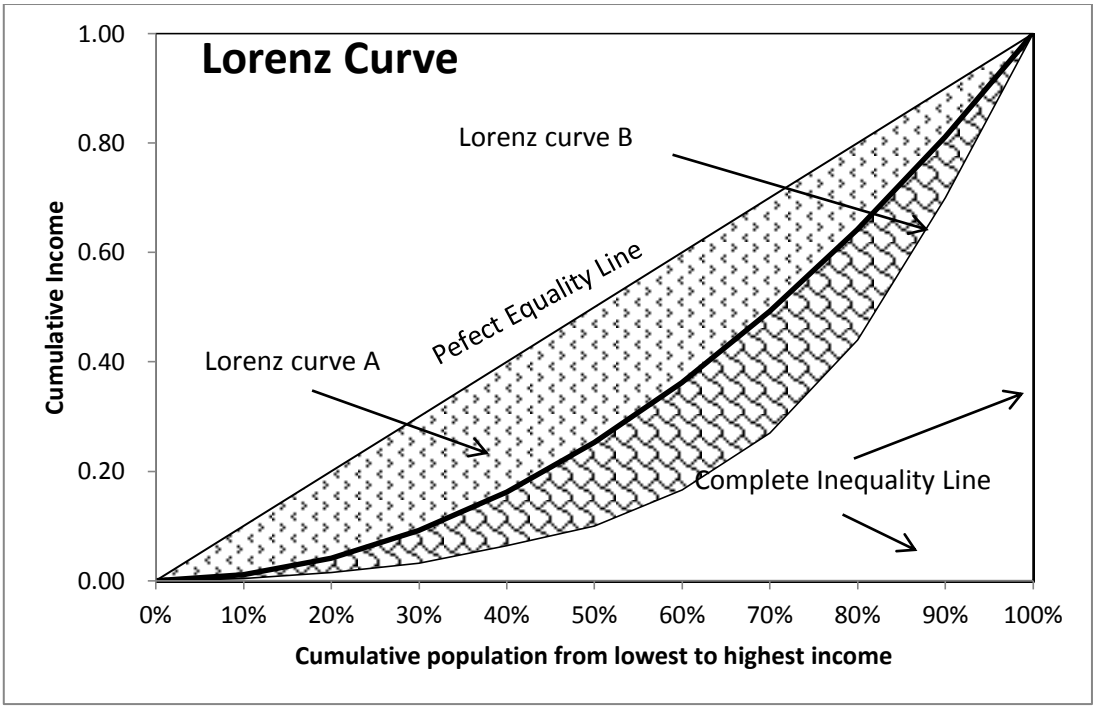


This picture (Figure 1.3 - 2) is Pen's parade (quantile function)[16] for expenditure per capita, Vietnam, 1993 and 1998. X axis shows the cumulative percentage of individuals, from poor to rich, by 100 units. If Y axis shows the income, the solid line represents more inequality than the dashed line.

The Lorenz curve is a graphical representation of the distribution, such as, income or wealth. It was developed by Max O. Lorenz in 1905 for representing inequality of income or of the wealth distribution. Lorenz curve, sorts the population from poorest to richest, and shows the cumulative proportion of the population on the horizontal axis and the cumulative proportion of income (or expenditure) on the vertical axis. On the graph, a straight diagonal line represents perfect equality of income distribution; the Lorenz curve lies beneath it, showing the reality of income distribution. The area comprised between the straight line and the curved line represents the amount of inequality of income distribution. Lorenz curve A therefore represents lower inequality *vis-à-vis* Lorenz curve B.

Figure 1.3 - 3. Lorenz Curve

[16] Haughton, Jonathan; Khandker, Shahidur R.. 2009. Handbook on poverty and inequality. Washington, DC: World Bank.P109, Pen's parade (quantile function) for expenditure per capita, Vietnam, 1993 and 1998



1.3.2.5 Measurements

Four criteria for inequality measurement:[17] make income inequality assessment universal.

1) Anonymity principle (sometimes called the symmetry principle), which says that it does not matter who receives the income. Permutations of incomes among people should not matter for inequality judgments. This means that we can always arrange the income distribution of n people so that $y_1 \leq y_2 \leq \ldots \leq y_n$, where y is income. If the prime minister trades his income with one of yours, income inequality should not change.

2) Population principle, which says that cloning the entire population and their incomes should not change overall inequality. According to this principle, population size does not matter. All that matters are the proportions of the population that earn different levels of income.

3) Relative income principle, which says that only relative incomes and not the absolute levels of these incomes matter. For example, think of an income distribution over two people: the first having half income with respect to the second, e.g. (500, 1000). This principle means that the same inequality level should be found as with (2000, 4000), and therefore it would be the same regardless of the currency the incomes are denominated in.

4) The Dalton principle (also known as "Pigou-Dalton transfer principle"): Let $(y_1, y_2, \ldots, y_n)$ be an income distribution and consider two incomes y_i and y_j, with $y_i \leq y_j$. A transfer of income from the "not richer" individual to the "not poorer" individual will be called a regressive

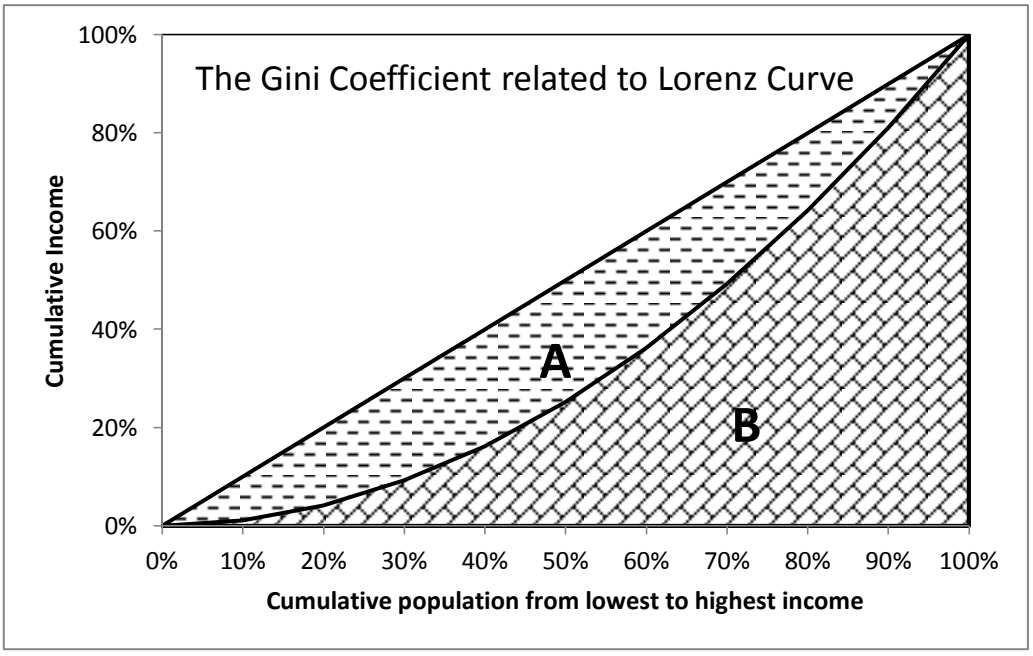
[17] Debraj Ray, development economics, *Oxford University Press*

transfer and makes inequality higher. The Dalton principle states that if one income distribution can be generated from another via a sequence of regressive transfers, then the original distribution is more equal than the other. Formally, we say that *i* satisfies the Dalton principle if and only if for every income distribution, $i(y_1 ,...,y_i ,...,y_j ,...,y_n) < i(y_1 ,...,y_{i-\delta},...,y_{i+\delta},..., y_n)$, for every positive number δ.

I. Gini Coefficient

The Gini coefficient is based on the comparison of cumulative proportions of the population against cumulative proportions of income they receive.[18] It is a measure of the deviation of the distribution of income among individuals or households within a country from a perfectly equal distribution.[19] It is defined as half the average of all pairwise absolute deviations between people, relative to the mean income. It ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality. The Gini's main limitation is that it is not easily decomposable or additive. Also, it does not respond in the same way to income transfers between people in opposite tails of the income distribution as it does to transfer in the middle of the distribution. Furthermore, the same Gini coefficient can represent very different income distributions.

Figure 1.3 - 4. The Gini Coefficient related to Lorenz Curve



The Gini coefficient can be related to the Lorenz curve: it is calculated by the ratio of area A over area A+B. On the graph earlier, the Gini is 0 if there is total equality and 1 if there is total inequality.

[18] Income inequality, OECD Data, https://data.oecd.org/inequality/income-inequality.htm

[19] Income Gini coefficient, Human Development Reports,United Nations Development Programme, http://hdr.undp.org/en/content/income-gini-coefficient

$$Gini = \frac{\text{area A}}{\text{area (A + B)}}$$

Calculate the Gini coefficient with formula:

$$\text{Gini coefficient} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}|y_i - y_j|}{2n(n-1)\bar{y}}$$

Where y_i and y_j are individual incomes or consumptions with a mean of $\bar{y}$, and n is the total number of observations for both individual and households.

The advantage of Gini coefficient is that it is easy to understand, in the light of the Lorenz curve. However, the first disadvantage, the Gini coefficient is not additive. The aggregate Gini for the total population is not equal to the sum of the Gini coefficients for its subgroups. The second disadvantage, the coefficient is sensitive to changes in the distribution, irrespective of whether they take place at the top, the middle or the bottom of the distribution (any transfer of income between two individuals has an impact, irrespective of whether it occurs among the rich or among the poor). The third, Gini coefficient gives equal weight to those at the bottom and those at the top of the distribution.

There are a plenty of studies about the calculation and decomposition of Gini coefficient The related study could be found by Chakravarty (1990)[20], Cowell (2000)[21], Atkinson (1970a)[22], Shorrocks (1984)[23], Shi Li(1999,[24] 2002[25]), Zongsheng Chen(2002)[26], Yonghong Cheng(2006[27], 2008[28]), Chengwu Jin(2007)[29], Zuguang Hu(2004)[30], Guanghua Wan(2004)[31], Jing Dong, Zinai

[20] Chakravarty, S. R.(1990).Ethical Social Index Numbers[M]. *New York: Springer Verlag*.P53

[21] Cowell, F. A.(2011). Measuring Inequality [M]. *Oxford: Oxford University Press*.P39

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[24] Li, Shi. and Zhao, Renwei.(1999). A study on income distribution of Chinese Residents 2 (Zhongguo Jumin Shouru Fenpei Zaiyanjiu)[J] *Economic Research Journal*,1999(4):3-17

[25] Li, Shi. (2002).Further Explanation Of The Gini Coefficient Estimation And Decomposition: A Reply To Professor Chen Zongsheng 'S Comments (Dui Jinni Xishu Gusuan Yu Fenjie De Jinyibu Shuoming – Dui Chen Zongsheng Jiaoshou Pinglun De Zaidafu)[J]. *Economic Research Journal*,2002(5):P84-7

[26] Chen, Zongsheng. (2002). A Suggestion On The Calculation Method Of The Overall Gini Coefficient - A Re-Comment For Researcher Shi Li's "Reply"(Guanyu Zongti Jini Xishu Jisuan Fangfa De Yige Jianyi – Dui Li Shi Yanjiuyuan<Dafu>De Zaipinglun) [J]. *Economic Research Journal*, 2002(5):P81-7

[27] Cheng, Yonghong.(2006).Calculation And Decomposition Of The Overall Gini Coefficient In Dual Economies (Eryuan Jingji Zhong Chengxiang Hunhe Jini Xishu De Jisuan Yu Fenjie) [J]. *Economic Research Journal*, 2006(1):P109-120

[28] Cheng, Yonghong.(2008).A New Decomposition Of Gini Coefficient By Population Subgroups (Jini Xishu Zuqun Fenjie Xinfangfa Yanjiu: Cong Chengxiang Eryazu Dao Duoyazu)[J]. *Economic Research Journal*. 2008(8) :P124-44.

[29] Jin, Chengwu.(2007). Gini Coefficient for Discrete income data in Vector-Matrix Forms and Related issues(Lisan Fenbu Shouru Shuju Jini Xishu De Juzhen Xiangliang Xingshi Ji Xiangguan Wenti)[J]. *Economic Research Journal*,2007(4):P149-58.

[30] Hu, Zuguang.(2004). A Study Of The Best Theoretical Value Of Gini Coefficient And Its Concise Calculation Formula(Jini Xishu Lilun Zuijiazhi Jiqi Jianyi Jisuan Gongshi Yanjiu) [J]. *Economic Research Journal*. 2004(9):P60-9 .

[31] Wan, Guanghua.(2004). Measurement and Decomposition of Income Distribution: A evluation for Methodology (Shouru Fenpei De Duliang Yu Fenjie: Yige Duiyu Yanjiu Fangfa De Pingjia)[J]. *World Economic Papers*,

Li(2004)[32], Hu Li(2005)[33], Xingjian Hong(2008)[34], Jinfeng Zhang, Peiguo Yu(2006)[35] *et al*.

II. Dispersion Ratio Measures

The dispersion ratios measure the "distance" between two groups in the distribution of income. Typically, they measure the average income of the richest *x%* divided by the average income of the poorest *x%*. There are different alternatives, the most frequently used are for deciles and quintiles. A decile is a group containing 10% of the total population ranked according to their individual income from poorer to richer.

$$\text{Decile ratio} = \frac{\text{average income of top group i}}{\text{average income of bottom group j}}$$

Group *i* and group *j* can be defined as deciles (1/10), quintiles (1/5), quartiles (1/4), percentiles (1/100), etc.

The advantage of the decile ratio is readily understandable. Comparing to the top group and bottom group, to some extent, it shows the inequality according to the ratio. The higher the ratio is, the more inequality is observed.

The disadvantage is that the value of decile ratio is very much vulnerable to extreme values and outliers, especially in case of estimates from small samples. In addition, its meaning is mathematical rather than economic, because it is not derived from principles about equity.

The other common indicators following this measure are:

Quintile ratio, the 20:20 ratio compares how much richer the top 20% of people are, compared to the bottom 20%.[36] If it is more inequality in a group the first quintile or last quintile, its decile ratio should be more sensitive. Quintile ratio is better to see the whole.

P90/P50 of the upper bound value of the ninth decile to the median income, it shows the distance between the upper and the median. The less the ratio is, the more equality is. It is mainly to study the upper group income.

2004(1):P64-9.

[32] Dong, Jing. And Li, Zinai.(2004). Revise The Urban-Rural Weighting Method And Application: Estimating The China's National Gini Coefficient By The Rural-Urban Gini Coefficients(Xiuzheng Chengxiang Jiaquanfa Jiqi Yingyong – You Nongcun He Chengzhen Jinni Xishu Tuisuan Quanguo Jinni Xishu) [J]. *The Journal of Quantitative & Technical Economics*,2004(5):P120-3.

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[34] Hong, Xingjian.(2008). A New Subgroup Decomposition Formula for Gini Coefficient: Urban - rural Decomposition of China 's Gini Coefficient (Yige Xinde Jinni Xishu Ziqun Fenjie Gongshi – Jian Lun Zhongguo Zongti Jinni Xishu De Chengxiang Fenjie)[J]. *China Economic Quarterly*, 2008(10):P307-24.

[35] Zhang, Jinfeng. and Yu, peiguo. (2006). Calculate the Gini Coefficient by Group: A matrix decomposition method (An Renqun Fenzu Jisuan Quanguo Jinni Xishu: Yizhong Juzhen Fenjie Fangfa) [J], Statistics and Decision, 2006(12):P142-3.

[36] https://www.equalitytrust.org.uk/how-economic-inequality-defined

P50/P10 of median income to the upper bound value of the first decile,[37] it shows the distance between the lowest and the median. The less the ratio is, the more equality is. It is mainly to study the lowest group income.

- **Palma Ratio**

The Palma ratio, named after Gabriel Palma (2011) is the ratio of the income share of the top 10% to that of the bottom 40%. In more equal societies this ratio will be one or below, meaning that the top 10% does not receive a larger share of national income than the bottom 40%. The Palma ratio addresses the Gini coefficient's over-sensitivity to changes in the middle of the distribution and insensitivity to changes at the top and bottom.[38],[39]

III. Theil index and General Entropy measures

The values of the General Entropy (GE) class of measures vary between zero (perfect equality) and infinity (or one, if normalized). A key feature of these measures is that they are fully decomposable, i.e. inequality may be broken down by population groups or income sources or using other dimensions, which can prove useful for policy makers. Another key feature is that researchers can choose a parameter α that assigns a weight to distances between incomes in different parts of the income distribution. For lower values of α, the measure is more sensitive to changes in the lower tail of the distribution and, for higher values, it is more sensitive to changes that affect the upper tail (Atkinson and Bourguignon, 2015)[40]. The most common values for α are 0, 1, and 2. When α=0, the index is called "Theil's L" or the "mean log deviation" measure. When α=1, the index is called "Theil's T" index or, more commonly, "Theil index". When α=2, the index is called "coefficient of variation". Similarly to the Gini coefficient, when income redistribution happens, change in the indices depends on the level of individual incomes involved in the redistribution and the population size (Bellù, 2006)[41].

For a population of N "agents" each with characteristic x, the situation may be represented by the list x_i $(i=1,...,N)$ where x_i is the characteristic of agent i. If the characteristic is income, then x_i is the income of agent i. The Theil index is defined as[42]:

$$T_T = \frac{1}{N}\sum_{i=1}^{N}\frac{xi}{\mu}ln\left(\frac{xi}{\mu}\right)$$

[37] https://data.oecd.org/inequality/income-inequality.htm

[38] Alex Cobham, Palma vs Gini: Measuring post-2015 inequality,*Center For Global Development*,4/5/13 http://www.cgdev.org/blog/palma-vs-gini-measuring-post-2015-inequality

[39] How is Economic Inequality Defined? *The equality trust* https://www.equalitytrust.org.uk/how-economic-inequality-defined

[40] Anthony, B. Atkinson and François,Bourguignon.(2015).Handbook of Income Distribution

[41] Bellù, L. G., and Liberati, P. (2006), 'Describing Income Inequality: Theil Index and Entropy Class Indexes', *Food and Agriculture Organization of the United Nations*

[42] http://www.poorcity.richcity.org (Redundancy, Entropy and Inequality Measures)

Where μ is the mean income:

$$\mu = \frac{1}{N}\sum_{i=1}^{N} xi$$

Because of decomposable characteristics, Theil index could be represented by,

$$T_t = T_b + T_w$$

Where T_t is total Theil index, T_b is Theil index between group, T_w is Theil index within group.

$$T_b = \sum_{k=1}^{K} y_k ln\left(\frac{yk}{Nk/N}\right)$$

$$T_w = \sum_{k=1}^{K} y_k \left(\sum_{i \in gk} \frac{yi}{yk} ln \frac{yi/yk}{1/Nk}\right)$$

k is the number of groups, denotes *N* agents divided by *k* groups. The group called *gk, (k=1,…,k)*, *Nk* is the number of agents in group *gk* and *yk* is the income share of group *k* over the total income. y_i is the income share of agent *i* over the total income.

While the General Entropy is defined as[43]:

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha}[\frac{1}{N}\sum_{i=1}^{N}\left(\frac{x_i}{\mu}\right)^{\alpha} - 1]$$

Where α is the weight given to distances between incomes at different parts of the income distribution.

IV. The Robin Hood Index

Conceptually, this is a simple measurement of inequality used in income metrics. It is equal to the portion of the total community income that would have to be redistributed (taken from the richer half of the population and given to the poorer half) for the society to live in perfect equality. The Robin Hood index[44] is based on the Lorenz Curve and is closely tied to the better known inequality measure the Gini coefficient, which is also based on the Lorenz curve. In other words, the Robin Hood index is the proportion of money which would need to transfer from the rich to the poor to achieve equality.

[43] Feng, Xinguang.And Zhang, Xiaojing.(2005). Measuring And Decomposing Of Regional Inequality Based On Generalized Entropy Index:1978-2003(Jiyu Guangyishang Zhishu De Diqu Chaju Cedu Yu Fenjie:1978-2003), *Statistics & Information Forum*, Vol.20 No.4,July,2005

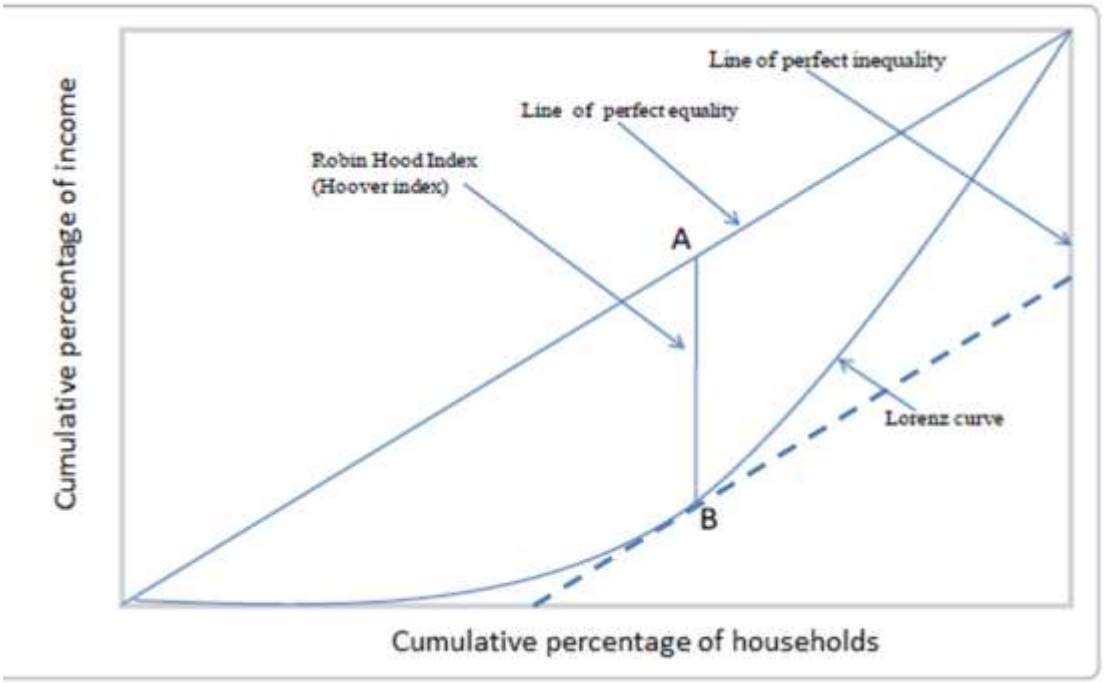
[44] Edgar Malone Hoover jr. (1936) The Measurement of Industrial Localization, *Review of Economics and Statistics*, 18, No. 162–71

$$H = 1/2 \sum_{i=1}^{N} | \frac{Ei}{E_{total}} - \frac{Ai}{A_{total}} |$$

Where E_i is the income of quintile i and A_i is the amount of earners in quintile i, while E_{total} is the sum of incomes and A_{total} is the sum of all earners.

The Robin Hood index is equivalent to the maximum vertical distance between the Lorenz curve, or the cumulative portion of the total income held below a certain income percentile, and the Perfect Equality Line, that is the 45 degree line of equal incomes.

Figure 1.3 - 5. the value of Robin Hood Index equal the distance of AB



V. Atkinson's inequality measure

Atkinson's inequality measure (or Atkinson's index) is the most popular welfare-based measure of inequality. It presents the percentage of total income that a given society would have to forego in order to have more equal shares of income between its citizens. This measure depends on the degree of society aversion to inequality (a theoretical parameter decided by the researcher), where a higher value entails greater social utility or willingness by individuals to accept smaller incomes in exchange for a more equal distribution. An important feature of the Atkinson index is that it can be decomposed into within-and between-group inequality. Moreover, unlike other indices, it can provide welfare implications of alternative policies and allows the researcher to include some normative content to the analysis (Bellù, 2006).

Atkinson noted inequality cannot be measured without introducing social judgments[45] as the formula showing below,

$$A_\varepsilon = 1 - \left[\frac{1}{n}\sum_{i=1}^{n}\left[\frac{y_i}{\mu}\right]^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}$$

$A_\varepsilon A_\varepsilon$ is Atkinson's index. y_i is income of individual or group i, n is the number of sample, ε is sensitivity parameter, also called "inequality aversion parameter", $0<\varepsilon<+\infty$ where 0 means that the researcher is indifferent about the nature of the income distribution, while infinity means the researcher is concerned only with the income position of the very lowest income group.

In practice, ε values of 0.5, 1, 1.5 or 2 are used; the higher the value, the more sensitive the Atkinson index becomes to inequalities at the bottom of the income distribution.

VI. Range

The Range (or called "The Relative Range" is imputed by Range over a given value like mean) is the common statistical measures of dispersion for a distribution in general. It is useful measures in the context of income. The range is defined as the absolute difference between the highest and the lowest income levels divided by the mean income:

$RGE = (x_{max} - x_{min})/\mu$

Where the arithmetic mean income is $\mu = 1/n \sum^{n}_{i=1} y_i$

The method is easy to understand and calculate. Another advantage is this method is not affected by inflation. However, it is very sensitive to extreme observations, while it ignores all but two of the observations.

VII. Summary

The Range and Dispersion Ratio Measures satisfy the first three criteria, and are easy to understand and calculate, but violate the Pigou-Daltion principle by ignoring the distribution inside the range. If we have not enough data, they are still proper measurements. The Robin Hood Index violates the Pigou-Daltion principle, too. For instance, when transfer happens between high income observation and low income observation comparing to mean income, the Robin Hood Index changes. Otherwise, when transfer happens within higher income observation, or within lower income observations, the Robin Hood Index will not change.

The Gini coefficient, Theil's inequality measures and Atkinson's index satisfy all four criteria conditions.[46] The Gini Coefficient generally regarded as gold standard in economic work. It is attractive intuitive interpretation. Also, it allows direct comparison between units with different

[45] Atkinson AB. The economics of inequality. *Oxford: Clarendon Press*, 1975. p.47.

[46] Almas Heshmati, Inequalities and Their Measurement, *MTT Economic Research and IZA Bonn*, July 2004, Discussion Paper No. 1219

size populations. It incorporates all data. Just for this reason, it requires comprehensive individual level data and imputed with a more sophisticated method. A major limitation of Lorenz curves is that since when two Lorenz curves intersect we can not say which distribution is more unequal.

Theil's T Statistic lacks an intuitive picture and involves more than a simple difference or ratio. It is comparatively mathematically complex measure. Nonetheless, it has several properties that make it a superior inequality measure. Theil's T Statistic can incorporate group-level data and is particularly effective at parsing effects in hierarchical data sets. Theil's T allows the researcher to parse inequality into within group and between group components. There is a limited should be considered if compare populations with different size that Thei's T cannot directly compare populations with different sizes or group structures

Considering to the inability of the Gini framework to give different parts of the income spectrum varying weights, the Atkinson index allows for varying sensitivity to inequalities in different parts of the income distribution. Atkinson's index can be decomposed, but the sum is not equal to between add within.

1.3.3 Poverty

Income is an important proxy variable to measure poverty, is an important tool to achieve poverty alleviation, but cannot fully reflect the real poverty situation. To this end, some other variables are added to measure poverty. Based on Amartya Sen's capability approach, Alkire and Foster (2007)[47] constructed a multidimensional poverty index to fully reflect the multi-dimensional deprivation of the poor. The multidimensional poverty index includes important indicators that reflect environmental poverty and asset poverty. Income variable and multi-dimensional poverty methods are valuable to measure poverty, monitor poverty and formulate anti-poverty policy.

The understanding of poverty is an evolving process that progresses with the development of human society. The definition of poverty is also deepening and enriching. Initially, people's awareness of poverty was largely confined of avoiding hunger and malnutrition. In 1901, the British scholar Benjamin Seebohm Rowntree (1901)[48] began to use income to define British poverty. In 1981, the World Bank began to calculate the consumption and income poverty of the developing countries. In 1990, based on the capability approach of the Amartya Sen, the Human Development Index (HDI) first time is presented in the Human Development Report by the United Nations Development Programme, and defined poverty on the perspective of human development. In 2010, based on Sabina Alkire's measurement, multi-dimensional poverty index (MPI) is presented in the Human Development Report by UNDP, and expanded the measurement of

[47] Alkire,S;Foster,J.E Counting and multidimensional poverty measures.*[OPHI Working Paper 7,*]2007
[48] Benjamin Seebohm Rowntree. Poverty, A Study of Town Life. *Macmillan Publishers*.1901

poverty. So far, we can classify the widely used criteria for measuring poverty: income variable and multidimensional poverty.

1.3.3.1 Poverty income standards

Britain is the first country to develop poverty income standards. The British scholar Benjamin Seebohm Rowntree, in his 1901 book, The Study of "Poverty: A Study of Town Life", based on the money budget required for the "shopping basket" of "the minimum needed to maintain physical strength", and estimate the poverty line of York City. For a family of six people, the lowest food budget for the week is 15 shillings. With some housing, clothing, fuel and other expenditure, he arrived at a poverty line of twenty-six shillings for a family of six that implied a poverty rate of almost 10 percent in York. (Kanbur R., and L., Squire 1999, p. 3)[49] This is the first assessment in terms of food and non-food goods sub-divided in two parts that defines poverty in a monetary variable.

1.3.3.2 The poverty line

The World Bank (1990)[50] introduced the dollar-a-day international poverty line. The World Bank's definition of poverty is "deprivation of welfare", in which welfare is primarily concerned with whether individuals or families have sufficient resources to meet their basic needs. The World Bank has collected the poverty lines of 33 countries (including developing and developed countries), and using the 33 national poverty line data to identify poverty lines that can be used for global poverty comparisons. The World Bank adjusted the monetary unit of the poverty line in these countries in accordance with the purchasing power parity PPP in 1985 to forecast the poverty line, and found that the monthly consumption of the poorest six countries (Indonesia, Bangladesh, Nepal, Kenya, Tanzania, Morocco), was around $ 31/person. Accordingly, the World Bank has set a poverty line of $1/day. After that a new set of PPPs was published in 1993, the line changed to $1.08 per day. PPPs were revised again in 2005, and the line was correspondingly upped to $1.25. The World Bank set $ 1.25 per day poverty line by estimating the average of the 15 least developed countries' poverty lines. The World Bank's international poverty line has been raised to $1.90 per day[51] since 2015.

1.3.4 Multidimensional poverty

In 1987, Hagenaars[52] introduced leisure in the study of poverty, and constructed the first multidimensional poverty index from the two dimensions of income and leisure, making poverty

[49] Kanbur, R., & Squire, L. (1999). The Evolution of Thinking about Poverty: Exploring the Interactions. *Working Papers from Cornell University, Department of Applied Economics and Management.* No 127697,P3

[50] World Development Report 1990

[51] The international poverty line has just been raised to $1.90 a day, but global poverty is basically unchanged. How is that even possible?
http://blogs.worldbank.org/developmenttalk/international-poverty-line-has-just-been-raised-190-day-global-poverty-basically-unchanged-how-even

[52] Aldi Hagenaars, A Class of Poverty Indices[J],*International Economic Review*,1987,P583-602

research not only at the income level, but also focusing on factors other than income. Since 1997, the United Nations has adopted the Human Poverty Index (HPI) to measure multidimensional poverty. The HPI concentrates on the deprivation in the three essential elements of human life already reflected in the HDI: longevity, knowledge and a decent standard of living.

Amartya Sen (2003, 2004)[53], studied poverty up to the level of personal welfare then rose to the level of social development. He sees development as a process of people's enjoyment of substantive freedoms from basic viability, including avoiding hunger and malnutrition, living older, engaging in economic transactions or participating in political activities. Sen's method of defining poverty is called capability approach. Amartya Sen points out that the core of multidimensional poverty is that not only income poverty, but also poverty encompasses several dimensions some of which can be regarded as objective (such as drinking water, roads, sanitation and other objective indicators) and other subjective feelings of poverty. Sen's theory of multi-dimensional poverty has been put forward by academics, governments and international agencies.

The Multidimensional Poverty Index (MPI) was presented in the 2011 Human Development Report which is based on Sen's theory and is classified among the various measures of poverty, which replaced Human Poverty Index (HPI). The difference is that HPI is summed up by the national macro-level data, reflecting the deprivation of health, education and living standards, and MPI can measure from the micro level, such as the individual or family level, not only to reflect the incidence of deprivation, but also to reflect the depth of deprivation of poverty, to carry out various aspects of decomposition, to understand the relative proportion of poverty MPI support personal or family level of micro-data, gender age, regional dimensions and other aspects of decomposition. HPI focuses on three dimensions, life expectancy, knowledge and standard of living, and three indicators for developing countries (probability of not surviving till age 40, adult illiteracy rate, and means average of population with sustainable access to an improved water source and children under weight for age), and four indicators for developed countries (probability of not surviving till age of 60, adult who doesn't have functional literacy skills, population below income poverty line and rate of long term unemployment). MPI also forces 3 dimensions, health, education, and living standards, with 10 indicators (child mortality, nutrition, years of schooling, school attendance, cooking fuel, toilet, water, electricity, floor, assets). Comparing to HPI, MPI has some advantages: more indicators than HPI could be better and less susceptible to bias; identifying the most vulnerable and poorest among the population; revealing spatial and temporal, inter and intra nation and regional variations; effective allocation of resources by targeting greatest

[53] Sen,A. A Decade of Human Development [J].*Journal of Human Development*,2003,17-23.
Sen,A.Elements of a theory of human rights, *Philosophy and Public Affairs[*J].2004,315-356.
Sen,A. Dialogue Capabilities, Lists, and Public Reason: Continuing the Conversation[J].*Feminist Economics*,2004,77-80.

intensity of poverty; monitoring impacts of policy intervention for eradication programs. However, MPI needs much more data than HPI for calculating.

2. State of the Art

2.1. The evolution of China's income inequality

2.1.1. Current status on income inequality in China

This part is described by levels, including national, regional, provincial, urban, rural, urban-rural and industrial. For well-understanding it is presented by income and Gini coefficient two indicators.

I. National level

China's income inequality (Gini coefficient-Based)

The World Bank published China's Gini Coefficients which was 0.29 in 1981, and then ten years later it went up to 0.32 in 1990, and after another decade it became 0.42 in 2002. China' Gini coefficient has broken through 0.40 (since 2002, or even since 2000[54],) which is a serious figure in economics named the "international alertness line". The data published by the NBSC indicated China's Gini coefficient was between 0.473 - 0.491 from 2003 to 2012. The Gini coefficient was 0.473 in 2013, while it was 0.469 in 2014.

Table 2.1 - 1. China's Gini coefficients (1981 – 2010)

Year	1981	1984	1987	1990	1993	1996	1999	2002	2005	2008	2010
Gini	29.11	27.69	29.85	32.43	35.5	35.7	39.23	42.59	42.48	42.63	42.06

Source: World Bank

Table 2.1 - 2. China's Gini coefficients (2003 – 2016)

Year	2003	2004	2005	2006	2007	2008	2009
Gini	0.479	0.473	0.485	0.487	0.484	0.491	0.490
Year	2010	2011	2012	2013	2014	2015	2016
Gini	0.481	0.477	0.474	0.473	0.469	0.462	0.465

Source: National Bureau of Statistics of China

Table 2.1 - 3. China's Gini coefficients (1978-2008)

year	1978	1979	1980	1981	1982	1983	1984	1985
Gini	0.31	0.305	0.322	0.297	0.269	0.263	0.264	0.242
year	1986	1987	1988	1989	1990	1991	1992	1993
Gini	0.305	0.309	0.319	0.348	0.341	0.358	0.377	0.407
year	1994	1995	1996	1997	1998	1999	2000	2001

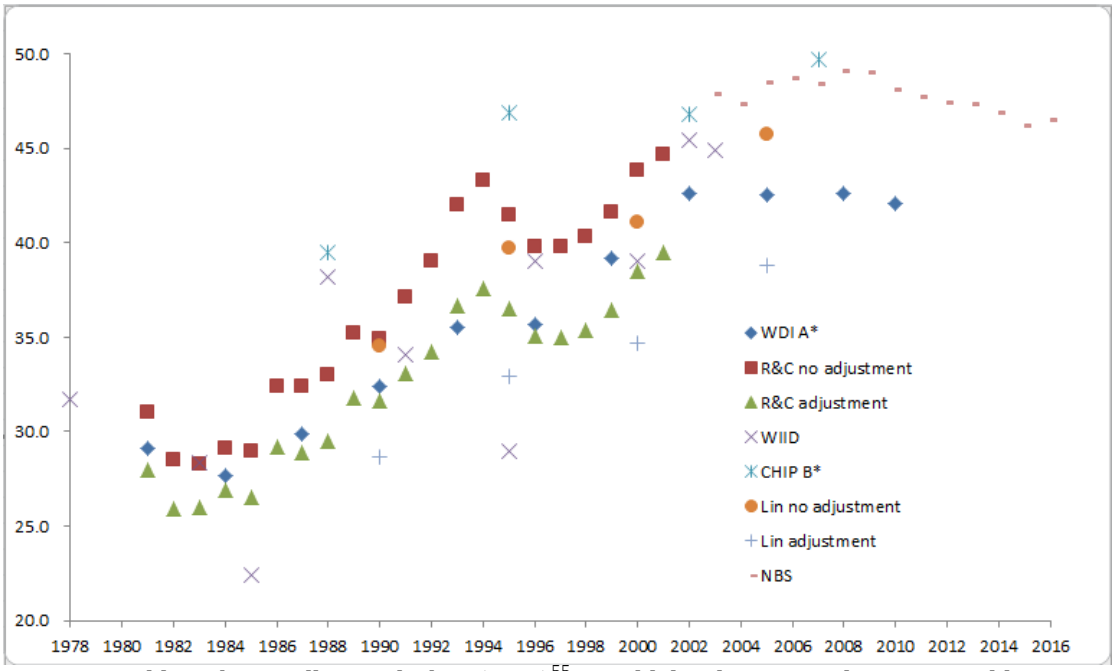
[54] Source: National Development and Reform Commission, Research Group of institute of social development, A Study on the Income Distribution Pattern of resident in China [J]. Economic Research Reference,2012(21):32-82.P67

Gini	0.399	0.397	0.38	0.369	0.376	0.389	0.402	0.413
year	2002	2003	2004	2005	2006	2007	2008	
Gini	0.44	0.45	0.451	0.452	0.453	0.455	0.457	

Source: National Development and Reform Commission, Research Group of institute of social development, (2012) A Study on the Income Distribution Pattern of resident in China [J]. Economic Research Reference, 2012 (21)：32-82.P67

With other studies measurements, let's take a picture and have a look at China's Gini coefficient evolution according to different sources.

Figure 2.1 - 1. China's Gini coefficients evolution from 1978 to 2016



Source: World Bank, Ravallion and Chen (2007)[55], World development indicators, World Income Inequality Database, Chinese Household Income Project, Lin et al.(2010)[56], National Bureau of Statistics of China

That concludes the degree of income inequality in term of Gini in China. China's Gini goes stable nine years after economic reform, and then grows rapidly in 15 years from 0.298 in 1987 to 0.491 in 2008. After 2008, the Gini declines little by little and ends 0.465 in 2016. The whole shape goes like a half inverted U-shape, and it is expected a whole inverted U-shape eventually.

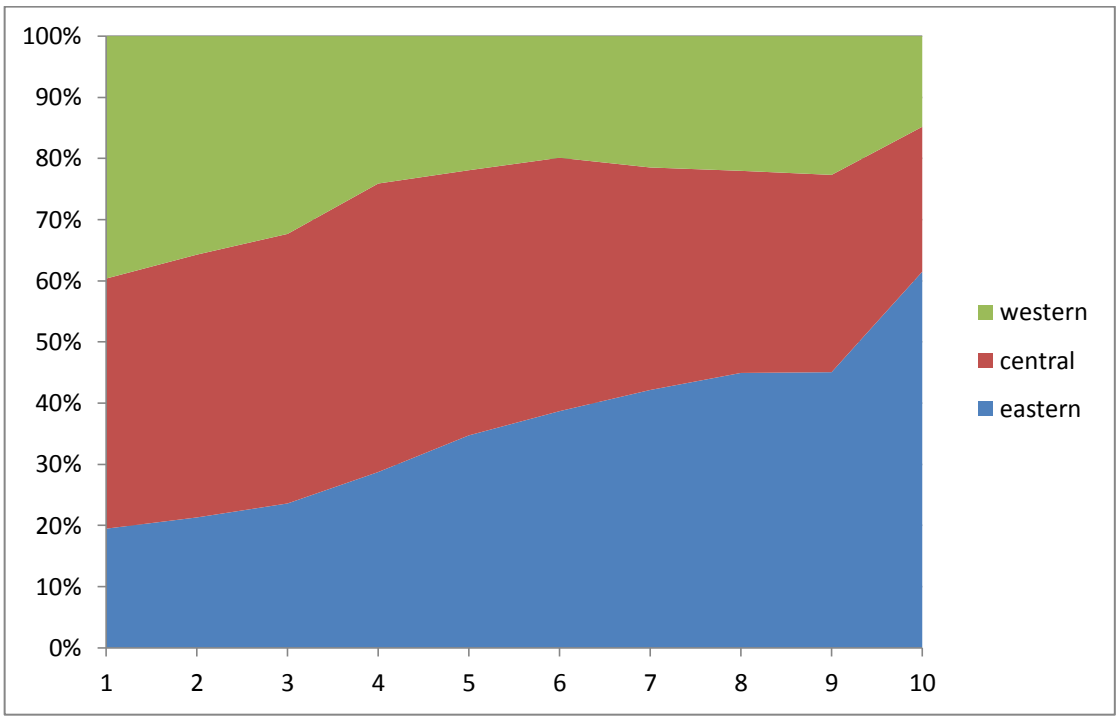
It has been over 0.40 international alert line since the beginning of 21th century, and it is still high, even though it has declined since 2008 up to 2016 with 5% decline from 0.491 to 0.465.

[55] Ravallion, M., and S. Chen. 2007. China's (Uneven) Progress against Poverty. Journal of Development Economics.82 (1). pp. 1–42.

[56] Lin, T., J. Zhuang, D. Yarcia, and F. Lin. 2010. Decomposing Income Inequality: People's Republic of China, 1990–2005. In J. Zhuang, ed. Poverty, Inequality, and Inclusive Growth in Asia: Measurement, Policy Issues, and Country Studies.Manila: ADB and London: Anthem Press

II. Regional level

Figure 2.1 - 2. Decile income by region 2013



Data source: CHIP 2013

The Chinese Household Income Project (CHIP) is a project developed by China Institute for Income Distribution to measure and estimates the distribution of personal income in both rural and urban areas of the People's Republic of China. The data were collected through a series of questionnaire-based interviews conducted in rural and urban areas. The sample covers half provinces and corresponds to half of the population of China. Based on the 2013 data, this dissertation ranked all income and got decile income by 3 regions (eastern, central and western). It is clear that income of eastern regions is more than that of the central regions, and that of western regions is less than that of central regions. At the first income decile (the poorest Chinese people), it covers 19% eastern population, 41% central and 40% western. At the last decile (the richest Chinese people), it covers 59% eastern population, 25% central and 16% western. It presents clearly how income distribution goes in these 3 regions.

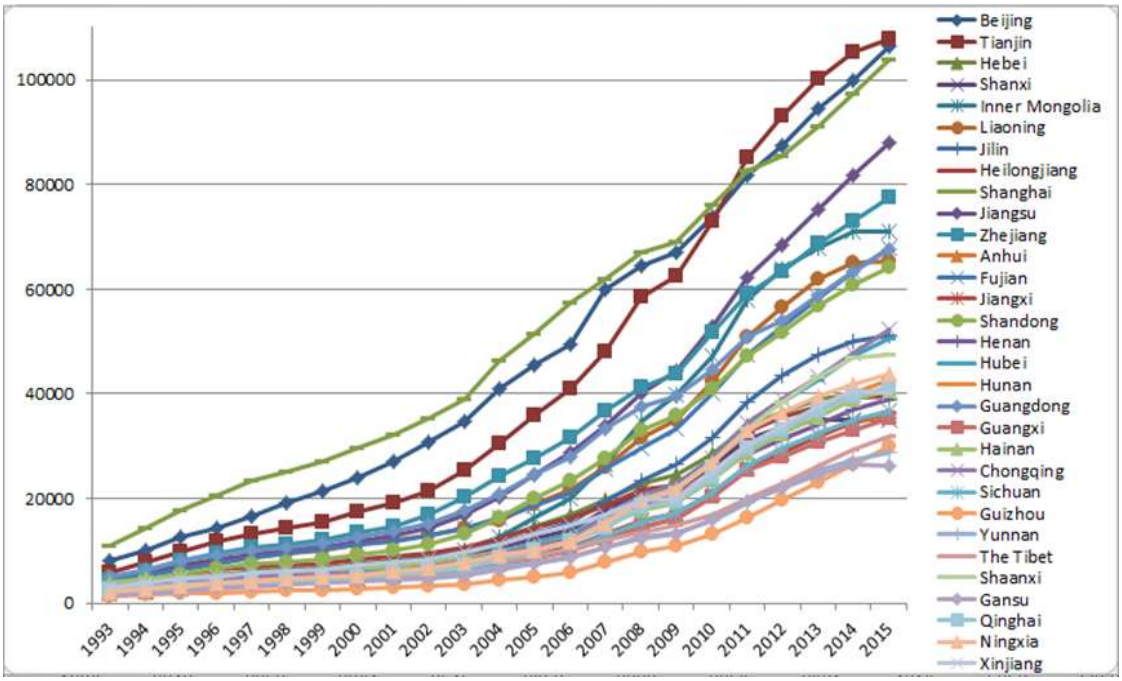
III. Provincial level

China's provincial inequality (GDP -Based)

Gross Domestic Product (GDP) is one of the most widely used measures of an economy's output or production. It is defined as the total value of goods and services produced within the geographic boundaries of a country's or an area's borders in a specific time period – monthly, quarterly or annually. Although it is not flawless, the GDP is the most accurate indication available for an

economy's size.[57] Referring to the population size and GDP as provincial income we also take per GDP to consider the provincial income inequality.

Figure 2.1 - 3. Gross Regional Product per capita (yuan) from 1993 to 2015 in China



Source: National Bureau of Statistics

The figure illustrates the GDP per capita from 1993 to 2015 at the provincial level in China. Considering the evolution of the curves through the years, the provinces GDP per capita apparently evolved yielding four classes in China on the basis of their per capita GDP.

In the class I: Beijing, Tianjin, Shanghai;

In the class II: Inner Mongolia, Liaoning , Jiangsu, Zhejiang , Fujian, Shandong, Guangdong;

In the class III: Hebei, Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Hainan, Chongqing, Sichuan, Shaanxi, Qinghai, Ningxia, Xinjiang;

In the class IV: Guizhou, Yunnan, The Tibet, Gansu.

Comparing the highest and lowest, the GDP per capita class 1 Tianjin is 3.98 times as much as class 4 Gansu in 2014, while class 1 Shanghai's was 8.96 times as much as class 4 Guizhou's in 1993. Therefore it does not seem that more inequality has taken place across provinces. However, if we set aside the population factor, the GDP of class 1 Guangdong 678,098.500 (million yuan) is 24.64 times as much as of class 3 Ningxia 27521 in 2015, while class 2 Guangdong's GDP was 34,692.800 (million yuan) and 92.72 times as much as class 4 Tibet's 374.200 (million yuan) in 1993.

[57] Elvis Picardo, The GDP and its Importance,investopedia, August 2, 2016 - 5:34 PM EDT http://www.investopedia.com/articles/investing/121213/gdp-and-its-importance.asp

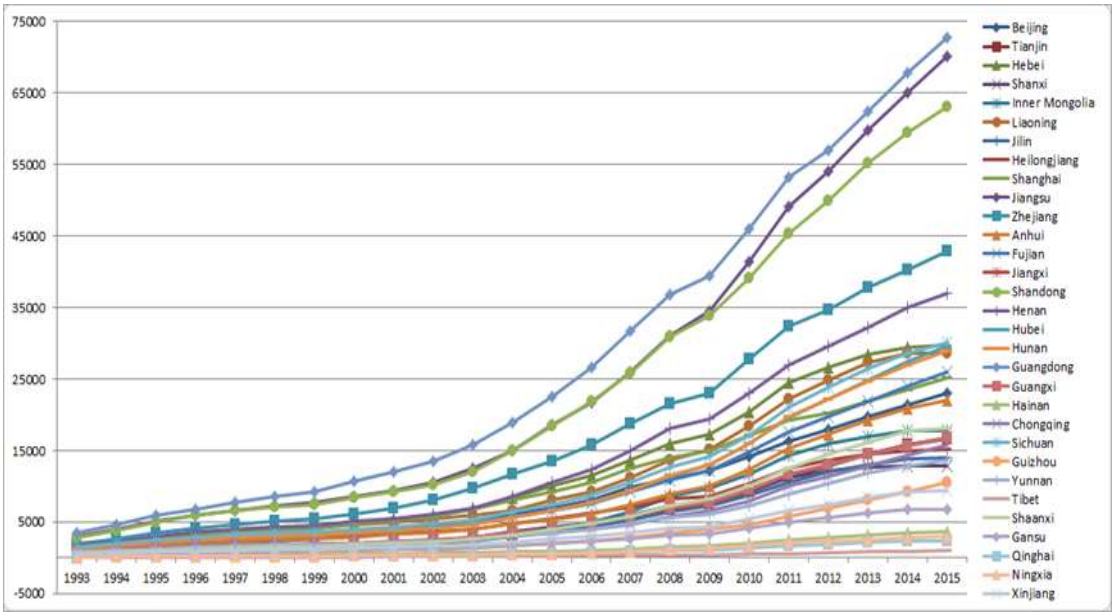
Otherwise, in these two classes, the biggest gap of per capita disposable income is 4.28 times as much as Shanghai 45,965.83 yuan compares Tibet 10,730.22 yuan in 2014.

It concludes the degree of income inequality in terms of per GDP in provinces in China. The province with higher per GDP is always the higher, the lower is always lower.

Figure 2.1 - 4. China's provinces GDP per capita, 2015

The same situation happens for the GDP. It is clearly divided in three or four classes. The top three always are Guangdong, Jiangsu and Shandong. At the bottom they are always Qinghai, Ningxia, Hainan and Tibet. The others are in the middle.

Figure 2.1 - 5. Gross Regional Product (100 million yuan) from 1993 to 2015 in China

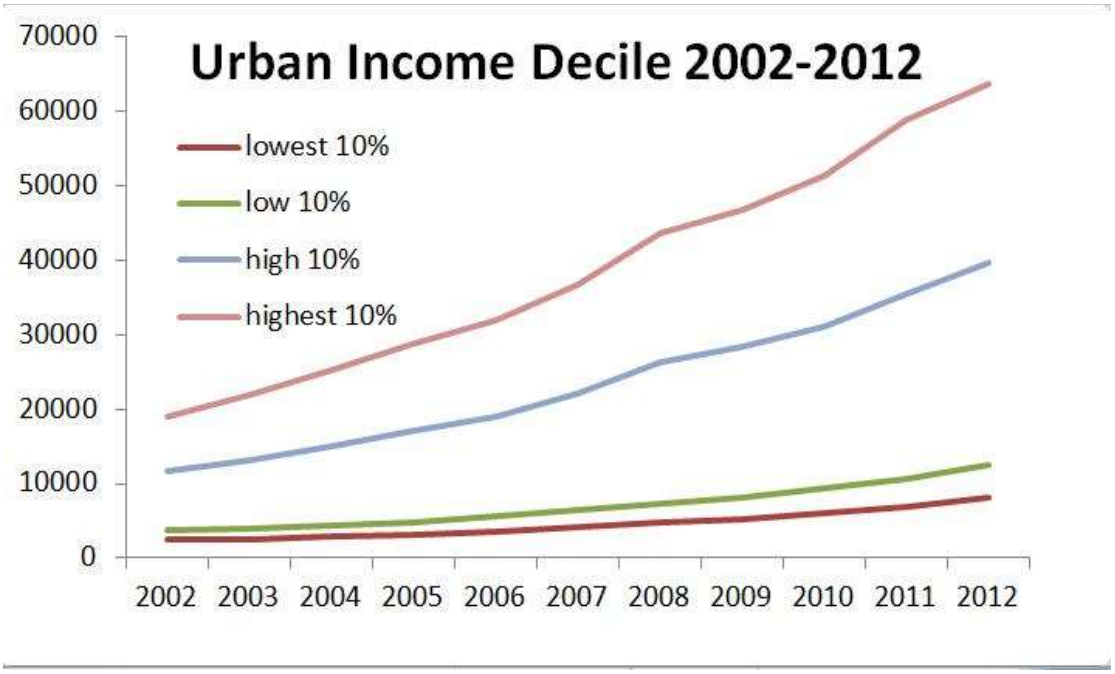


Source: National Bureau of Statistics

IV. Inter Urban

A. China's income inequality (Income-Based): Per Capita Disposable Income of Urban Households

Figure 2.1 - 6. Per Capita Disposable Income of Urban Households decile (yuan) 2000-2012



Data Sources：National Bureau of Statistics of China

According to the Per Capita Disposable Income of Urban Households decile data from NBSC, Per Capita Disposable Income of Urban Households the lowest and the highest income households are 8,215.1 yuan and 63,824.2 yuan in 2012, while they were 2,408.6 yuan and 18,995.9 yuan in 2002.

The ratios between the highest and the lowest are around 7.8 in 2012 and 2002. However the others years, all ratios are above 7.8, while there are two peaks of about 9.18 times in 2005 and 2008. That means the pattern shows an inverted U-shape during the 11 years period between 2002 and 2012 (see figure 2.1 -7).

Figure 2.1 - 7. The ratio between the highest and the lowest decile of Per Capita Disposable Income of Urban Households 2002-2012

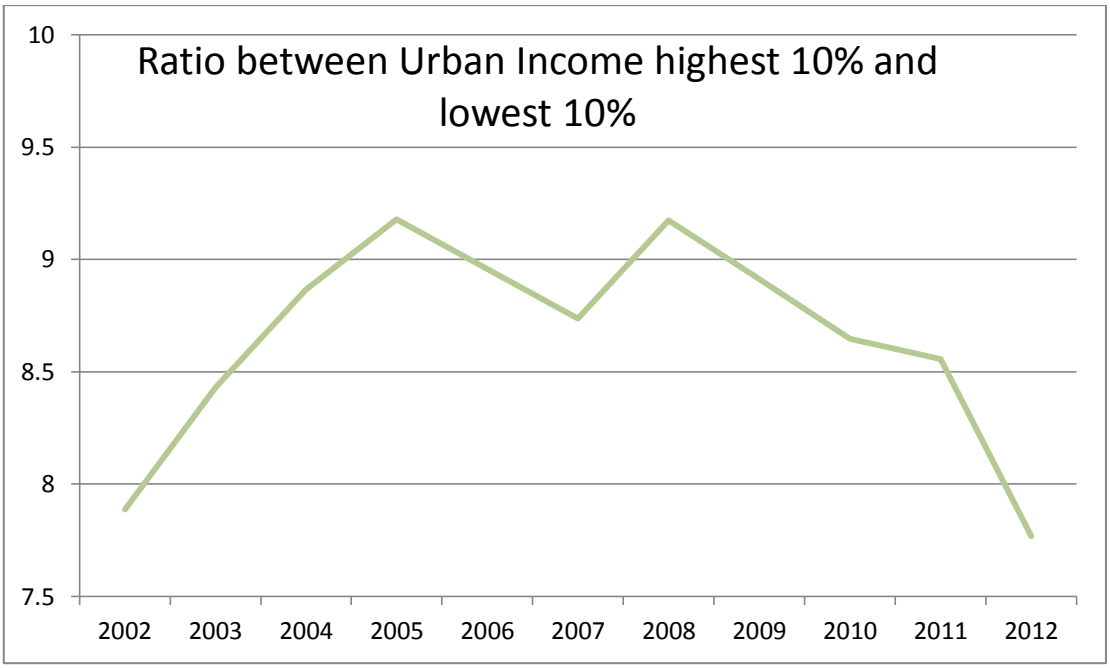


Table 2.1 - 4. Per Capita Disposable Income of Urban Households decile and quintile (yuan) 2002-2012

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1st 10%	2408.6	2590.2	2862.4	3134.9	3568.7	4210.1	4753.6	5253.2	5948.1	6876.1	8215.1
2nd 10%	3649.2	3970	4429.1	4885.3	5540.7	6504.6	7363.3	8162.1	9285.3	1067.2	1248.6
2nd 20%	4932	5377.3	6024.1	6710.6	7554.2	8900.5	10195.6	11243.6	12702.1	14498.3	16761.4
3rd 20%	6656.8	7278.8	8166.5	9190.1	10269.7	12042.3	13984.2	15399.9	17224	19544.9	22419.1
4th 20%	8869.5	9763.4	11050.9	12603.4	14049.2	16385.8	19254.1	21018	23188.9	26420	29813.7
9th 10%	11772.8	13123.1	14970.9	17202.9	19069	22233.6	26250.1	28386.5	31044	35579.2	39605.2
10th 10%	18995.9	21837.3	25377.2	28773.1	31967.3	36784.5	43613.8	46826.1	51431.6	58841.9	63824.2
Ratio	7.9	8.4	8.9	9.2	9.0	8.7	9.2	8.9	8.6	8.6	7.8

Per Capita Disposable Income of Urban Households

1st 10%: Lowest Income Households (first decile group)

2nd 10%: Low Income Households (second decile group)

2nd 20%: Lower Middle Income Households (second quintile group)

3rd 20%: Middle Income Households (third quintile group)

4th 20%: Upper Middle Income Households (fourth quintile group)

9th 10%: High Income Households (ninth decile group)

10th 10%: Highest Income Households (tenth decile group)

Ratio: ratio between highest 10% and lowest 10%

Data Sources：National Bureau of Statistics of China

Since 2013, the survey method and index caliber of household income and living conditions were changed by National Bureau of Statistics because of the integration of urban and rural. The income definition is also changed, therefor we can not comparing them pre-2013 and post-2013. However, we found the income growth ratio was going down quickly, and the income growth ratio of low income group decreased quickly, but income growth ratio decreased slowly for the high income group. Since the high income group growth slow and the low income group growth slower, we can conclude the income inequality within urban was going wide since 2013.

Figure 2.1 - 8. Growth ratio of per capita disposable income of urban households by income quintile 2014-2015

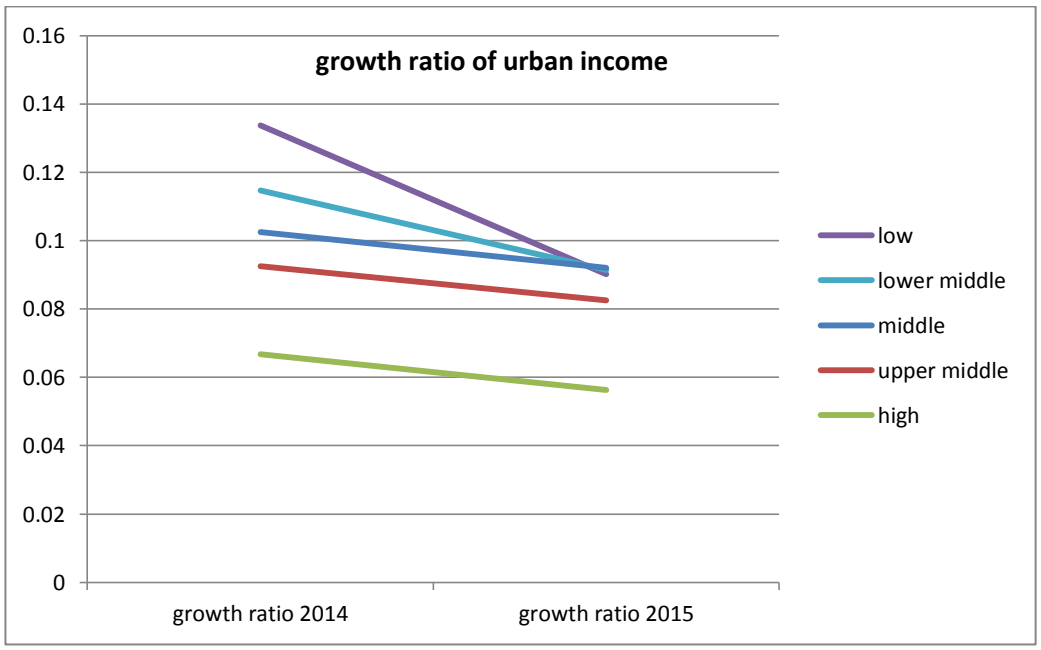


Table 2.1 - 5. Per capita disposable income of urban households by income quintile

	2013	2014	2015	growth ratio 2014	growth ratio 2015
1st 20%	9895.9	11219.3	12230.9	0.133732152	0.090166053
2nd 20%	17628.1	19650.5	21446.2	0.114725921	0.091381899
3rd 20%	24172.9	26650.6	29105.2	0.10249908	0.092102992
4th 20%	32613.8	35631.2	38572.4	0.092519118	0.082545634
5th 20%	57762.1	61615	65082.2	0.066702907	0.056272012

1st 20%: low income households

2nd 20%: lower middle income households

3rd 20%: middle income households

4th 20%: upper middle income households

5th 20%: high income households

Data Sources：National Bureau of Statistics of China

It was calculated the Gini coefficient in urban area in China. It was under 0.2 before 1990. It was equality less than 0.3 until 2001. It was around 0.32 from 2002 to 2008.

B. China's urban income inequality (Gini Coefficient-Based)

Table 2.1 - 6. Gini coefficient in urban area in China 1978-2008

Year	1978	1979	1980	1981	1982	1983	1984	1985
Gini	**0.16**	**0.16**	**0.16**	**0.161**	**0.162**	**0.155**	**0.163**	**0.164**
Year	1986	1987	1988	1989	1990	1991	1992	1993
Gini	**0.166**	**0.166**	**0.174**	**0.176**	**0.167**	**0.204**	**0.211**	**0.218**
Year	1994	1995	1996	1997	1998	1999	2000	2001
Gini	**0.213**	**0.218**	**0.208**	**0.219**	**0.225**	**0.233**	**0.245**	**0.256**
Year	2002	2003	2004	2005	2006	2007	2008	
Gini	**0.307**	**0.315**	**0.323**	**0.329**	**0.326**	**0.323**	**0.33**	

Source, National Development and Reform Commission, Research Group of institute of social development, (2012) A Study on the Income Distribution Pattern of resident in China [J]. Economic Research Reference, (21):32-82.P67

V. Inter rural

A. China's rural income inequality (Income-Based): Per Capita Annual Net Income of Rural Households

According to the Per Capita Annual Net Income of Rural Households quintile data, the lowest and the highest income households are 2,316.2 yuan and 19,008.9 yuan in 2012, while they were 857 yuan and 5,903 yuan in 2002. The ratios between the highest and the lowest increased from 6.9 in 2002 to 8.2 in 2012, while it hit reached once 8.4 in 2011. The trend goes undulatory growth during 2002 and 2012.

Figure 2.1 - 9. Per Capita Annual Net Income of Rural Households (yuan) 2002-2012

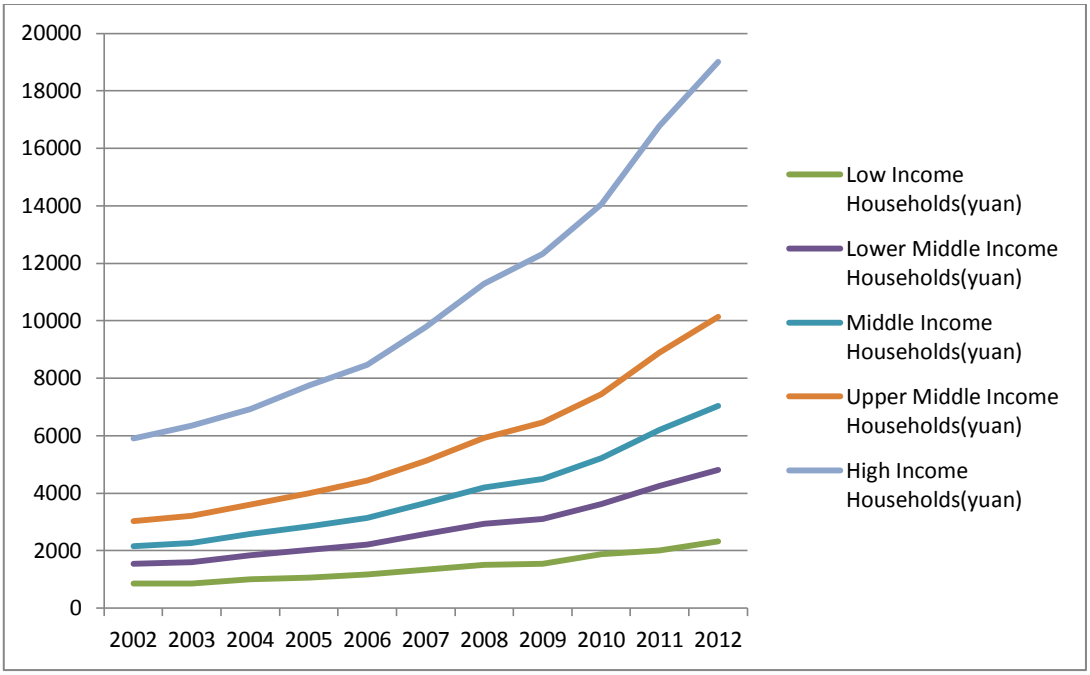


Figure 2.1 - 10. The ratios between the highest and the lowest quintile of Per Capita Annual Net Income of Rural Households (yuan)

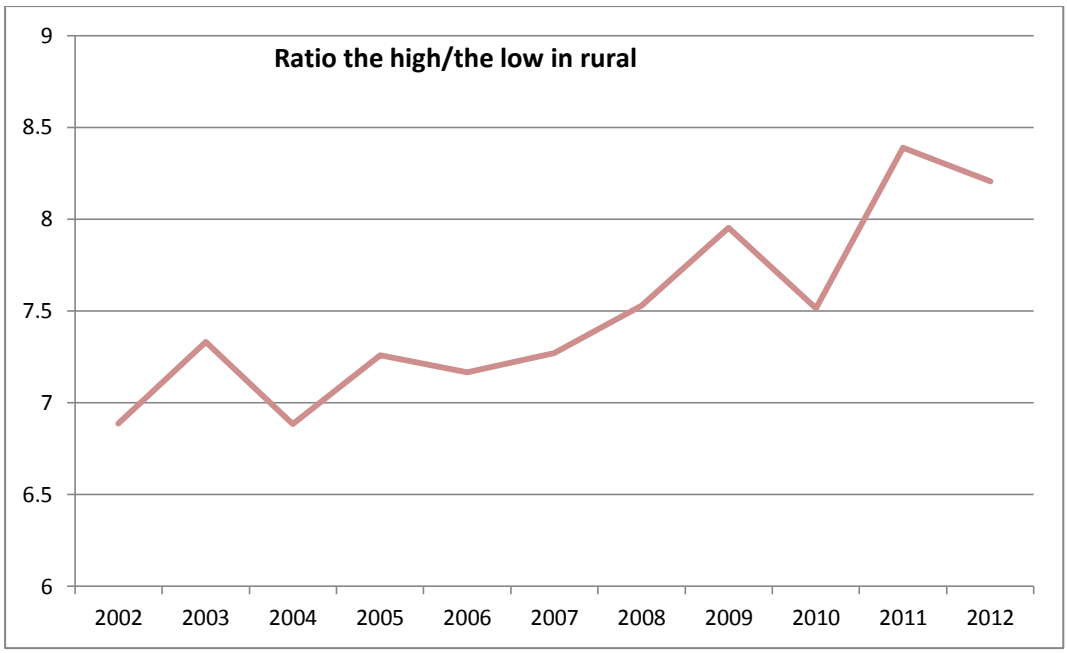


Table 2.1 - 7. Per Capita Annual Net Income of Rural Households (yuan) 2002-2012

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1st	857	865.9	1007	1067.2	1182.5	1346.9	1499.8	1549.3	1869.8	2000.5	2316.2
2nd	1548	1606.5	1842.2	2018.3	2222	2581.8	2935	3110.1	3621.2	4255.7	4807.5
3rd	2164	2273.1	2578.6	2851	3148.5	3658.8	4203.1	4502.1	5221.7	6207.7	7041

4th	3031	3206.8	3608	4003.3	4446.6	5129.8	5928.6	6467.6	7440.6	8893.6	10142.1
5th	5903	6346.9	6931	7747.4	8474.8	9790.7	11290.2	12319.1	14049.7	16783.1	19008.9
R	6.9	7.3	6.9	7.3	7.2	7.3	7.5	8.0	7.5	8.4	8.2

Data Sources：National Bureau of Statistics of China

1st: Low Income Households

2nd: Lower Middle Income Households

3rd: Middle Income Households

4th: Upper Middle Income Households

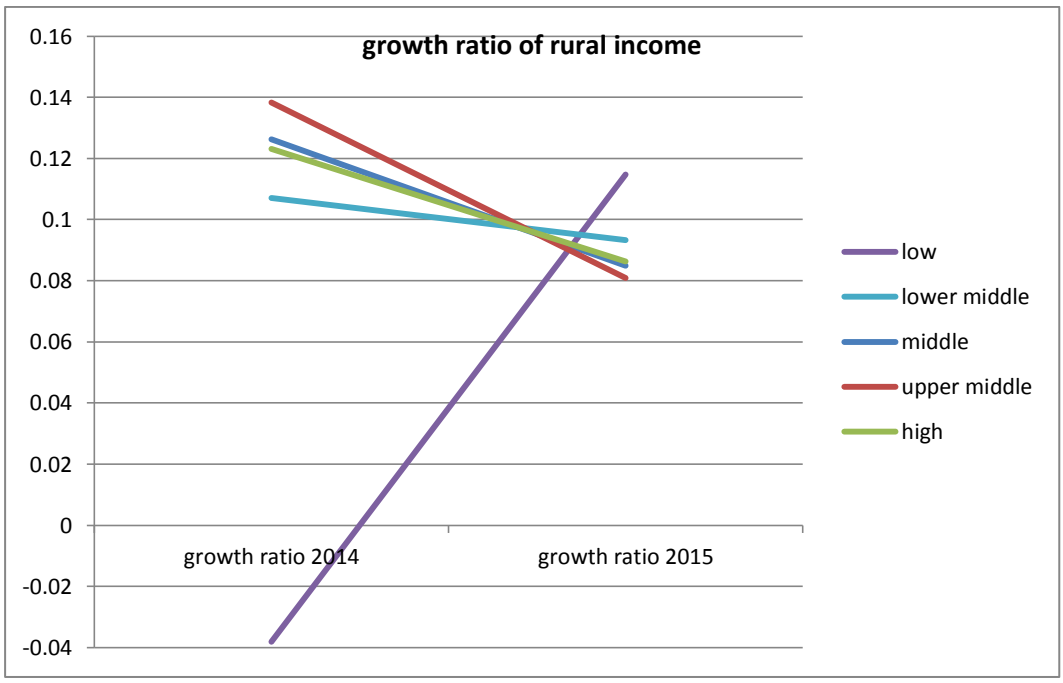
5th: High Income Households

R.: ratio between the high 20% and the low 20% in rural

Table 2.1 - 8. Per capita disposable income of rural households by income quintile

	2013	2014	2015	growth ratio 2014	growth ratio 2015
1st 20%	2877.9	2768.1	3085.6	-0.03815282	0.114699613
2nd 20%	5965.6	6604.4	7220.9	0.107080595	0.09334686
3rd 20%	8438.3	9503.9	10310.6	0.12628136	0.084880944
4th 20%	11816	13449.2	14537.3	0.138219364	0.08090444
5th 20%	21323.7	23947.4	26013.9	0.123041498	0.086293293

Figure 2.1 - 11. Growth ratio of per capita disposable income of rural households by income quintile



See Figure 2.1 -12, the low income growth raised quickly than other groups. It means income

inequality was improved in 2015 comparing to 2014, but it was not significant.

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B. China's rural income inequality (Gini Coefficient-Based)

The Gini coefficient of rural was higher than urban's. It reached 0.3 since 1986, and steady increasing to 0.378 till 2008.

Table 2.1 - 9. Gini coefficient in rural area in China 1978-2008

Year	1978	1979	1980	1981	1982	1983	1984	1985
Gini	**0.212**	**0.225**	**0.241**	**0.241**	**0.232**	**0.246**	**0.244**	**0.227**
Year	1986	1987	1988	1989	1990	1991	1992	1993
Gini	**0.304**	**0.305**	**0.303**	**0.31**	**0.31**	**0.307**	**0.313**	**0.329**
Year	1994	1995	1996	1997	1998	1999	2000	2001
Gini	**0.321**	**0.342**	**0.323**	**0.329**	**0.337**	**0.336**	**0.354**	**0.36**
Year	2002	2003	2004	2005	2006	2007	2008	
Gini	**0.365**	**0.368**	**0.369**	**0.375**	**0.374**	**0.374**	**0.378**	

Source, National Development and Reform Commission, Research Group of institute of social development, (2012). A Study on the Income Distribution Pattern of resident in China [J]. Economic Research Reference, (21)：32-82.P67

VI. Urban-Rural

A. China's urban-rural income inequality (Income-Based)

Per Capita Annual Disposable Income of Urban Households (yuan), Per Capita Annual Net Income of Rural Households (yuan), and the income ratio of urban-rural.

The income ratio between urban and rural declined from 2.57 in 1978 to 1.84 in 1984, and raised up to 2.86 in 1994, and dropped to 2.47 in 1997, and increased to 3.33 at 2009, and felt to 3.1 until 2012. The whole trend of income ratio of urban and rural from 1978 to 2012 goes like rising wave.

Figure 2.1 - 12. Urban income and rural income and their ratio (1978-2015)

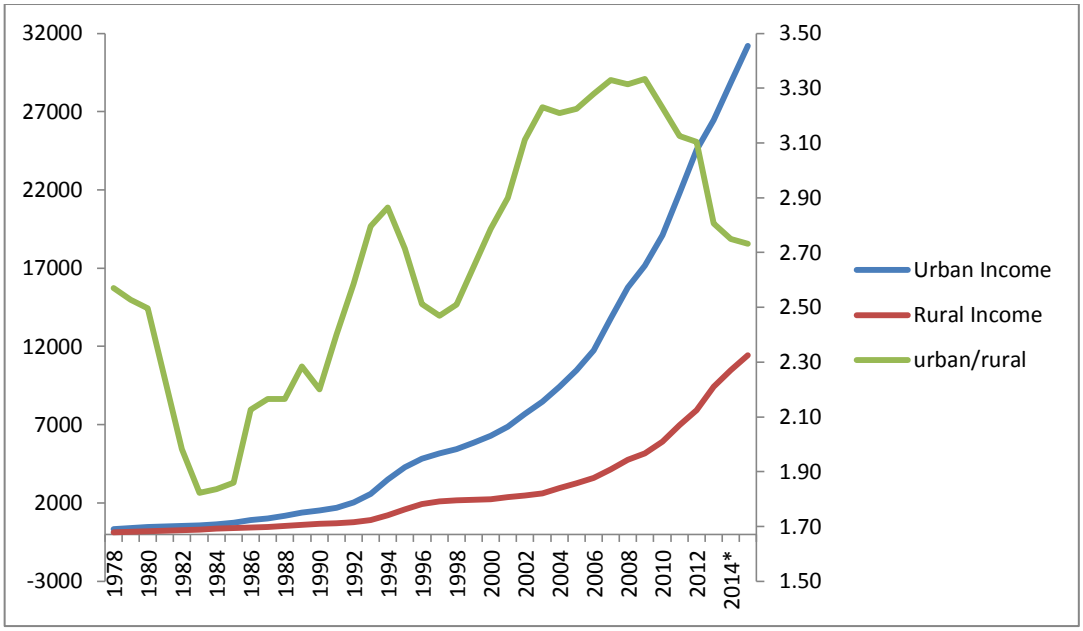


Table 2.1 - 10. Urban income and rural income and their ratio (1978-2015)

year	1978	1979	1980	1981	1982	1983	1984	1985
Urban Income	343.4	405.0	477.6	500.4	535.3	564.6	652.1	739.1
Rural Income	133.6	160.2	191.3	223.4	270.1	309.8	355.3	397.6
urban/rural	2.57	2.53	2.50	2.24	1.98	1.82	1.84	1.86
year	1986	1987	1988	1989	1990	1991	1992	1993
Urban Income	900.9	1002.1	1180.2	1373.9	1510.2	1700.6	2026.6	2577.4
Rural Income	423.8	462.6	544.9	601.5	686.3	708.6	784.0	921.6
urban/rural	2.13	2.17	2.17	2.28	2.20	2.40	2.58	2.80
year	1994	1995	1996	1997	1998	1999	2000	2001
Urban Income	3496.2	4283.0	4838.9	5160.3	5425.1	5854.0	6280.0	6859.6
Rural Income	1221.0	1577.7	1926.1	2090.1	2162.0	2210.3	2253.4	2366.4
urban/rural	2.86	2.71	2.51	2.47	2.51	2.65	2.79	2.90
year	2002	2003	2004	2005	2006	2007	2008	2009
Urban Income	7702.8	8472.2	9421.6	10493.0	11759.5	13785.8	15780.8	17174.7
Rural Income	2475.6	2622.2	2936.4	3254.9	3587.0	4140.4	4760.6	5153.2
urban/rural	3.11	3.23	3.21	3.22	3.28	3.33	3.31	3.33
year	2010	2011	2012	2013*	2014*	2015*		
Urban Income	19109.4	21809.8	24564.7	26467	28844	31195		
Rural Income	5919.0	6977.3	7916.6	9430	10489	11422		
urban/rural	3.23	3.13	3.10	2.81	2.75	2.73		

Source: National Bureau of Statistics of China.

"*": since 2013 the statistics method changes, the income calculated by new method.

From the tables, we could understand the urban income is always higher than the rural income. So the widest gap should be between the last decile Income Households of Urban Households and the

first quintile Income Households of Rural Households. These ratios are more than 20. The first decile income of Rural Households are unfortunately not available, therefore we compare urban and rural income by last decile urban household income and first quintile of rural household income. If both indicators are shown in decile, the ratios should be more than this. The real inequality should be more than this, indeed.

Figure 2.1 - 13. The ratios of the last decile Income Households of Per Capita Disposable Income of Urban Households comparing the first quintile Income Households of Per Capita Annual Net Income of Rural Households

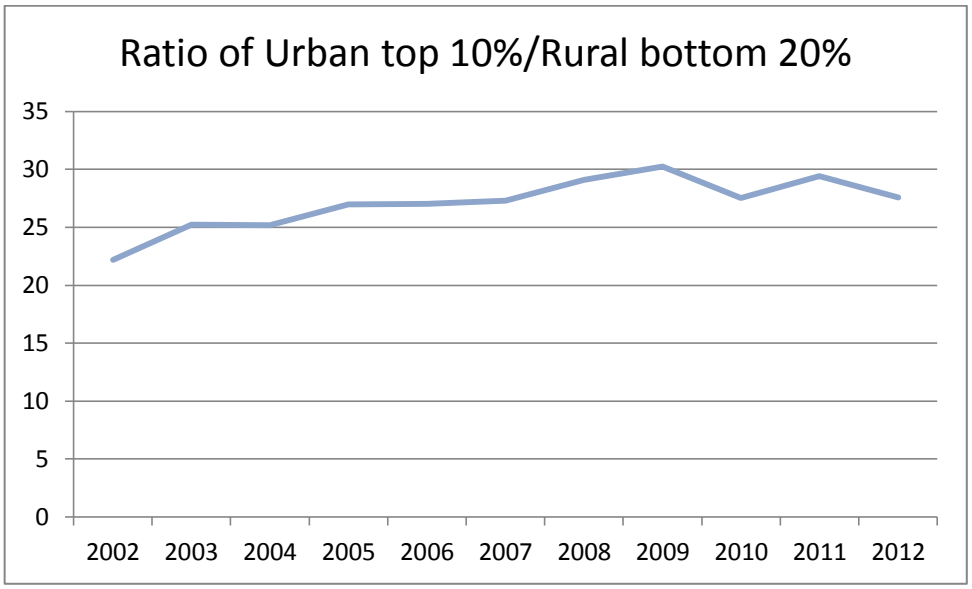


Table 2.1 - 11. the last decile Income Households of Per Capita Disposable Income of Urban Households and the first quintile Income Households of Per Capita Annual Net Income of Rural Households

Indicators	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Rural bottom 20%	857	865.9	1007	1067.2	1182.5	1346.9	1499.8	1549.3	1869.8	2000.5	2316.2
Urban top 10%	18995.9	21837.3	25377.2	28773.1	31967.3	36784.5	43613.8	46826.1	51431.6	58841.9	63824.2
ratio	22.2	25.2	25.2	27.0	27.0	27.3	29.1	30.2	27.5	29.4	27.6

Indicators

Rural bottom 20%: Per Capita Annual Net Income of Rural Households, Low Income Households (first quintile group) (yuan)

Urban top 10%: Per Capita Disposable Income of Urban Households, Highest Income Households (tenth decile group)(yuan)

Ratio: Ratio of Urban top 10%/Rural bottom 20%

Data Sources：National Bureau of Statistics of China

The income in urban-rural was more equal than urban and rural. It was always under 0.3 until

2008.

B. China's urban-rural income inequality (Gini Coefficient-Based)

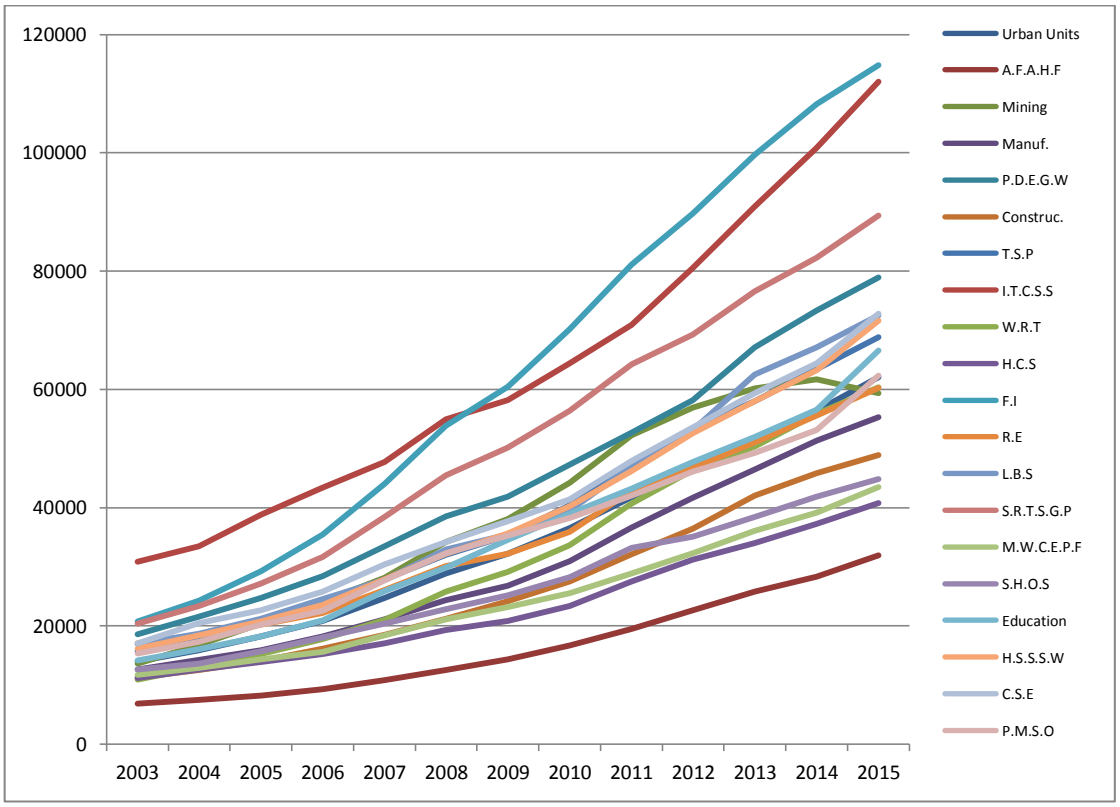
Table 2.1 - 12. The Gini coefficients of urban-rural (1978-2008)

Year	1978	1979	1980	1981	1982	1983	1984	1985
Gini	**0.18**	**0.17**	**0.181**	**0.156**	**0.132**	**0.119**	**0.123**	**0.112**
Year	1986	1987	1988	1989	1990	1991	1992	1993
Gini	**0.143**	**0.148**	**0.159**	**0.186**	**0.177**	**0.2**	**0.22**	**0.241**
Year	1994	1995	1996	1997	1998	1999	2000	2001
Gini	**0.248**	**0.236**	**0.219**	**0.217**	**0.223**	**0.238**	**0.251**	**0.26**
Year	2002	2003	2004	2005	2006	2007	2008	
Gini	**0.275**	**0.282**	**0.279**	**0.279**	**0.281**	**0.282**	**0.279**	

Source, National Development and Reform Commission, Research Group of institute of social development, A Study on the Income Distribution Pattern of resident in China [J]. Economic Research Reference, 2012(21):32-82.P67

VII. China's Industrial Income inequality

Figure 2.1 - 14. Average wages of employed persons in urban units (Yuan) (2003-2015)



Source: National Bureau of Statistics of China. (Data see appendix)

Table 2.1 - 13. Industry codes

Urban Units	Average Wage of Employed Persons in Urban Units
A.F.A.H.F	Average Wage of Employed Persons in Urban Units, Agriculture, Forestry, Animal Husbandry and Fishery
Mining	Average Wage of Employed Persons in Urban Units, Mining
Manuf.	Average Wage of Employed Persons in Urban Units, Manufacturing
P.D.E.G.W	Average Wage of Employed Persons in Urban Units, Production and Distribution of Electricity, Gas and Water
Construc.	Average Wage of Employed Persons in Urban Units, Construction
T.S.P	Average Wage of Employed Persons in Urban Units, Transport, Storage and Post
I.T.C.S.S	Average Wage of Employed Persons in Urban Units, Information Transmission, Computer Service and Software
W.R.T	Average Wage of Employed Persons in Urban Units, Wholesale and Retail Trades
H.C.S	Average Wage of Employed Persons in Urban Units, Hotels and Catering Services
F.I	Average Wage of Employed Persons in Urban Units, Financial Intermediation
R.E	Average Wage of Employed Persons in Urban Units, Real Estate
L.B.S	Average Wage of Employed Persons in Urban Units, Leasing and Business Services
S.R.T.S.G.P	Average Wage of Employed Persons in Urban Units, Scientific Research, Technical Services, and Geological Prospecting
M.W.C.E.P.F	Average Wage of Employed Persons in Urban Units, Management of Water Conservancy, Environment and Public Facilities
S.H.O.S	Average Wage of Employed Persons in Urban Units, Services to Households and Other Services
Education	Average Wage of Employed Persons in Urban Units, Education
H.S.S.S.W	Average Wage of Employed Persons in Urban Units, Health, Social Securities and Social Welfare
C.S.E	Average Wage of Employed Persons in Urban Units, Culture, Sports and Entertainment
P.M.S.O	Average Wage of Employed Persons in Urban Units, Public Management and Social Organization

During 2003 to 2015, the average wages of employed persons in urban units in all industries are steadily growing except the average wage of mining, which decreased in 2015. The average wages among industries did not yield convergence. On the contrary, they have been divergent. The average wage gap of industry has been enlarging. The gap changed from 24,013 (30,897-6,884=24,013) yuan in 2003 to 82,830 (114,777-31,947=82,830) yuan in 2015. See the figure 2.1-14, the industry of Agriculture, Forestry, Animal Husbandry and Fishery has been keeping the last position. That means the average wage of employed persons in urban units, agriculture, forestry, animal husbandry and fishery was lowest during 2003 the period standing up to 2015 among all industries. At the same period, the average wage of employed persons in urban units, financial intermediation increased at a high rate among the all industries and became the highest wage after 2008. The wage of financial intermediation was the second highest in all industries following the wage of information transmission, computer service and software before 2008, and then jumped to the first.

However, it is different situation, if we see the change of their ratio. The highest wage and the lowest were between ITCSS (Information Transmission, Computer Service) and SAFAHF (Software and Agriculture, Forestry, Animal Husbandry and Fishery), and their ratio (industry income gap) was 4.49 (30,897/6,884=4.49) in 2003, but 3.60[58] in 2015. The their ratio of industries encountered a convergence trend. Nevertheless, the industry income gap is still high in

[58] 3.60= 114,777/ 31,947, Average Wage of Financial Intermediation/ Average Wage of Agriculture, Forestry, Animal Husbandry and Fishery

China.

VIII. Summary

The evolution process of China's income inequality can be subdivided into different phases.
Before 1978 Reform and opening-up policy, China's Gini coefficient had been relatively stable, the urban Gini coefficient was below 0.2, while the rural Gini coefficient was between 0.21-0.24, and the national Gini coefficient was around 0.3. Since Reform and opening-up policy, China's Gini coefficient has been increasing rapidly approaching 0.5. According to World Bank and NBSC reports, since 2002, the Gini coefficient have been over 0.40 the international alert line, and reached the highest level (0.491) in 2008, subsequently dropping to 0.462 in 2015 which has been continuously declining during the following seven years since 2008, and then it rebounced up to 0.465 by 2016.

At the regional level, based on the CHIP data, it is clearly shown that the income presents the climbing stair-like inequality, the income of resident in eastern region is obviously higher than that in central and western, and the western is lowest among them.

At the provincial level, all provincial GDP trends appear stair-like growth. The higher GDP provinces have always been higher than others, even the GDP gap has been enlarging increasingly. The same situation happens at the indicator of GDP per capita at the provincial level.

The income gap between urban and rural areas is stable and remarkable. Urban residents per capita disposable income is more than three times the per capita net income of rural residents from 2002 to 2012. The income inequality in rural area is higher than inter urban and urban-rural. No matter from which aspect you look, the income inequality in China is widening or at least oscillating now.

2.1.2. China's income distribution policy evolution

2.1.2.1. The dualistic structure system of urban and rural areas

The National People's Congress of China passed <the PRC Household Registration Ordinance> (Hukou system) in 1958. The hukou system serves key functions in China, register of residents, regulation of migration and resource allocation.[59]

First, the hukou system registers residents, collects and stores information about the personal identification and certifies relations and residence. Second, the hukou system allows the government to control and regulate internal migration, especially rural-to-urban migration. It rigidly restricts the migration from rural to urban. The restriction made China in two different and semi-isolated sectors. The situation of income inequality in urban and in rural had been set before the reform and opening policies in 1978. The restriction allowed conditionally a small part of rural resident to migrate to urban since 1984. Since that, rural migrants flowed gradually into urban areas, and were controlled by government. Third, the hukou system is the basis for resource allocation and the provision of subsidies for selected groups of the population (mainly the urban hukou holders who are a clear minority). This function has shaped much of Chinese economic development in the past half-century by politically affecting the movement of capital, goods, and human resources, heavily favoring the urban centers with investment and subsidies. The urban priority policy promoted the urban development and growth because of resources priority including the benefits of rural form of trade consecrated to urban areas. Specially, the hukou system restricted the rural labor immigrating to urban, and deprived them of the share the growth dividend. That is the main source of income inequality of urban-rural.

2.1.2.2. 'Egalitarianism'

Before the reform and opening policies in 1978, China had adopted planned economy and equalitarianism over a long period. The means of production and some means of livelihood were state-owned. And income distribution was equalitarian. Urban factories, shops, and other means of production as well as residential housing were basically state-owned or collectively owned. In the urban economy, workers' wages were centrally planned and administered, with the central government setting unified wage standards and scales. As the concept of equalitarianism gained increasing popularity, in centrally planned administered mechanism, the difference diminished between high and low wage scales in urban area. According to data estimated by NBSC, the Gini coefficient for income inequality among urban residents at the end of the 1970s was about 0.16.[60]

[59] Martin King Whyte ed., One Country, Two Societies: Rural-Urban Inequality in Contemporary China, Harvard University Press, pp. 335-364.

[60] Ren Caifang and Cheng Xuebin, examining income inequality from the perspective of urban incomes[J], review of economic research,1996, 157:2-9

In rural areas, land and all other means of production were owned by people's communes and the production teams[61]. The state monopolized the purchase and sale of grain, cotton and other key agricultural products. Among the members of production teams or communes, an even income distribution system was implemented. However, the income-setting mechanism in rural areas was different from that in urban areas. The people's commune system and the related distribution system could only guarantee a limited equality in income distribution within villages and communes. Consequently, there were relatively large income gaps between villages, between townships, between counties, or between provinces. Compared with urban Gini coefficient 0.16, the rural Gini coefficient was 0.21 in 1978, which means income inequality in rural areas was far higher than urban areas in the end of planned economy.[62] To pursue industrialization, the government invested substantial funds in urban industries and regarded rural areas as a base for the supply of grain. To accumulate more funds for industrialization, authorities deliberately suppressed the price of grain and other farm products, so aggravating the urban-rural income gap. In 1978, urban per capita income was 2.6 times rural per capita income.[63]

2.1.2.3. Breaking down 'Egalitarianism'

Since the 3rd Plenary Session of the 11th Central Committee of the Communist Party of China in 1978, China carried out a series of reforms to economic transition from planned economy to market economy. The principle of "each according to his work" should be followed rather than the principle of "each according to his need". It was stated that in order to promote production, it is necessary "to work out payment in accordance with the amount and quality of work done, and avoid equalitarianism". This represented a major departure from the previous egalitarian policy. Afterwards, the "production responsibility system"[64] linking remuneration with output was introduced for agricultural production, which encouraged largely agricultural production and obviously increased rural incomes. Correspondingly, the income inequality declined.

In 1984, the 3rd Plenary Session of the 12th Central Committee of the Communist Party of China proposed that some areas and some people can get rich first by lawful operation and honest working, lead and help other regions and people, and gradually achieve common prosperity in <The central committee of the communist party of China about the decision of the economic system reform>.

[61] people's communes and the production teams (renmin gongshe he shengchandui)

[62] Research group of China Social Development Research Institute(guojia fazhan gaige weiyuanhui, shehuifazhan yanjiusuo, ketizu),(2012) A Study on the Distribution Pattern of National Income in China(woguo guomin shouru fenpei geju yanjiu),Review of Economic Research,(21):34-82. P67

[63] National Bureau of Statistics of China, 2004:357

[64] production responsibility system (jiating chengbaozhi),Household contract responsibility system (jiating lianchan chengbao zerenzhi), means household are held responsible for the benefits and losses of agricultural products instead of commune's responsibility..

A few years later, the "dual-track"[65] pricing system was adopted for industrial and agricultural products. The government offered the price of agricultural products lower than market's, and required priority to purchase. This system reduced the agricultural income. The income inequality that would have declined down has risen up again.

Meanwhile, the central government opened China to the rest of the world by designating Shenzhen, Zhuhai, Shantou and Xiamen four cities Special Economic Zones (SEZs). The government of China gives SEZs special (more free market-oriented) economic policies and flexible governmental measures. This allows SEZs to utilize an economic management system that is more attractive for foreign and domestic firms to do business with than the rest of mainland China. In SEZs, foreign and domestic trade and investment are conducted without the authorization of the Chinese central government in Beijing. SEZs offer tax and business incentives to attract foreign investment and technology. By this policy, the China's income inequality began to show two-dimensions: urban-rural inequality and coastal-inland inequality.

Over time the opening-up policy was extended to all coastal regions, which saw consequently rapid economic growth and a widening development gap with interior regions. In the early days of the economic transition, market forces were immature and resulted in some economic distortion. Some commodities and services were in short supply and the "dual-track" pricing system induced rent-seeking activities.

During the early years of reform, although an uneven strategy of regional development was implemented, economic reforms and growth affected most people's lives. Although gains varied from person to person and income gaps widened within rural areas, within urban areas and nationwide, the level of inequality was acceptable to most people.

2.1.2.4. Distribution according to work, efficiency and equity

At the 14th National Congress of the Communist Party of China in 1992, it was proposed that "taking into account the efficiency and equity, it should take distribution according to work as the main body, the other ways of distribution as the supplement, and regulating the income distribution. For achieving gradually common prosperity, it should encourage the diligent and the efficient, tolerate income inequality but prevent income polarization." It is the first time when the efficiency and equity in the distribution were taken into account.

Starting from the mid-1990s, economic reforms went deeper that the state-owned sector steady drops as a percentage of the overall economy, while the non-state sector experienced dramatic

[65] dual-track (shuangguizhi),double-track price system, the price of agricultural products was divided 2 system. In a system, the price of agricultural products is planed by state; in another's, the price is depended by market. In dual-track price system, the agricultural products should firstly supply to state, the surplus is allowed to flow in the market. China government controlled the price of agricultural products by this system, and made the agricultural products flow into the industry by a lower price.

growth. Prices of most products, including grain and coal, were determined by the market as the "dual track" system was dismantled. The government reformed the state-owned sector by privatizing small and medium-sized state-owned enterprises. Owing to competitive pressures, state-owned enterprises across the board resorted to cutting payrolls to improve efficiency. As a result, hundreds of thousands of workers were laid off. Due to lagging reform of the social security system, urban poverty loomed large. On one hand, there was a booming economy in urban areas and more opportunity to earn high income. This was especially true for elite groups who profited from their political and economic power, and for a small number of people who took advantage of loopholes in the system. On the other hand, there was a decline in income for the unemployed and laid-off workers.

The same period saw fluctuations in growth in rural incomes. In 1994 and 1995, the government substantially raised the price of agricultural produce, resulting in rapid income growth in rural China. From 1997 onwards, however, a steady decline in grain prices slowed income growth for rural households. The widening urban-rural income gap emerged as the leading factor contributing to China's growing income inequality.

2.1.2.5. For more equality

In 2002, the 16th National Congress of the Communist Party of China proposed that "aiming at common prosperity, it should expand the proportion of middle-income earners, and raise the income level of low-income earners, and regulate the excessive income of high-income earners, and ban illegal income. In addition, it should strengthen the supervision of the income distribution in monopoly industries."

In recent years, the central government has been regulating the income gap through expansion of domestic demand and promotion social fairness. It is the key link to implement the strategy of expanding domestic demand and improve the consuming capacity of middle-low income earners by increasing their income. As a result, the government introduced a series of policies and curbed partly the trend of widening income gap; such as the abolition of agricultural tax, the implementation of industrial nurturing agriculture, the support for rural by urban, the establishment of the minimum wage and social security system, rural compulsory education "two exemptions and one subsidy, etc.

The Chinese 16th CPC Central Committee 6th Plenary Session[66] held in Beijing in 2006. It is proposed to strengthen the macro-regulation to income distribution, pay attention to social equity, and to focus on improving the income level of low-income earners, gradually expand the proportion of middle-income earners, effectively regulate the high income, resolutely abolish

[66] Chinese 16th CPC Central Committee 6thPlenary Session

illegal income and promote common prosperity.

The 13th five year-plan is started in 2016. In the plan chapter 63 "*bridge the income gap*" elaborates how to narrow income gap. The government proposed to strike the right balance between fairness and efficiency, ensure that personal income grows in step with economic growth and that wages increase in step with increases in labor productivity, and work continuously to grow personal incomes. They will improve primary income distribution, intensify efforts to regulate income redistribution, adjust and optimize the pattern of national income distribution, and work to bridge income gaps throughout the whole of society.[67] More elaborate policies will be introduced on aspect of Primary Distribution Systems, Redistribution Regulating Mechanisms and Standardization of Income Distribution.

2.1.2.6. Conclusion

After 30 years of reform and opening-up, China has implemented the transformation from a planned economy to a market economy. The income distribution reform develops from breaking down 'Egalitarianism' to according to work, efficiency and equity ending to equality. Based on the China's development strategy, including "dual-track", Special Economic Zones, regional development strategy, the household registration systems of urban and rural areas, property ownership, etc., and the policies enlarged the income gap including also legal construction lagging and monopoly. The earlier policy "production responsibility system" in 1980s could not stop the gap. Afterwards, the Gini coefficient from 0.491 at 2008 to 0.469 at 2014, it decreased 4.5% that attributed to a series of policies, such as the abolition of agricultural tax, the implementation of industrial nurturing agriculture, the support for rural by urban, the establishment of the minimum wage and social security system, rural compulsory education "two exemptions and one subsidy," etc. Seeing the 13th five year-plan, the new policies will be published to narrow income gap.

[67] Translated by Compilation and Translation Bureau, Central Committee of the Communist Party of China Beijing, China. The 13th Five-Year Plan For Economic And Social Development Of The People's Republic Of China (2016–2020).Central Compilation & Translation Press

2.1.3. Discussion

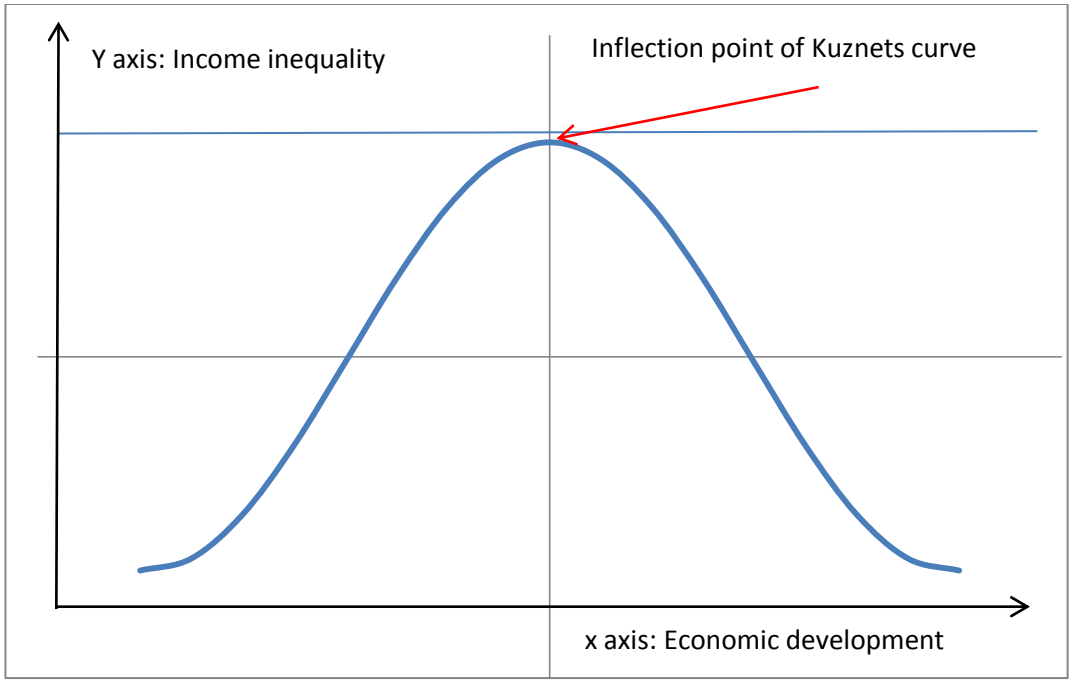
In China, the measurement of economic inequality is beset by several sampling issues such as the concealment of high incomes; under-counting of very poor people living in remote and inaccessible regions; and under-reporting of migrants' income. There are also conceptual issues: whether and how to include imputed rent on owner-occupied housing in income, as it happens in the international standard; whether and how to take into account the price differences among provinces and between urban and rural areas in calculating incomes. All the above problems make the Gini coefficient undervalued. In spite of the decline of the Chinese Gini, scholars are still discussing whether the China's income inequality reached or got close to the turning point. The scholars argue in two aspects, the Lewis turning point and the inflection point of Kuznets curve.

2.1.3.1. The inflection point of Kuznets curve.

"Inflection point of Kuznets curve" is a turning point, which refers to the income inequality in a certain stage of economic development from the ever-expanding to reducing gradually. "Kuznets turning point" is based on Kuznets inverted U curve hypothesis which puts forward a concept introduced by Simon Kuznets[68] in 1955. According to this hypothesis, the income inequality in a country at the initial stage of economic development tends to expand; and when the economic development goes to a certain stage, its income inequality will gradually shrink; the whole trend goes like an inverted U curve in a diagram where on the X axis is Economic Development and Y axis is Income Inequality.

Figure 2.1 - 15. Kuznets curve

[68] Simon Kuznets. (1955) Economic Growth and Income Inequality. The American Economic Review.Vol. 45, No. 1 (March), pp. 1-28



The turning point in the shift from "expanding trend" to "narrowing trend" is called “inflection point of Kuznets curve” or “Kuznets turning point”.

The cause of Kuznets inverted U curve hypothesis is that at initial growth only a small part of population could benefit in the growing market. Their incomes inescapably rise with economic growth. If they are at the lower income sector, the income inequality in this economy declines at the same period; if they are not at the lower income sector (such as at higher income group or sector), income inequality rises. As the sector and relative sector development the economic grows steadily. Meanwhile, on the one hand, most of sectors get benefit which almost involved all population, on another hand, the income inequality rise markedly. As a certain stage of economic development is reached, the sector which leads economic growth lacks driving force and the new driving force absent, the incomes of this sector do not rise any more. The income inequality of this economy would decrease.

Wenli Cheng and Yongzheng Wu (2015)[69], investigate income inequality in the post-reform Chinese economy using both national time series and provincial panel data 1978 to 2011. They identify a Kuznets inverted U relationship between economic development and income inequality and show that this relationship was driven by the process of urbanization. They find that, after controlling for urbanization, low productivity in agriculture relative to that of the economy as a whole (i.e., dualism) and inflation appear to have been significant contributing factors to income inequality.

[69] Cheng, Wenli and Wu, Yongzheng. (2015) Income inequality in China: Testing the Kuznets Hypothesis with National Time Series and Provincial Panel Data 1978-2011,Monash Business School, ISSN 1441-5429 Dicussion Paper 32/15

Their study shows the Kuznets inverted U relationship between 1978 and 2011. The China's Gini coefficient went down from 2008, just 3 years declining, which can not completely indicate the whole Kuznets inverted U curve. If the subsequent urbanization is still the significant driven of economic development, the declining Gini coefficient forebode probably the Kunznets inverted U relationship.

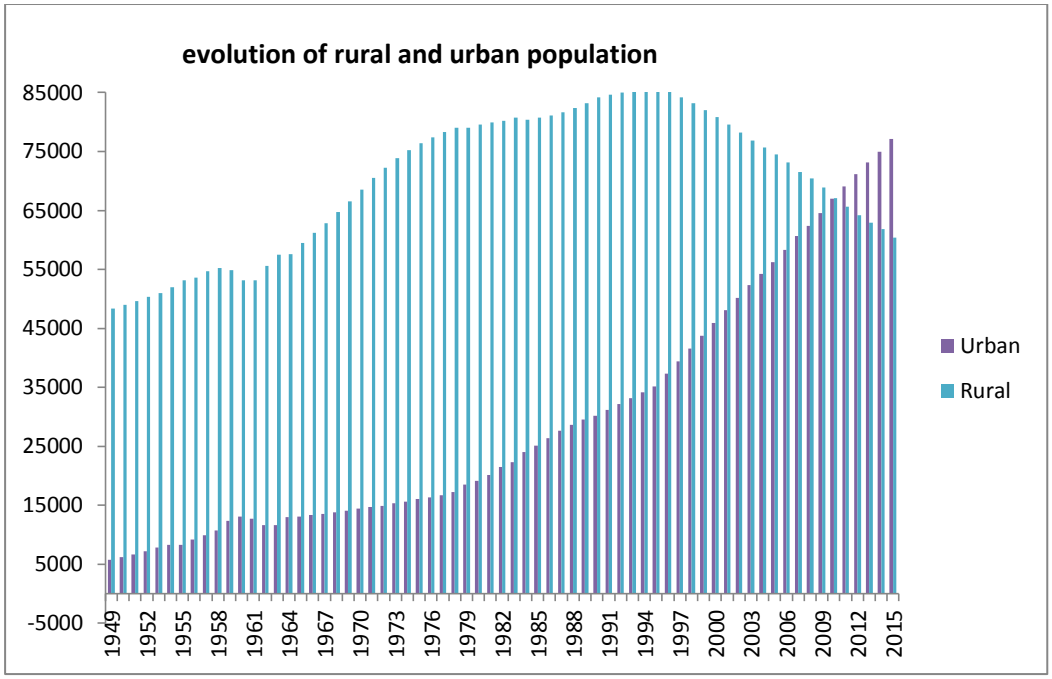
The inverted U curve is still called a Hypothesis which has not been completely proved. Some previous researches do basically support the "inverted u shape" hypothesis. Same empirical studies show that the income inequality does not shrink with the economic development rising, and the "turning point" depends on the government's allocation policy and redistribution policy. In other words, the "turning point" is government policy-driven rather than simply market behavior. However, if the government intervention improves appropriately the market, instead of deteriorating the market; the market would go positive cycle and the Kuznets inverted U Hypothesis may realize.

2.1.3.2. The Lewis turning point

"Lewis turning point"[70] refers to the transition point (transition period) in the process of transformation of labor force from infinite supply to limited supply during a certain stage of economic development. At this point, the surplus labor force in the whole society basically disappears, and the overall supply and demand of labor force is basically balanced, the wage level of unskilled labor is on the rise. For most countries from the traditional economy to the modern economy, the "Lewis turning point" is a necessary stage. Therefore, the arrival of Lewis turning point is vital milestone for a developing economy which has not only theoretical meaning but also practical significance, because only does it pass through this point that the marginal productivity of labor in traditional (agricultural) sector begins to converge that in modern (non-agricultural) sectors.

Figure 2.1 - 16. The evolution of rural and urban population

[70] Lewis, Arthur. (1954). Economic development with unlimited supplies of labour. The Manchester school of economic and social studies 22(2), 139-91.



Source: National Bureau of Statistics of China

Before 1984, the mobility was restricted by government. The rural population was 803.40 million that was 3.3 times than in urban areas. Comparing the urban labor, rural population could be understood as unlimited labor supply. As policies easing, more and more rural workers moved to urban areas. We could not say the growth of population in urban areas equals the decrease of rural population because of different birth rate and death rate. However, considering the rate of change in rural and urban, we could roughly understand the growth of population in urban areas equal the decrease of rural population. So Lewis turning point should come out after 1997.

In the past years, labor shortage in China has become an emerging issue. Therefore, there is a heated debate on whether China has passed the Lewis turning point and entered a new era of labor shortage from a period of unlimited labor supply. Xiaobo Zhang et al. (2011)[71] used micro level data in six provinces and concluded that the era of unlimited labor supply has already passed and that the Lewis turning point in rural China arrived in 2003. Cai (2010)[72] concluded the industrial labour supply is no longer infinite.

However, John Knight et al. (2011)[73] fit the characteristics of a large sample of rural residents in a Probit model of migration and estimate that there were still 80 million potential migrants in the countryside in 2007. Yao and Zhang (2010)[74], using provincial data for the period 1998–2007,

[71] Zhang, Xiaobo. Yang, Jin. And Wang,Shenglin. (2011).China has reached the Lewis turning point [J],*China Economic Review*, 22(4),542-554

[72] Cai, Fang. (2010). Demographic Transition,Demographic Dividend,and Lewis Turning Point in China. *China economic journal,* 3(2), 107-20

[73] Knight, John; Quheng Deng, and Shi Li. (2011). The puzzle of migrant labour shortage and rural labour surplus in China, *China Economic Review*, 22(4):585-600

[74] Yao, Yang and Zhang,Ke. (2010).Has China passed the Lewis turning point? A structural estimation based on provincial data. *China economic journal* 3(2), 155-62.

estimate the supply and demand functions of migrant workers in each year for a typical Chinese province in a structural framework that explicitly takes into account the Lewis turning point in the supply function. The results are extrapolated to the national level, and the turning point and the equilibrium level of migrant employment are both estimated for each year. The comparison of those two estimates shows that China has not passed the Lewis turning point.

In theory, the arrival of "Lewis turning point" has a certain impact to income inequality. The process of disappearing rural surplus labor will increase the labour productivity of agriculture and the income of farmers. As a result, it will restrain the widening income inequality.

2.1.3.3. The future income distribution reform

The Chinese 16th CPC Central Committee 6thPlenary Session held in 2016 and then the government has been highlighting the income distribution. To some extent, China's income inequality shrinks since 2008. It means the China's income distribution policies do work well and that did not enlarge income inequality. The 13th five year-plan elaborates in details how to narrow income inequality in a series of policy on aspect of Primary Distribution Systems, Redistribution Regulating Mechanisms and Standardization of Income Distribution. It is clear that the income inequality will be narrowed in the future. But it is not clear when this will happen and in which way.

2.2. China's poverty evolution and multidimensional poverty studies

2.2.1. China's poverty evolution

Because of the lack of urban poverty data, in this dissertation we just describe the rural poverty. Poverty in China is mainly concentrated in the rural areas, therefore, we can roughly access to China's poverty just looking the rural poverty.

There are three versions of poverty line in China by different period, Poverty Standard 1978[75], and Poverty Standard 2008[76], Poverty Standard 2010[77]. As China's economic development, the poverty line has been rising up. Consequently, poverty line was pulled up again after every adjustment.

Table 2.2 - 1. The Scale of Poverty and the Poverty headcount ratio in rural area of China 1978-2015

[75] Poverty line (1978) is 100 yuan/person per year in 1978. The proportion of food expenditure was set up 85%, 85 yuan, which could afford essential food of 2100 calorie. These foods could barely satisfy one's hunger.

[76] Poverty line (2008) proposed in 2008, the standard was implemented for data from 2000 to 2010. Under this standard, poverty line was 865 yuan/person per year in 2000, which is divided into 60% for 2100 calorie's food, 40% for clothing and other articles of daily use. With these expenditures, one could dress warmly and has enough food.

[77] Poverty line (2010) is 2300 yuan/person per year in 2010. With this amount of money, people could access to nine-year compulsory education, essential health care, basic housing, 2100 calorie and 60 gram's protein.

	Poverty Standard 1978 Yuan, 10 thousand,			Poverty Standard 2008 Yuan, 10 thousand,			Poverty Standard 2010 Yuan, 10 thousand,			World Bank (Yuan)
Year	pl	pp	phr (%)	pl	pp	phr (%)	pl	pp	phr (%)	
1978	100	25000	30.7				366	77039	97.5	
1979										
1980	130	22000	26.8				403	76542	96.2	
1981		15200	18.5							
1982		14500	17.5							
1983		13500	16.2							
1984		12800	15.1							
1985	206	12500	14.8				482	66101	78.3	
1986		13100	15.5							
1987		12200	14.3							
1988		9600	11.1							
1989		10200	11.6							
1990	300	8500	9.4				807	65849	73.5	1744
1991		9400	10.4							
1992		8000	8.8							
1993										2271
1994		7000	7.7							
1995	530	6500	7.1				1511	55463	60.5	
1996										
1997		4962	5.4							
1998		4210	4.6							
1999		3412	3.7							
2000	625	3209	3.4	865	9422	10.2	1528	46224	49.8	
2001		2927	3.2		9030	9.8				
2002		2820	3		8645	9.2				
2003		2900	3.1		8517	9.1				
2004		2610	2.8		7587	8.1				
2005	683	2365	2.5	944	6432	6.8	1742	28662	30.2	3737
2006		2148	2.3		6698	6.0				
2007		1479	1.6		4320	4.6				
2008				1196	4007	4.2	2172			
2009					3597	3.8				
2010				1274	2688	2.8	2300	16567	17.2	
2011							2536	12238	12.7	

2012							2625	9899	10.2	
2013							2736	8249	8.5	
2014							2800	7017	7.2	
2015							2855	5575	5.7	4319

PP: poverty population (10 thousand)

PL: poverty line (Yuan/person per year)

PHR: Poverty headcount ratio (%)

Source: Poverty Monitoring Report of Rural China 2016, table 1-3-1, table 8-1-1

In the year 1978, the year of beginning the economic reforms, according to the Poverty Standard 1978 in which poverty line was set at 100 Yuan/person per year there was a population of 250 million people under poverty line in rural area in China.[78] The poverty headcount ratio was 30.7% by that year. As economic development took off, the poverty line under Poverty Standard 1978 was adjusted every five years, so it was not always fixed. The poverty population declined to 14.78 million and poverty headcount ratio went down to 1.6% by 2007 referring to the poverty line of 683 Yuan/person per year set by Poverty Standard 1978. The number of poor population decreased by 235.22 million, and the annual decline ratio averaged 9.3% from 1978 to 2007.

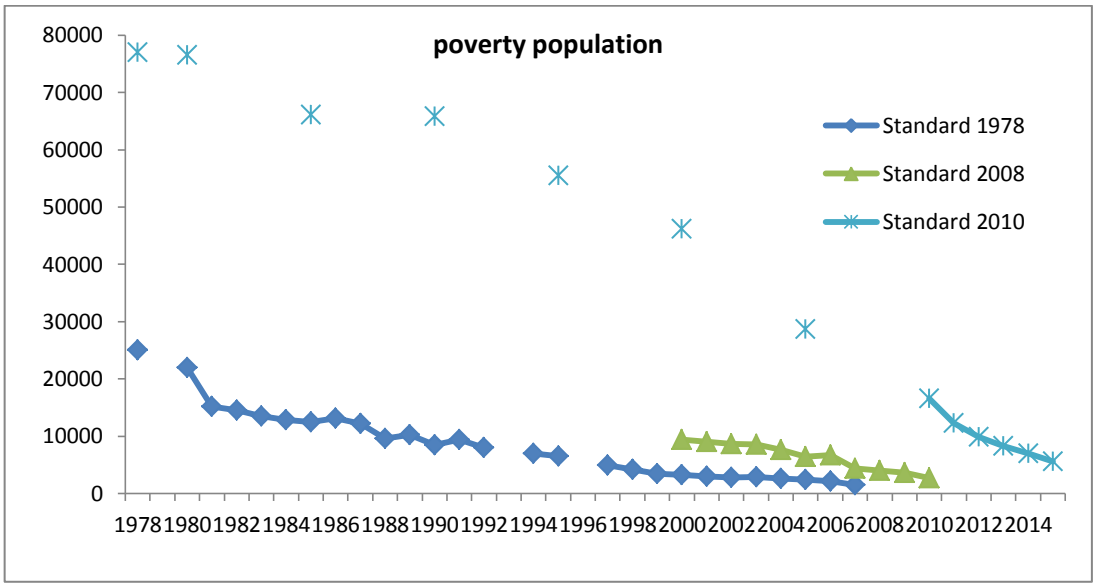
Up to the year of 2008, the Poverty Standard 2008 was published. We can find more data based on this standard on the report of Poverty Monitoring Report of Rural China 2016. The data are involved from the year of 2000 to 2010 at this standard. The poverty line was set at 865 Yuan/person per year and the poverty populations and poverty headcount ratio were calculated at 94.22 million people and 10.2% in 2000. The corresponding data were published 1274 Yuan/person per year, 26.88 million population and 2.8% by 2010. We could calculate the number of poor people had declined by 67.34 million. The poverty headcount ratio declined from 10.2% to 2.8%.

The data cover more years at poverty standard 2010 than poverty standard 2008. The years were spanned from 1978 to 2015. The poverty line of 1978 was set at 366 Yuan/person per year at poverty standard 2010 instead of 100 Yuan by poverty standard 1978. Taking of 366 Yuan/person per year as poverty line the poverty populations and poverty headcount ratio were calculated 770.39 million populations and 97.5% of whole population of China in 1978. By 2015, the corresponding data were 2855 Yuan/person per year by poverty line, 55.75 million poverty populations, 5.7% poverty headcount ratio. Referring to this poverty standard, China had lifted 714.64 million populations out of poverty, and declined poverty headcount ratio from 97.5% to 5.7%.

[78] Poverty Monitoring Report of Rural China (2016), Rural Survey Department of National Bureau of Statistics, P.182

Considering to the poverty line provided by World Bank, 1 dollar per day in 1990, 1.08 dollar per day in 1993, 1.25 dollar per day 2005 and 1.90 dollar per day in 2015, we calculated them into Yuan by exchange rate 1744 Yuan in 1990, 2271 Yuan in 1993, 3737 Yuan in 2005 and 4319 Yuan in 2015. The World Bank's poverty lines are higher than China's far away. The poverty issue in rural of China is still worth to regard. No matter which poverty standard we take, the China's poverty reduction made an impressive progress.

Figure 2.2 - 1. Poverty population based on three different standards in China from 1978 to 2015



China has lifted more than 800 million people out of poverty (the dollar-a-day poverty line)[79] since 1978.

China's mainly contribution on the poverty reduction is divided in five stages. The first stage is rural reform from 1978 to 1985. The rural reform, for instance "Production Responsibility System"[80], greatly promoted the economic development and delivered remarkable results in terms of poverty reduction as well as agricultural production and rural industries. A strong growth in grain yields and in rural industries, accompanied by sharp increases in agricultural procurement prices raised rural incomes. The growth in agricultural production and farmers' income was spectacular in some extremely poverty-stricken regions, such as the Huanghuaihai region in Eastern Fujian (Wang, 1994)[81]. As poverty in China was widely dispersed across China's rural areas in the early years of post-1979 reforms, rural income growth delivered nearly universal

[79] The World Bank In China, overview, http://www.worldbank.org/en/country/china/overview

[80] Production Responsibility System (jiating chengbaozhi), Household contract responsibility system (jiating lianchan chengbao zerenzhi), means household are held responsible for the benefits and losses of agricultural products instead of commune's responsibility..

[81] Wang Sangui, (1994). Poverty Problems and Economic Development, Rural Reading Materials Press.

poverty reduction.

The second stage is "The National Targeted Poverty Reduction Programs" from 1986 to 1993. In 1986, The State Council Leading Group Office of Poverty Alleviation and Development (LGPR)[82] was established to provide coherence to the large number of poverty reduction initiatives and, in particular, to expedite economic development in poor areas. As the basic unit for poverty targeting, the government designated poor counties. For the officially designated "poor" counties, the central government created special funds to support a subsidized loan program, food for work (FFW) program, and budgetary poor area development fund grants. Subsidized loans covered both households and enterprises in industry and agriculture, food-for-work program was utilizing surplus farm labor mainly to develop infrastructure, and government budgetary grants supported investment in poor areas across all the sectors (World Bank, 2001a)[83].

At the local level, most poor provinces, prefectures, and counties have all established Leading Groups, and local governments were required to provide counterpart funds. Different agencies became responsible for different poverty reductions projects and activities (rural roads constructed under the FFW program, for example, have been implemented by local staff of the Transport Bureau). Certain preferential taxation treatment was offered to poor regions (Office of the Leading Group for Poverty Reduction and Development, 1989). But the overall progress in poverty reduction in China has been slower coinciding with stagnation in the rural economy.

The third stage is "The 8-7 Plan"[84] from 1994 to 2000. In 1994, the Government announced "The 8-7 Plan", aspiring to lift the majority of the remaining 80 million poor above the government's poverty line[85] during the seven year period 1994-2000. That needed more effort and greater determination to solve the food and clothing problem of the remaining 80 million rural poor populations. The Plan aimed at increasing rural production, improving primary education, providing basic preventive and curative health care, building infrastructure (including access to road, drinking water, electricity), funding to poverty reduction activities and looking for other kind of domestic and international supports. In implementing the 8-7 Plan, the Government refined its selection of "poor" counties and emphasized the responsibility of local government leaders for the effectiveness of poverty reduction work in their jurisdictions. During the 8-7 Plan China's rural poverty populations declined from 80 million populations to 32 million, and the poverty headcount ratio decreased form 8.8% to 3.4%. Although the 8-7 Plan didn't develop as they had expected, it had a positive impact on poverty reduction and made a great development on other dimensions, education, health care, and infrastructure and so on.

[82] The State Council Leading Group Office of Poverty Alleviation and Development (guowuyuan fupin kaifa lingdao xiaozu bangongshi) http://www.cpad.gov.cn/

[83] World Bank, (2001a). China: Overcoming Rural Poverty (The World Bank, Washington, D.C.).

[84] to help 80 million people out of poverty within seven years

[85] The poverty line was set by 317 Yuan/person per year in 1992, there were 80 million people.

The fourth stage is Poverty Reduction Strategy in the New Century. The Chinese Government launched the outline for poverty reduction and development of China's rural areas (2001-2010) by 2010.

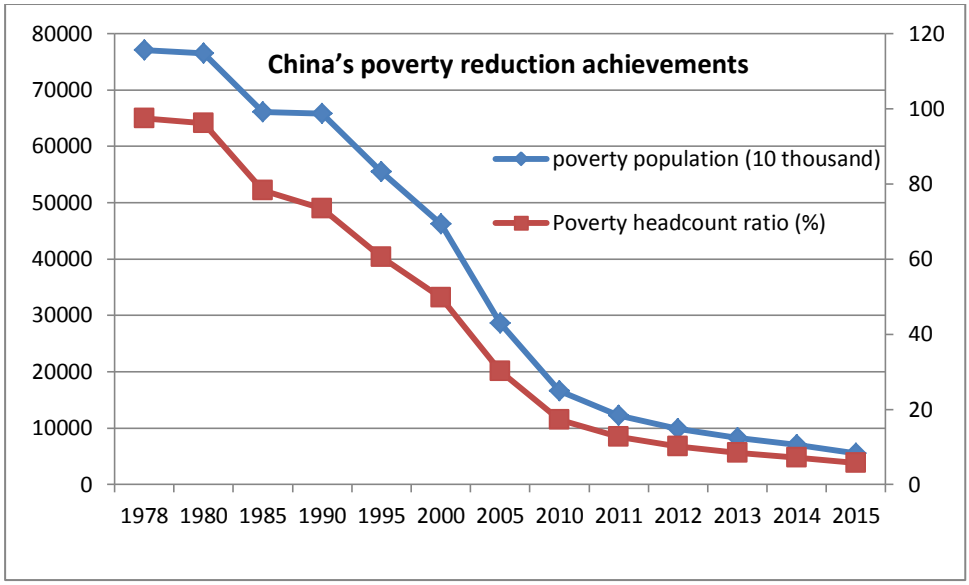
During this decade, the government successively abolished the animal husbandry tax, pig slaughtering tax, and tax on agricultural and forestry specialties. In particular, it abolished the agriculture tax that had existed in China for over 2,600 years. The government issued subsidies directly to grain growers, subsidies for purchasing fine seeds and agricultural machinery and tools and general subsidies for purchasing agricultural supplies; gradually established and improved the social security system for rural China, and pushed forward the construction of infrastructure related to drinking water, electricity, road and methane, along with the renovation of dilapidated rural housing. The government kept increasing investment into measures that strengthen agriculture and measures that bring benefits to the farmers and increase their incomes, as well as the development-oriented poverty reduction program.

The problems of subsistence, food and clothing for rural residents have been basically solved. Based on the poverty standard 2008, the poverty line raised for rural residents from 865 yuan in 2000 to 1,274 yuan in 2010. Based on this change, the poverty-stricken rural population decreased from 94.22 million at the end of 2000 to 26.88 million at the end of 2010; and their proportion in the total rural population decreased from 10.2 percent in 2000 to 2.8 percent in 2010. Also other economic development indicators have greatly improved.

With the fifth stage is poverty reduction strategy (2011-2020) the Chinese Government launched the outline for poverty reduction and development of China's rural areas (2011-2020) by 2011. Standing on the achievements made during 2000 to 2010, China promoted rural development, in particular, in the field of infrastructure, social security and health care, education and cultural services. At the Fifth Plenary Session of the 18th CPC Central Committee held in October 2015, the CPC further specified the task of eliminating rural poverty by 2020.

Referring to the poverty line 2855 Yuan/person per year, the number of rural poor had fallen to 55.75 million by 2015, with the poverty headcount ratio dropping to 5.7 % in rural.

Figure 2.2 - 2. Figure 1-2 China's poverty reduction achievements from 1978 to 2015 based on the poverty standards 2010



Looking at the diagram one can see that the poor population declined from 770.39 million individuals to 55.75 million, and the poverty headcount ration decreased from 97.5% to 5.7 during 1978 to 2015.

China's poverty reduction achievements have benefited from economic growth. Over the past 30 years of reform and opening up, China's economy has maintained rapid growth, and China's poverty reduction achievements have been particularly remarkable. In most areas she have solved the problem of food and clothing, and more than 700 million Chinese people have been lifted from poverty. China is the first developing country to achieve a halving of poverty from the Millennium Development Goals, and has made tremendous contributions to the cause of global poverty reduction.

2.2.2. Multidimensional Poverty in China

Multidimensional Poverty in current years is new conception and less focused. There are a few studies about China and they developed the measurement in urban and rural, and in some poor areas.

Yanyun Gao (2012)[86], measured the MPI for Chinese urban and rural areas with education, health and living standard based on 2000 and 2009 CHNS dataset. The main conclusions are that the multidimensional poverty is more serious in rural than in urban areas, health insurance, sanitation, cooking fuel and housing are important dimensions for poverty reduction. The government should pay more attention for the middle and west provinces.

[86] Gao Y.Y., (2012).The Multidimensional Poverty in Urban and Rural China: Measurement and Comparison. Statistical Research. 29(11):61-66

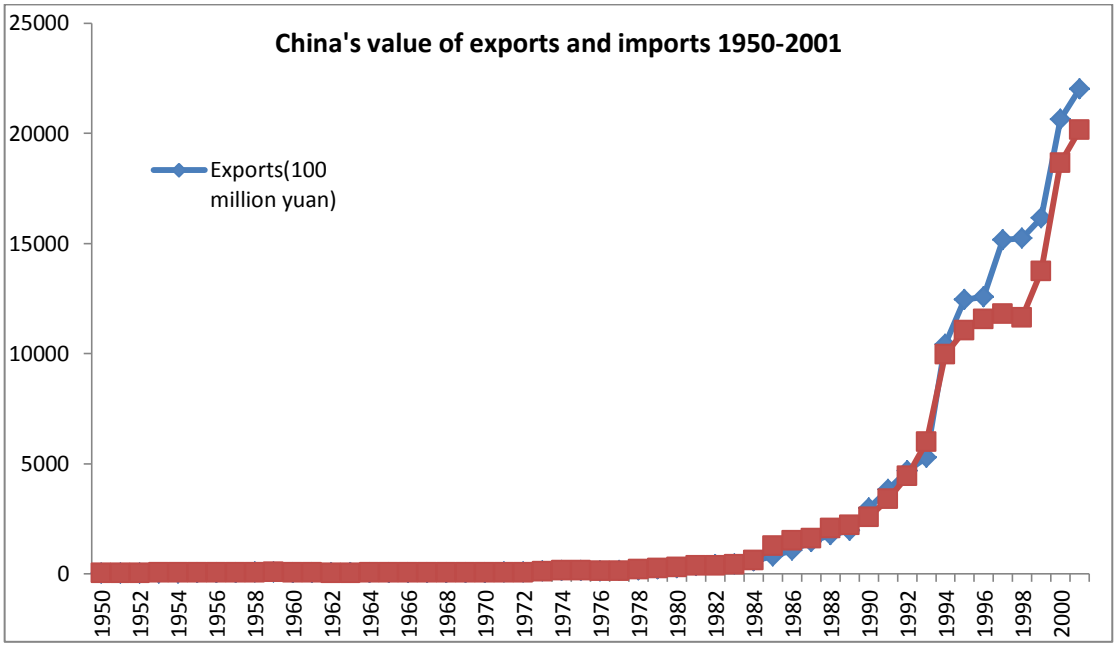
Wang Xiaolin, Sabina Alkire (2009)[87], based on the Alkire and Foster's method measured the multidimensional poverty of China 2006. They measured 9 provinces by taking 8 dimensions (Housing, drinking water, sanitation, electricity, assets, land, education and health insurance), then concluded that rural multidimensional poverty is more serious than urban, and sanitation, electricity, education and health insurance contribute the highest proportion in multidimensional poverty.

Jianyu Guo and Guobao Wu (2012)[88], measured the Shanxi province MPI with Shanxi Poverty County data. They concluded that the lack of education and health are the main reason of multidimensional poverty in Shanxi Poverty Counties. Government should develop education and health insurance in Shanxi Poverty County.

2.3. .The evolution of China's import-export

If we take a picture of the whole trend of China's value of export and import since 1949, we could have a look to its evolution. This part presents the evolution of trade in three periods.

Figure 2.3 - 1. The evolution of China's value of exports and imports 1950-2001



Source: National Bureau of Statistics of China

[87] Wang, Xiaolin. and Sabina Alkire. (2009) The measurement of Multidimensional Poverty of China: Estimation and Policy Implications (zhongguo duowei pinkun zeliang: guji he zhengce hanyi). Chinese Rural Economy Dec,P.4-10

[88] Guo,Jianyu. And Wu, Guobao. (2012) Multidimensional Poverty Measurement Based on Different Indicators and Weight Selection - A Case Study of poverty counties in Shanxi Province (jiyu butong zibiao ji quanzhong xuanzede duowei pinkun celiang – yi shanxisheng pinkunxian weili)[J], Chinese Rural Economy, Feb, P.12-20

Before 1978

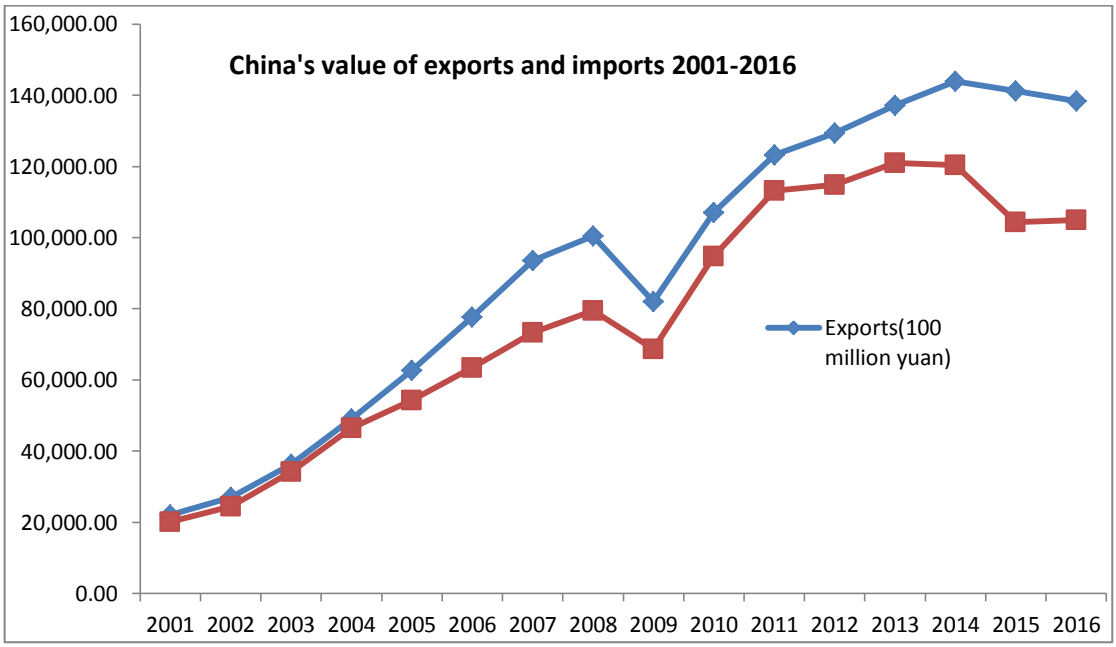
The values of import and export began at 2,130 million yuan and 2,020 million yuan in 1950 respectively. Then the values increased to 18,740 million and 16,760 million by 1978. Obviously, that was a great progress and the growth rate reached 7.8% annual. However, the values of import and export before 1978 were limited comparing the latter years, although the growth rate was so high.

1978 to 2001

From 1978 the curve began to rise slightly, and later years it went sharply since 1984 until 2001. The value of import and export increased respectively from 18,740 million yuan and 16,760 million by 1978 to 2,015,920 million yuan and 2,202,440 million yuan by 2001. The growth rate was about 25% annual since 1978 to 2010. The diagram shows a sharp growth.

2001 to 2016

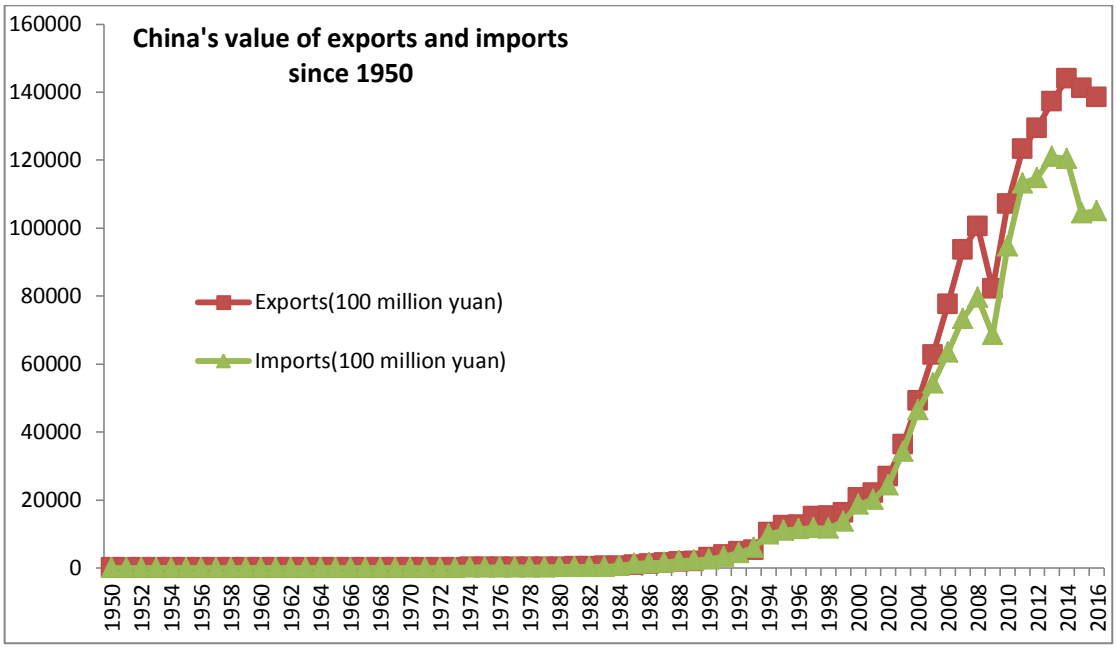
Figure 2.3 - 2. The evolution of China's value of exports and imports 2001-2016



Source: National Bureau of Statistics of China

The growth annual was 15.5% from 2001 to 2014 and went a bit more slightly than during the previous period. Nevertheless, the value of import and export reached at 12,035,803 and 14,388,375 million yuan by 2014 as the first export country and second import country in the world. Because of World Financial Crisis started in 2008, the value of import and export dropped by 14% and 18% in 2009, and then recovered in 2010 and continued the previous growth momentum. The value of import and export in 2015 and 2016 went down slightly, but it made no difference of her trade ranking in the world.

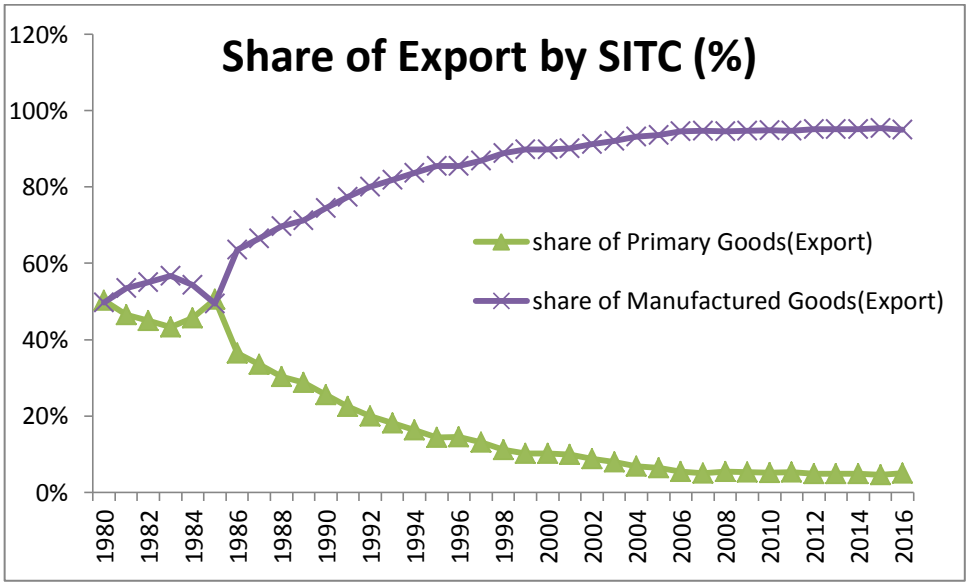
Figure 2.3 - 3. The evolution of China's value of exports and imports since 1950



Source: National Bureau of Statistics of China

When we take a look to the whole picture from 1950 to 2016, we can see that the Chinese import and export began at a very low lever at 1950 and still kept low level in the first three decades by 1978 even with 7.8% annual growth. It took off since 1978 or a little later. The 25% annual growth lifted China up from 32nd trade county at 1978 to 6th import-export country in the world by 2001. China surpassed Germany as the first export country and second import country in the world by 2009.

Figure 2.3 - 4. Share of Primary Goods and Manufactured Goods on Export by SITC (%)



Source: National Bureau of Statistics of China

Since the Reform and Open, China's export commodity structure has been continuously changing. In 1980, primary goods accounted for 50.30% total export commodities, and manufactured goods accounted for 49.70%. From 1981 to 1984, the share of primary goods fell first and then rose. In 1985, the share of primary goods exports to total exports was almost equal to that of manufactured goods, accounting for half of each. Since then, China's export commodity structure has always been the share of manufactured goods more than the share of primary goods, and the gap has increased year by year. In 1990, the share of exports of manufactured goods to total exports reached more than 70%, and manufactured goods became the main products in China's exports. After the "Eighth Five-Year Plan 1991-1995" and the "Ninth Five-Year Plan 1996-2000", the share of primary goods in China's export commodity structure has further declined sharply, and manufactured goods have become the absolute main products of exports. In 2010, primary product exports accounted for 9.90% of total exports, and manufactured goods accounted for 90.10%. In 2006, primary goods fell further to 5.46% and manufactured goods to 94.53%. Until nowadays the share of primary goods and of manufacture goods keep around these shares like the year of 2006.

The main policies

There is little doubt that 1978 was a turning year of China’s trade history. Due to the 1978 economic reform, China conducted trade and liberalization on a huge scale which is almost unparalleled in economic history. After Deng Xiaoping held the first power of China, he quickly abandoned most of the ideological measures and policies of Mao era in economic areas and ended the country’s isolation from the rest of the world. The series of reform are called Reform and Open which made Chinese benefit tremendously from integrating into the global trade system. Hereafter, China started to trade with as many countries as it could and reformed the foreign trade system as open as possible.

Before 1978, China’s foreign trade system was fully centralized, dominated by a dozen or so specialized foreign trade companies organized along products lines and based in Beijing. Since 1978, China opened to the outside world, including established special economic zones (SEZs) and opened some coastal cities in succession. State-Owned Enterprise and Joint Venture were allowed to deal with their own materials and products, even some Joint Venture were allowed to engaging in international business in later years.

China entered the WTO in 2001 as a part of the world market economy and the multilateral trading system. Since then, China has fully engaged in bilateral trade agreements and provided a huge driving force for her foreign trade. That expanded China’s exports markets and increased in the supply of exports into others’ markets, and expansion investment in China and, potentially, outward foreign investment from China.

3. Literature Review

3.1. .China's income inequality

China's income inequality has been noticeable since 2000, and even earlier. Therefore, there are many contributions on it. Some of them concern geographical aggregates or different groups, while others address methodological issues. Within methodology, they focused on various aspects of quantitative analysis, such as how to measure the inequality, what contribution factors, what bring about from inequality.

3.1.1. Measurement

Ravallion and Chen[89] (2007) who had partial access to the NBSC micro data, found growing income inequality: urban, rural and national Gini coefficients increased by 3 percentage points over the six years between 1995 and 2001. Their estimate of the national Gini in 2001 was 0.45. NBSC statistics for urban China shows that income inequality continued to rise after 2001. The share of the lowest three quintiles fell monotonically over the period of 2000–2008, whereas that of the highest quintile increased sharply. Moreover, the national Gini coefficient based on grouped NBSC data was estimated to rise by 5 percentage points between 2000 and 2008.[90]

Zuxiang Wang (2009)[91] based on income distribution density function adjusted the grouped income distribution data published in the China Statistical Year Book, then calculated China's Gini coefficient that has reached 0.44 since 2003. Meanwhile, this contribution indicated that the key of income inequality of China from 1995-2005 was between urban and rural instead of inter urban and inter rural.

Yiyong Yang[92], Fuquan Qi[93] indicated that the urban-rural gap has widened by income ratio between urban and rural population.

Zuguang Hu[94] set up a concise formula for calculating Gini coefficient, and proved Gini coefficient equals the difference between the income percentage of the highest income group and the income percentage of the lowest income group in the quinque-partite income distribution.

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[89] Ravallion, Martin, and Shaohua Chen. (2007). "China's (Uneven) Progress against Poverty." *Journal of Development Economics*, 82 (1): P1–42.

[90] Lin, T., J. Zhuan, D. Garcia, and F. Lin. (2010). "Income Inequality in the PRC, 1995-2008." In Poverty, Inequality and Inclusive Growth in Asia, ed. J. Zhuang. *London: Anthem Press*.

[91] Wang, Zuxiang. Zhang, Kui. And Meng, Yong. (2009) Estimation of Chinese Gini Coefficient(Zhongguo Jinni Xishu De Gusuan Yanjiu) [J]. *Economic Review,* (3):P14-21

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[93] Qi, Fuquan. (2010). An Empirical Study Of The Income Gap Between Urban And Rural Residents In Beijing (Beijingshi Chengxiang Jumin Shouru Fenpei Chaju Bianhua De Shizheng Fenxi).*Social Science of Beijing*,vol.1,P18-26

[94] Hu, Zuguang. (2004) A Study of the Best Theoretical Value of Gini Coefficient and Its Concise Calculation Formula(Jinni Xishu Lilun Zuijiazhi Jiqi Jianyi Jisuan Gongshi Yanjiu).*Econominc Research Journal,* (9):P60-69.

Xiaoyong Liu (2009)[95] based on decomposable GE inequality measure and found that between group inequality among eastern, western and central regions accounts for more than 70 percent of the total GE inequality, and the coast-inland between group inequality accounts for more than 50 percent of the total inequality. He found that there is polarization orientation in coast-inland, low and high development areas, the polarization in low and high decentralization is not serious.

Missing data on income may lead to bias in the estimation of income inequality even inappropriate conclusions and policy recommendations. Chen and Fu (2015)[96] utilized a multiple imputation approach to measure income inequality considering missing data problem. In particular, they propose an extended approach to correct the possible sample selection bias in the imputation process. They used seven waves of the China Health and Nutrition Survey (CHNS) data including nine provinces. They concluded China's Gini coefficient after imputations reached 0.511 in 2009.

By using household survey data for 1995 and 2002, Sicular et al (2007)[97] investigate the size of China's urban-rural income gap, the gap's contribution to overall inequality in China, and the factors underlying the gap. They used a fuller measure of income, adjusting for spatial price differences and including migrants. They decomposed inequality by population subgroup and the Oaxaca-Blinder decomposition. Their adjustments substantially reduce China's urban-rural income gap and its contribution to inequality. Nevertheless, the gap remains large and has increased somewhat over time.

Li et al (2013)[98] based on CHIP database and took migrant factor and then calculated China's Gini coefficient 0.483 in 2007, while it was 0.460 in 2002.

Luo et al (2017)[99] measured China's income inequality based on CHIP database and indicated China's Gini coefficient decreased from 0.470 in 2007 to 0.448 in 2013. However, when they incorporated top incomes in the calculation they found the Gini coefficient increased from 0.492 in 2007 to 0.553 in 2013.

Liangchun Yu(2007)[100], Lequn Zhou and Diping Chen (2000)[101], Wen Li (2001)[102], Xizai Jin and

[95] Liu, Xiaoyong. (2009) On Inequalities and Polarization of China's Rural Residents' Income, *Collected Essays on Finance and Economics*, Jan. No. 1(General, No. 142):1-6

[96] Chen, Y., Fu, D.(2015) Measuring income inequality using survey data: the case of China, *The Journal of Economic Inequality, 13*(2), pp 299–307

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[99] Luo, Chuliang, Terry Sicular, Shi Li. (2017) "2017-13 Overview: Incomes and Inequality in China, 2007-2013." Centre for Human Capital and Productivity. CHCP Working Papers, 2017-13. London, ON: Department of Economics, University of Western Ontario.

[100] Yu, Liangchun, and Yu, Huayang. (2007) Studying The Reform Of Income And Distribution System of Monopoly

Xianglong Xu (2002)[103], Guojun Shi (2000)[104], Xiaoying Wang (2000)[105], Guoan Zeng and Zhenguo Hu (2003)[106] *et al*., discussed the effect of monopolization to income distribution.

Some studies take account of general definition of income to measure income inequality, their authors calculate the actual income gap between urban and rural in China up to 6: 1[107], taking into account the various benefits enjoyed by urban residents, including housing subsidies, public health care and children's education. A small number of scholars pointed out the urban residents of non-monetary income, including housing subsidies, medical subsidies, material subsidies, educational subsidies, social insurance (Cai and Yang 2000[108], Li and Gustafsson 2008[109]). However, it is difficult to quantify these subsidies, the studies are focused on monetary income.

In China, the measurement of economic inequality is beset by several sampling issues: the concealment of high incomes; under-counting of very poor people living in remote and inaccessible regions; and under-reporting of migrant's incomes. There are also conceptual issues: whether and how to include imputed rent on owner-occupied housing in income, as it is done under the international standard; whether to take into account price differences among provinces and between urban and rural areas in calculating incomes. Different methodologies generate different estimates of income inequality, although the main trends are similar whatever the approach used.[110]

3.1.2. Contribution Factors

Tian Feng (2010)[111], based on the data 2008 of Chinese General Social Survey, took Brown

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Industries In Chinese Transitional Economy, theory journal, sep.,No.9 (ser. No.163):63-9

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[103] Jin, Xizai and Xu, and Xianglong. (2002). Reflection On Problem Of Income Distribution In State-Owned Monopoly Enterprises, *Journal Of Changchun Communist Party Institute*, sept., (general no,76). No.5:p25-8

[104] Shi, Guojun. (2000). The Cause Of Unfair Distribution And Its Countermeasure Research.*Journal Of Lanzhou Commercial College*, Vol.16, No3, Aug.:p73-5

[105] Wang, Xiaoying. (2000). An Analysis on the Gap of Income of Workers and Staff Members in Different Lines of China. *Journal Of Shangxi Finance And Economics University*, Oct., Vol. 22,No.5:P46-8

[106] Zeng, Guoan and Hu, Zhenguo. (2003). On The Changeable Tendency, Cause, Effect And Regulatory Policies Of Resident Income Of China(20 Shiji 90 Niandai Yilai Zhongguo Jumin Shouru Chaju De Bianhua Qushi,Yuanyin,Yingxiang Yu Tiaojie Zhengce)[J].*Taxation And Economy*,No.2,March 15,(Serial No.127):P11-5

[107] Li, Shi. and Yue, Ximing. (2004). The survey of Urban-Rural income gap in China (Zhongguo Chengxiang Shouru Chaju Diaocha). *Tribune of Villages and Townshios*, (8):P21-2

[108] Cai, Fang and Yang,Tao. (2000). Political Economy of the Income Gap Between Urban and Rural Areas (Chengxiang Shouru Chaju De Zhengzhijingjixue)[J]. *Social Sciences in China Press*, (4):11-22

[109] Li, Shi.and Gustafsson, Björn. (2008). Study on Income Distribution of Chinese Residents III (Zhongguo Jumin Shouru Fenpei Yanjiu 3)[M]. *Beijing Nomal University Publishing Group*, P174-177.

[110] Fan,Shenggen and Kanbur, Ravi. et al. (2014).The Oxford Companion To The Economics Of China[M].*Oxford University Press*.P418

[111] Tian, Feng. (2012). A Study Of The Income Gap Between Urban Workers And Migrant Works[J], *Sociological Studies*,(2):87-105

(1980a, [112] 1980b[113]) decomposition method to analyze the income inequality formation causes and processes between local labor and migrant labor in urban. He found the difference of ownership is the major part of the overall income inequality, and household registration system is the threshold impeding the raise of migrant labor's income level in public-owned enterprises. Human capital can explain 36.2% of the income inequality.

Ravi Kanbur and Xiao-Bo Zhang (1998)[114] developed an empirical framework for describing the relative contribution of rural-urban and inland-costal inequality to overall regional inequality in China during the 1980s and 1990s, and concluded that the inland-costal contribution has increased several fold while the rural-urban contribution has not changed very much.

Zhao Chen *et al*[115] based on regression decomposed the income disparity in China. They indicated that in the years 1988, 1995 and 2002 inter-industry inequality made a rising contribution to income disparity in urban China and that most of this disparity was caused by the soaring earnings of monopoly industries. Meanwhile, locality, education, property ownership, occupation and the presence of a second occupation contributed increasingly to income disparity, while the contribution of age and being fully employed fell significantly.

Feng Lin (2014)[116] combined deviation and the Theil index method, and measured the contribution of administrative monopoly industries to the gap of income distribution in all industry. The contribution of 11 administrative monopoly industries group to the total gap was between 18.38% -19.35%, which was obviously higher than proper criterion.

Chunjin Chen, Shi Li (2013)[117] based on the data collected by China Health and Nutrition Survey from 1989 to 2009 through 8 sample surveys of the China national citizen households, and decomposed income by the use of the method of the Shapley Value Decomposition, explored quantitatively how the structural change in the urban labor market has resulted in the change in the

[112] Randall S. Brown, Marilyn Moon and Barbara S. Zoloth,(1980) Incorporating Occupational Attainment in Studies of Male-Female Earnings Differentials,The Journal of Human Resources Vol. 15, No. 1 (Winter, 1980), pp. 3-28

[113] RS Brown, M Moon, BS Zoloth,(1980) occupational Attainment and Segregation by Sex. Industrial and Labor Relations Review, v33 n4 p506-17

[114] Kanbur, R. and X. Zhang, "Which Regional Inequality? The Evolution of Rural–Urban and Inland–Coastal Inequality from 1983 to 1995," (1999) *Journal of Comparative Economics*, 27(4), 686–701, December.

[115] Chen, Zhao. Wan, Guanghua. and Lu, Ming. (2010). Inter-industry Income Inequality: An Increasingly Important Cause of Income Disparity in Urban China—A Regression-based Decomposition (Hangyejian Bupingdeng: Riyi Zhongyaode Chengzhen Shouru Chaju Chengyin – Jiyu Huiguifangchengde Fenjie) [J]; *Social Sciences in China*; 2010(03):65-76

[116] Lin, Feng. (2014).The Study Of The Income Distribution Gap And Its Rationalization Between Administrative Monopoly Industries And Competitive Industries(Xingzhenglongduanxing Hangye Yu Jingzhengxing Hangye Shouru Fenpei Chaju Yu Helihua Wenti Yanjiu)[D], *Shandong University*, 2014

[117] Chen, Chunjin. and Li, Shi. (2013). The Structural Changes in the Labor Market and the Wage Inequality in Urban China between 1989 and 2009 (Chenzhen Laodongli Shichang Jiegou Bianqian Yu Shouru Bupingdeng: 1989-2009)[J]. *Management World*, 2013(1): 45-55.

inequality of labor income. The Shapley Value Decomposition has further revealed that the rate of relative contribution, for the inequality of labor income, of the ownership, the household register, the sex, the experience and the regional factor tends to rise.

Yu Xie and Xiang Zhou (2013)[118] calculated Gini coefficients of family income by using the data[119] from seven data source: mini-census 2005, CGSS 2010, CGSS 2012, CFPS 2010, CFPS 2012, CHFS 2011 and CLDS 2012, and comparing USA's income inequality explained China's high income inequality based on social determinants, then concluded that a substantial part of China's high income inequality is due to regional disparities and the rural-urban gap.

Kan Tian (2005)[120], based on the Marxist distribution, new classical economics, development economics, welfare economics, new policy economics, modern finance and revenue theory, analyzed income inequality between urban and rural in aspect of household register system, tax, social security, land property.

Bing Bai (2013)[121] based on dialectical materialism, historical materialism, empirical research, quantitative research and literature research to understand China's current income distribution, and analyzed the formative causes of income distribution in the term of social security, legal construction, market regulation, regional development strategy, urban and rural dual economic structure, education.

Biwei Su and Almas Heshmati (2013)[122] used Ordinary Least Square, conditional quantile regression and Blinder-Oaxaca decomposition methods to analyze four waves of the Chine Health and Nutrition Survey household data. The results show that education and occupation are essential determinants of household's income level, and the income inequality can be largely explained by the individuals' attributes, especially by the level of education and type of occupation.

Peng Teng (2008)[123] indicated the serious imbalance of the interests of the first distribution, the weak regulation of the redistribution, the limited role of third distribution, have widened the

[118] Xie, Yu; Zhou, Xiang (2014). "Income inequality in today's China". *Proceedings of the National Academy of Sciences*. 111 (19): 6928–6933. doi:10.1073/pnas.1403158111

[119] the China 2005 1% Population Intercensus Survey (also called the 2005 minicensus, hereafter Mini-Census 2005), the 2010 and 2012 Chinese General Social Surveys (CGSS 2010 and CGSS 2012), the 2011 Chinese Household Finance Survey (CHFS 2011), the 2012 baseline wave of the China Labor Force Dynamic Survey (CLDS 2012), and the 2012 wave of the China Family Panel Studies (CFPS 2012).

[120] Tian, Kan.2005.The Study Of Income Distribution Between Urban And Rural(Chengxiang Shouru Fenpei Chaju Yanjiu)[D], *Zhongnan University Of Economics And Law,*2005

[121] Bai, Bing. On The Issue Of Income Distribution Gap In China At Present And Countermeasures(Dangqian Woguo Jumin Shouru Fenpei Chaju Wenti Tanxi) [D],*Dalian Maritime University*,2013

[122] Su, Biwei. and Heshmati, Almas. Analysis of the determinants of income and income gap between urban and rural China[J],*China Economic policy review,*Vol2,No.1(2013) 1350002(29 pages).

[123] Peng, Teng.Defection And Perfection Of The Income Distribution System[J],*Journal Of Lanzhou Commercial College*, Vol.24 No.6, Dec.,2008:p29-35

income distribution gap.

Xianping Bin, Zhengyou Li (2005)[124] revealed that institutional barriers and various structural constrains were vital contributors to widening income inequality between 1980 and 2002 in China.

Li Wei, Wang Shaoguo (2008)[125] found that the broaden inequality from the first distribution was the main factor of the income inequality between 1981 and 2006 in China.

Ren Zhong, Zhou Yunbo (2009)[126] indicated that monopoly and partial monopoly created by incomplete reform of China's economic system were major factors contributing to industrial income inequality between 1999 and 2007.

3.1.3. Consequence

Ye Tian (2012)[127] tested the regression model of income inequality in China by examining the relation among Gini coefficient, GDP growth rate, saving rate, and concluded that income inequality has a negative impact on economic growth rate in the case of Chinese economic condition and situation.

Jun Yang, Xiao Huang and Xiaoyu Li (2008)[128] by the use of a simultaneous equation model based on the endogenous growth theory, and by the phenomenon of educational inequality (EI) measured by the Gini coefficient in education, they have studied the mechanism and orientation that trigger off the relationship between EI and income distribution. Their findings are that (1) the income distribution inequality leads to EI but the lessening of EI has not promoted the narrowing of the gap in income distribution, the relationship between EI and the difference in income distribution is not a simple linear relationship, but educational expansion is conducive to the improvement of inequality in education and income distribution; (2) education relates to income distribution through the human capital, which fact, however, cannot spontaneously form a virtuous circle—educational equality—income distribution equality; (3) in the long run, the reduction of IE cannot improve the income distribution inequality, but at present, the income distribution inequality can aggravate EI; (4) at the present time, the amount of input into education and the degree of urbanization have not been able to effectively lessen the EI. The robustness of the said model has been partly proved.

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[124] Bi, Xianping. Li, Zhengyou.Relation Between Institutional Changes, Structural Changes And Income Gap: Theoretical And Empirical Study[J], *China Soft Science*,2005,No.2.:P111-8

[125] Li, Wei. Wang, Shaoguo. (2008) The Source And Income Inequality Comparative Analysis On Rural Resident's Between The First Distribution And The Redistribution In China [J].*Journal of Beijing Institute of Economic Management*,Dec. .vol. 23 no.4 (ger.83):p 16-21

[126] Ren, Zhong.and Zhou, Yunbo. (2009) How Much Does Monopoly Influence China'S Industrial Income Gap?[J], *Economic Theory And Business Management*, No.4:P25-30

[127] Tian, Ye (2012). "The Effect of Income Inequality on Economic Growth in China", *Economics & Business Journal: Inquiries & Perspectives*, Vol.4, No. 1, October

[128] Yang, Jun. Huang, Xiao. and Li, Xiaoyu. (2008) The Educational Inequality and the Gap in Income Distribution: an Empirical Analysis on China (Jiaoyu Bupingdeng Yu Shourufenpei Chaju: Zhongguode Shizheng Fenxi)[J], Management World, (1)

Binkai Chen (2012)[129] tested the Average propensity to consume (APC) and Marginal propensity to consume (MPC) with the panel data of 28 Chinese provinces, municipalities and autonomous regions from 1978 to 2009, and proved that households with higher income have lower average and marginal propensity to consume (APC and MPC), and that the larger the income inequality is, the weaker household consumption demand becomes.

3.1.4. Conclusion

Different methodologies generate different estimates of income inequality, although the main trends are similar whatever the approach used. Income inequality at the regional level, the inland-coastal contribution has increased several folds as a major contribution comparing to the rural-urban. There is a number of elements that have been taken into consideration so to explain income inequality increasing in the last recent years. They include social security, legal construction, market regulation, regional development strategy, urban and rural dual economic structure, education, the household register, the gender, the experience and the regional factor, locality, property ownership, occupation and the presence of a second occupation make income inequality rise.

3.2. .The effect of import-export on income inequality and China's cases

In earlier theory, David Ricardo (1817)[130] argued that international trade comes out because of Comparative Advantages in addition to Absolute Advantages. Based on his theory, a country will export that goods it produces at a lower relative opportunity cost. In the model, labor is the only production factor which could flow freely across productions. Consequently, because of his Theory of Comparative Advantages, international trade drives labor flow from the lower productivity sector to the higher. In so doing, international trade leads wage changes, and income distribution changes. The wage of industry with comparative advantage would spontaneously rise.

The first research about the effect of trade on income distribution should derive from neoclassical economics following the Heckscher-Ohlin model and the Stolper-Samuelson (S-S) theorem. Their theories based on Comparative Advantage describe how international trade impacts income distribution though relative prices. Trade brings about factor price equalization, thereby income inequality decreases.

As a consequence of globalization, the international trade flows change. It has been proved that income distribution could be impacted by intra-industry trade, technological innovation, technical transformation and others with globalization. The numbers of impact factors for trade on income

[129] Chen, Binkai, (2012) China's Household Consumption Decline Amidst Rising Income Inequality: A Theoretical and Empirical Study[J],China Economist Vol.7, No.6, November-December,

[130] David Ricardo. (1817) On the Principles of Political Economy and Taxation [M]. *London G. Bell and Sons, LTD*.(first published in 1817), 1919, 85-103

distribution are more than before.

According to the theories above, the following researchers contributed studies on the effect of trade on income distribution. Robert E. and Lucas Jr (1988)[131] consider that international trade brings about income inequality higher. Also, Benhabib and Spiegel (1994)[132], Keller (1996)[133], Eaton and Kortum (1996)[134], Acemoglu and Zilibotti (1999)[135], Narula (2004)[136] hold the same viewpoint. It seems a paradox with H-O or S-S theories.

However, some researchers disagree with that. They indicate that international trade facilitates income equality. Such as, Rodriguez-Pose and Sanchez-Reaze (2002, 2003)[137], Coulombe, S (2007)[138], Ades, A and Glaeser, E. (1994)[139], proved that international trade facilitates income equality.

Andreas Savvides (1998)[140] investigated the link between income inequality and trade protection, and then found that among less developed countries, more open economies experienced increased income inequality during the late 1980s. Trade policy has had no effect on income inequality in developed countries.

Shaojin Wang (2007)[141] analyzed the relationship between openness and income inequality in China with the provincial panel data from 1991 to 2004 and found that the increase of imports and exports and FDI lead to the increase of income inequality in China. And he also found that imports could significantly increase the income inequality, however, exports could lower income inequality to some extent.

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[131] Robert E and Lucas Jr, (1988) On the Mechanics of Economic Development, *Journal of Monetary Economics,* Volume 22, Issue 1, July, Pages 3-42

[132] Benhabib, J and M Spiegel. (1994) The roles of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics*, (34):143-173

[133] Keller,W. (1996) Absorptive capacity: on the creation and acquisition of technology in development, *Journal of development economics,* 49,199-227.

[134] Eaton,J. and Kortum,S. (1996) Trade in ideas:patenting and productivity in the OECD, *Journal of international economics,*Vol.40:251-278

[135] Acemoglu, D and Zilibotti (1999). Information Accumulation in Development. *Journal of economic growth* (4):5-38.

[136] Narula. R. (2004) R&D Collaboration by SEMs: new opportunities and Limitations in the face of globalization. *Thechnovation*, (24):153-161

[137] Sanchez-Reaza, J., Rodriguez- Pose,A. (2002) The impact of trade liberalization on regional disparities in Mexico[J]. *Growth and Change*, 33(1): 72- 90.
Rodriguez- Pose, A.,Sanchez-Reaza, J. (2003) Economic polarization through trade: Trade liberalization and regional growth in Mexico.*WIDER*, Discussion Paper No.2003/60

[138] Coulombe, S. (2007) Globalization and Regional Disparity: A Canadian Case Study [J].*Regional Studies*, 41(1): 1-17.

[139] Ades,A. Glaeser, E. (1994) Trade and Circuses: Explaining Urban Giants [R].*National Bureau of Economic Research*，Working Paper No.4715.

[140] Andreas Savvides, (1998) Trade policy and income inequality: new evidence, *Economics Letters*, vol. 61, issue 3, 365-372

[141] Wang, Shaojin, (2007) Openness and Income Inequality in China: Empirical Analysis based on Panel Data, *World Economy Study*, No.4, (Serial No.58):16-20

Ying Zhao (2003)[142] took the degree of dependence on foreign trade as trade indicator from 1978 to 1998 in China to prove that trade impacts income inequality. He indicated that the increase of imports and exports and FDI lead to the increase of income inequality in China; and imports could significantly increase the income inequality, whereas exports could lower income inequality to some extent.

Chao Hu (2008)[143] also used the degree of dependence on foreign trade as trade indicator, and analyzed the relationship between foreign business trade and income inequality with the time series data from 1985 to 2005, and found that foreign business trade and income inequality have a reversed "U" shape relationship. The income inequality increased with the expansion of foreign business trade from1985 to 2004, and then decreased.

Lulu Yang (2014)[144] indicated that international trade increase will widen income distribution gap in China from 1978 to 2012. Exports will help to narrow the income gap, while imports will expand both in peripheral and inland provinces. While, the marginal impact of exports are less than that of impact.

Table 3.2 - 1. Summary the studied of effect of trade on income distribution

	author	The effect of trade on income distribution
1	David Ricardo (1817)	negative
2	Robert E. & Lucas Jr (1988)	positive
3	Benhabib & Spiegel (1994)	positive
4	Keller (1996)	positive
5	Eaton & Kortum (1996)	positive
6	Acemoglu and Zilibotti (1999)	positive
7	Narula (2004)	positive
8	Rodriguez-Pose & Sanchez-Reaze (2002, 2003)	negative
9	Coulombe, S (2007)	negative
10	Ades, A & Glaeser, E. (1994)	negative
11	Andreas Savvides (1998)	For less developed countries: positive For developed countries: no significant effect
12	Shaojin Wang (2007)	Imports and exports and FDI: For imports: positive For exports: negative
13	Ying Zhao (2003)	Imports and exports and FDI: For imports: positive For exports: negative
14	Chao Hu (2008)	reversed "U" shape relationship
15	Lulu Yang (2014)	For export: negative

[142] ZHAO, Ying, (2003) China's opening up and income gap (zhongguo de duiwaikaifang he shouruchaju)[J], *world economic forum*, (4),P55-70

[143] HU, Chao., (2008) Foreign Business Trade and Income Inequality: Empirical Analysis in China[J], *Journal of International Trade*, (3),22-27

[144] YANG, Lulu,. (2014). The impact of international trade on Chinese income distribution Gap-Based on an empirical analysis of the peripheral provinces compared with inland provinces[D], *Shandong University*

		For import: positive

Conclusion

International trade impacts income distribution by comparative advantage, indeed. We have been told that income distribution could change by trade; most studies proved that income inequality would go higher by trade, few would not. As trade theory developing, the more factors of trade impact income distribution. It should be a complicated mechanism.

To sum up, trade definitely impacts income distribution. And trade impacts income inequality, and make it either rise according to some authors or decrease according some others. Considering H-O or S-S theories, trade eventually brings about income convergence by factor price equalization; whereas the empirical studies proved that trade leads to higher income inequality. We could assume that between trade and income inequality there is a relationship formed reversed U shape in less developed countries - at the beginning the income inequality rises, and decreases at the end. In China's case, trade impacts income inequality with reversed U shape from 1985 to 2005; moreover, exports narrow income inequality, while imports increase income inequality form 1978 to 2012. What can one say for China where imports and exports move together across the years?

3.3. .The effect of income inequality on import-export

3.3.1. The effect of income inequality on import

Keynesian macroeconomic theory proposes the law of diminishing marginal propensity to consume. The theoretic model shows that households with higher income have lower average and marginal propensity to consume (APC and MPC), and that the larger the income inequality is, the weaker household consumption demand becomes. This proposition in general is based on homogeneous goods and therefore does not take into account different qualities. However, at present the situation is a little different in China where the higher income households would like to consume higher quality products and luxuries.

Linder made a great contribution on the impact of income distribution on import. In his classic treatise, Linder (1961)[145] points out that the dependence of the composition of a household's consumption basket on its income means that aggregate demand for different types of goods is determined by income distribution. Aggregate demand for different types of goods is determined by the income distribution within and across regions. As observed by Linder (1961), once the difference in expenditure decisions between rich and poor consumers is acknowledged, the trade pattern between industrialized and less developed regions is determined not only by differentials in technology, factor endowment and income but also by income distribution within each region. After Linder's study, the subsequent researchers who devote themselves to income distribution / income inequality on import following the Linder's work. They take Linder's methodology which

[145] Linder, S. (1961), An Essay on Trade and Transformation, *Almqvist and Wiksells*, Uppsala.

assumes income distribution / income inequality impacts import by demand for import.

I. The volume import

Jinchun Zhao and Jianguo Xie (2013)[146] analyzed the influence of income inequality on inter-provincial import demand of China by using the inter-provincial panel data between 1993 and 2010. The empirical results show income inequality has a strong non-linear threshold effect on China's inter-provincial import demand. The income inequality in underdeveloped regions has no notable effect on such a demand, but the income inequality in moderately developed regions restrains the import demand while the income inequality in highly developed regions stimulates the import demand.

II. New product

Maurice Kugler and Josef Zweimueller (2005)[147] build a model of international trade and technological innovation and imitation between industrialized and developing regions, when preferences are non-homothetic. They relax the assumption of Unit income elasticity for all consumption goods and incorporate the insight from Engel's Law. Since the composition of individual consumption depends on income, aggregate demand for newly invented goods depends not only on the distribution of income across countries but also within countries. To account for the impact of income distribution, they introduce preferences where consumers rank indivisible goods according to a hierarchy of both needs and desires. They get the results from the econometric analysis of panel data on bilateral trade flows among 57 countries over three decades on the impact of inequality on imports and total trade. They show that the composition of the total consumption basket in the integrated economy depends on both inter-and intra-national inequality. Inequality decreases the volume of international trade by reducing import.

III. Vertically differentiated products

Margarita Katsimi, and Thomas Moutos (2006)[148] build a model of trade in vertically differentiated products and find that income inequality can affect the demand for imports even in the presence of homothetic preferences. The empirical importance of changes in inequality on the demand for imports is then assessed by examining US data for the 1948-1996 periods. Using the Johansen (1988) procedure they find not only evidence for the existence of a cointegrating equation in imports, income, relative prices and inequality, but that the evolution of inequality has a large and positive influence on the demand for imports in the US.

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[146] Zhao, Jinchun. Xie, Jianguo, (2013) Income Distribution and Import Demand: A Threshold Regression Analysis Based on China's Provincial Panel Data[J], *Journal of International Trade*, (8):13-24.

[147] Maurice Kugler and Josef Zweimueller, (2005). National Income Distribution and International Trade Flow, mimeo, *university of Southampton and Unh'ersily ofZurith*.

[148] Katsimi, M., and Moutos, T., (2006) ,Inequality and the us import demand function, *CESifo* Working Paper,No.1827.

IV. High-income countries produce the high quality products

Antonis Adam, Katsimi, M., and Moutos, T.,(2008)[149] build a model of trade in vertically differentiated products and find that income inequality can affect the demand for imports even in the presence of homothetic preferences. The empirical importance of changes in inequality on the demand for imports is then assessed by examining panel data for 36 developing and developed countries for the 1980-1997 periods. They find significant evidence supporting their prediction that inequality has a large influence on the demand for imports. Moreover they find that, in line with the predictions of their theoretical model, this influence is positive for high-income countries (countries that produce the high quality variety of the vertically differentiated product) and negative for low-income countries (countries that produce the low quality variety of the vertically differentiated product).

Xiaojuan Lin (2013)[150] adopts OLS and takes relative price; population growth rate and labor force participation as control variable, and conducts an empirical analysis on payment imbalance by using multinational empirical panel data. She finds that the income inequality has a significant impact on a country's import demand and it is a main factor affecting the trade imbalance. The empirical results show that: in the low-income countries the expansion of income inequality degree will lead to the reduction of the country's import demand. On the contrary, the expansion of inequality will increase the import demand in high-income countries.

V. Luxuries and necessities

Dalgin, Mitra and Trindade (2004)[151] found that inequality is an important determinant of import demand, in that it augments the standard gravity model in a significant way. They interpret this result with the aid of a model in which tastes are non-homothetic. Classification of products, based on the correlation between household budget shares in the US and income, into "luxuries" and "necessities," works very well in their analysis when they restrict the analysis to developed importing countries. While the imports of luxuries increase with the importing country's inequality, imports of necessities decrease with it. Furthermore, they find that an increase in the level of inequality in the importing country generally leads to an increase in imports from developed countries, and to a reduction in imports from low-income countries.

Dalgin, Mitra and Trindade (2008)[152] construct the first direct classification of goods as luxuries or necessities that is compatible with international trade data. They use it to test an idea that has

[149] Antonis, Adam., Katsimi, M., and Moutos, T.,2008, Inequality And The Import Demand Function, *CESifo* Working Paper,No.2196

[150] Lin, Xiaojuan. Income Inequality And Import Demand: An Anlaysis Based On Multinational Panel Data[D], *Nanjing university*, (2013)

[151] Dalgin, M., Mitra, D., and Trindade, V.,(2004). Inequality, Nonhomothetic Preferences, And Trade: A Gravity Approach.*NBER* Working Paper, No.10800

[152] Dalgin, M., Mitra. D., Trindade, V, 2008.Inequality. Non-homothetic Preferences, and Trade: a Gravit> Approach, *Southern Economic Journal,* 74, pp.747-774

not been tested directly in the literature: Countries' income distributions are important determinants of their import demand, in particular, of the difference in their import demands of luxuries versus necessities. They interpret this result with the aid of a model in which preferences are non-homothetic, thus relaxing a long-held and standard —but empirically dubious— assumption in the theory of international trade. Their model is strongly borne out by the results: Imports of luxuries increase with the importing country's inequality, and imports of necessities decrease with it. Their calculations imply that if income distribution in the United States became as equal as in Canada, the United States would import about 9–13% fewer luxury goods and 13–19% more necessities.

Fortune, J. Neill (1979)[153] develops a model to incorporate differences in per capita incomes and the distribution of income as explanations of bilateral trade intensities for finished manufactured consumer imports by accounting for the propensity to import these commodities within each fractile of the income distribution of any importing country. The model relaxes the assumption of a constant income variance among countries. the results shows that the bilateral average propensity to import is recognized to be dependent on the country's income distribution as well as on differences in per capita incomes between the importing and exporting countries; and income redistributions which reduce the degree of inequality of the income distribution and increases in per capita incomes to increase countries' bilateral per capita imports.

3.3.2. The effect of income inequality on export

Bernasconi[154](2009) analyzes the two extensive margins of international trade flows (product and country-level) by an application of the Linder hypothesis. He finds strong supportive evidence for the demand sided effects proposed by Linder, the more uneven the within income distribution is, the higher is the extensive margin of trade.

Bohman, Nilsson (2007)[155] use a model from Mitra and Trindade (2005) to set up a gravity model in which they include income distribution measures as explanatory variables for the exporting as well as for the importing countries. Their results indicate that non-homothetic preferences affect significantly both exports and imports. They find that greater inequality generates higher exports of necessities and higher imports of luxury goods. However, countries with a more equal distribution of income tend to export more luxuries and import more necessities. Their results are robust to changes in the model specification.

[153] Fortune, J. Neill, (1979) Income Distribution and Linder's Thesis, *Southern Economic Journal.* Jul, Vol. 46 Issue 1, p158. 10p. 2 Charts

[154] C. Bernasconi. (2009) New Evidence for the Linder Hypothesis and the two Extensive Margins of Trade. *Institute for Empirical Research in Economics, University of Zurich*

[155] H. Bohman, D. Nilsson. (2007) Income Inequality as a Determinant of Trade Flows. *International journal of applied economics*, 4(1), march, 40-59

H. Latzer, F. Mayneris (2011)[156] find that richer countries produce and export higher quality goods, while the level of inequalities has a heterogenous impact, positively affecting the quality content of exports for rich enough countries only. Furthermore, they show that in terms of magnitude of the effects, inequalities are a second-order demand-based determinant of the quality of exports as compared to average income.

Mani and Hwang (2004)[157] examine the impact of the income distribution in a less-developed country (LDC) on its patterns of trade, through its influence on home market demand patterns. In a learning-by-doing model with non-homothetic preferences, the authors show that import substitution under low inequality generates more focused learning and enhances trade potential more effectively. The model predicts that high-inequality LDCs are more likely to remain exporters of unskilled/low-skilled goods, whereas low-inequality LDCs are more likely to mature into simple manufactures and beyond a prediction that is consistent with world trade patterns of LDCs.

Maurice Kugler and Josef Zweimueller (2005)[158] introduce preferences where consumers rank indivisible goods according to a hierarchy of both needs and desires. In their model they assume that the distribution of wealth is unequal in the less developed country and even in the industrialized country. They show that the composition of the aggregate consumption basket in the integrated economy depends on both inter- and intra-national inequality. Hence, they identify a demand channel through which inequality affects the international trade pattern. Empirical evidence from a panel of bilateral trade data among 57 countries, for which adequate income distribution measures exist, and spanning three decades supports the conjecture that high inequality in a trading partner yields less bilateral trade flows through lower imports, after controlling for both observed and unobserved heterogeneity.

Marcelo Fukushima (2008) [159] builds a two-country-two-sector trade model with a monopolistically competitive sector and non-homothetic preferences. It assumes the existence of two types of goods: necessities (which are homogeneous) and luxuries (which are differentiated) and heterogeneous labor. The implications of income inequality on trade patterns are examined. They conclude that in autarky, the more unequal country produces a larger number of varieties; and the more equal country benefits more from trade liberalization.

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[156] Hélène Latzer and Florian Mayneris (2011), Trade in quality and income distribution: an analysis of the enlarged EU market, *Working Papers of BETA*.

[157] A. Mani, J. Hwang. Income Distribution (2004), Learning-by-Doing, and Comparative Advantage[J].*Review of Development Economics,* 8(3):452-473.

[158] Maurice Kugler and Josef Zweimueller, (2005) National Income Distributions and International Trade Flows[D], Southampton and Zurich ,*University of Southampton and University of Zurich*.

[159] Marcelo Fukushima ,(2008) Non-Homothetic Preferences and Labor Heterogeneity: The Effects of Income Inequality on Trade Patterns, *Kobe University Working Paper Series* No. 231, May

About the effect of income inequality on import-export, the most researches are done based on Linder hypothesis. They define income inequality by richer and poorer, and demand and supply though high quality and low quality goods, and importing countries and exporting country as skill labor and unskilled labor countries. It could be concluded that different income distributions lead to different demand-supply goods distribution on international trade. So income inequality impacts import-export in this way. (See table at the end of this chapter: the effect of income inequality on import and export.)

3.4. .The effect of China's multidimensional poverty to import-export

There is no any study focus on the effect of multidimensional poverty to import-export, even on trade. We are the first to link them and try to discuss the relationships between multidimensional poverty and import-export.

The effect of income inequality on import and export

	Author(year)	Dependent Variable	Independent Variable	Control Variables	Sign of the Coefficient
1	Zhao, J.C., Xie,J.G.(2013) [160]	Import/ GDP	Theil index	Industrialization Index[161], perGDP, Urbanization index[162], Investment in Fixed Assets[163], Final Consumption Expenditure Index[164], Open Index[165].	Undeveloped：0 Medium developed：- Developed：+
2	Katsimi, M.,Moutos,T. (2006) [166]	real imports of	GINI coefficient in logs[167]	the relative price of imports (RP) in logs, real GDP (Y) in logs	positive

[160]Zhao, J.C., Xie,J.G. (2013). shouru fenpei yu jinkou xuqiu – jiyu woguo shengji mianban shuju de menxian huigui fenxi [Income Distribution and Import Demand: A Threshold Regression Analysis Based on China's Provincial Panel Data]. *Journal of International Trade, 8*,13-24.

[161] Industrialization Index, [Industrialization Index =(Value-added of All State-owned Enterprises and Non-state-owned Enterprise above Designated Size by Region)/GRP]
Data source: China Statistical Yearbook, e.g., <China Statistical Yearbook2005>
14-2 Value-added of All State-owned Enterprises and Non-state-owned Enterprise above Designated Size and Its Growth Rates by Region

[162]Urbanization index, [Industrialization Index =(Urban Population)/Population] by Region

[163]Investment in Fixed Assets Index, [(Investment in Fixed Assets Index)=(Investment in Fixed Assets by Region]/GRP], data source: National Bureau of Statistics of China - Investment in Fixed Assets and Real Estate

[164] Final Consumption Expenditure Index, [(Final Consumption Expenditure Index)=(Final Consumption Expenditure by Region]/GRP], data source: National Bureau of Statistics of China – National Accounts – Gross Regional Product by Expenditure Approach - Final Consumption Expenditure.

[165]Open Index,{(Open Index)=(Total Value of Imports and Exports Commodities by Destinations and Catchments _ by Region)/GRP}, data source: National Bureau of Statistics of China – Foreign Trade and Economic Cooperation –Total Value of Imports and Exports Commodities by Destinations and Catchments

[166] Katsimi, M.,Moutos,T. (2006), Inequality and the US Import Demand Function, CESifo Working Paper No. 1827.

[167] Authors said:" Our measure of inequality is taken from the revised version of World Income Inequality Dataset (WIID) constructed by Deininger and Squire (1996). This data set is to our knowledge the most complete and reliable source of inequality data and it provides alternative estimates for the US GINI coefficient. We measure

		goods and services (IM) in logs			
3	Adam,A.Katsimi,M.Moutos, T.(2008)[168]	Demand for Import: log of real imports	log of household income inequality: Theil index[169]	log of real income, the log of relative price of imports	High-income countries:+ High-income countries:-
4	Lin X.J.(2013)[170]	Real imports[171]	Thiel index	Real GDP,perGDP,Relative Price, Population and Population Growth, Labour Participation Ratio	High income countries:+ High income countries:-
5	Dalgin, M., Mitra. D., Trindade, V (2008)[172]	Logarithms of exports[173]	Gini of importing countries[174]	Logarithmsof GDP and per GDP of exporting countries[175], Logarithms of distance[176], Logarithms of remote[177]	+ from rich countries - form poor countries
6	Fortune,J. N.(1979)[178]	Imports of finished manufactured consu	Variance of the income distribution	National income,distance,	Reduce inequality and increases in per capita income to the level tend to increase countries' bilateral per capita imports.

inequality (IN) with the GINI coefficient that covers the longest period (1944-1996) constructed by Brandolini (1998)."

[168] Adam,A. Katsimi,M. Moutos,T.(2008).Inequality and the Import Demand Function, CESifo Working Paper,No.2196

[169] Authors said:" Our measure of inequality is taken from the EHII dataset of the UTIP project (UTIP, 2005). This dataset is to our knowledge the most complete source of household income inequality data, as it provides a dataset for the Theil index of inequality (Theil, 1976) for a wide range of countries over an extended time period, which differs however across countries."

[170] Lin, X.J.(2013).*Shouru Bu Pingdeng Dui Jinkou Xuqiu De Yingxiang Yanjiu – Jiyu Kuaguo Mianban Shuju De Shizheng Fenxi [Income Inequality And Import Demand: An Anlaysis Based On Multinational Panel Data]* (Unpublished master's thesis). Nanjing university, Nanjing, Jiangsu, China

[171] Real imports, the volume of imports is carried out instead of the volume of contract. Data source: World Bank, WDI

[172] Dalgin, M., Mitra. D., Trindade, V (2008).Inequality, Non-homothetic Preferences, and Trade: a Gravity Approach, *Southern Economic Journal, 74*(3), 747-774.

[173] Authors said:" The trade data come from the World Trade Analyzer (WTA), which is a panel covering trade flows from 1970 to 1997 for most countries of the world, organized by the Standard International Trade Classification (SITC), Revision 2, at the 4-digit aggregation level."

[174] Authors said:" Our inequality data come from Dollar and Kraay (2002), according to whom theirs is the largest data set on inequality available up to date. It is largely a recompilation of the UN-WIDER data set that was also used by Deininger and Squire (1996) to construct a "high quality data set." This dataset is a panel of 137 countries, spanning the years from 1955 to 1999."

[175] Real GDP and per-capita real GDP data (in 1995 constant US dollars) come from the World Bank's World Development Indicators.

[176] Distance: great circle distance between principal cities of countries i and j. Authors said: "We obtained the logarithm of the great circle distance data and regional dummies from Rose (2004)."

[177] Remote: product of the average distance of country i and country j from all other counties, weighted by GDPs

[178] Neil Fortune, J. (1979) Income Distribution and Linder's Thesis. *Southern Economic Journal*. (Jul 1979), Vol. 46 Issue 1, p158. 10p. 2 Charts

		mer commodities			
7	Bohman,H.,Nilsson,D(2007)[179]	value of export(Comtrade, UN)	GINIi measured by disposable income (World Income Inequality Database, WIID2a)	(GDP/CAP):average individual income level(World Development Indicators, World Bank); POP:population size(World Development Indicators, World Bank); D:distance between countries iand j (Centre d'Études Prospectives et d'Informations Internationales, CEPII); Language indicated by 1 if countries i and j use the same language, if not indicated by 0(Centre d'Études Prospectives et d'Informations Internationales, CEPII).	Greater inequality generates: higher exports of necessities and higher imports of luxury goods. Countries with a more equal distribution of income tend to export more luxuries and import more necessities.
8	Latzer,H. Mayneris,F. (2011)[180]	Log of value of export[181]	Log of interquartile ratio of income，gini index	Log in Distance, log in Average income, log in share of population(with tertiary education as a proxy for skills), log in Balassa index[182], product and year fixed effects, rich is a dummy	export: Interquartileand gini index without rich dummy:0 Interquartile and gini index in rich country:+ Import: inequalities have an ambiguous impact.
9	Mani,A.,Hwang,J. (2004)[183]	primary exports[184]	land Gini index data(Deininger and Squire1998)	Log of total arable land, percentage of population with log of secondary school attainment, log of capital stock(measured as discounted sum of gross investment flows over the last 14 years), log of GDP import tariffs	less-developed country (LDC) trade pattern: high-inequality LDCs are more likely to remain exporters of low-skilled goods, low-inequality LDCs are more likely to mature into simple manufactures and beyond.

4. Empirical Studies

[179] Bohman,H., Nilsson,D (2007) Income Inequality as a Determinant of Trade Flows. *International journal of applied economics, 4*(1), march 2007, 40-59

[180] Latzer,H. Mayneris,F. (2011) .Trade in quality and income distribution: an analysis of the enlarged EU market,[Working Papers of BETA]. 2011-21,41

[181] values as a proxy for quality of exports: the share of country m in the total volume of exports within EU25 of product p by country x at time t [from BACI database]

[182] Balassa index : $B_{xpt} = \frac{X_{xpt}/X_{xt}}{X_{EU25pt}/X_{EU25t}}$ where X denotes exports in volume. This index measures the share of product p in exports of country x, as compared to the share of product p in total exports of EU25 countries.

[183] Mani,A.,Hwang,J. (2004). Income Distribution, Learning - by - Doing, and Comparative Advantage.Review of Development Economics, 8(3):452-473,2004

[184] RPX:Ratio of primary exports to total exports (World Bank's World Development Report)

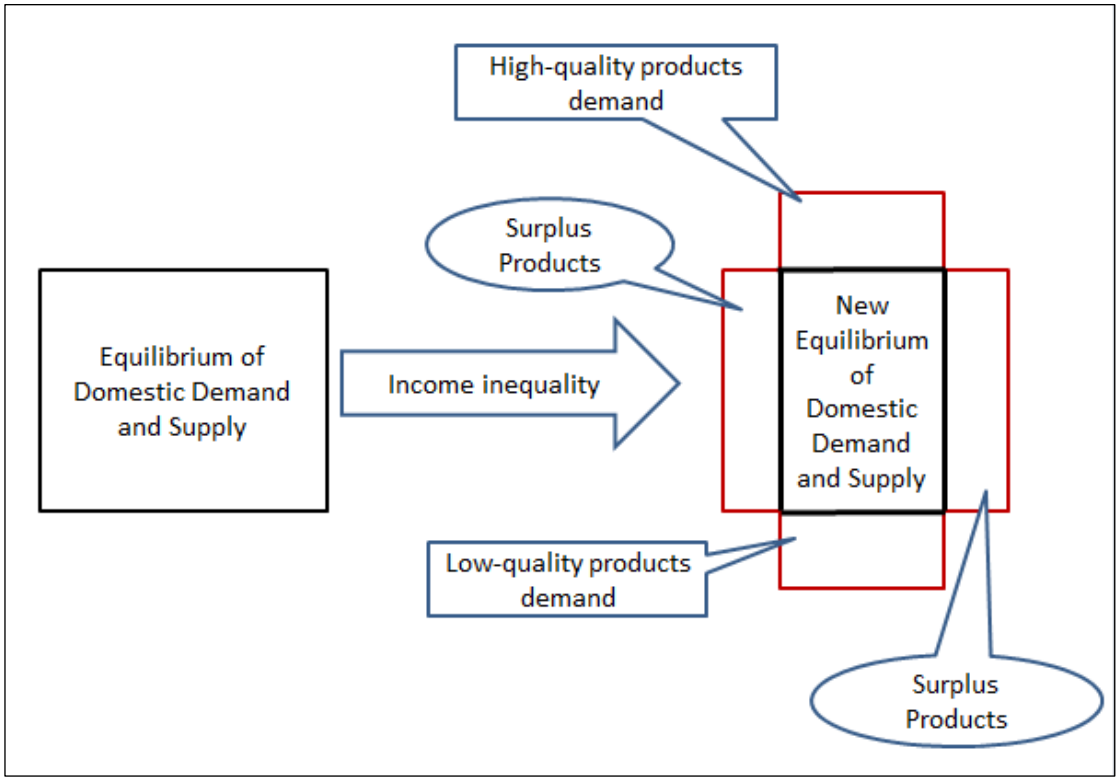
4.1. The effect of China’s income inequality to import-export

4.1.1. Influence Mechanism and Modeling

According to Linder 1961, the per capita income level determines the demand of a country. In a closed country (or an economy), the demand determines the produce of enterprise, so that demand and supply are in equilibrium. After trade opening, trade will be generated, and countries will increase their income by importing and exporting through their own advantages, thereby improving living of standard. Such trade will improve a country's income, but it may not reduce income inequality, because the proportion of low-income groups may not benefit more than high-income groups in trade. For example, if a country exports more industrial manufactured goods rather than agricultural products, farmers' income growth is much lower than manufacturers in international trade.

When inequality rises in a closed country, the balance of domestic demand and supply would be broken. Domestic supply can't meet the demand of higher-income groups for higher-quality products and can't meet the demand of lower-income groups for lower-quality products, and more supply form enterprises is naturally made and bring about Surplus Products. If this moment the country is opened, this part of the mismatch will look for opportunities to match abroad. Therefore, the remaining products will be exported, and consumers will import much higher quality and lower quality products cannot meet their demand domestic.

Figure 4-1 Influence Mechanism of the effect of income inequality on import and export



If the country itself is open, the total demand-supply in new market, which combined domestic and aboard is equilibrium. Then when the inequality increases, the same demand supply mismatch will occur. It will still increase import and export trade. (See figure 4 -1)

4.1.2. Data and Variables

This dissertation takes import and export as dependent variables, and income inequality as independent variable, and some other control variables.

The value of trade is an important variable to illustrate a statement of trade in a country. In this dissertation income inequality impacts import though import demand of higher-quality and lower-quality, and export by surplus products. We take the value of import as import demand of higher-quality and lower-quality, and the value of export as surplus products. The shortcoming is they are not equivalent. When we point out the findings, we should consider about this shortcoming.

The data resource is from NBSC "Total Value of Imports of Destinations and Catchments" and "Total Value of Exports of Destinations and Catchments"

This dissertation takes independent variable Gini coefficient (Tian 2012)[185] as within province income inequality and Theil elements as between provinces income inequality. Theil Element is calculated by Theil's T statistic. Theil's T statistic is a flexible, mathematically elegant, and underutilized tool for measuring inequality. The following formula gives the algebra behind Theil's T statistic. While these particular equations use income as the variable of interest, Theil's T can address any number of quantifiable phenomena. When household or individual data is available, Theil's T statistic is:

$$T = \sum_{p=1}^{n} \left\{ \left(\frac{1}{n} \right) * \left(\frac{y_p}{\mu_y} \right) * \ln \left(\frac{y_p}{\mu_y} \right) \right\}$$

Where n is the number of individuals in the population, y_p is the income of the person indexed by p, and μ_y is the population's average income. If every individual has exactly the same income, T will be zero; this represents perfect equality and is the minimum value of Theil's T. If one individual has all of the income, T will equal ln n; this represents utmost inequality and is the maximum value of Theil's T statistic.

As Theil index can be decomposed into T_b and T_w.

$$T_t = T_b + T_w$$

[185] Tian Weimin (2012) Calculation of Gini Coefficient of Provincial Resident Income and Its Trend Analysis (Shengyu Jumin shouru jinni xishu cesuan jiqi biandong qushi fenxi). Economic Science (Jingji Kexue). Vol.2. P53

$$T_b = \sum T_e$$

T_b generates an element for each group in the analysis, which weights the data point's size (in terms of population share) and eccentricity (in terms of proportional distance from the mean). When individual data is available, each individual has an identical population share (1/N), so each individual's Theil element is determined by his or her proportional distance from the mean.

$$T_e = \frac{P_k}{P_s} * \frac{\bar{y}_k}{\bar{y}_s} * ln\frac{\bar{y}_k}{\bar{y}_s}$$

where P_k is the numbers of total population of k province, P_s is the numbers of total state population (China), $\bar{y}_k$ is average income of province, $\bar{y}_s$ is state average income (China).

Theil element means the distance to average, the value distributes around 0.

- 0 means absolute equality, both of positive and negative mean inequality.
- The further the distance from 0 is, the more inequality is.

* University of Texas inequality project: data inequality set for using wage and employment statistics of 19 industrial sectors within each province from 1987 to 2012

In this dissertation, income inequality means between provinces by Theil elements. For inter province test, we take Gini coefficient form Tian (2012)[186].

Considering to literature review on the effect of income inequality on trade, this dissertation takes Gross Regional Product (GRP), GRP per capita, Population, Consumption, and Length of Railways as control variables.

GRP and GRP per capita are important economic indicator, and previous studies took these two variables (Zhao and Xie 2013, Katsimi and Moutos 2006, Lin 2013, Dalgin, Mitra and Trindade 2008, Bohman and Nilsson 2007). Population is an important determinant of volume of trade referring to the huge population of China and her provinces. Some studies support this variable (Lin 2013, Bohman and Nilsson 2007, Latzer and Mayneris 2011, Mani and Hwang 2004). Consumption could embody product demand and inflect the consumption level of province, and in this dissertation we take data of Final Consumption Expenditure. Rail transportation is an important mode of transportation and takes goods to consumers. The length of railways in operation reveals a transport capacity. In this dissertation we take Length of Railways in Operation as a control variable. All data of control variables involved are adopted from National Bureau of Statistics of China

[186] Tian W.M., 2012, Calculation of the Gini Coefficient of Provincial Residents' Income and Its Trend Analysis (Shengyu Jumin Shouru Jini Xishu Cesuan Jiqi Biandong Qushi Fenxi), Economic Science (Jingji Kexue), Vol.34 (2):

4.1.3. Methodology

This dissertation adopts static regressions with panel data to develop this study. For processing more data and testing deeply, it is better to develop at the provincial level instead of at the national level. China has been divided into regions consisting of 34 administrative units including 23 provinces, 5 autonomous regions, 4 municipalities directly under the jurisdiction of the central government, and 2 special administrative regions. Because of data of Taiwan, Hong Kong and Macao are unavailable; finally, we have 30 provinces. The available year of all data at all provinces, we have the data form 2000 to 2012.

General specification of the model

$Y_{it}=\alpha_i +\beta_1 X_{1,i,t}+\beta_2 X_{2,i,t}+\ldots+\beta_m X_{m,i,t}+\varepsilon_{it}$

Y, Independent variables: import, import per capita, import over grp, export, export per capita, export over grp.

X_m, (m=1…m)Independent variables: Theil elements, Gini coefficient, GRP, per GRP, populations, consumption, railways.

$\alpha_{i,}$ (i=1…n) is the unknow intercept for each entity

β, the coefficient for independent variables and control variables.

$\varepsilon_{it\ i}$s the error term.

4.1.4. The first results

After Hausman test the result of P value (probability value) equaled to 0.0000, the p-value is less than 0.05, we reject the null hypothesis that there's no difference between the means and conclude that a significant difference does exist. Meanwhile, that result indicates that Hausman test selects fixed effect. The results by regression below are significant, and the effects of income inequality on import/export/trade are negative.

The effect of Theil element to import shows results -0.103*** and -0.065*** which mean significant negative effect. The effect of Theil element to export shows results -0.163*** and -0.119*** which mean significant negative effect.

The effects of others control variables to import one by one show the results are positive and significant (see table 4.1-1). Other while, when put all variables together to test the effect to import (see table 4.1-2 column 17), the result shows different with of one by one input. Among them, the constant of GRP is negative figures.

In addition, the effects of others control variables to export one by one show the results are positive and significant (see table 4.1-3). Other while, when put all variables together to test the effect to import (see table 4.1-4 column 17), the result shows different with of one by one input. Among them, the constant of GRP is negative figures.

Table 4.1 - 1. Income inequality impacts import 1

	1 fe	2 re	3 fe	4 re	5 fe	6 re	7 fe	8 re	9 fe	10 re	11 fe	12 re
Theil element	-0.103*** (0.011)	-0.065*** (0.010)										
GRP			0.420*** (0.016)	0.426*** (0.015)								
per GRP					0.169*** (0.011)	0.171*** (0.010)						
Resident Population							1.579*** (0.050)	0.520*** (0.044)				
Final Consumption Expenditure									0.100*** (0.003)	0.101*** (0.003)		
Length of Railways in Operation											0.000*** (0.000)	0.000*** (0.000)

Table 4.1 - 2. Income inequality impacts import 2

	13 fe	14 re	15 fe	16 re	17 fe	18 re
Theil element	-0.046*** (0.007)	-0.029*** (0.006)	-0.025*** (0.005)	-0.026*** (0.005)	-0.032*** (0.005)	-0.040*** (0.005)
GRP			-0.162** (0.078)	-0.424*** (0.093)	-0.392*** (0.073)	-0.623*** (0.074)
per GRP	0.020 (0.014)	0.005 (0.013)			0.106*** (0.015)	0.161*** (0.014)
Resident Population			0.754*** (0.060)	0.026 (0.016)	0.493*** (0.060)	0.003 (0.015)
Final Consumption Expenditure	0.107*** (0.006)	0.113*** (0.006)	0.111*** (0.018)	0.207*** (0.021)	0.181*** (0.018)	0.256*** (0.017)
Length of Railways in	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***

Operation	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dammy year 1-12					0.000*** (0.000)	0.000*** (0.000)
Dammy year 13					0.000 (.)	0.000 (.)

Notice:***,**and*represent significance value at 1%,5% and 10%, respectively. Standard errors are in parentheses.

Table 4.1 - 3. Income inequality impacts export 1

	1 fe	2 re	3 fe	4 re	5 fe	6 re	7 fe	8 re	9 fe	10 re	11 fe	12 re
Theil element	-0.163*** (0.013)	-0.119*** (0.013)										
GRP			0.523*** (0.021)	0.533*** (0.021)								
per GRP					0.191*** (0.015)	0.193*** (0.014)						
Resident Population							1.986*** (0.068)	0.579*** (0.053)				
Final Consumption Expenditure									0.124*** (0.005)	0.126*** (0.005)		
Length of Railways in Operation											0.000*** (0.000)	0.000*** (0.000)

Table 4.1 - 4. Income inequality impacts export 2

	13 fe	14 re	15 fe	16 re	17 fe	18 re

Theil element	-0.089*** (0.008)	-0.063*** (0.007)	-0.072*** (0.007)	-0.050*** (0.006)	-0.072*** (0.006)	-0.069*** (0.006)
GRP			-0.110 (0.103)	-0.496*** (0.125)	-0.398*** (0.094)	-0.736*** (0.098)
per GRP	-0.018 (0.017)	-0.034** (0.016)			0.091*** (0.019)	0.159*** (0.018)
Resident Population			0.881*** (0.079)	0.019 (0.016)	0.590*** (0.078)	-0.026* (0.015)
Final Consumption Expenditure	0.142*** (0.007)	0.152*** (0.007)	0.116*** (0.024)	0.251*** (0.028)	0.216*** (0.023)	0.329*** (0.023)
Length of Railways in Operation	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Dammy year 1-12					0.000*** (0.000)	0.000*** (0.000)
Dammy year 13					0.000 (.)	0.000 (.)

Notice:***,**and*represent significance value at 1%,5% and 10%, respectively. Standard errors are in parentheses.

The tables show the results of regression. Besides income inequality (Theil elements), this paper adds a series of control variables gradually. We expect that the constant could to some extent reflect respective fixed effect. In the process, the unexpected heterogeneity is allowed; also the correlations among the explanatory variables are acceptable. Referring to this research, fixed effect is appropriate. Furthermore, the result of Hausman test indicates the fixed effect is better than random effect in this research.

The column 1 (table 3-1) indicates that the Theil elements impact import without other control variables, and the result shows the constant is -0.103 and significant. The column 17 (table 3-2) means besides Theil element, GRP, perGRP, population, consumption and length of railways are involved. GRP, perGRP and population absolutely impact trade to a large extent. With them in the test, the constant of Theil is -0.032 and significant. Comparing to the column 1 (table 3-1) and column 17 (table 3-2), the constants of Theil elemente do not change significant. That indicates Theil element impacts import negative. In the columns 13-16 (table 3-2), all constants of Theil element are negative. That indicates the effect of Theil element on import is robust.

Meanwhile, the results indicate that the other control variables as expected have positive effect to import, when we test the effect of them on import respectively. That means that all variables have positive effect on import. During the test, time effect could impact the results. The 13 dummy years are added to control the time effect in the regression model. We could see that the results are not changed. Moreover, the result of impact of Theil element on export is similar with on import.

4.1.5. General Results to solve the Endogeneity Problem

In order to account for the potential endogeneity problem, this research used dynamic panel data estimators (GMM estimation) and processed data tested the effect in several methods,

- By introducing 1 year lag of dependent variable to test causal relationship
- Take Arellano-Bond dynamic panel-data estimation (Arellano and Bond 1991)[187], and tried one-step and two-step GMM estimation.

Other information on the empirical analysis

- Theil elements (called Theil below) results higher and lower than value 0. Theil values lower than value 0 (negative) means that the income of province i is lower than average income. Theil elements values higher than value 0 imply that the income of province i is higher than the average income. The value of Theil elements is monotonous but the mean is not. Considering this situation, this dissertation tried the absolute value and the square value of Theil elements in

[187] Arellano, M. and S. Bond. (April 1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58. pp. 277 – 297.

empirical study.

- Also the Gini coefficient of the region is used as independent variable.
- The model considers dummy variables to solve potential interference by qualitative variables, such as dummy-province and dummy-year, dummy-region, dummy-poor province and dummy-trader top 5 provinces.
- Take the robust test by code "vce(robust)" for the standard errors referring to the potential heteroscedasticity problem
- For the influence of heteroscedasticity, this research tried to process all the data in natural logarithmic.
- Filter the control variables because of correlation among control variables.
- To minimize the impact of size heterogeneity on results this dissertation tried transform all variables either in per capita terms or over GRP.
- Transfer the value unit in RMB Yuan instead of US dollar or million RMB Yuan.

Considering the results above, we got some conclusions.
If the data processed in natural logarithmic, the results were not significant any more in any test, FE, RE, one-step GMM estimation and two-step GMM estimation with independent variables (Gini or Theil) and dependent variables (import, import per capita, import over grp, export, export per capita, export over grp,).

With control variables grp, pergrp, population, consumption and railways, Theil results to be significatively (at the 99% level) correlated with dependent variables (import, import per capita, export, export per capita, export over grp) during 2000 to 2012 with FE and RE specifications.

No matter if you consider Theil square, Theil absolute value, or just Theil value. There are significative correlated with dependent variables (import, import per capita, export, export per capita, export over grp) both with FE and RE specifications.

When we considered the GMM estimation in models, the significance of Theil was weakened.

Population, consumption per capita and grp are correlated with other the control variables (grp, pergrp). After cutting off the correlated control variables, Theil is still at the 99% level significantively correlated with dependent variables (import, import per capita, export and export per capita) in the FE specification.

After cutting off the correlated control variables, the significance of Theil were improved in the GMM estimation, and Theil results to be at the 95% level significant.

We can conclude that when "variables over grp" are used, the results are not consistent in different model with different test.

When we took Theil as independent variable, it was significant during 2000 and 2012. If we extended years to 1993-2012, the Theil were not significant any more. However, when we took Gini as independent variable, Gini were significant during 2000 to 2010 even during 1995 t o2010.

We adopted Gini as independent variable, the signs of result were positive; while we used Theil as independent variable the signs of result were negative.

Theil were negative and *** significant[188] for export (export per capita) as dependent variable and with pergrp, consumption and railways as control variables during 2000 to 2012 in GMM estimation.[189]

Export raw data[190] in GMM estimation

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	(1) export	(2) export	(3) export	(4) export
L.export	0.951***	0.901***	0.703***	0.703***
	(0.022)	(0.046)	(0.103)	(0.105)
theil	-1.6e+09***	-1.9e+09***	-2.0e+09***	-2.0e+09***
	(3.9e+08)	(5.3e+08)	(6.5e+08)	(6.5e+08)
pergrp		527.118*	245.161	245.626
		(278.356)	(227.276)	(221.300)
_Iyea~2001		9.3e+06	2.5e+07**	2.5e+07**
		(7.5e+06)	(1.1e+07)	(9.8e+06)
consum			5218.428**	5230.771**
			(2207.331)	(2271.910)
railways				-1.2e+06
				(2.8e+07)

Export per capita[191] in GMM estimation

	(1) export_pc	(2) export_pc	(3) export_pc	(4) export_pc
L.export~c	0.897***	0.823***	0.807***	0.805***
	(0.014)	(0.043)	(0.089)	(0.089)
theil	-2.2e+05***	-2.4e+05***	-2.5e+05***	-2.5e+05***
	(8.3e+04)	(5.9e+04)	(9.3e+04)	(9.4e+04)

[188] *** significant which means "standard errors<0.01" (reject null hypothesis at the 1% level), in other words, are considered significant at the 99% level. The same ** significant means " standard errors < 0.05", and * significant means " standard errors < 0.1"

[189] export / export per capita = Theil + pergrp + consumption + railways.

[190] Theil were *** significant for export and export per capita as dependent variables.

[191] Theil were *** significant for export and export per capita as dependent variables.

pergrp			0.134	0.106	0.103		
			(0.105)	(0.117)	(0.117)		
_Iyea~2001			2282.201		2812.411		
			(3090.691)		(3617.171)		
consum_pc				975.963	1110.120		
				(3466.195)	(3487.325)		
railways~c					2.8e+06		
					(1.1e+07)		

Gini were *** significant with import yuan unit (import per capita yuan unit, export yuan unit and export per capita yuan unit) as dependent variables with grp, population and railways as control variables during 1995 and 2010 in two-step GMM estimation.

Import and export (yuan)_ two-step GMM estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	importy	importy	importy	exporty	exporty	exporty	exporty
L.importy	1.007***	0.846***	0.797***				
	(0.000)	(0.001)	(0.001)				
gini	6.1e+08***	1.0e+08***	8.1e+07***	8.8e+08***	8.3e+08***	4.1e+08***	3.8e+08***
	(3.7e+06)	(9.5e+06)	(2.6e+07)	(2.5e+06)	(3.6e+06)	(4.9e+06)	(1.2e+07)
popu2		1.9e+09***	1.6e+09***			1.8e+09***	1.8e+09***
		(1.1e+07)	(5.1e+07)			(5.2e+06)	(1.7e+07)
grp			4304.184***				
			(233.176)				
railways			-7.8e+07***		1.9e+08***		1.2e+08***
			(2.1e+07)		(3.6e+06)		(2.0e+06)
L.exporty				1.006***	1.000***	0.889***	0.887***
				(0.000)	(0.000)	(0.000)	(0.001)
_cons	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
N	334	334	334	334	334	334	334

Import per capita (yuan)_ two-step GMM estimation

	(1)	(2)	(3)	(4)
	importy~2	importy~2	importy~2	importy~2
L.im~y_pc2	0.957***	0.869***	0.957***	0.858***
	(0.001)	(0.001)	(0.000)	(0.001)
gini	1.9e+09	1.5e+09***	1.9e+09***	1.5e+09***
	(.)	(2.2e+07)	(1.2e+07)	(2.1e+07)
pergrp		6322.595***		7024.573***
		(52.126)		(51.071)
railways~2			1.8e+07**	-9.8e+07***
			(7.3e+06)	(6.3e+06)
_cons	-6.8e+08***	0.000	0.000	0.000
	(2.9e+07)	(.)	(.)	(.)
N	334	334	334	334

Export per capita (yuan)_ two-step GMM estimation

	(1) exporty~2	(2) exporty~2	(3) exporty~2	(4) exporty~2
L.ex~y_pc2	0.944***	0.895	0.944***	0.888***
	(0.000)	(.)	(0.000)	(0.001)
gini	2.4e+09***	2.1e+09	2.4e+09***	2.1e+09***
	(3.2e+07)	(.)	(4.9e+07)	(5.1e+07)
pergrp		3838.324		4401.494***
		(.)		(51.683)
railways~2			9.8e+06	-8.2e+07***
			(7.8e+06)	(1.2e+07)
_cons	0.000	-8.0e+08	0.000	0.000
	(.)	(.)	(.)	(.)
N	334	334	334	334

Conclusion

Based on previous studies this research illustrated the influence mechanism of effect of income inequality on import and export. The theory is that income inequality growth should break the equilibrium of domestic demand and supply, and bring about import demand and domestic surplus products, finally impact import and export. In a word, income inequality growth brings about the value of import and export growth. This research employed provincial data, and took Theil elements and Gini coefficient as independent variables, dependent variables (import, import per capita, import over grp, export, export per capita, export over grp) and control varibales (GRP, per GRP, populations, consumption, consumption per capita, consumption over grp, railways, railways per capita) , and estimated the effect of income inequality on import and export. The Fixed-effect test, Random-effect, test one-step and two-step GMM estimation (Arellano-Bond dynamic panel-data estimation) were used, and outputted some results.

Theil were negative and significant at the 99% level for export (export per capita) as dependent variable and with pergrp, consumption and railways as control variables during 2000 to 2012 in GMM estimation. Gini were significant at the 99% level with import yuan unit (import per capita yuan unit, export yuan unit and export per capita yuan unit) as dependent variables with grp, population and railways as control variables during 1995 and 2010 in two-step GMM estimation.

The signs of coefficient of Theil elements were negative, which means when income inequality between provinces rises, export and export per capita decrease. The signs of coefficient of Gini coefficient were positive, which means when income inequality within provinces rises, import yuan unit, import per capita yuan unit, export yuan unit and export per capita yuan unit increase.

4.2. The effect of multidimensional poverty to import-export

4.2.1. Influence Mechanism and Modeling

Although in absolute terms poverty can exist even without inequality, and in principle inequality may exist also without poverty, the relationship between poverty and inequality is worth mentioning and in relative terms poverty can be considered an extreme case of inequality. In addition to the assessment in absolute or relative terms, poverty can be evaluated in a single dimension (usually in terms of income) as well as in a multidimensional framework.

Domestic demand, consumption and imports are influenced by income inequality and the more so this is true for poverty.

This dissertation calculates the multidimensional poverty based on three levels: at the individual level, at the household level and at the provincial level. After the calculation of the multidimensional poverty indicators at three levels, the values of import and export in provinces under different levels of multidimensional poverty are discussed.

In the calculation of multidimensional poverty indicators, this dissertation refers to the dimensions (health, education and living standards) taken into account by the multidimensional poverty index (MPI). The calculation of the multidimensional indicators at the individual level of this dissertation uses four dimensional variables: income, education, health, and employment. The calculation of multidimensional indicators at the household level in this dissertation uses four dimensional variables: income, education, living standards, and employment.

Multidimensional poverty is a multidimensional indicator that combines income, health, education, and living standards. Multidimensional poverty itself has no direct impact on imports and exports or production and consumption, and it more expresses a state of deprivation. But the degree of deprivation of each of variables which calculate the multidimensional poverty has an impact on production and consumption.

Poverty not only has a direct impact on production and consumption but also has a profound impact on trade. For the individual level and the household level, the poor people lack produce materials, and the produce activities that can be carried out tend to sell their physical strength. They engage in low-tech or unskilled physical activities, and it is difficult to be a part of a trade-oriented industry and contributes to exports. As consumers, the consumption of the poor is extremely limited, and what they consume more is local low-quality products to meet their survival.

For a country, poverty means exporting more primary products in exchange for importing industrial manufactured goods. Such a trade pattern will create a series of dilemmas in today's globalization (Jeffrey Williamson 2011) [192], including de-industrialization, Dutch disease,

[192] Jeffrey G. Williamson (2011) Trade and Poverty: When the Third World Fell Behind. Cambridge, MA: MIT Press

commodity price volatility, and rising inequality, thus falling into the trap.

The impact of living standards on production and consumption is unclear. Most researches on living standards are used to express a degree of deprivation.

If we relax the hypothesis, regardless of the standard of living, we can understand that the various sub-variables of multi-dimensional poverty have an impact on production and consumption, so export as the production surplus and import as the import demand may also be affected by them. This is only a kind of transmission. There is no strong link in this kind of transmission. Therefore, it cannot be directly concluded whether in a province will increase or decrease the volume of import and export trade under multidimensional poverty change. We can relax the assumptions about the impact of these indicators on imports and exports. We assume that the more production is produced, the more surplus production is produced, and then the more exports are transported. The stronger domestic demand is, the more import demand it is, the more imports would be required. In this way, we can provide a perspective through a cross-sectional data to discuss the volume of import and export trade in different provinces under different multidimensional poverty.

$$\text{Multidimentional Poverty} = \begin{cases} \text{Income} \\ \text{Education} \\ \text{Health} \\ \text{Living Standards} \end{cases} = \begin{cases} \text{Income} \\ \text{Human Capital} \\ \text{Living Standards} \end{cases} \rightarrow \begin{cases} \text{Produce} \\ \text{Consume} \end{cases}$$

$$\rightarrow \begin{cases} \text{Production Surplus} \\ \text{Import Demand} \end{cases} = \text{Import and Export}$$

The multidimensional poverty has been assessed for four dimensions in the Chinese provinces with reference to three different units of analysis (the individuals, the households and the provinces) each of which relies upon different indicators.

4.2.2. Data and process

The multidimensional poverty has been calculated on the CHIP 2013 dataset, which is best in terms of completeness of information, but unfortunately does not cover all Chinese Provinces.

I. The personal data

The personal level considers the individual as unit of analysis and the data set offers information about 4 dimensions: Education, Health, Income and Employment as substitute dimension of Living Standards. We have 61,162 individuals in the samples, and we consider 6 variables. Although the variables enter the calculation each by each, in terms of dimensions we consider: two variables for education (highest level of education completed, years of formal education), one for health (health conditions), one for living standard (employment status), and two for income (income from the main job, and income from other jobs). With fuzzy set methodology, each individual is evaluated according to 6 multidimensional poverty values, and the sum of these 6 values is the multidimensional poverty value of this individual sample. We sum up all individual

samples of Beijing, and then we get the Beijing multidimensional poverty value. We sum up all individual samples of Gansu, and then we will get the Gansu multidimensional poverty value. We aggregate the individual multidimensional poverty value as the province multidimensional poverty value

II. The household data

Usually people do not live alone, they live in a household where consumption of several goods is collective and some income redistribution exists between earners and dependent members. Therefore studies about distributive issues often take the household as unit of analysis.

At the household level we still consider 4 dimensions: Education (Household Education), Health (Household Subjective Self-Evaluation enters the calculation as a substitute dimension of Health), Income (Household Income) and Living Standard (Employment enters the calculation as substitute dimension of Living Standards) but the number of variables is higher because the dataset considers each household an entry and each household member observation as additional variable. We have 17,891 household in the samples, and 23 variables: total disposable income of the household in 2013, total disposable income of the household in 2012, total disposable income of the household in 2011, total living expenditure of the household in 2013, the balance of RMB financial assets (the total amount), spot cash, demand deposits, time deposits, estimated net present value of fixed productive assets, the education level of household head's father, the employment status of household head's father, the education level of household head's mother, the employment status of household head's mother, the education level of spouse's father, the employment status of spouse's father, the education level of spouse's mother, the employment status of spouse's mother, the education level of siblings of the respondent, the employment status of siblings of the respondent, the amount of money to keep the minimum living standard of your family (subjective questions related to the living level), evaluate the living standards comparing with average (subjective questions related to the living level), evaluate the living standards by comfortably (subjective questions related to the living level), evaluate economic condition according to economic shocks (subjective questions related to the living level).

The same method with processing personal data, each household entry has 23 multidimensional poverty values, and the sum of these 23 values is the multidimensional poverty value of this household sample. We sum up all household samples of Beijing, and then we get the Beijing multidimensional poverty value. We sum up all household samples of Gansu, and then we will get the Gansu multidimensional poverty value. We aggregate the household multidimensional poverty value as the province multidimensional poverty value.

III. The provincial data

The same 4 dimensions (Education, Health, Income and Standard of living) are described by 15 variables at the provincial level where multidimensional poverty include the following: 1) no schooling rate on Aged 6 and Over and, Illiterate rate on Aged 15 and Over, per capita Local Governments Expenditure on Education (Yuan), 2) per capita GDP (Yuan), Per Capita Disposable Income Nationwide (Yuan), Per Capita Expenditure Nationwide (Yuan) for Income, 3) Life Expectancy (age), per capita Local Governments Expenditure on Medical and Health Care (Yuan), per capita Number of Medical Personnel, per capita Number of Beds in Health Care Institutions for Health, 4) per capita Total Investment in Fixed Assets in the Whole Country (Yuan), Coverage Rate of Urban Population with Access to Gas, Coverage Rate of Urban Population with Access to Tap, Number of Public Lavatories Per 10 000 Population (unit), Number of Public Transportation Vehicles Per 10000 Population (unit) for Standard of living. The data prepared for fuzzy set method to measure the multidimensional poverty of province with macro data. The same method with processing personal data, each province sample has 15 multidimensional poverty values, and the sum of these 15 values is the multidimensional poverty value of this province sample.

Table 4.2 - 1.

individual	households	provincial
X1 = income X2 = education X3 = health X4 = employment	X1= Household Income X2= Household education X3= Household employment X4= Household Subjective self-evaluation (Subjective questions related to the living level)	X1= Income X2 = Education X3 = Health X4 = Infrastructures (Infrastructures related to the living level)

In CHIP 2013 data, the invalid data and outliers should be eliminated. In the questionnaire under a question, if the respondent of questionnaire gave an answer, which is out of the options, or he/she gave no answer, we say the answer is invalid or outlier. The corresponding data of this question is defined invalid. If the invalid answers more than 20%, the corresponding data should be eliminated, in other words, the corresponding variable is not employed.

After data processing, the variables are taken to measure the individual poverty on the four dimensions of education, health, living standard and income; to measure the household poverty on the same four dimensions and to aggregate them at the provincial level.

In these dimensions, we defined the poor in individual by “no schooling” or “no more than 2 years of formal education” on education, “very poor health condition” by self-assessment on health, “Family worker” on employment, and “less than 75% average income” on income. Then we

calculated every poor sample's weight by Napierian Logarithm and average value. At the end, every person gets a sum value on this kind of multidimensional; the summation of all samples of each province, the final value should be the fuzzy value. The higher the value is, the poorer is the province. The same method is taken to process the province data.

4.2.3. Methodology

4.2.3.1. Fuzzy sets

Fuzzy set is a mathematical model of vague qualitative or quantitative data; it was introduced by Lotfi A. Zadeh in 1965[193]. The model is based on the generalization of the classical concepts of set and its membership (characteristic) function[194]. In classical set theory, the membership of elements in a set is assessed in binary terms according to a dichotomic condition - an element either belongs or does not belong to the set. By contrast, fuzzy set theory permits the gradual assessment of the membership of elements in a set; this is described with the aid of a membership function valued in the real unit interval [0, 1]. Fuzzy sets generalize classical sets, since the indicator functions of classical sets are special cases of the membership functions of fuzzy sets, if the latter only take values 0 or 1.[195] In fuzzy set theory, classical dichotomic sets are usually called crisp sets. The fuzzy set theory can be used in a wide range of domains in which information is incomplete or imprecise, such as bioinformatics [196], artificial intelligence, linguistics, economics [197], decision-making, consumer products[198] and actuarial science[199].

Fuzzy sets in two examples

Suppose that E is some (universal) set, x - an element of E, ($x \in E$), R - some property. A usual subset A of set E ($A \subseteq E$)) which elements satisfy the properties R, is defined as a set of ordered pairs $A = \{-\mu A(x), x\}$ where $\mu(x)$ is the characteristic function, i.e. the so-called affiliation (membership) function, which takes the value $\mu A(x) = 1$, if the properties R satisfies or $\mu A(x) = 0$ otherwise.

Fuzzy subset differs from normal (usual) only what there is no single answer "Yes-No" for elements $x \in E$ about properties R when the affiliation function accepts only two values: either 1 or 0. Fuzzy subset A of universal set E is defined as the set of ordered pairs $A = \{(\mu A(x), x\}$

[193] Zadeh, L. A., Fuzzy sets. Information and Control, Vol. 8(3), pp. 338–353. (1965).
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[197] BERZIERI,L. Indicatori di benessere nelle regioni europee: analisi multidimensionali ed approccio basato sui fuzzy sets [D].University of Parma,2013
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where μA(x) is affiliation function of the subset element that now can take a value in the range M = [0, 1]. Affiliation function indicates the degree of belonging of element to fuzzy subset: from μA(x) = 0 i.e. the item is guaranteed not to be into subset up to μA(x) = 1 i.e item is guaranteed to be into subset. If μA(x) > 0.5 then the element most likely belongs to the fuzzy subset A than does not belong to it. Elements x, for which μA(x) = 0.5, called "jump points" of fuzzy subset A.[200]

With this methodology, we need k variables chosen as indicators of k poverty dimensions: X_1, X_2… X_k. Then every w_1, w_2…w_k represents a generic weight system, while g-(x_{ij}) is the deprivation measure of element i for the indicator j.

$$\overline{g(x_{ij})} = \left(\sum_i g(x_{ij})\right)/n$$

$$w_j = \log[1/\overline{g(x_j)}]$$

$$f(x_i) = \frac{\sum_{j=1}^{k} g(x_{ij}) w_j}{\sum_j^k w_j}$$

The function f ($_{xi}$) is a weighted average of each g ($_{xij}$) and represents a global poverty index

4.2.3.2. MPI

The Multidimensional Poverty Index (MPI) is a popular method to describe poverty. It was developed by OPHI (Oxford Poverty and Human Development Initiative) in collaboration with UNDP's Human Development Report Office and first published in 2010 in UNDP's Human Development Report. MPI captures the multiple deprivations that each poor person faces at the same time with respect to education, health and living standards.

4.2.4. Results

4.2.4.1. Multidimensional poverty based on personal data

Based on the personal data, we aggregate all individual multidimensional poverty value of each province to represent their province multidimensional poverty. The results are below. (MP=multidimensional poverty)

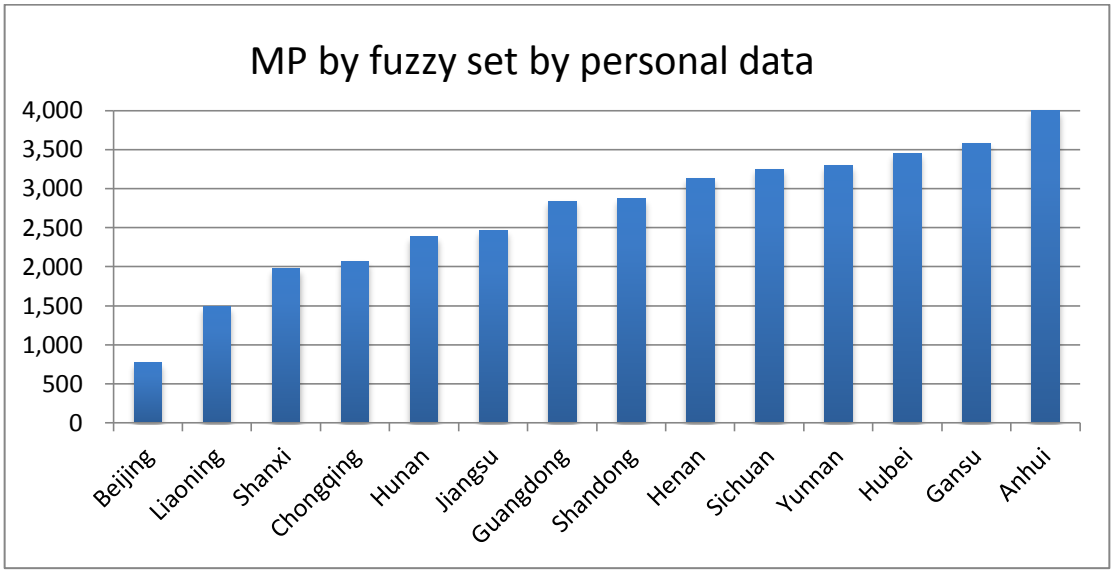
Table 4.2 - 2. **MP by fuzzy set by personal data**

Province	MP by personal data
Beijing	766
Liaoning	1485
Shanxi	1973

[200] Zadeh, L. A., Fuzzy sets. Information and Control, Vol. 8(3), pp. 338–353. (1965).

Chongqing	2059
Hunan	2383
Jiangsu	2462
Guangdong	2836
Shandong	2869
Henan	3127
Sichuan	3246
Yunnan	3292
Hubei	3446
Gansu	3580
Anhui	3992

Figure 4.2 - 1. **MP by fuzzy set by personal data**



As the result showed, the Anhui province is the multidimensional poorest, and Gansu is the second multidimensional poorest, while the Beijing is the multidimensional richest, then Liaoning is the second multidimensional richest among the 14 provinces for which the survey CHIP 2013 provides data.

4.2.4.2. Multidimensional poverty based on household data

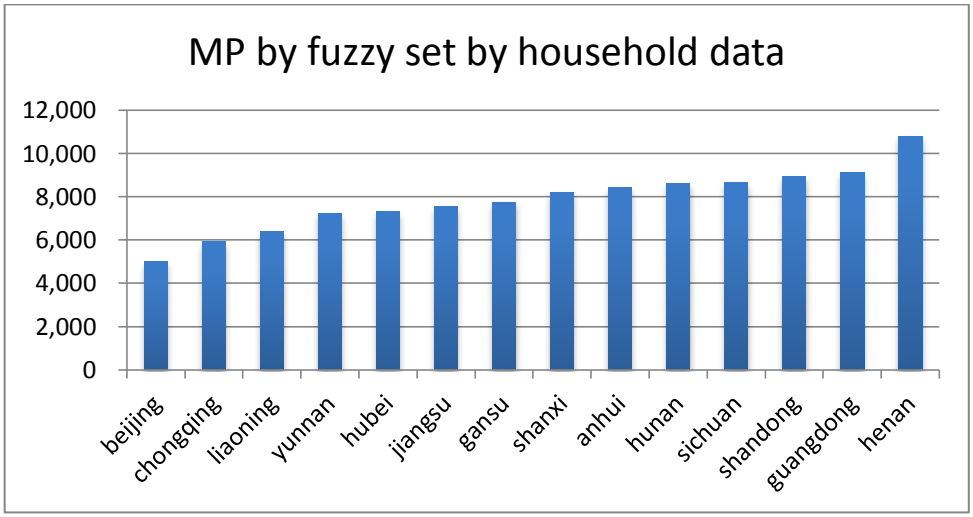
Based on the household data, we aggregate all household multidimensional poverty value of each province to represent their province multidimensional poverty. The results are below. (MP=multidimensional poverty)

Table 4.2 - 3. **MP by fuzzy set by household data**

Province	MP by household data
Beijing	5009
Chongqing	5918
Liaoning	6403
Yunnan	7208
Hubei	7320
Jiangsu	7544
Gansu	7754
Shanxi	8204
Anhui	8427
Hunan	8629
Sichuan	8635
Shandong	8932
Guangdong	9131
Henan	10797

Figure 4.2 - 2.

Figure 4-2 MP by fuzzy set by household data



As the result shows, the Henan province is the multidimensional poorest, and Guangdong is the second multidimensional poorest, while the Beijing is the multidimensional richest, then Chongqing is the second multidimensional richest among these 14 provinces.

4.2.4.3. Multidimensional poverty based on province data

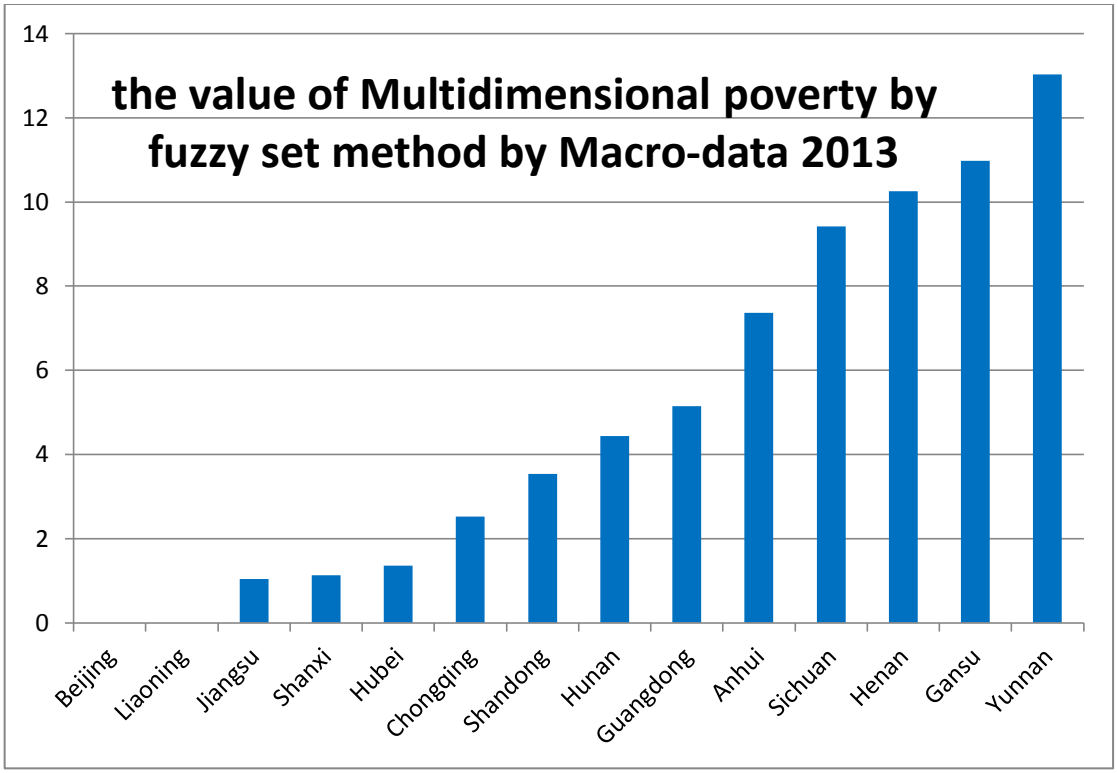
Based on the province data, we calculate multidimensional poverty value of province. The results are below. (MP=multidimensional poverty)

Based on province data

Table 4.2 - 4. **MP by fuzzy set by province data**

Province	MP by Provincial data
Beijing	0
Liaoning	0
Jiangsu	1.036091932
Shanxi	1.131402111
Hubei	1.354545663
Chongqing	2.524168987
Shandong	3.535769899
Hunan	4.438330438
Guangdong	5.143648154
Anhui	7.362533143
Sichuan	9.423956179
Henan	10.25063475
Gansu	10.98304427
Yunnan	13.03073711

Figure 4.2 - 3. **MP by fuzzy set by province data**



As the result showed, the Yunnan province is the multidimensional poorest, and Gansu is the second multidimensional poorest, while the Beijing and Liaoning are same the multidimensional richest, then Jiangsu is the second multidimensional richest among these 14 provinces.

Imports and Exports data

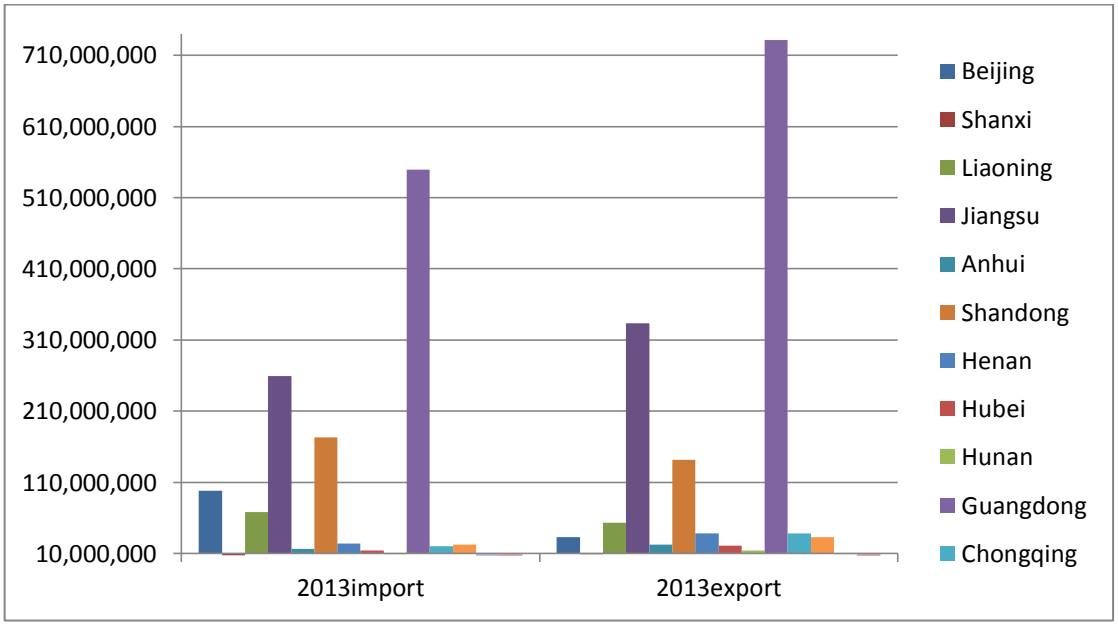
Table 4.2 - 5. **total Value of Imports and Exports (1,000 US dollars)**

	Total Value of Imports	Total Value of Exports
Beijing	98339383	33221397
Shanxi	7411556	9749371
Liaoning	67952596	53407910
Jiangsu	259491086	333804198
Anhui	16467306	22460220
Shandong	173395991	141546096
Henan	24195796	38577788
Hubei	14649289	20985995
Hunan	9913099	14402966
Guangdong	549428183	731763406
Chongqing	20573837	38211396
Sichuan	22334219	32760464
Yunnan	7055755	8768549

Gansu	5412130	1429426

Data sources: National Bureau of Statistics of China, Total Value of Imports of Destinations and Catchments (1,000 US dollars), Total Value of Exports of Destinations and Catchments (1,000 US dollars)

Figure 4.2 - 4. **Total Value of Imports and Exports (1,000 US dollars)**



As the table showed, the Guangdong province is the most import and export, and Jiangsu is the second most import and export, while the Gansu is the fewest import and export, then Yunnan is the second fewest import and export among these 14 provinces. The gap of import and export between provinces is huge. They could be classified in two groups, the top 5 province and others.

The top 5 provinces in import: Guangdong, Jiangsu, Shandong, Beijing, Liaoning.

The top 5 province in export: Guangdong, Jiangsu, Shandong, Liaoning, Henan (because the values of export of Chongqing and Beijing are approximately equal with Henan's, so Chongqing and Beijing could be situated as 5th). So the top 5 should be Guangdong, Jiangsu, Shandong, Liaoning, and Beijing.

4.2.4.4. Comparing multidimensional poverty data and import-export data

To compare the rank of all provinces, we list all data of MP by personal data, MP by household data, MP by Province data, Total Value of Imports and Total Value of Exports.

Table 4.2 - 6. **the data of MP by personal data, MP by household data, MP by Province data, Total Value of Imports and Total Value of Exports**

Province	personal	household	Provincial	Imports	Exports
Beijing	766	5009	0	98339383	33221397

Shanxi	1973	8204	1.131	7411556	9749371
Liaoning	1485	6403	0	67952596	53407910
Jiangsu	2462	7544	1.036	259491086	333804198
Anhui	3992	8427	7.363	16467306	22460220
Shandong	2869	8932	3.536	173395991	141546096
Henan	3127	10797	10.25	24195796	38577788
Hubei	3446	7320	1.355	14649289	20985995
Hunan	2383	8629	4.438	9913099	14402966
Guangdong	2836	9131	5.144	549428183	731763406
Chongqing	2059	5918	2.524	20573837	38211396
Sichuan	3246	8635	9.424	22334219	32760464
Yunnan	3292	7208	13.03	7055755	8768549
Gansu	3580	7754	10.98	5412130	1429426

Table 4.2 - 7. **Ranking the order by province**

order	personal	household	Provincial	Imports	Exports
1	Beijing	Beijing	Beijing	Guangdong	Guangdong
2	Liaoning	Chongqing	Liaoning	Jiangsu	Jiangsu
3	Shanxi	Liaoning	Jiangsu	Shandong	Shandong
4	Chongqing	Yunnan	Shanxi	Beijing	Liaoning
5	Hunan	Hubei	Hubei	Liaoning	Henan
6	Jiangsu	Jiangsu	Chongqing	Henan	Chongqing
7	Guangdong	Gansu	Shandong	Sichuan	Beijing
8	Shandong	Shanxi	Hunan	Chongqing	Sichuan
9	Henan	Anhui	Guangdong	Anhui	Anhui
10	Sichuan	Hunan	Anhui	Hubei	Hubei
11	Yunnan	Sichuan	Sichuan	Hunan	Hunan
12	Hubei	Shandong	Henan	Shanxi	Shanxi
13	Gansu	Guangdong	Gansu	Yunnan	Yunnan
14	Anhui	Henan	Yunnan	Gansu	Gansu

The multidimensional richest province Beijing is not the province of most and fewest import-export. The most import-export province Guangdong is not the multidimensional rich.
The fewest import-export province Gansu is the poorest province (except household, because of family members). One of the multidimensional poorest (except household) Yunnan is the one of the fewest import-export province.

If we take account for the top 5 import and export province, we could find out these 5 provinces

except Guangdong are multidimensional rich provinces.

Conclusion

As above indicated the influence mechanism, the poor people lack produce materials, and the produce activities that can be carried out tend to sell their physical strength. They engage in low-tech or unskilled physical activities, and it is difficult to be a part of a trade-oriented industry and contributes to exports. As consumers, the poor consume extremely limited, and what they consume more is local low-quality products to meet their survival. So at the individual level and the household level, a province with poorer person or household could be limited to access to import and export. For a country, poverty means exporting more primary products in exchange for importing industrial manufactured goods. Such a trade pattern will create a series of dilemmas in today's globalization, including de-industrialization, Dutch disease, commodity price volatility, and rising inequality, thus falling into the trap.

We selected four dimensions based on MPI, and employed CHIP data 2013, and then measures the multidimensional poverty by fuzzy set theory. The results show that the top 5 exporters and importers except Guangdong are multidimensional rich province. If we ignore the potential reciprocal causations, we could simply conclude multidimensional rich provinces could access to import-export and get benefit on the top seat, even it is not the top 1, and its volume of import-export still is one of the most.

The provinces at medium level in import and export they values of multidimensional poverty kept at the middle level. In the Multidimensional poverty provinces Yunnan and Gansu, they are import-export much less.

Referring to the results we can not conclude multidimensional poverty deprive the participation of import and export. Neither import nor export improves multidimensional poverty. To some extent, we could say they have correlation between multidimensional poverty and import-export. The further relationship should be test by regression model, even by panel data.

5. Conclusion

Because of the similar trend of income inequality and import-export in China, this dissertation reviewed the related literatures. And we found the income inequality and the value of import and export increased rapidly since 1978 economic reform. The classical trade theories indicate trade improves income distribution, in other words, it reduces income inequality. However, China's case tells another story. Through the literature review on the relationship between income inequality and trade we found the classical trade theories referred to supply side to explain their relationship, which is why failed to suit China's case. And then we take an opposite way, demand side to explain China's case.

The theory is developed that income inequality growth should break the equilibrium of domestic demand and supply, and bring about import demand and domestic surplus products, finally impact import and export. In a word, income inequality growth brings about the value of import and export growth. This research employed provincial data, and took Theil elements and Gini coefficient as independent variables, dependent variables (import, import per capita, import over grp, export, export per capita, export over grp) and control variables (GRP, per GRP, populations, consumption, consumption per capita, consumption over grp, railways, railways per capita) , and estimated the effect of income inequality on import and export. The Fixed-effect test, Random-effect, test one-step and two-step GMM estimation (Arellano-Bond dynamic panel-data estimation) were used, and outputted some results.

The results showed signs of coefficient of Theil elements were negative and significant at the 99 % level under GMM estimation, which means when income inequality between provinces rises, export and export per capita decrease. The signs of coefficient of Gini coefficient were positive, and significant at the 99 % level under two-step GMM estimation which means when income inequality within provinces rises, import yuan unit, import per capita yuan unit, export yuan unit and export per capita yuan unit increase.

From the perspective of income inequality within provinces, this conclusion fit the trends of Gini coefficient and import-export evolution in the first chapter; also meet the theory developed in this dissertation.

To extend the analysis over the monetary dimension of income inequality, this dissertation calculated multidimensional poverty based on fuzzy set at provincial level. Although China has undertaken a tremendous and successful effort to get rid of poverty in recent years, a share of poor population still exists, especially in rural area. Because different observation impacts production and consumption at different way, this dissertation developed the provincial level poverty

assessment at three levels of units of analysis, at personal level, household level and provincial level. The micro data, both personal data and household data, were aggregated in provincial multidimensional poverty.

We found that between the multidimensional poverty and import-export some correlation exist, although we have been able to compare only the year 2013, which corresponds to the most recent CHIP issue. The multidimensional-poor provinces export and import less, while multidimensional-rich provinces export and import more. That means the poor contribute less in production and consumption, thereby, import and export less. Since the micro data on which the multidimensional poverty is based are cross-sectional data, do not survey all provinces and the CHIP issues are not yearly we were unable to seek whether a causal relationship can be shown between multidimensional poverty and import-export.

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- The State Council Leading Group Office of Poverty Alleviation and Development (guowuyuan fupin kaifa lingdao xiaozu bangongshi) http://www.cpad.gov.cn/
- Translated by Compilation and Translation Bureau, Central Committee of the Communist Party of China Beijing, China. The 13th Five-Year Plan For Economic And Social Development Of The People's Republic Of China (2016–2020).Central Compilation \& Translation Press
- the China 2005 1\% Population Intercensus Survey (also called the 2005 minicensus, hereafter Mini-Census 2005), the 2010 and 2012 Chinese General Social Surveys (CGSS 2010 and CGSS 2012), the 2011 Chinese Household Finance Survey (CHFS 2011), the 2012 baseline wave of the China Labor Force Dynamic Survey (CLDS 2012), and the 2012 wave of the China Family Panel Studies (CFPS 2012).

6. Appendix

6.1. CHIP [201](Chinese Household Income Project Survey)

The Chinese Household Income Project (CHIP) is launched by China Institute for Income Distribution of Beijing Normal University to track the dynamics of income distribution in China. CHIP has conducted five waves of household surveys, in 1989, 1996, 2003, 2008 and 2013. They covered the income and expenditure information in 1988, 1995, 2002, 2007 and 2013 respectively and called CHIP1988, CHIP1995, CHIP2002, CHIP2007, and CHIP2013. These surveys were carried out as part of a collaborative research project on incomes and inequality in China organized by Chinese and international researchers, with assistance from the National Bureau of Statistics (NBS). The CHIP project participants and other researchers have analyzed the data from these four waves and published a wide range of articles, reports, and books. Descriptions of the CHIP surveys and key findings can be found in Griffin and Zhao (1993)[202], Riskin, Zhao, and Li (2001)[203], Gustafsson, Li, and Sicular (2008)[204], and Li, Hiroshi and Sicular (2013)[205], etc.
Eichen and Zhang (1993)[206] describe the 1988 survey, and Li, Luo, Wei, and Yue (2008)[207] describe the 1995 and 2002 surveys. Luo, Li, Sicular, Deng, and Yue (2013)[208] provide basic information about the 2007 survey. The CHIP surveys are closely related to the NBS household survey. Li et al. (2008)[209] discuss how the NBS household survey samples were selected. Additional details about the NBS household surveys can be found in recent NBS statistical reports and publications.

All the CHIP waves contain surveys of urban and rural households. In view of the increased importance of rural-to-urban migration, and because the urban and rural household subsamples do not adequately cover migrants, the 2002 survey added a survey of rural-to-urban migrants. Thus, the 2002 CHIP survey includes three subsamples. The same procedure was adopted for the 2007

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and 2013 survey, which is also composed of three parts: the urban household survey, the rural household survey, and the rural-to-urban migrant household survey. This structure reflects China's urban-rural division and the increased number of rural individuals who have migrated into the urban areas, especially during the last two decades.

The 2002 surveys were carried out by the NBS. The 2007 urban and rural surveys were conducted by the NBS, but the rural-to-urban migrant survey was conducted by a survey company. The 2007 survey is also a part of the larger RUMiC (Rural-Urban Migrants in China) survey project. The sampling procedure and survey method for the 2007 migrant survey are described in detail in the Rural-Urban Migration in China Project Survey Documentation. See Sherry Tao Kong (2010)[210].

The latest data is CHIP 2013. CHIP took samples from the big sample database of NBS; the data are extracted from the annual integration household survey. The latter contains 160 thousands households in 31 provinces. The CHIP sample was selected by systematic sampling method in three layers of east, center and west and contains 15 provinces, 126 cities, 234 counties, 18948 households and 64777 individuals. In which, there are 7175 urban households, 11013 rural households, and 760 migrant households.

The CHIP2013 contains household income, expenditure, individual information, labor time in 2013, job information, assets, demolition land information, agriculture business and so forth.

6.2. Tables

Table 6 - 1.
The Exchange Rate Between RMB and USD(USD=100)(Yuan) ($100=(¥))

Year	$100=¥	Year	$100=¥	Year	$100=¥	Year	$100=¥	Year	$100=¥
1978	168.36	1986	345.28	1994	861.87	2002	827.70	2010	676.95
1979	155.49	1987	372.21	1995	835.10	2003	827.70	2011	645.88
1980	149.84	1988	372.21	1996	831.42	2004	827.68	2012	631.25
1981	170.50	1989	376.51	1997	828.98	2005	819.17	2013	619.32
1982	189.25	1990	478.32	1998	827.91	2006	797.18	2014	614.28
1983	197.57	1991	532.33	1999	827.83	2007	760.40	2015	622.84
1984	232.70	1992	551.46	2000	827.84	2008	694.51	2016	664.23
1985	293.67	1993	576.20	2001	827.70	2009	683.10		

Table 6 - 2.
The People's Republic of China's Gini Coefficient, 1978-2016

[210] Kong, Sherry Tao (2010), "Rural-Urban Migration in China: Survey Design and Implementation," in X. Meng, C. Manning, S. Li, and T. N. Effendi, eds., The Great Migration: Rural-Urban Migration in China and Indonesia, 135-150, Northampton, MA: Edward Elgar.

Year	WDI	R&C n	R&C	WIID	CHIP	Lin n	Lin	NBSC
1978				31.7				
1979								
1980								
1981	29.1	31.0	28.0					
1982		28.5	25.9					
1983		28.3	26.0	28.4				
1984	27.7	29.1	26.9					
1985		29.0	26.5	22.4				
1986		32.4	29.2					
1987	29.9	32.4	28.9					
1988		33.0	29.5	38.2	39.5			
1989		35.2	31.8					
1990	32.4	34.9	31.6			34.5	28.7	
1991		37.1	33.1	34.1				
1992		39.0	34.2					
1993	35.5	42.0	36.7					
1994		43.3	37.6					
1995		41.5	36.5	29.0	46.9	39.7	32.9	
1996	35.7	39.8	35.1	39.0				
1997		39.8	35.0					
1998		40.3	35.4					
1999	39.2	41.6	36.4					
2000		43.8	38.5	39.0		41.1	34.7	
2001		44.7	39.5					
2002	42.6			45.4	46.8			
2003				44.9				47.9
2004								47.3
2005	42.5					45.7	38.8	48.5
2006								48.7
2007					49.7			48.4
2008	42.6							49.1
2009								49.0
2010	42.1							48.1
2011								47.7
2012								47.4
2013								47.3
2014								46.9
2015								46.2
2016								46.5

WDI, world development indicators, Based on income (1981-1987) and consumption (1990-2009)
R&C n , Ravallion and Chen (2007)[211] without adjustment for spatial COL difference
R&C, Ravallion and Chen (2007) with adjustment for spatial COL difference
COL= cost of living,
WIID=World Income Inequality Database
CHIP : Chinese Household Income Project, A project of Beijing Normal University
Lin n, Lin et al.(2010)[212] without adjustment for spatial COL difference

[211] Ravallion, M., and S. Chen. 2007. China's (Uneven) Progress against Poverty. Journal of Development Economics.82 (1). pp. 1–42.
[212] Lin, T., J. Zhuang, D. Yarcia, and F. Lin. 2010. Decomposing Income Inequality: People's Republic of China,

Lin, Lin et al.(2010)with adjustment for spatial COL difference

Table 2.1 - 14. The average wages of employed persons in urban units (2003 – 2015)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Urban Units	13969	15920	18200	20856	24721	28898	32244	36539	41799	46769	51483	56360	62029
A.F.A.H.F	6884	7497	8207	9269	10847	12560	14356	16717	19469	22687	25820	28356	31947
Mining	13627	16774	20449	24125	28185	34233	38038	44196	52230	56946	60138	61677	59404
Manuf.	12671	14251	15934	18225	21144	24404	26810	30916	36665	41650	46431	51369	55324
P.D.E.G.W	18574	21543	24750	28424	33470	38515	41869	47309	52723	58202	67085	73339	78886
Construc.	11328	12578	14112	16164	18482	21223	24161	27529	32103	36483	42072	45804	48886
T.S.P	15753	18071	20911	24111	27903	32041	35315	40466	47078	53391	57993	63416	68822
I.T.C.S.S	30897	33449	38799	43435	47700	54906	58154	64436	70918	80510	90915	100845	112042
W.R.T	10894	13012	15256	17796	21074	25818	29139	33635	40654	46340	50308	55838	60328
H.C.S	11198	12618	13876	15236	17046	19321	20860	23382	27486	31267	34044	37264	40806
F.I	20780	24299	29229	35495	44011	53897	60398	70146	81109	89743	99653	108273	114777
R.E	17085	18467	20253	22238	26085	30118	32242	35870	42837	46764	51048	55568	60244
L.B.S	17020	18723	21233	24510	27807	32915	35494	39566	46976	53162	62538	67131	72489
S.R.T.S.G.P	20442	23351	27155	31644	38432	45512	50143	56376	64252	69254	76602	82259	89410
M.W.C.E.P.F	11774	12884	14322	15630	18383	21103	23159	25544	28868	32343	36123	39198	43528
S.H.O.S	12665	13680	15747	18030	20370	22858	25172	28206	33169	35135	38429	41882	44802
Education	14189	16085	18259	20918	25908	29831	34543	38968	43194	47734	51950	56580	66592
H.S.S.S.W	16185	18386	20808	23590	27892	32185	35662	40232	46206	52564	57979	63267	71624
C.S.E	17098	20522	22670	25847	30430	34158	37755	41428	47878	53558	59336	64375	72764
P.M.S.O	15355	17372	20234	22546	27731	32296	35326	38242	42062	46074	49259	53110	62323

Source: National Bureau of Statistics of China

China's Gini Coefficient of Provincial Resident Income[213]

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Beijing	0.2405	0.2308	0.2401	0.25	0.2477	0.2613	0.2695	0.2809	0.2668	0.2892	0.2803	0.2756	0.2801	0.2955	0.2896	0.2739
Tianjin	0.2776	0.2754	0.2752	0.2745	0.2854	0.2851	0.299									
Hebei	0.2643	0.2594	0.2731	0.3096	0.3331	0.3434	0.3406	0.3477	0.3526	0.347	0.3545	0.358	0.3497	0.3764	0.3801	0.3686
Shanxi	0.3777	0.3461	0.3414	0.3357	0.3624	0.3648	0.3937	0.4013	0.4118	0.4147	0.4096	0.4135	0.4157	0.4147	0.4163	0.4251
Neimenggu	0.339	0.3171	0.3485	0.3358	0.3663	0.3975	0.4085	0.4094	0.437	0.4271	0.4185	0.4077	0.3971	0.4054	0.4229	0.4154
Liaooning	0.3154	0.3013	0.2983	0.2773	0.3014	0.3488	0.3331	0.3663	0.3631	0.3574	0.3786	0.3819	0.3827	0.3765	0.374	0.3577
Heilongjiang	0.3084	0.2618	0.2649	0.2801	0.3061	0.3474	0.3664	0.3862	0.3953	0.3731	0.3893	0.3865	0.38	0.3743	0.3721	0.3484
Shanghai	0.244	0.2429	0.2275	0.2293	0.2627	0.256	0.2799	0.2652	0.3129	0.3183	0.3116	0.3134	0.3052	0.305	0.297	0.2839
Jiangsu	0.3078	0.2875	0.2903	0.2902	0.2993	0.3013	0.3104	0.3414	0.353	0.3574	0.3621	0.3742	0.3767	0.377	0.3827	0.3738
Zhejiang	0.3314	0.3229	0.3258	0.3292	0.3361	0.335	0.3428	0.3528	0.3603	0.3611	0.3741	0.3733	0.3755	0.374	0.3749	0.3731
Anhui	0.3417	0.3401	0.3196	0.3279	0.344	0.359	0.364	0.38	0.413	0.3976	0.4172	0.4166	0.4123	0.4128	0.4061	0.3884
Fujian	0.3265	0.3186	0.3151	0.3275	0.3508	0.3404	0.3613	0.3843	0.3939	0.3956	0.3985	0.4009	0.4045	0.4119	0.411	0.3897
Jiangxi	0.3018	0.2683	0.2686	0.2834	0.3059	0.3495	0.364	0.369	0.3609	0.3719	0.384	0.3814	0.393	0.4033	0.3905	0.3683
Henan	0.3316	0.3138	0.3177	0.3182	0.3287	0.3539	0.3641	0.3908	0.414	0.3993	0.3974	0.3956	0.3931	0.398	0.409	0.3931
Hubei	0.3574	0.328	0.3238	0.3282	0.3438	0.3465	0.3541	0.3767	0.3847	0.3182	0.3863	0.3918	0.3888	0.388	0.3914	0.3792
Hunan	0.3849	0.3497	0.3399	0.3515	0.3597	0.386	0.4053	0.4065	0.4221	0.4069	0.4237					
Guangdong	0.3583	0.346	0.3415	0.3478	0.3507	0.3687	0.3813	0.3989	0.4284	0.4305	0.4284	0.4276	0.4252	0.4222	0.4219	0.4136
Guangxi	0.4224	0.3967	0.3753	0.3673	0.3647	0.3977	0.4158	0.4299	0.4368	0.4316	0.4248	0.4376	0.4535	0.4516	0.4555	0.4409
Chongqing	0.4063	0.3998	0.3802	0.3835	0.3992	0.4126	0.4261	0.4474	0.4346	0.4353	0.4356	0.4473	0.4417	0.4337	0.4304	0.4003
Sichuan	0.385	0.3612	0.35	0.3534	0.3626	0.375	0.3844	0.3867	0.3895	0.3816	0.3821	0.3857	0.3876	0.3792	0.3933	0.3931
Guizhou	0.3474	0.3288	0.3481	0.3464	0.3553	0.418	0.4326	0.4538	0.4665	0.4679	0.4782	0.49	0.4907	0.4795	0.4836	0.4756
Yunnan	0.3275	0.2756	0.2623	0.284	0.3146	0.3874	0.4001	0.4304	0.4301	0.4175	0.4336	0.4308				
Shaanxi	0.405	0.3896	0.3849	0.386	0.3881	0.4559	0.4613	0.4784	0.4786	0.4698	0.4651	0.4606	0.4593	0.464	0.4587	0.4123
gansu	0.41	0.3708	0.3696	0.3774	0.3878	0.4253	0.4506	0.4719	0.4828	0.4831	0.4754	0.4816	0.4901	0.478	0.4793	0.46
qinghai	0.424	0.4182	0.4076	0.4018	0.4205	0.4487	0.4663	0.4635	0.4739	0.4552	0.4591	0.4729	0.4735	0.4857	0.4807	0.4693
ningxia	0.4257	0.3607	0.371	0.3555	0.3714	0.409	0.4197	0.4265	0.4323	0.4225	0.4299	0.4435	0.4482	0.4529	0.4424	0.4361
xinjiang	0.4378	0.4367	0.4175	0.4102	0.4182	0.4545	0.4546	0.4588	0.4484	0.4452	0.4343	0.4352	0.4308	0.4372	0.4294	0.4161

[213] Tian Weimin (2012) Calculation of Gini Coefficient of Provincial Resident Income and Its Trend Analysis (Shengyu Jumin shouru jinni xishu cesuan jiqi biandong qushi fenxi). Economic Science (Jingji Kexue). Vol.2. P53

6.3. To solve the Endogeneity Problem

1) The first test: 5 control variables, Theil ^2, Hausman test FE model estimation (Fixed-effects GLS regression), and RE model estimation (Random-effects GLS regression).

At the beginning, we test the model by Hausman test, FE model estimation and RE model estimation, the results displayed *** significant which means "standard errors<0.01" (reject null hypothesis at the 1% level), in other words, are considered significant at the 99% level.

The data were employed in the test the values of import and export were minimized into trillion US dollar; for minimizing the scale of data other units of variables were transformed grp into 10 trillion RMB Yuan, pergdp into 10 thousand RMB Yuan, consumption into trillion RMB Yuan, Population into 10 million person. The coefficients of Theil elements were -0.103 for import and -0.163 for export with control variables absent in the output of fixed effect test. With other control variables the coefficients of Theil elements were -0.032 for import and -0.072 for export in the output of fixed effect test.

Import = Theil ^2 + grp + pergrp + population + consumption + length of railways + dumyyear*
Export = Theil ^2 + grp + pergrp + population + consumption + length of railways + dumyyear*

2) The second test: 5 control variables, Theil , Hausman test FE model estimation, and RE model estimation.

Because of Theil elements are some positive others negative around value 0, we took Theil^2 make the value positive and keep it monotonous at the first try. In order to avoid interference, the value is returned to original Theil elements.

After Hausman test, FE model estimation and RE model estimation, the results displayed "standard errors<0.01" reject null hypothesis at the 1% level. The units of variables were not adjusted, and then the coefficient of Theil calculated with -6.1e+9 without control variables and -1.3e+9 with other control variables for import in fixed effect. For export the results were similar.

	(1) import	(2) import	(3) import	(4) import	(5) import	(6) import
theil	-6.1e+09***	-2.7e+09***	-3.7e+09***	-1.0e+09***	-1.3e+09***	-1.5e+09***
	(5.0e+08)	(4.4e+08)	(3.4e+08)	(2.9e+08)	(2.8e+08)	(2.1e+08)
grp			3361.315***	4202.234***	-3.4e+03***	-5.4e+03***
			(272.310)	(285.535)	(736.526)	(765.531)
pergrp			196.884	-26.931	930.968***	1477.692***
			(133.063)	(144.715)	(149.095)	(142.040)
popu					4.8e+04***	-955.895
					(6638.611)	(1576.309)
consum					1.7e+04***	2.4e+04***
					(1792.831)	(1792.050)
railways					-7.3e+07***	-9.8e+07***
					(2.2e+07)	(1.8e+07)

	(1) export	(2) export	(3) export	(4) export	(5) export	(6) export
theil	-9.6e+09***	-5.6e+09***	-6.5e+09***	-3.1e+09***	-4.2e+09***	-2.8e+09***
	(5.8e+08)	(5.5e+08)	(3.8e+08)	(3.7e+08)	(3.4e+08)	(2.6e+08)
grp			4487.454***	5560.805***	-2.9e+03***	-5.6e+03***
			(309.145)	(354.668)	(898.077)	(1008.055)
pergrp			-108.711	-390.494**	868.758***	1424.662***
			(151.062)	(178.411)	(181.797)	(186.986)
popu					4.1e+04***	-3.9e+03**
					(8094.734)	(1777.294)
consum					1.9e+04***	2.9e+04***
					(2186.073)	(2352.520)
railways					-4.6e+07*	-1.2e+08***
					(2.7e+07)	(2.2e+07)
dumyyear1					6.7e+07***	9.4e+07***
					(7.5e+06)	(8.0e+06)

3) **The third test: 5 control variables and one year lag of dependent variable, GMM estimation, and RE model estimation.**

GMM estimation is a methodology of Generalized Method of Moments by Arellano Bond (1991). In this dissertation we took Arellano-Bond dynamic panel-data estimation as GMM estimation

After GMM estimation and RE model estimation, the results of GMM estimation for import without control variables displayed ** significant which means “standard errors<0.05” more significant than RE model estimation showed. With control variables Theil was not significant any more under GMM estimation. For export the results of Theil were still “standard errors<0.01”, and coefficients of Theil were negative by GMM estimation and positive by RE model estimation.

	(1) import	(2) import	(3) import	(4) import	(5) import	(6) import
L.import	1.005***	1.115***	1.068***	0.799***	0.592***	1.076***
	(0.029)	(0.009)	(0.016)	(0.082)	(0.097)	(0.019)
theil	-6.8e+08**	7.8e+07*	1.8e+08***	-1.2e+09**	-3.8e+08	1.3e+08**
	(3.1e+08)	(4.0e+07)	(5.1e+07)	(5.0e+08)	(3.8e+08)	(6.0e+07)
grp			359.000***	864.236*	-2.0e+03	330.482
			(92.339)	(467.528)	(1487.917)	(335.167)
pergrp			-71.234*	142.082	266.363	-19.881
			(40.401)	(153.494)	(313.697)	(56.583)
popu					3.7e+04***	131.425
					(1.0e+04)	(346.592)
consum					8234.806**	-72.780
					(4034.449)	(907.268)
railways					-1.9e+06	-2.4e+06
					(2.1e+07)	(3.2e+06)

	(1) export	(2) export	(3) export	(4) export	(5) export	(6) export
L.export	0.971***	1.125***	0.760***	1.089***	0.650***	1.095***
	(0.017)	(0.008)	(0.076)	(0.014)	(0.108)	(0.018)
theil	-1.5e+09***	6.6e+07	-2.2e+09***	2.1e+08***	-1.5e+09***	1.6e+08**
	(3.7e+08)	(4.6e+07)	(6.2e+08)	(5.9e+07)	(4.9e+08)	(7.4e+07)
grp			1505.436**	427.567***	-736.168	449.908
			(657.309)	(113.930)	(1716.202)	(408.043)
pergrp			-74.768	-165.939***	100.889	-128.532*
			(167.915)	(49.606)	(308.189)	(68.351)
popu					3.4e+04***	129.150
					(9475.099)	(444.583)
consum					6139.675	-181.823
					(5278.958)	(1137.031)
railways					2.2e+07	-4.0e+06
					(2.7e+07)	(3.9e+06)

4) Transform variables over population and over grp, Generate dummy province besides dummy year and one year lag of dependent variable, tested by GMM estimation and FE and RE model estimation.

FE and RE test

All variables over population comparing without over population in FE and RE test

Adopted variables in per capita for FE and RE test it did not make difference comparing to variables without over population for import per capita and export per capita. All variables were *** significant.

All variables over GRP comparing without over GRP in FE and RE test

Adopted variables over grp in FE and RE test, the significances of Theil were disappeared in FE test and weakened in RE test for import over grp. On the contrary, the significances of Theil were kept for export over grp just invalid with all control variables present in RE test.

All variables over GRP comparing over population in FE and RE test

For import/grp the significances of Theil were worse than import/population. For export/grp the significances of Theil were similar with results from import/population only in RE test with all control variables for expot/grp the significance of Theil disappeared.

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over population

import_pc FE test, RE.

	import_pc	import_pc	import_pc	import_pc	import_pc	import_pc
theil	-5.0e+05***	2.6e+05***	-4.7e+05***	7.3e+04	-3.1e+05***	-2.7e+05***
	(1.2e+05)	(8.5e+04)	(9.2e+04)	(6.5e+04)	(7.7e+04)	(5.1e+04)
grp			-0.185**	-0.032	-0.092	-0.010
			(0.075)	(0.070)	(0.056)	(0.052)
pergrp			0.475***	0.444***	0.028	0.012
			(0.036)	(0.036)	(0.066)	(0.065)
popu					2.634	-0.432
					(1.785)	(0.391)
consum_pc					1.9e+04***	2.1e+04***
					(1451.416)	(1319.724)
railways~c					-5.7e+07***	-5.2e+07***
					(1.2e+07)	(9.7e+06)
dumyyear1					1.8e+04***	2.0e+04***
					(1619.556)	(1445.864)

export_pc FE test,RE.

	(1)	(2)	(3)	(4)	(5)	(6)
	export_pc	export_pc	export_pc	export_pc	export_pc	export_pc
theil	-1.0e+06***	-1.9e+05**	-8.7e+05***	-2.4e+05***	-7.6e+05***	-5.3e+05***
	(1.1e+05)	(9.1e+04)	(8.9e+04)	(7.2e+04)	(8.6e+04)	(5.9e+04)
grp			0.082	0.260***	0.206***	0.322***
			(0.072)	(0.073)	(0.063)	(0.060)
pergrp			0.328***	0.289***	0.043	0.031
			(0.035)	(0.037)	(0.074)	(0.075)
popu					0.260	-0.804*
					(1.994)	(0.466)
consum_pc					1.5e+04***	1.6e+04***
					(1621.496)	(1531.870)
railways~c					-3.8e+07***	-4.2e+07***
					(1.3e+07)	(1.1e+07)
dumyyear1					1.7e+04***	1.9e+04***
					(1809.339)	(1681.100)

over grp

import_grp: FE test, RE.

	(1)	(2)	(3)	(4)	(5)	(6)
	import_pg	import_pg	import_pg	import_pg	import_pg	import_pg
theil	-1.2e+04	2.0e+04*	-3.2e+03	4.0e+04***	-4.5e+03	3.9e+04***
	(1.1e+04)	(1.0e+04)	(1.1e+04)	(1.0e+04)	(1.3e+04)	(9696.120)
grp			0.004	0.018**	0.001	0.017*
			(0.009)	(0.009)	(0.009)	(0.009)
pergrp			0.018***	0.015***	0.003	0.013**
			(0.004)	(0.005)	(0.006)	(0.006)
popu					-0.136	0.141
					(0.299)	(0.086)
consum_pg					4878.882***	2881.257***
					(835.679)	(782.300)
railways					-1.2e+03	-3.2e+03***
					(956.317)	(856.857)
dumyyear1					-1.4e+03***	-772.175***
					(269.976)	(280.536)

export_grp: FE test, RE.

	(1)	(2)	(3)	(4)	(5)	(6)
	export_pg	export_pg	export_pg	export_pg	export_pg	export_pg
theil	-7.2e+04***	-3.8e+04***	-5.2e+04***	624.129	-4.8e+04***	3379.803
	(1.3e+04)	(1.2e+04)	(1.4e+04)	(1.2e+04)	(1.5e+04)	(1.1e+04)
grp			0.025**	0.045***	0.032***	0.052***
			(0.011)	(0.011)	(0.011)	(0.010)
pergrp			0.007	0.001	0.008	0.016**
			(0.005)	(0.006)	(0.008)	(0.007)
popu					-0.171	0.174*
					(0.350)	(0.097)
consum_pg					4202.487***	2086.983**
					(979.721)	(904.194)
railways					-1.1e+03	-3.7e+03***
					(1121.151)	(982.992)
dumyyear1					-496.872	73.044
					(316.510)	(324.296)

One year dependent variable lag, GMM estimation, RE test

Comparing variables and variables in per capita

Adopted variables in per capita for import per capita and export per capita and one year dependent variable lag as control variable; the significances of Theil were weakened in GMM estimation and strengthened in RE.

Comparing variables over grp and variables in per capita

Adopted variables over grp for import over grp test the significances of Theil were only strengthened in GMM estimation effect with all control variables present. For export over grp test, the results were less significant.

import_pc: One year dependent variables lag, GMM estimation, RE

	import_pc	import_pc	import_pc	import_pc	import_pc	import_pc
L.import~c	0.993***	1.075***	0.869***	1.053***	0.685***	1.047***
	(0.010)	(0.011)	(0.024)	(0.016)	(0.087)	(0.018)
theil	-2.3e+04	3.4e+04***	-5.2e+04**	3.6e+04***	-5.4e+04	2.3e+04
	(3.1e+04)	(1.1e+04)	(2.3e+04)	(1.2e+04)	(9.3e+04)	(1.4e+04)
grp			-0.037	0.011	-0.038	0.015
			(0.053)	(0.014)	(0.060)	(0.023)
pergrp			0.107***	0.016	-0.028	0.045*
			(0.040)	(0.012)	(0.092)	(0.026)
popu					4.071***	-0.059
					(1.534)	(0.072)
consum_pc					6959.487	-277.721
					(5149.807)	(724.337)
railways~c					-5.0e+06	-3.3e+06*
					(1.1e+07)	(1.8e+06)
dumyyear3					-229.259**	1678.851**
					(110.519)	(708.172)

export_pc: One year dependent variable lag, GMM estimation,RE

	(1) export_pc	(2) export_pc	(3) export_pc	(4) export_pc	(5) export_pc	(6) export_pc
L.export~c	0.914***	1.065***	0.799***	1.049***	0.784***	1.059***
	(0.014)	(0.011)	(0.028)	(0.015)	(0.080)	(0.016)
theil	-2.4e+05**	2.7e+04**	-2.3e+05**	4.2e+04***	-1.3e+05	5.3e+04***
	(9.7e+04)	(1.1e+04)	(1.1e+05)	(1.2e+04)	(1.1e+05)	(1.5e+04)
grp			0.034	0.053***	0.056	0.071***
			(0.088)	(0.016)	(0.067)	(0.026)
pergrp			0.079	-0.014	0.089	0.062**
			(0.060)	(0.011)	(0.116)	(0.028)
popu					3.083**	-0.129*
					(1.345)	(0.078)
consum_pc					542.465	-2.1e+03***
					(3532.716)	(723.103)
railways~c					4.2e+06	-2.8e+06
					(1.1e+07)	(1.9e+06)
dumyyear3					78.845	38.517
					(165.673)	(736.136)

import_pg: One year dependent variable lag, GMM estimation,RE

	(1) import_pg	(2) import_pg	(3) import_pg	(4) import_pg	(5) import_pg	(6) import_pg
L.import~g	0.641***	0.985***	0.595***	0.992***	0.558***	0.992***
	(0.027)	(0.012)	(0.049)	(0.015)	(0.036)	(0.015)
theil	2.0e+04*	5558.493**	3.0e+04**	6597.872**	3.8e+04**	6368.154**
	(1.2e+04)	(2420.469)	(1.5e+04)	(2666.184)	(1.8e+04)	(2661.913)
grp			0.006	0.002	-0.013	-0.000
			(0.015)	(0.003)	(0.014)	(0.005)
pergrp			0.003	-0.003	-0.016**	-0.003
			(0.007)	(0.002)	(0.008)	(0.003)
popu					0.804**	0.003
					(0.337)	(0.013)
consum_pg					2225.231	-559.927*
					(1576.851)	(288.707)
railways					1858.220	-123.350
					(1375.323)	(152.935)
dumyyear3					62.766	109.015
					(74.095)	(121.637)

export_pg: One year dependent variable lag, GMM estimation,RE

	(1) export_pg	(2) export_pg	(3) export_pg	(4) export_pg	(5) export_pg	(6) export_pg
L.export~g	0.660***	0.997***	0.659***	1.001***	0.683***	1.005***
	(0.047)	(0.011)	(0.050)	(0.013)	(0.048)	(0.013)
theil	-6.1e+03	4178.777*	105.982	8663.192***	1.1e+04	9423.796***
	(2.1e+04)	(2205.511)	(2.8e+04)	(2613.026)	(2.5e+04)	(2491.821)
grp			0.005	0.005	0.003	0.001
			(0.020)	(0.003)	(0.016)	(0.005)
pergrp			-0.001	-0.007***	-0.014	-0.010***
			(0.010)	(0.002)	(0.015)	(0.003)
popu					0.561*	0.007
					(0.304)	(0.013)
consum_pg					-1.5e+03	-1.0e+03***
					(987.113)	(282.248)
railways					-509.178	-273.548*
					(1619.388)	(151.601)
dumyyear3					151.154**	-163.159
					(62.267)	(120.930)

One year dependent variable lag, GMM estimation,RE test with dummy province

After dummy provinces added the significances of Theil were weakened for import and strengthened for export.

After dummy provinces added the significances of Theil were weakened for import per capita and export per capita.

After dummy provinces added the significances of Theil were weakened for import over grp, and for export over grp Theil was not significant any more.

IMPORT dummy province besides dummy year and one year lag of dependent variable, Examed by GMM estimation and RE model estimation

	import	import	import	import	import	import
L.import	1.005***	1.024***	0.799***	0.936***	0.592***	0.806***
	(0.029)	(0.020)	(0.082)	(0.030)	(0.097)	(0.037)
theil	-6.8e+08**	-2.5e+08	-1.2e+09**	-3.5e+08*	-3.8e+08	-3.1e+07
	(3.1e+08)	(1.8e+08)	(5.0e+08)	(1.9e+08)	(3.8e+08)	(2.0e+08)
_Iprov_2		1.8e+07*		2.0e+07*		9.4e+07***
		(1.0e+07)		(1.0e+07)		(2.1e+07)
grp			864.236*	601.934***	-2.0e+03	-634.317
			(467.528)	(164.615)	(1487.917)	(500.372)
pergrp			142.082	138.942	266.363	113.457
			(153.494)	(100.207)	(313.697)	(107.437)
popu					3.7e+04***	2.0e+04***
					(1.0e+04)	(4693.881)
consum					8234.806**	3764.991***
					(4034.449)	(1326.310)
railways					-1.9e+06	-1.4e+07
					(2.1e+07)	(1.6e+07)
dumyyear2					2.3e+07**	0.000
					(1.1e+07)	(.)

EXPORT dummy province besides dummy year and one year lag of dependent variable, Examed by GMM estimation and RE model estimation.

	(1) export	(2) export	(3) export	(4) export	(5) export	(6) export
L.export	0.971***	1.012***	0.760***	0.905***	0.650***	0.822***
	(0.017)	(0.021)	(0.076)	(0.031)	(0.108)	(0.038)
theil	-1.5e+09***	-6.9e+08***	-2.2e+09***	-1.0e+09***	-1.5e+09***	-9.5e+08***
	(3.7e+08)	(2.5e+08)	(6.2e+08)	(2.7e+08)	(4.9e+08)	(2.8e+08)
_Iprov_2		3.6e+07***		5.1e+07***		1.1e+08***
		(1.4e+07)		(1.4e+07)		(2.7e+07)

grp	1505.436**	921.033***	-736.168	-330.695	
	(657.309)	(208.355)	(1716.202)	(601.106)	
pergrp	-74.768	82.048	100.889	39.684	
	(167.915)	(116.963)	(308.189)	(128.797)	
popu			3.4e+04***	1.5e+04***	
			(9475.099)	(5573.497)	
consum			6139.675	3703.812**	
			(5278.958)	(1590.405)	
railways			2.2e+07	-2.5e+06	
			(2.7e+07)	(1.9e+07)	
dumyyear2			2.3e+07	0.000	
			(1.4e+07)	(.)	

import_pc: One year dependent variable lag, GMM estimation,RE, dummy prov

	import_pc	import_pc	import_pc	import_pc	import_pc	import_pc
L.import~c	0.993***	0.987***	0.869***	0.938***	0.685***	0.843***
	(0.010)	(0.018)	(0.024)	(0.024)	(0.087)	(0.032)
theil	-2.3e+04	-1.1e+04	-5.2e+04**	-1.4e+04	-5.4e+04	1234.780
	(3.1e+04)	(3.4e+04)	(2.3e+04)	(3.8e+04)	(9.3e+04)	(4.6e+04)
_Iprov_2		3652.820*		1931.262		6394.724
		(2046.221)		(2154.504)		(4447.937)
grp			-0.037	0.012	-0.038	-0.007
			(0.053)	(0.030)	(0.060)	(0.033)
pergrp			0.107***	0.074***	-0.028	-0.008
			(0.040)	(0.028)	(0.092)	(0.038)
popu					4.071***	1.601
					(1.534)	(1.047)
consum_pc					6959.487	3461.430***
					(5149.807)	(1012.623)
railways~c					-5.0e+06	-9.7e+06
					(1.1e+07)	(6.8e+06)
dumyyear3					-229.259**	0.000
					(110.519)	(.)

export_pc: One year dependent variable lag, GMM estimation,RE, dummy prov

	(1)	(2)	(3)	(4)	(5)	(6)
	export_pc	export_pc	export_pc	export_pc	export_pc	export_pc
L.export~c	0.914***	0.926***	0.799***	0.881***	0.784***	0.863***
	(0.014)	(0.019)	(0.028)	(0.024)	(0.080)	(0.029)
theil	-2.4e+05**	-1.5e+05***	-2.3e+05**	-1.4e+05***	-1.3e+05	-1.4e+05***
	(9.7e+04)	(3.8e+04)	(1.1e+05)	(4.2e+04)	(1.1e+05)	(5.1e+04)
_Iprov_2		8879.924***		7001.814***		8621.963*
		(2185.438)		(2232.326)		(4641.160)
grp			0.034	0.067**	0.056	0.064*
			(0.088)	(0.031)	(0.067)	(0.035)
pergrp			0.079	0.047*	0.089	0.034
			(0.060)	(0.026)	(0.116)	(0.040)
popu					3.083**	0.491
					(1.345)	(1.088)
consum_pc					542.465	553.375
					(3532.716)	(979.728)
railways~c					4.2e+06	-6.6e+06
					(1.1e+07)	(7.0e+06)
dumyyear3					78.845	0.000
					(165.673)	(.)

import_pg: One year dependent variable lag, GMM estimation,RE, dummy prov

	(1) import_pg	(2) import_pg	(3) import_pg	(4) import_pg	(5) import_pg	(6) import_pg
L.import~g	0.641***	0.731***	0.595***	0.738***	0.558***	0.710***
	(0.027)	(0.034)	(0.049)	(0.034)	(0.036)	(0.036)
theil	2.0e+04*	1.2e+04*	3.0e+04**	1.3e+04*	3.8e+04**	1.8e+04**
	(1.2e+04)	(6185.527)	(1.5e+04)	(6956.514)	(1.8e+04)	(8726.566)
_Iprov_2		572.058		731.086*		2019.294**
		(384.985)		(423.162)		(842.621)
grp			0.006	0.003	-0.013	-0.002
			(0.015)	(0.006)	(0.014)	(0.006)
pergrp			0.003	-0.006	-0.016**	-0.011**
			(0.007)	(0.004)	(0.008)	(0.004)
popu					0.804**	0.239
					(0.337)	(0.206)
consum_pg					2225.231	1357.079**
					(1576.851)	(593.074)
railways					1858.220	849.262
					(1375.323)	(689.577)
dumyyear3					62.766	0.000
					(74.095)	(.)

export_pg: One year dependent variable lag, GMM estimation,RE, dummy prov

	(1) export_pg	(2) export_pg	(3) export_pg	(4) export_pg	(5) export_pg	(6) export_pg
L.export~g	0.660***	0.809***	0.659***	0.832***	0.683***	0.835***
	(0.047)	(0.030)	(0.050)	(0.031)	(0.048)	(0.033)
theil	-6.1e+03	-894.863	105.982	1570.202	1.1e+04	8312.365
	(2.1e+04)	(6837.159)	(2.8e+04)	(7352.915)	(2.5e+04)	(9294.909)
_Iprov_2		244.350		661.991		1142.000
		(396.649)		(423.077)		(870.693)
grp			0.005	0.004	0.003	0.005
			(0.020)	(0.006)	(0.016)	(0.006)
pergrp			-0.001	-0.014***	-0.014	-0.014***
			(0.010)	(0.004)	(0.015)	(0.005)
popu					0.561*	0.193
					(0.304)	(0.214)
consum_pg					-1.5e+03	-445.997
					(987.113)	(618.897)
railways					-509.178	-143.676
					(1619.388)	(714.154)
dumyyear3					151.154**	0.000
					(62.267)	(.)

5) **Filter variables, dummy years, robust test, FE model estimation test, GMM estimation**

Considering to the correlation of control variables, cut off grp and population.

- take dummy year and adopt “vce (robust)” code for all models to solve heteroscedasticity problem
- To test the significance, process the data into per capita and over grp, and then compare them.
- run and compare the output of fixed-effects regression and Arellano-Bond dynamic panel-data estimation

For import and import per capita as dependent variables, FE test proved Theil more significant

than GMM estimation. For import over grp GMM estimation indicated more significant than FE test, but the sign was positive.

For export and export per capita, the Theil showed well significant in FE and GMM estimation. For export over grp in FE test Theil was significant well, but was not significant in GMM estimation.

It could conclude that the results were significant no matter import and export in per capita or raw data[214], but over grp.

Filter variables, dummy years, robust test, FE

Import

raw data of variables

	(1) import	(2) import	(3) import	(4) import
theil	-5.8e+09***	-5.5e+09***	-2.7e+09**	-2.5e+09**
	(2.1e+09)	(1.8e+09)	(1.0e+09)	(1.0e+09)
_Iyea~2001	9.8e+05	-1.1e+06	-2.1e+06***	2.4e+06
	(1.1e+06)	(1.2e+06)	(7.4e+05)	(1.7e+06)
pergrp		2607.560***	1261.072***	1339.528***
		(796.770)	(438.667)	(392.429)
consum			1.0e+04***	1.1e+04***
			(1458.617)	(1397.793)
railways				-1.2e+08**
				(4.8e+07)

In per capita

	(1) import_pc	(2) import_pc	(3) import_pc	(4) import_pc
theil	-4.2e+05*	-3.5e+05**	-3.6e+05**	-3.4e+05**
	(2.4e+05)	(1.4e+05)	(1.5e+05)	(1.6e+05)
_Iyea~2001	225.319*	-405.166**	-739.528***	-130.244
	(128.491)	(171.161)	(264.550)	(385.179)
pergrp		0.794***	-0.038	-0.006
		(0.192)	(0.307)	(0.285)
consum_pc			2.1e+04**	2.0e+04**
			(9133.863)	(9225.695)
railways~c				-5.4e+07**
				(2.6e+07)

Over grp

[214] raw or raw data in this dissertation refer to data were not processed by in per capita or over grp.

	import_pg	import_pg	import_pg	import_pg
theil	-7.0e+03	-5.9e+03	-2.5e+03	-936.733
	(1.8e+04)	(1.9e+04)	(1.9e+04)	(2.0e+04)
_Iyea~2001	-5.320	-15.420	-25.485	28.540
	(44.452)	(44.006)	(45.837)	(77.382)
pergrp		0.013	0.006	0.002
		(0.018)	(0.015)	(0.014)
consum_pg			3389.189*	4705.845***
			(1825.355)	(1479.345)
railways				-1.2e+03
				(1548.767)

Filter variables, dummy years, robust test, GMM estimation

Import

raw data of variables

	(1) import	(2) import	(3) import	(4) import
L.import	0.986***	0.924***	0.733***	0.721***
	(0.033)	(0.045)	(0.108)	(0.105)
theil	-7.2e+08**	-9.9e+08**	-8.8e+08	-8.7e+08
	(3.3e+08)	(4.1e+08)	(5.7e+08)	(5.6e+08)
pergrp		489.348***	383.732***	380.893**
		(168.659)	(148.462)	(150.288)
_Iyea~2001		1.2e+07***	2.5e+07***	2.3e+07***
		(3.9e+06)	(7.3e+06)	(7.0e+06)
consum			3926.795**	4148.351***
			(1552.735)	(1584.173)
railways				-3.7e+07
				(2.7e+07)

Per capita

	(1) import_pc	(2) import_pc	(3) import_pc	(4) import_pc
L.import~c	0.984***	0.892***	0.710***	0.701***
	(0.010)	(0.020)	(0.100)	(0.103)
theil	3399.849	-5.0e+03	-1.5e+05**	-1.5e+05**
	(3.0e+04)	(3.8e+04)	(6.8e+04)	(6.9e+04)
pergrp		0.151***	-0.036	-0.037
		(0.052)	(0.098)	(0.101)
_Iyea~2012		-3.8e+03**	-7.6e+03**	-7.5e+03**
		(1536.663)	(3703.022)	(3847.796)
consum_pc			7790.129	7941.488
			(5135.640)	(5361.718)
railways~c				-7.0e+06
				(1.0e+07)

Over grp

	(1)	(2)	(3)	(4)
	import_pg	import_pg	import_pg	import_pg
L.import~g	0.712***	0.712***	0.683***	0.656***
	(0.065)	(0.069)	(0.072)	(0.071)
theil	2.7e+04*	2.1e+04**	2.2e+04***	2.3e+04***
	(1.4e+04)	(8153.434)	(8087.532)	(8262.850)
_Iyea~2011	241.341***	229.415***	220.752***	232.024***
	(45.541)	(50.721)	(45.546)	(49.817)
pergrp		-0.003	-0.007	-0.011
		(0.006)	(0.007)	(0.007)
consum_pg			1670.166	3300.125**
			(1307.694)	(1457.054)
railways				1171.794
				(1087.648)

Filter variables, dummy years, robust test, FE

Export

raw data of variables

	(1)	(2)	(3)	(4)
	export	export	export	export
theil	-9.2e+09***	-9.0e+09***	-5.5e+09***	-5.3e+09***
	(2.3e+09)	(1.9e+09)	(8.9e+08)	(8.8e+08)
pergrp		2849.153***	1142.547***	1213.544***
		(1019.853)	(370.870)	(375.163)
consum			1.3e+04***	1.4e+04***
			(2241.694)	(2213.782)
railways				-8.8e+07**
				(3.8e+07)

Per capita

	(1)	(2)	(3)	(4)
	export_pc	export_pc	export_pc	export_pc
theil	-9.6e+05***	-9.0e+05***	-9.0e+05***	-8.8e+05***
	(1.9e+05)	(7.6e+04)	(1.1e+05)	(1.1e+05)
	(2566.029)	(4534.967)	(5029.513)	(4932.221)
_Iyea~2012	1.0e+04***	-1.4e+04**	-1.7e+04**	-1.5e+04**
	(2414.728)	(5433.773)	(6303.036)	(6205.414)
pergrp		0.692***	0.099	0.135
		(0.196)	(0.303)	(0.300)
consum_pc			1.5e+04	1.4e+04
			(1.0e+04)	(1.1e+04)
railways~c				-5.0e+07**
				(2.0e+07)

Over grp

	(1)	(2)	(3)	(4)
	export_pg	export_pg	export_pg	export_pg
theil	-6.8e+04***	-6.6e+04***	-6.3e+04***	-6.1e+04***
	(2.2e+04)	(2.1e+04)	(2.1e+04)	(2.1e+04)

_Iyea~2012	648.535***	-120.931	361.510	614.804
	(200.506)	(782.718)	(672.144)	(652.150)
pergrp		0.022	0.016	0.014
		(0.026)	(0.023)	(0.024)
consum_pg			3010.853*	4257.582**
			(1761.490)	(1829.815)
railways				-272.293
				(2100.334)

Filter variables, dummy years, robust test, GMM estimation

Export

raw data of variables[215]

	(1) export	(2) export	(3) export	(4) export
L.export	0.951***	0.901***	0.703***	0.703***
	(0.022)	(0.046)	(0.103)	(0.105)
theil	-1.6e+09***	-1.9e+09***	-2.0e+09***	-2.0e+09***
	(3.9e+08)	(5.3e+08)	(6.5e+08)	(6.5e+08)
pergrp		527.118*	245.161	245.626
		(278.356)	(227.276)	(221.300)
_Iyea~2001		9.3e+06	2.5e+07**	2.5e+07**
		(7.5e+06)	(1.1e+07)	(9.8e+06)
consum			5218.428**	5230.771**
			(2207.331)	(2271.910)
railways				-1.2e+06
				(2.8e+07)

Per capita[216]

	(1) export_pc	(2) export_pc	(3) export_pc	(4) export_pc
L.export~c	0.897***	0.823***	0.807***	0.805***
	(0.014)	(0.043)	(0.089)	(0.089)
theil	-2.2e+05***	-2.4e+05***	-2.5e+05***	-2.5e+05***
	(8.3e+04)	(5.9e+04)	(9.3e+04)	(9.4e+04)
pergrp		0.134	0.106	0.103
		(0.105)	(0.117)	(0.117)
_Iyea~2001		2282.201		2812.411
		(3090.691)		(3617.171)
consum_pc			975.963	1110.120
			(3466.195)	(3487.325)
railways~c				2.8e+06
				(1.1e+07)

Over grp

[215] Theil were *** significant for export and export per capita as dependent variables.
[216] Theil were *** significant for export and export per capita as dependent variables.

	(1)	(2)	(3)	(4)
	export_pg	export_pg	export_pg	export_pg
L.export~g	0.720***	0.740***	0.748***	0.749***
	(0.066)	(0.067)	(0.059)	(0.059)
theil	4113.823	-2.0e+03	-2.7e+03	-1.6e+03
	(1.8e+04)	(1.1e+04)	(1.1e+04)	(1.1e+04)
pergrp		-0.011	-0.009	-0.008
		(0.010)	(0.012)	(0.012)
_Iyea~2009		-169.427	-288.958	-777.906***
		(140.275)	(236.990)	(265.034)
consum_pg			-859.617	-666.772
			(858.403)	(1071.517)
railways				-633.121
				(1581.044)

Theil were * significant for export and export per capita as dependent variables at the same time with pergrp, consumption and railways as control variables. This brings about an important conclusion (see the end of this appendix).**

6) Filter control variables

- Considering to correlation between pergrp and consumption per captia, not take both at the same model.
- Take perGRP if variables processed in per capita at the same model, otherwise take GRP.

For import

Comparing to FE test GMM estimation indicated when dependent variables were import and import per capita, the Theil was significant and negative. However, the Theil was positive and significant when import over grp as dependent variable in GMM estimation.

We can conclude for import when Theil raise the import and import per capita decrease, but import over grp increase. It that means grp goes decrease quickly than import value.

grp or pergrp as control variables were significant, but they were not when control variable consumption or consumption per capita added in the model. There exist correlation between grp and consumption and between pergrp and consumption per capita.

Control variable railways and railways per capita did not make any effect, they were not almost significant.

For export

Comparing to FE test GMM estimation indicated when dependent variables were export and export per capita, the Theil was significant and negative. We can conclude for export when Theil raise the export and export per capita decrease.

In the GMM estimation for import over grp as dependent variable, Theil was not significant any more.

grp or pergrp as control variables were significant, but they were not when control variable consumption or consumption per capita added in the model. There exist correlation between grp and consumption and between pergrp and consumption per capita, and grp was much significant when it as control variable without consumption aside.

Control variable railways and railways per capita did not make any effect, they were not almost significant.

Import, FE

raw data of variables

	import	import	import	import
theil	-5.8e+09***	-3.0e+09**	-2.0e+09**	-1.9e+09**
	(2.1e+09)	(1.3e+09)	(9.3e+08)	(9.3e+08)
_Iyea~2001	9.8e+05	-7.2e+05	-1.9e+06***	7.3e+05
	(1.1e+06)	(6.7e+05)	(6.3e+05)	(1.7e+06)
grp		4672.075***	-4.8e+03	-4.2e+03
		(651.511)	(2909.100)	(2777.382)
consum			2.3e+04***	2.2e+04***
			(7086.495)	(6819.650)
railways				-7.2e+07
				(4.8e+07)

Per capita

	(1)	(2)	(3)	(4)
	import_pc	import_pc	import_pc	import_pc
theil	-4.2e+05*	-3.5e+05**	-3.6e+05**	-3.4e+05**
	(2.4e+05)	(1.4e+05)	(1.5e+05)	(1.6e+05)
_Iyea~2001	225.319*	-405.166**	-739.528***	-130.244
	(128.491)	(171.161)	(264.550)	(385.179)
pergrp		0.794***	-0.038	-0.006
		(0.192)	(0.307)	(0.285)
consum_pc			2.1e+04**	2.0e+04**
			(9133.863)	(9225.695)
railways~c				-5.4e+07**
				(2.6e+07)

Over grp

	(1)	(2)	(3)	(4)
	import_pg	import_pg	import_pg	import_pg
theil	-7.0e+03	-5.9e+03	-2.5e+03	-936.733
	(1.8e+04)	(1.9e+04)	(1.9e+04)	(2.0e+04)
_Iyea~2001	-5.320	-15.420	-25.485	28.540
	(44.452)	(44.006)	(45.837)	(77.382)

pergrp		0.013	0.006	0.002
		(0.018)	(0.015)	(0.014)
consum_pg			3389.189*	4705.845***
			(1825.355)	(1479.345)
railways				-1.2e+03
				(1548.767)

Import, GMM estimation

raw data of variables

	(1)	(2)	(3)	(4)
	import	import	import	import
L.import	0.986***	0.875***	0.705***	0.698***
	(0.033)	(0.083)	(0.105)	(0.105)
theil	-7.2e+08**	-6.5e+08	-8.8e+08**	-8.8e+08**
	(3.3e+08)	(5.1e+08)	(4.3e+08)	(4.3e+08)
grp		1051.069**	-2.7e+03**	-2.5e+03**
		(420.188)	(1248.225)	(1261.682)
consum			1.1e+04***	1.0e+04***
			(3777.622)	(3787.215)
_Iyea~2001			1.6e+07***	1.4e+07**
			(5.4e+06)	(5.6e+06)
railways				-2.5e+07
				(2.9e+07)

Per capita

	(1)	(2)	(3)	(4)
	import_pc	import_pc	import_pc	import_pc
L.import~c	0.984***	0.892***	0.710***	0.701***
	(0.010)	(0.020)	(0.100)	(0.103)
theil	3399.849	-5.0e+03	-1.5e+05**	-1.5e+05**
	(3.0e+04)	(3.8e+04)	(6.8e+04)	(6.9e+04)
pergrp		0.151***	-0.036	-0.037
		(0.052)	(0.098)	(0.101)
_Iyea~2012		-3.8e+03**	-7.6e+03**	-7.5e+03**
		(1536.663)	(3703.022)	(3847.796)
consum_pc			7790.129	7941.488
			(5135.640)	(5361.718)
railways~c				-7.0e+06
				(1.0e+07)

Over grp

	(1)	(2)	(3)	(4)
	import_pg	import_pg	import_pg	import_pg
L.import~g	0.712***	0.712***	0.683***	0.656***
	(0.065)	(0.069)	(0.072)	(0.071)
theil	2.7e+04*	2.1e+04**	2.2e+04***	2.3e+04***
	(1.4e+04)	(8153.434)	(8087.532)	(8262.850)
_Iyea~2001	-168.498	-271.268	-609.232*	-828.089**
	(112.099)	(170.148)	(344.804)	(331.768)

pergrp		-0.003	-0.007	-0.011
		(0.006)	(0.007)	(0.007)
consum_pg			1670.166	3300.125**
			(1307.694)	(1457.054)
railways				1171.794
				(1087.648)

Export, FE

raw data of variables

	(1)	(2)	(3)	(4)
	export	export	export	export
theil	-9.2e+09***	-5.8e+09***	-4.8e+09***	-4.7e+09***
	(2.3e+09)	(1.3e+09)	(8.1e+08)	(8.1e+08)
grp		5779.063***	-4.0e+03	-3.6e+03
		(1125.302)	(2664.315)	(2749.765)
consum			2.4e+04***	2.3e+04***
			(5778.802)	(5893.096)
railways				-4.6e+07
				(4.6e+07)

Per capita

	(1)	(2)	(3)	(4)
	export_pc	export_pc	export_pc	export_pc
theil	-9.6e+05***	-9.0e+05***	-9.0e+05***	-8.8e+05***
	(1.9e+05)	(7.6e+04)	(1.1e+05)	(1.1e+05)
_Iyea~2012	1.0e+04***	-1.4e+04**	-1.7e+04**	-1.5e+04**
	(2414.728)	(5433.773)	(6303.036)	(6205.414)
pergrp		0.692***	0.099	0.135
		(0.196)	(0.303)	(0.300)
consum_pc			1.5e+04	1.4e+04
			(1.0e+04)	(1.1e+04)
railways~c				-5.0e+07**
				(2.0e+07)

Over grp

	(1)	(2)	(3)	(4)
	export_pg	export_pg	export_pg	export_pg
theil	-6.8e+04***	-6.6e+04***	-6.3e+04***	-6.1e+04***
	(2.2e+04)	(2.1e+04)	(2.1e+04)	(2.1e+04)
_Iyea~2001	-65.681	-83.217*	-92.158**	-73.383
	(39.806)	(42.038)	(43.280)	(76.622)
pergrp		0.022	0.016	0.014
		(0.026)	(0.023)	(0.024)
consum_pg			3010.853*	4257.582**
			(1761.490)	(1829.815)
railways				-272.293
				(2100.334)

Export, GMM estimation

raw data of variables

	(1) export	(2) export	(3) export	(4) export
L.export	0.951***	0.787***	0.697***	0.696***
	(0.022)	(0.080)	(0.111)	(0.113)
theil	-1.6e+09***	-1.8e+09***	-2.0e+09***	-2.0e+09***
	(3.9e+08)	(6.6e+08)	(6.1e+08)	(6.1e+08)
grp		1754.690***	-1.3e+03	-1.2e+03
		(655.497)	(1381.757)	(1338.332)
consum			8459.213*	8417.924*
			(4895.903)	(4839.576)
_Iyea~2001			1.9e+07**	1.8e+07**
			(8.4e+06)	(8.2e+06)
railways				-6.6e+06
				(2.9e+07)

Per capita

	(1) export_pc	(2) export_pc	(3) export_pc	(4) export_pc
L.export~c	0.897***	0.823***	0.807***	0.805***
	(0.014)	(0.043)	(0.089)	(0.089)
theil	-2.2e+05***	-2.4e+05***	-2.5e+05***	-2.5e+05***
	(8.3e+04)	(5.9e+04)	(9.3e+04)	(9.4e+04)
pergrp		0.134	0.106	0.103
		(0.105)	(0.117)	(0.117)
_Iyea~2001		2282.201		2812.411
		(3090.691)		(3617.171)
consum_pc			975.963	1110.120
			(3466.195)	(3487.325)
railways~c				2.8e+06
				(1.1e+07)

Over grp

	(1) export_pg	(2) export_pg	(3) export_pg	(4) export_pg
L.export~g	0.720***	0.740***	0.748***	0.749***
	(0.066)	(0.067)	(0.059)	(0.059)
theil	4113.823	-2.0e+03	-2.7e+03	-1.6e+03
	(1.8e+04)	(1.1e+04)	(1.1e+04)	(1.1e+04)
pergrp		-0.011	-0.009	-0.008
		(0.010)	(0.012)	(0.012)
_Iyea~2009		-169.427	-288.958	-777.906***
		(140.275)	(236.990)	(265.034)
consum_pg			-859.617	-666.772
			(858.403)	(1071.517)
railways				-633.121
				(1581.044)

7) take Theil absolute value, 2-step GMM estimation

Take Theil absolute value

The value of Theil element is monotonous, but the meaning is not. So try their absolute value instead of the value.

After taking Theil absolute value, GMM estimation was better than FE test for import and import per capita. For import over grp as dependent variable the Theil was not significant.
For export and export per capita GMM estimation and FE test bought about similar results and significant. For export over grp, Theil was significant in FE test and not in GMM estimation.

Import_FE test,raw data of variables Not significant
Import per capita _FE test Not significant
Import over grp _FE test Not significant
Export_FE test,raw data of variables All variables *** significant. Consumption interfered grp.
Export per capita _FE test All variables *** significant but railways * significant. Consumption and grp interfered each other
Export over grp _FE test Theil *** significant.

Import_GMM estimation,raw data of variables Theil was * significant. grp **, consumption ***, railways 0 *.
Import per capita _GMM estimation Theil was *** significant with consumption per capita, **significant with consumption per capita and pergrp.
Import over grp _GMM estimation Theil was ** significant but positive. other control variables were not significant..
Export_GMM estimation,raw data of variables Theil *** significant. Consumption interfered grp.
Export per capita _GMM estimation Theil *** significant but control variables not.
Export over grp _GMM estimation Not significant

8) Theil value without taking absolute, dependent variable over grp, two-step GMM

estimation , take logarithm value , extend years

- Theil value no absolute
- take import over grp and export over grp
- two-step GMM estimation
- take logarithm value, GMM estimation, two-step GMM estimation
- extend the years to 1993-2012, and compare with 2000-2012. because the year of population spans 2000-2012, we have to divide the pergrp by grp to calculate population2 as new population data.

When taking import over grp as dependent variable Theil was not significant only one exception when with control variable consumption per capita during 2000 to 2012. When taking export over grp as dependent variable Theil was not significant

After taking logarithm value of variables, all variables were not significant。After taking two-step GMM estimation, all variables were not significant。

Because of population data lack of years we calculate population2 by using grp and pergrp and then extend the first to 1993 instead of 2000. However, more years than before made the results not significant any more.

9) Gini as independent variable, FE test, GMM estimation, Two step GMM estimation, dummy region

Take Gini as independent variable instead of Theil , FE test, GMM estimation, Two step GMM estimation, Two step GMM estimation with dummy provinces. import and import per capita, extend years, dummy region, Two step GMM estimation, Two step GMM estimation with dummy region.

Import_FE test,raw data of variables Gini * significant and positive, grp population *** significant, railways * significant. grp interfered the Gini significance.
Export_FE test,raw data of variables Gini * significant and positive, grp population *** significant, railways * significant. grp interfered the Gini significance.
Import_GMM estimation,raw data of variables Gini * significant and positive, grp population *** significant, railways * significant. grp interfered the Gini significance.
Export_GMM estimation,raw data of variables Gini ** significant and positive, grp population *** significant.

Import_ two-step GMM estimation,raw data of variables[217]

Pointed out that variance matrix is nonsymmetric or highly singular.

After deleted "i. year" as dummy year, all variables were * significant including Gini, but when railways present the results invalid.**

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	(1) import	(2) import	(3) import	(4) import
L.import	1.015***	0.708***	0.598***	0.465***
	(0.000)	(0.000)	(0.001)	(0.000)
gini	3.1e+07***	3.2e+07***	5.1e+07***	4.8e+07***
	(2.4e+05)	(1.3e+05)	(5.2e+05)	(4.8e+05)
grp		1991.432***		1381.645***
		(3.309)		(7.276)
popu			7.3e+04***	5.9e+04***
			(174.761)	(87.473)
_cons	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
N	216	216	216	216

Export_two-step GMM estimation, raw data of variables

Pointed out that variance matrix is nonsymmetric or highly singular, even if deleted "i. year"..

Gini were positive and * significant for import in FE test, and * significant in GMM estimation, * significant in two-step GMM estimation. This brings about an important conclusion (see the end of this appendix).**

Gini were positive and ** significant for import per capita in FE test, and * significant in GMM estimation, and invalid in two-step GMM estimation.

Gini were positive and * significant for export in FE test, ** significant in GMM estimation, invalid in two-step GMM estimation.

Gini were positive and ** significant for export per capita in FE test, ** significant in GMM estimation, invalid in two-step GMM estimation.

Import per capita_FE test,

Gini ** significant and positive, pergrp *** significant, railways * significant. pergrp interfered the railways significance.

Export per capita _FE test,

Gini ** significant and positive, pergrp ** significant, railways **significant. pergrp interfered the railways significance.

Import per capita _GMM estimation, one-step

[217] All variables were *** significant including Gini, but when railways present the results invalid.

Gini * significant and positive, pergrp ** significant, railways ** significant.
Export per capita _GMM estimation,one-step Gini ** significant and positive, pergrp and railways not significant.
Import per capita _GMM estimation, two-step Pointed out that variance matrix is nonsymmetric or highly singular. And all variables were not significant.
Export per capita _GMM estimation,two-step Pointed out that variance matrix is nonsymmetric or highly singular. And all variables were not significant.

We classified the provinces into three regions, east, central and west. The dummy region did not make any different.

Extend years

Because the population data were available from 2000 to 2010, so we tried to calculate the population2 by grp over pergrp. With population2, the year could be extended to 1995 as the first year instead of 2000. For FE and GMM estimation Gini were not significant any more for import and export as dependent variable.

By taking import per capita and export per capita as dependent variable to test FE and GMM estimation, Gini were only significant when tested GMM estimation for export per capita.

Extend years did make estimation significant.

The more important conclusion would come out that use two-step GMM estimation tests the effect of Gini on import value, the results are * significant, even control variables grp and population.**

10) transfer trade unit into RMB Yuan, FE test, GMM estimation, Two step GMM estimation

For import yuan and export yuan in FE test Gini were * significant, grp and population *** significant, railways not significant.

For GMM estimation import yuan make Gini not significant any more, while export yuan make Gini ** significant and grp interfered Gini significance.

Gini were * significant with import yuan unit and export yuan unit as dependent variables in FE test; Gini were not significant with import yuan unit as dependent variable in GMM estimation, and ** significant with export yuan unit as dependent variable in GMM estimation.

Gini were * significant with import yuan unit and export yuan unit as dependent variables with grp, population and railways as control variables in two-step GMM estimation.**

Gini were * significant with import per capita yuan unit and export per capita yuan unit as dependent variables with grp, population and railways as control variables in two-step GMM estimation, even extended the year to 1995-2010.**

Comparing to number 9 results we could conclude exchange rate impact the significance of import and export.

Taken two-step for import yuan and export yuan[218]

	(1) importy	(2) importy	(3) exporty	(4) exporty
L.importy	0.929***	0.517***		
	(0.000)	(0.001)		
gini	4.5e+08***	7.4e+08***	1.2e+09***	1.3e+09***
	(2.6e+06)	(2.3e+07)	(2.6e+06)	(5.7e+07)
grp		8066.931***		1.3e+04***
		(135.405)		(402.000)
railways		-2.4e+08***		-5.8e+08***
		(7.9e+06)		(4.0e+07)
popu		3.0e+05***		2.7e+05***
		(1905.947)		(7584.326)
L.exporty			0.939***	0.596***
			(0.000)	(0.002)
_cons	0.000	0.000	-4.2e+08***	0.000
	(.)	(.)	(3.5e+06)	(.)
N	216	216	216	216

import yuan per capita

In FE test for import yuan per capita and export yuan per capita, Gini were ** significant, pergrp *** significant, railways no significant.

	(1) importy~c	(2) importy~c	(3) importy~c	(4) importy~c	(5) importy~2	(6) importy~2	(7) importy~2	(8) importy~2
gini	5.2e+05**	3.8e+05**	5.1e+05**	3.8e+05***	5.4e+09**	4.0e+09**	5.3e+09**	3.9e+09**
	(2.4e+05)	(1.4e+05)	(2.4e+05)	(1.3e+05)	(2.5e+09)	(1.5e+09)	(2.5e+09)	(1.5e+09)
_Iyea~2001	-4.1e+03	-7.4e+03**	2220.230	-2.2e+03	-4.4e+07	-7.7e+07**	1.9e+07	-2.6e+07
	(2936.601)	(2736.637)	(3638.889)	(3871.325)	(2.9e+07)	(2.8e+07)	(3.5e+07)	(3.9e+07)
pergrp		5.958***		5.863***		6.1e+04***		6.0e+04***
		(1.897)		(1.788)		(1.9e+04)		(1.8e+04)
railways~c			-5.2e+08*	-4.2e+08				
			(2.8e+08)	(3.0e+08)				
railways~2							-5.2e+08*	-4.2e+08
							(2.8e+08)	(3.0e+08)

export yuan per capita

[218] Gini were *** significant with import yuan unit and export yuan unit as dependent variables in two-step GMM estimation.

	(1) exporty~c	(2) exporty~c	(3) exporty~c	(4) exporty~c	(5) exporty~2	(6) exporty~2	(7) exporty~2	(8) exporty~2
gini	6.3e+05**	4.8e+05**	6.2e+05**	4.7e+05**	6.5e+09**	5.0e+09**	6.4e+09**	4.9e+09**
	(3.0e+05)	(2.0e+05)	(2.9e+05)	(1.9e+05)	(3.0e+09)	(2.0e+09)	(3.0e+09)	(2.0e+09)
_Iyea~2001	-6.4e+03*	-1.0e+04***	424.474	-4.6e+03	-6.6e+07*	-1.0e+08***	5.3e+05	-4.9e+07
	(3476.600)	(3219.048)	(3169.561)	(4694.854)	(3.5e+07)	(3.3e+07)	(3.2e+07)	(4.8e+07)
pergrp		6.661**		6.561**		6.8e+04**		6.7e+04**
		(2.454)		(2.388)		(2.5e+04)		(2.4e+04)
railways~c			-5.6e+08**	-4.4e+08				
			(2.6e+08)	(3.5e+08)				
railways~2							-5.5e+08**	-4.5e+08
							(2.5e+08)	(3.6e+08)

For import per capita GMM estimation Gini were not significant.

For export per capita GMM estimation Gini were ** significant.

	(1) exporty~c	(2) exporty~c	(3) exporty~c	(4) exporty~c	(5) exporty~2	(6) exporty~2	(7) exporty~2	(8) exporty~2
L.exp~y_pc	0.888***	0.731***	0.880***	0.725***				
	(0.014)	(0.101)	(0.019)	(0.106)				
gini	4.4e+05**	4.0e+05**	4.5e+05**	4.0e+05**	4.7e+09**	4.5e+09**	4.8e+09**	4.6e+09**
	(2.2e+05)	(1.8e+05)	(2.3e+05)	(1.9e+05)	(2.4e+09)	(2.1e+09)	(2.4e+09)	(2.2e+09)
pergrp		2.309		2.306		2.3e+04		2.3e+04
		(1.644)		(1.656)		(1.6e+04)		(1.6e+04)
_Iyea~2009		-5.5e+04*		-5.4e+04*		-5.6e+08**	-1.7e+08***	-5.5e+08**
		(2.9e+04)		(2.8e+04)		(2.9e+08)	(6.0e+07)	(2.8e+08)
railways~c			-1.1e+08	-8.8e+07				
			(1.0e+08)	(1.3e+08)				
L.ex~y_pc2					0.881***	0.730***	0.874***	0.723***
					(0.017)	(0.096)	(0.020)	(0.101)
railways~2							-1.0e+08	-8.7e+07
							(9.1e+07)	(1.3e+08)

Taken two-step for import yuan per capita and export yuan per capita[219]

Gini were significant for import yuan per capita and export yuan per capita in GMM estimation. And control variables were *** significant.

	(1) importy~2	(2) importy~2	(3) importy~2	(4) importy~2	(5) exporty~2	(6) exporty~2
L.im~y_pc2	0.863***	0.671***	0.863***	0.621***		
	(0.000)	(0.000)	(0.000)	(0.001)		
gini	9.1e+08***	1.3e+09***	9.1e+08***	1.5e+09***	3.1e+09***	3.1e+09***
	(1.1e+07)	(1.7e+07)	(6.7e+06)	(1.9e+07)	(5.0e+07)	(1.2e+08)
pergrp		1.1e+04***		1.4e+04***		
		(17.201)		(65.857)		
railways~2			4.3e+07***	-2.9e+08***		1.5e+07
			(8.3e+06)	(2.3e+07)		(9.7e+07)
L.ex~y_pc2					0.871***	0.871
					(0.000)	(.)
_cons	0.000	-5.5e+08***	0.000	0.000	0.000	-1.2e+09***
	(.)	(6.8e+06)	(.)	(.)	(.)	(8.2e+07)
N	216	216	216	216	216	216

[219] Gini were *** significant with import per capita yuan unit and export per capita yuan unit as dependent variables in two-step GMM estimation.

If extended the year from 1995 to 2010

Import_FE test,raw data of variables Gini not significant.
Export_FE test,raw data of variables Gini not significant.
Import_GMM estimation,raw data of variables Gini not significant.
Export_GMM estimation,raw data of variables Gini ** significant, grp and population *** significant, railways not significant.
Two step GMM estimation[220]

	(1) importy	(2) importy	(3) importy	(4) exporty	(5) exporty	(6) exporty	(7) exporty
L.importy	1.007***	0.846***	0.797***				
	(0.000)	(0.001)	(0.001)				
gini	6.1e+08***	1.0e+08***	8.1e+07***	8.8e+08***	8.3e+08***	4.1e+08***	3.8e+08***
	(3.7e+06)	(9.5e+06)	(2.6e+07)	(2.5e+06)	(3.6e+06)	(4.9e+06)	(1.2e+07)
popu2		1.9e+09***	1.6e+09***			1.8e+09***	1.8e+09***
		(1.1e+07)	(5.1e+07)			(5.2e+06)	(1.7e+07)
grp			4304.184***				
			(233.176)				
railways			-7.8e+07***		1.9e+08***		1.2e+08***
			(2.1e+07)		(3.6e+06)		(2.0e+06)
L.exporty				1.006***	1.000***	0.889***	0.887***
				(0.000)	(0.000)	(0.000)	(0.001)
_cons	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)
N	334	334	334	334	334	334	334

Import per capita_EF and Export per capita_EF Gini not significant.
Import per capita_GMM estimation Gini not significant.
Export per capita_GMM estimation Gini ** significant, other control varibales not significant.
Import per capita_ two-step GMM estimation

[220] Gini were *** significant with import per capita yuan unit and export per capita yuan unit as dependent variables in two-step GMM estimation during 1995 to 2010.

	(1) importy~2	(2) importy~2	(3) importy~2	(4) importy~2
L.im~y_pc2	0.957***	0.869***	0.957***	0.858***
	(0.001)	(0.001)	(0.000)	(0.001)
gini	1.9e+09	1.5e+09***	1.9e+09***	1.5e+09***
	(.)	(2.2e+07)	(1.2e+07)	(2.1e+07)
pergrp		6322.595***		7024.573***
		(52.126)		(51.071)
railways~2			1.8e+07**	-9.8e+07***
			(7.3e+06)	(6.3e+06)
_cons	-6.8e+08***	0.000	0.000	0.000
	(2.9e+07)	(.)	(.)	(.)
N	334	334	334	334

Export per capita_ two-step GMM estimation

	(1) exporty~2	(2) exporty~2	(3) exporty~2	(4) exporty~2
L.ex~y_pc2	0.944***	0.895	0.944***	0.888***
	(0.000)	(.)	(0.000)	(0.001)
gini	2.4e+09***	2.1e+09	2.4e+09***	2.1e+09***
	(3.2e+07)	(.)	(4.9e+07)	(5.1e+07)
pergrp		3838.324		4401.494***
		(.)		(51.683)
railways~2			9.8e+06	-8.2e+07***
			(7.8e+06)	(1.2e+07)
_cons	0.000	-8.0e+08	0.000	0.000
	(.)	(.)	(.)	(.)
N	334	334	334	334

11) import and export are test by different control variable group, dummy poor grp province, dummy poor pergrp provinces.

import per capita yuan = Gini + consumption per capita+dummy poor province

In FE test for import per capita yuan Gini were positive and ** significant, when with dummy grp poor province or dummy pergrp poor provinces Gini raise significant to ***.

Exporty=Gini+grp+railways+dummy poor province

In FE test for Export yuan Gini were positive and * significant, but not significant with control variable grp. Railways was not significant. Dummy poor province did not make any improve.

In GMM estimation for import per capita yuan Gini were not significant, even with dummy poor province.

In GMM estimation for export yuan Gini were ** significant, * significant with control grp. dummy poor province did not make any different.

In two-step GMM estimation test for import per capita yuan Gini were not significant, even with dummy poor province.

In two-step GMM estimation test for export yuan Gini were *** significant. dummy poor province did not make any different.

12) import_pc&pergrp, export&grp, different periods, logarithm variables, dummy trader top 5 province.

We took different independents variable with different dependent variables and control variables. divide the whole period into two periods，dummy trader top 5 province, FE test, GMM estimation, Two step GMM estimation

Import per capita

In FE test import per capita yuan, Gini were * or ** significant, negative during 1995-2001, and positive 2001-2010. pergrp was *** significant.

	(1) importy~c	(2) importy~c	(3) importy~c	(4) importy~c	(5) importy~c	(6) importy~c	(7) importy~c	(8) importy~c
gini	-1.0e+04**	4.0e+04*	-5.4e+03*	3.0e+04**	-1.0e+04**	4.0e+04*	-5.4e+03*	3.0e+04**
	(4916.094)	(2.1e+04)	(3095.875)	(1.4e+04)	(4916.094)	(2.1e+04)	(3095.875)	(1.4e+04)
_Iyea~2010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
pergrp			0.571***	0.513***			0.571***	0.513***
			(0.138)	(0.162)			(0.138)	(0.162)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)

In FE test without dummy year lnImport per capita yuan, lnGini were positive and * or *** significant, *** during 1995-2001, * 2001-2010. pergrp was *** significant during 2001-2010, otherwise not.

	(1) lnimpor~c	(2) lnimpor~c	(3) lnimpor~c	(4) lnimpor~c	(5) lnimpor~c	(6) lnimpor~c	(7) lnimpor~c	(8) lnimpor~c
lngini	2.478***	3.218*	2.115***	1.280**	2.478***	3.218*	2.115***	1.280**
	(0.360)	(1.807)	(0.425)	(0.491)	(0.360)	(1.807)	(0.425)	(0.491)
lnpergrp			0.258	1.092***			0.258	1.092***
			(0.206)	(0.072)			(0.206)	(0.072)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)
_cons	8.631***	10.238***	5.988***	-2.133***	8.631***	10.238***	5.988***	-2.133***
	(0.385)	(1.659)	(2.091)	(0.727)	(0.385)	(1.659)	(2.091)	(0.727)
N	166	216	166	216	166	216	166	216

In GMM estimation without dummy year import per capita yuan Gini were *** significant and negative during 1995-2001, otherwise not.

	(1) importy~c	(2) importy~c	(3) importy~c	(4) importy~c	(5) importy~c	(6) importy~c	(7) importy~c	(8) importy~c
L.import~c	1.152***	0.868***	0.730***	0.730***	1.152***	0.868***	0.730***	0.730***
	(0.052)	(0.028)	(0.064)	(0.033)	(0.052)	(0.028)	(0.064)	(0.033)
gini	5979.976	9663.429	-3.7e+03***	9276.134	5979.976	9663.429	-3.7e+03***	9276.134
	(3979.096)	(1.2e+04)	(1351.987)	(1.2e+04)	(3979.096)	(1.2e+04)	(1351.987)	(1.2e+04)
pergrp			0.303***	0.087***			0.303***	0.087***
			(0.044)	(0.025)			(0.044)	(0.025)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)
_cons	-2.1e+03	-2.7e+03	-541.294	-3.7e+03	-2.1e+03	-2.7e+03	-541.294	-3.7e+03
	(1338.850)	(4257.925)	(671.618)	(4771.846)	(1338.850)	(4257.925)	(671.618)	(4771.846)
N	120	216	120	216	120	216	120	216

In GMM estimation without dummy year lnimport per capita yuan lnGini were *** significant and positive during 1995-2001, otherwise not.

	(1) lnimpor~c	(2) lnimpor~c	(3) lnimpor~c	(4) lnimpor~c	(5) lnimpor~c	(6) lnimpor~c	(7) lnimpor~c	(8) lnimpor~c
L.lnimpo~c	0.331***	0.924***	0.323***	0.368***	0.331***	0.924***	0.323***	0.368***
	(0.117)	(0.022)	(0.113)	(0.082)	(0.117)	(0.022)	(0.113)	(0.082)
lngini	2.521***	0.021	1.822***	0.691*	2.521***	0.021	1.822***	0.691*
	(0.335)	(0.305)	(0.419)	(0.354)	(0.335)	(0.305)	(0.419)	(0.354)
lnpergrp			0.382**	0.704***			0.382**	0.704***
			(0.177)	(0.097)			(0.177)	(0.097)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)
_cons	6.715***	0.736*	2.662	-1.525***	6.715***	0.736*	2.662	-1.525***
	(0.790)	(0.413)	(2.028)	(0.563)	(0.790)	(0.413)	(2.028)	(0.563)
N	118	216	118	216	118	216	118	216

In two-step GMM estimation test without dummy year import per capita yuan Gini with control variable pergrp were *** significant and negative during 1995-2001. Without control variable Gini itself was * significant and positive.

	(1) importy~c	(2) importy~c	(3) importy~c	(4) importy~c	(5) importy~c	(6) importy~c	(7) importy~c	(8) importy~c
L.import~c	1.158***	0.868	0.731***	0.730	1.158***	0.868	0.731***	0.730
	(0.052)	(2.588)	(0.066)	(6.357)	(0.052)	(2.588)	(0.066)	(6.357)
gini	5302.496*	9643.230	-3.5e+03***	9238.949	5302.496*	9643.230	-3.5e+03***	9238.949
	(3165.839)	(1.8e+06)	(1251.763)	(1.1e+05)	(3165.839)	(1.8e+06)	(1251.763)	(1.1e+05)
pergrp			0.301***	0.087			0.301***	0.087
			(0.044)	(4.397)			(0.044)	(4.397)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)
_cons	-1.9e+03*	0.000	-487.443	0.000	-1.9e+03*	0.000	-487.443	0.000
	(1045.172)	(.)	(599.988)	(.)	(1045.172)	(.)	(599.988)	(.)
N	120	216	120	216	120	216	120	216

In two-step GMM estimation test without dummy year lnimport per capita yuan lnGini were *** significant and positive during 1995-2001.

	(1) lnimpor~c	(2) lnimpor~c	(3) lnimpor~c	(4) lnimpor~c	(5) lnimpor~c	(6) lnimpor~c	(7) lnimpor~c	(8) lnimpor~c
L.lnimpo~c	0.315**	0.927	0.294**	0.366	0.315**	0.927	0.294**	0.366
	(0.127)	(0.587)	(0.116)	(3.026)	(0.127)	(0.587)	(0.116)	(3.026)
lngini	2.179***	0.013	1.516***	0.688	2.179***	0.013	1.516***	0.688
	(0.441)	(14.526)	(0.406)	(6.800)	(0.441)	(14.526)	(0.406)	(6.800)
lnpergrp			0.393*	0.706			0.393*	0.706
			(0.216)	(3.205)			(0.216)	(3.205)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)
_cons	6.320***	0.707	2.430	-1.542	6.320***	0.707	2.430	-1.542
	(0.994)	(17.257)	(2.150)	(12.325)	(0.994)	(17.257)	(2.150)	(12.325)
N	118	216	118	216	118	216	118	216

Export

In FE test for export yuan, Theil were *** significant, negative during 2001-2012, otherwise not significant. grp was *** significant.

	(1) exporty	(2) exporty	(3) exporty	(4) exporty	(5) exporty	(6) exporty	(7) exporty	(8) exporty
theil	2.8e+11	-5.7e+13***	-4.4e+11	-4.0e+13***	2.8e+11	-5.7e+13***	-4.4e+11	-4.0e+13***
	(3.4e+12)	(1.4e+13)	(1.7e+12)	(6.9e+12)	(3.4e+12)	(1.4e+13)	(1.7e+12)	(6.9e+12)
grp			2.9e+07***	2.3e+07***			2.9e+07***	2.3e+07***
			(8.5e+06)	(3.6e+06)			(8.5e+06)	(3.6e+06)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)
_cons	4.7e+10***	3.3e+11***	-2.2e+10	7.7e+10*	4.7e+10***	3.3e+11***	-2.2e+10	7.7e+10*
	(3.7e+09)	(1.7e+10)	(1.9e+10)	(3.8e+10)	(3.7e+09)	(1.7e+10)	(1.9e+10)	(3.8e+10)
N	275	341	275	341	275	341	275	341

In FE test for lnexport yuan, Theil were not significant. lngrp *** significant.

In GMM estimation for export yuan, Theil were *** significant, positive 1993-2001. negative during 2001-2012. Theil was not significant with grp during 1993-2001. grp *** significant.

	(1) exporty	(2) exporty	(3) exporty	(4) exporty	(5) exporty	(6) exporty	(7) exporty	(8) exporty
L.exporty	0.735***	0.934***	0.318*	0.845***	0.735***	0.934***	0.318*	0.845***
	(0.030)	(0.016)	(0.172)	(0.038)	(0.030)	(0.016)	(0.172)	(0.038)
theil	2.2e+12***	-6.0e+12***	2.3e+11	-7.3e+12***	2.2e+12***	-6.0e+12***	2.3e+11	-7.3e+12***
	(7.2e+11)	(2.1e+12)	(1.1e+12)	(2.3e+12)	(7.2e+11)	(2.1e+12)	(1.1e+12)	(2.3e+12)
_Iyea~1994	2.6e+09**		3.9e+10**		2.6e+09**			
	(1.3e+09)		(1.8e+10)		(1.3e+09)			
_Iyea~2012		3.0e+10**				3.0e+10**		
		(1.2e+10)				(1.2e+10)		
grp			2.9e+07**	5.4e+06***			2.9e+07**	5.4e+06***
			(1.3e+07)	(2.0e+06)			(1.3e+07)	(2.0e+06)
_Iyea~1997			1.7e+10*				-2.2e+10**	
			(9.7e+09)				(8.5e+09)	
_Iyea~2002				1.8e+10**				1.8e+10**
				(8.1e+09)				(8.1e+09)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)

In GMM estimation for lnexport yuan, Theil were not significant.

In two-step GMM estimation test for lnexport yuan, if taken grp as control variable Theil was *** significant before 2001. However, without control variables Thiel was *** significant after 2001. Dummy top 5 trader province did not make any different.

	(1) exporty	(2) exporty	(3) exporty	(4) exporty	(5) exporty	(6) exporty	(7) exporty	(8) exporty
L.exporty	0.662***	0.946***	0.428***	0.858***	0.662***	0.946***	0.428***	0.858***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
theil	0.000	-5.6e+12***	1.6e+11***	0.000	0.000	-5.6e+12***	1.6e+11***	0.000
	(.)	(4.6e+09)	(3.2e+09)	(.)	(.)	(4.6e+09)	(3.2e+09)	(.)
grp			1.6e+07***	5.3e+06***			1.6e+07***	5.3e+06***
			(1.7e+04)	(731.908)			(1.7e+04)	(731.908)
_Iexport~1					0.000	0.000	0.000	0.000
					(.)	(.)	(.)	(.)
_cons	1.4e+11***	0.000	-7.4e+09***	3.6e+11***	1.4e+11***	0.000	-7.4e+09***	3.6e+11***
	(5.6e+09)	(.)	(5.6e+08)	(5.1e+09)	(5.6e+09)	(.)	(5.6e+08)	(5.1e+09)
N	213	341	213	341	213	341	213	341

In two-step GMM estimation test for lnexport yuan, Theil were not significant.

Conclusions

Considering to the results above, we got some conclusions.

For import and import per capita as dependent variables during 2000 to 2012, Theil were *** significant in FE test and RE test, but dependent variable import over grp was not.

For export, export per capita and export over grp as dependent variables during 2000 to 2012, Theil were *** significant in FE test and RE test.

No matter which taken Theil square or Theil absolute value, or just Theil value, Theil were significant in FE test and RE test.

When we considered the GMM estimation in models, import and import per capita as dependent variables during 2000 to 2012, Theil were not significant, but export and export per capita as dependent variables during 2000 to 2012, Theil were *** significant. And when we took variables over grp, Theil were significant in import over grp model but positive, and Theil were not significant in export over grp.

Control variables population and grp were correlation with control variable pergrp. Control variables consumption and consumption per capita were correlation with control variables grp and pergrp.

After cutting off the correlation control variables, in the FE test Theil were *** significant for import as dependent variables, and ** significant for import per capita as dependent variables; Theil were *** significant for export and export per capita as dependent variables.

After cutting off the correlation control variables, in the GMM estimation Theil were ** significant for import and import per capita as dependent variables; **Theil were *** significant for export and export per capita as dependent variables at the same time with pergrp, consumption and railways as control variables..**[221]**(See number 5)** For import over grp as dependent variable Theil were *** significant but positive, and Theil were not significant for export over grp as dependent variable.

For these results we can conclude when variables over grp the results are not consistent any more., In this case we can not take the share of import or export over grp as dependent variables to test the relationship between Theil and import or export.

[221] export / export per capita = Theil + pergrp + consumption + railways.

We took variables span years from 2000 to 2001 made the results more significant. When we extended the year as from 1993 to 2012, the results were not significant any more.

We tried Gini as independent variable; the signs of result were different comparing to we took Theil, they were positive and less significant as * significant.

Gini were positive and * significant in two-step GMM estimation with import as dependent variable during 2000 to 2010.[222] (see number 9)** Extend years from 2000-2010 to 1995-2010 did not make significant well with grp, population and railways as control variables, even worse for testing effect of Gini on import, import per capita, export and export per capita. (see number 9)

See number 10, Gini were * significant with import yuan unit and export yuan unit as dependent variables with grp, population and railways as control variables in two-step GMM estimation. Gini were *** significant with import per capita yuan unit and export per capita yuan unit as dependent variables with grp, population and railways as control variables in two-step GMM estimation, even extended the year to 1995-2010. Comparing to number 9 results we could conclude exchange rate impact the significance of import and export.**

[222] import / import per capita = Gini + grp + population + railways.
export / export per capita = Gini + grp + population + railways.