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Measuring Pro-poor Growth in China from 2000 to 2015

Jiajia Ou

Master in Economics

Supervisor:

PhD Sofia de Sousa Vale, Assistant Professor, Department of
Economics, Iscte-Iul

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Department of Economics / Department of Political Economy

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Resumo

Os estudos existentes sobre o crescimento da China a favor dos pobres não assentam em dados atualizados e não comparam as suas diferentes regiões, bem como não consideram as influências de diferentes linhas de pobreza. Esta tese estuda se o crescimento é pró-pobreza na China de 2000 a 2015 utilizando três índices, a saber de Kakwani e Pernia (2000), Ravallion e Chen (2003), e Kakwani, Khander e Son (2004), aplicados às regiões geográficas, organizadas em três grupos para comparar os resultados das regiões mais e menos desenvolvidas: Pequim, Xangai, Chongqing, Yunnan, Zhejiang, Shaanxi, Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi e Guizhou. A análise organiza as províncias representativas em grupos, distinguindo regiões mais e menos desenvolvidas, confrontando o leste e o oeste, regiões urbanas e rurais, costeiras e não costeiras. A análise foi conduzida sob os limiares de pobreza de \$1,25/dia e \$1,90/dia.

Os resultados mostraram que o crescimento, de 2000 a 2015 na China, é fracamente a favor dos pobres ou de uma diminuição da pobreza. O crescimento nas zonas ocidentais, rurais e não costeiras, as mais pobres, não é mais a favor dos pobres do que o crescimento nas zonas orientais, urbanas e costeiras, indicando que as regiões mais desenvolvidas têm um crescimento mais equilibrado. As implicações políticas são a necessidade de introduzir medidas corretivas para evitar o alargamento do fosso entre as regiões mais desenvolvidas e as menos desenvolvidas.

Classificação JEL: O4; R11

Keywords: Crescimento favorável aos pobres; Desigualdade; Pobreza; China.

Abstract

Existing studies stop short of the analysis of China's pro-poor growth with updated data and comparisons of different regions, as well as lacking in considering the influences of different poverty lines. This thesis studies the pro-poorness of the growth in China from 2000 to 2015 using three indexes from Kakwani and Pernia (2000), Ravallion and Chen (2003), and Kakwani, Khander and Son (2004) respectively, applied to the geographical regions which was organized into three groups to compare the results of more and less developed regions, confronting the east and the west, urban and rural, coastal and non-coastal regions. The analysis was conducted under the poverty lines of \$1.25/day and \$1.90/day.

The results displayed that growth, from 2000 to 2015 in China, is weakly pro-poor or trickle down. Growth in the west, rural and non-coastal areas, the poorest regions, is not more pro-poor than growth in the east, urban and coastal areas, indicating that the more developed regions have more balance growth. The policy implications are the need to introduce corrective measures to avoid widening the gap between the more developed and less developed regions.

JEL Classification: O4; R11

Keywords: Pro-poor growth; poverty; inequality; China

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1. Introduction

Inequality, poverty and economic growth are the main focuses of the development of a society. It is reasonable to say that the key tasks for a developing country are to reduce poverty and inequality and enable the economy to grow as much as possible. As a developing country, China has been fighting against poverty for many decades, and have achieved significant changes until now, especially in the last century. (Montalvo and Ravallion, 2009) Concurrently, there emerges a growing number of studies of poverty reduction and economic growth in China (Ravallion, M., & Chen, S, 2003; Goh, C., Luo, X., & Zhu, N, 2009; Montalvo, J. G., & Ravallion, M, 2009; Wang, X., Xu, L., & Shang, X, 2014) Regarding poverty reduction in China, the main policies in China since the 21st century are, in the first place, Dibao, the minimum living standard guarantee program that provide cash to those whose income is below a certain level. It was launched in 1990 on urban areas and 2007 on rural areas. Dibao is helpful on poverty alleviation but has not much advantages over a universal basic income scheme (Kakwani, Li & Wang, etc., 2019). Secondly, the new rural cooperative medical scheme, the national medical insurance that has been implemented since 2003 and has significantly relieved the poverty of rural households on Western region, compared to those on Eastern regions. The funding and actual compensation ratio of the insurance is relatively low, hence, to achieve the goal of poverty alleviation, the funding and actual compensation ratio of the insurance, especially towards chronic and serious diseases, should be improved (Qin, Chen, Li, etc., 2021). Thirdly, the targeted poverty alleviation strategy – a mechanism that started since 2013, which requires local governments to identify poor areas or even poor households and provide help, such as vocational training, microcredit, etc. (Zhou, Guo & Liu, etc., 2018). Finally, social security expenditure usually plays a large part in poverty alleviation. The expenditure of China's social security system has been growing over the past 40 years, nevertheless, the gap of social security like pension, the minimum living allowance and health care between rural and urban areas should be bridged. Moreover, more social security expenditure and a more equitable social security system is needed (Yu, Li, 2021).

Studying pro-poor growth is an effective way to examine poverty reduction and economic development since pro-poor growth is related to poverty, inequality and economic growth. To be simple, pro-poor growth can be defined as the growth which provides better opportunities to the poor in order to uplift their economic conditions. (OECD,2001)

The existing literature in this field tends to focus on the general profile of the pro-poor growth in China and stays short of analyzing the data from recent years. Another limitation associating is the lack of studies about the influences of poverty lines on the measurement of pro-poor growth. In response to these limitations, this study extends the research of Wang, Xu and Shang (2014), which studied the pro-poor growth in China from 1989 to 2009 using three indexes that were also used in this thesis: the pro-poor growth index by Kakwani and Pernia (2000), the rate of pro-poor growth by Ravallion and Chen (2003), and the poverty equivalent growth rate by Kakwani, Khander and Son (2004).

Following their lead, this work applies the three indexes to updated data (until 2015) retrieved from the China Health and Nutrition Survey. The thesis not only applies the indexes on the general data, but also on the data from the representative provinces/cities of the west, east, urban, rural, coastal and non-coastal regions, under 2005 and 2011 World Bank poverty lines, which are \$1.25/day and \$1.90/day, respectively. By doing these cross-sectors comparisons, the policy implications are discussed according to the results.

Thus, on the one hand, this thesis shows the trends of pro-poor growth in China over time, on the other hand, it shows how the growth behaved among regions under different poverty lines to extract more specific implications to anti-poverty policies regarding to the extent of pro-poor growth in different regions.

The main findings indicate that in general, growth has fluctuated in China from 2000 to 2015, the growth being the most pro-poor from 2011 to 2015. The pro-poor periods for every region under three indexes and poverty lines are indifferent, but the less-developed areas in total (the west, rural and non-coastal areas) have less pro-poor periods than more developed areas (the east, urban and coastal areas).

The thesis is organized in three parts: the first section discusses the definitions and the main findings regarding to pro-poor growth by reviewing existing literature; the second part reveals

the data and methods used in this study and the results gained from the data and methods; the third part conclude the findings and discuss the policy implications according to the results.

2. Literature Review

So far, there is no consensus about the definition of pro-poor growth: According to The ADB's *Fighting Poverty in Asia and the Pacific: The Poverty Reduction Strategy* (Asian Development Bank, 1999), "growth is pro-poor when it is labor absorbing and accompanied by policies and programs that mitigate inequalities and facilitate income and employment generation for the poor, particularly women and other traditionally excluded groups." Kakwani and Pernia (2000) considered that growth is pro-poor when the benefits of growth that accrue to the poor are proportionally more than those received by the nonpoor. They also argued that a pro-poor growth scenario would occur if growth reduces poverty, and inequality is decreased concurrently during the course of growth. To be simple, pro-poor growth can be defined as the growth that benefit the poor proportionally more than the non-poor. (Son and Kakwani, 2008). Moreover, the definitions of pro-poor growth can be classified as general and strict: where the general definition means that if poverty fell, the economic growth is pro-poor, for example, Ravallion and Chen (2003)'s research seemed to be agreed with this definition. The strict definition focus on the distribution of the benefits and if large part of it goes to the poor, the studies of Kakwani and Pernia (2000), Kakwani and Son (2008), and Son (2004) are based on this definition.

Son and Kakawani (2008) proposed an index to measure pro-poor growth, which estimates inequality by the Atkinson (1970)'s method of measuring inequality, and the method uses any linear function of logarithm of individual income as utility function. On the index, when Atkinson (1970)'s measure of inequality decreases (increases), there will be a gain (loss) in growth rate. The gain (loss) in growth rate is measured by the percentage of decreasing (increasing) of inequality in Atkinson (1970)'s method, when the inequality decreases (increases) by 1%, the gain (loss) in growth rate will also be 1%. A cross country analysis of 80 countries during the period of 1984 -2001 was made by this measure and the results turned out that only 23.2% of the countries with positive growth rate had pro-poor growth, while 45% of the estimated countries had negative growth rate. What can be deducted from the result is that pro-poor growth is still far from a global economic growth trend. To some extent, pro-poor

growth can be seen as the interrelation of these three elements: economic growth, poverty and inequality. Hence, it's of great necessity to discuss the relations among these elements. In this respect, Breunig and Majeed (2020) found that when poverty rate is under 30%, the relationship between inequality and economic growth is insignificant, for higher levels of poverty, inequality brings negative impacts to economic growth, which increases as poverty increases. Recently, Karimi, Delangizan and Daiari (2021) also pointed out that it's impossible to define a direct relationship between economic growth and poverty, economic growth also doesn't guarantee a reduction to poverty. Poverty reduction depends on both economic growth and income distribution. Thus, poverty and inequality are extremely interrelated. Besides, the study shows that distributional effects had always reduced poverty and inequality of income. Inequality is a hinder on the way of poverty reduction as well as one of the reasons why the effect of economic growth on poverty reduction has fluctuations. Hence, to figure out the trend of the development of inequality worldwide is of great significance. Dollar, Kleineberg and Kraay (2016), after estimating a dataset of 151 countries between 1967 and 2011, found that the income shares of the bottom 20 percent and 40 percent show no systematic tendency to decline over time, which brings out that, there's no worldwide trend that inequality is becoming greater, and growth is still good for the poor. Regarding to the recent international studies of pro-poor growth, they tend to research the relationships among economic growth, inequality and poverty by methods like GMM, instead of pro-poor growth indexes. (e.g. Gründler & Scheuermeyer, 2018; Breunig & Majeed, 2020) or estimating the global trend related to pro-poor growth. (e.g. Dollar & Kleineberg, 2016; Kakwani & Son, 2008)

Most of the available studies about the pro-poor growth in China focused on the period starting from the early stage of the economic reform in 1978 until the beginning of this century. Using the growth incidence curve, the Poverty–Growth–Inequality Triangle by Bourguignon (2005), and a modified Mincerian type equation, Goh, Luo, and Zhu (2009) showed that the urban-rural income gap increased during the period of 1989-2004, the rural income gap in inland provinces was wider than in coastal provinces, poverty reduction is the most significant in coastal areas. This result is also consistent with the findings of Chen and Fleisher (1996), who used augmented Solow growth model to estimate the data of China from 1978-1993 and

found that there's a widening income gap between coastal and inland provinces because of the higher growth rate in coastal provinces. Goh, Luo and Zhu also indicated that during the period, poverty reduction has primarily been a result of rapid income growth in China. Wang, Xu and Shang (2014) estimated the data of China from 1989 to 2009 by three indexes: Kakwani and Pernia (2000) pro-poor growth index, which measures the degree to which growth can be considered pro-poor by decomposing the total change in poverty into the impact of growth when income distribution doesn't change and the effect of income distribution when total income doesn't change. Ravallion and Chen (2003) index, also called the growth incidence curve, shows how the growth rate for a given quantile varies across quantiles ranked by income. And Kakwani, Khandker and Son (2004) poverty equivalent growth rate, which includes the magnitude of growth and the benefits the poor receive from the growth. The larger the rate, the greater the proportional reduction in poverty will be. The result indicates that the growth from 2006 to 2009 was pro-poor. From 1989 to 2006, poverty was reduced, but it was depended mainly on the "trickle-down effect".

“Trickle-down effect”, according to Kakwani and Pernia (2000), it implies a vertical flow from the rich to the poor: The rich benefit from economic growth first, then the poor only begin to benefit when the rich start spending their gains. Thus, the benefit of economic growth only goes to the poor indirectly through a vertical flow from the rich. Besides, the result revealed that Kakwani and Pernia's pro-poor growth index showed almost the same results as Kakwani, Khandker, and Son's poverty equivalent growth rate, while Ravallion and Chen's index shows a relatively longer pro-poor period. What can be learned from these studies are: Having a low initial inequality, and combining with rapid economic growth, poverty was reduced significantly in China from 1989 to 2009. Although not all the reductions are because of pro-poor growth and the regional differences of the degrees of poverty reduction can be big.

All the empirical and theoretical literature cited above provided the rationale and guides to the specific direction as well as the selection of the methods of this study.

3. Methodology

Many indexes were proposed to measure pro-poor growth, since it is impractical to reach a single indicator or index to measure it, for it is impacted by many elements. Generally speaking, every aspect caused by economic growth that makes the poor better-off can indicate that the growth is pro-poor. For example, when the education rate improves or the rate of people that can access healthcare services increases. Thus, the indexes will focus on what is caused by economic growth and has influence on the poor.

In this study, three indexes were selected to measure pro-poor growth in China from 2000-2019: the pro-poor growth index from Kakwani and Pernia (2000); the rate of pro-poor growth from Ravallion and Chen (2003); and, the poverty equivalent growth rate from Kakwani, Khander & Son (2004). The explanations of the indexes on this section were based on Harmáček, J., Srovátka, M., & Dušková, L. (2017) and Wang, X., Xu, L., & Shang, X. (2014).

3.1 Pro-poor growth index

The pro-poor growth index by Kakwani and Pernia (2000) was based on the strict definition of pro-poor growth, as mentioned on the literature review section.

The pro-poor growth index was defined as:

$$\varphi = \frac{\eta}{\eta_g} \quad (1)$$

In which η_g is the growth effect on poverty: η_g refers to a corresponding change in poverty when the growth rate increases by 1% and the relative inequality remains unchanged. η is a corresponding change in poverty, which can be decomposed to η_g and η_I . η_I is the income effect on poverty: it is a change in poverty caused by changes in income distribution when the real average income remains unchanged.

When $\varphi > 1$, $\eta_I < 0$, the growth will be pro-poor, since it indicates that both poverty and inequality decrease, thus the poor benefits proportionally more than the non-poor.

When $0 < \varphi < 1$, $\eta_I > 0$ and $|\eta_I| < |\eta_g|$, the growth is not strictly pro-poor, or it can be considered as trickle-down growth. Because in this case, poverty decreases while inequality

increases, which means that the poor still benefits from the growth but it's less than the non-poor.

When $\varphi < 0$, $\eta_l > 0$ and $|\eta_l| > |\eta_g|$, the growth is not pro-poor, as poverty and inequality both increase in this case, which can be called as immiserising growth.

All the discussions above fall on the assumption that the growth is positive, when the growth is negative, the index should be:

$$\varphi = \frac{\eta_g}{\eta} \quad (2)$$

When $\varphi > 1$, the recession is pro-poor. Although poverty increases, the income of the poor decreases less than the income of the non-poor.

When $\varphi < 1$, the recession is not pro-poor, since the income of the poor decreases more than the income of the non-poor.

3.2 Rate of pro-poor growth

In their study, Ravallion and Chen (2003) departed from the general definition of pro-poor growth, that is, if economic growth reduces poverty, even if the non-poor benefits proportionally more than the poor, growth is still pro-poor. The pro-poor growth index proposed by Ravallion and Chen (2003) was adapted from Watt's index. (Watts, H. W, 1970) The rate of pro-poor growth index proposed by Ravallion and Chen (2003) can be defined as:

$$g_t(p) = \left(\frac{\Delta W_t}{\Delta W^*_t} \right) g_t \quad (3)$$

The index was adapted from Watt's index (Watts, H. W, 1970): $W = Y / \hat{Y}(N, L, t)$, in which N is a family size, L is the place, t is time, Y is the permanent income and W is the welfare ratio. $\hat{Y}(N, L, t)$ is the poverty threshold of a family of size N in place L at time t .

In this function, $g_t(p)$ is the rate of pro-poor growth, ΔW_t is the actual change in poverty measured by Watt's index, ΔW^*_t is the change in poverty with distributional neutral growth, g_t is the growth rate of the mean income at time t .

Since this index is related to the mean growth rate of income of the poor, when the rate is bigger than 0, there's a poverty reduction, when the rate is less than 0, the growth is not pro-poor. However, this index can also be compared to the growth rate of the income. When the rate

is above g , the income of the poor grows faster than the non-poor and vice versa. This comparison can show if the growth is strictly pro-poor.

3.3 Poverty equivalent growth rate

As stated in the literature review section, this index was based on the strict definition of pro-poor growth, while using an absolute approach. Which means that, in this index, pro-poor growth would occur if the poor receive the absolute benefits of growth equal or more than the absolute benefits gained by the non-poor.

This index can be expressed as:

$$\gamma^* = (\delta/\eta) \gamma = \varphi\gamma \quad (4)$$

$\varphi = \delta/\eta$ represents the pro-poor growth index by Kakwani & Pernia (2000). When the inequality doesn't change during the growth process, γ^* is the growth rate that will lead to the same level of poverty reduction as the present growth rate γ . When $\gamma < 0$, poverty increases. But if inequality reduces so much that poverty decreases, in this case, $\gamma^* < 0$, we can call the economy as strongly pro-poor. The economy will be pro-poor if $\gamma < \gamma^* < 0$, in this case, poverty increases but the poor were harmed proportionally less than the non-poor, which represents the 'trickle-down effect'. The economy will be anti-poor if $\gamma^* < \gamma < 0$, in which case poverty increases while the poor were harmed proportionally more than the non-poor.

4. Data and Estimated Methods

The data used in this article was selected from the China Health and Nutrition Survey, which is an ongoing survey since 1989. This international collaborative project between the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention not only was designed to examine the effects of government policies and programs on health, nutrition, and family planning, also for how the social and economic transformation of Chinese society is affecting the health and nutritional status of its population. The data from 2000 to 2015 were selected for estimation on this article, since the goal of this article is to analyze pro-poor growth in China starting from the beginning of 21st century. The provinces that are covered by the survey, from 2000 to 2009, were Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi and Guizhou. These provinces include Coastal and non-coastal, Southern and Northern, Eastern and Western areas, which can be considered regionally and geographically representative. In 2011, three municipalities – Beijing, Shanghai and Chongqing were added to the survey regions, which were from the North, the South and the West respectively. In 2015, Yunnan, Zhejiang and Shaanxi were added to the survey regions, which represented the South, the East and the West respectively.

Two poverty lines were used in the estimation, both taken from the World Bank, for which the international poverty line was \$1.25/day in 2005 and \$1.90/day in 2011 both at purchasing power parity. (Dean and Espen Beer, 2016) According to this information, for the data of 2000 to 2009, the poverty line of \$1.25/day will be the reference, for the data of 2011 to 2015, the poverty line of \$1.90/day will be the reference.

In the estimation, the provinces were divided by regional characteristics: coastal and non-coastal, East and West, urban and rural. The regional development varies significantly in China: coastal areas have started developing earlier and are more developed than non-coastal areas; the development of urban areas started much earlier than the rural areas; Western areas are less developed than Eastern areas. In 2000, the government formulated the Great Western Development Strategy and started implementing it at 2001.

Since the income of the survey was in Chinese Renminbi while the poverty line was expressed in US dollars exchange rates of each survey year were used to make sure that both the household income and the poverty line were converted into USD.

The three pro-poor growth indexes were calculated by DASP package for Stata from Araar and Duclos (2007).

5. Results

In this section, the name of the three indexes will be represented briefly as KP: the index by Kakwani and Pernia (2000); RC: the index by Ravallion and Chen (2003); KKS: the index by Kakwani, Khander and Son (2004).

TABLE 5.1. General results of three measures in poverty line of \$1.25/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.227265	0.216033	0.934610	0.463000	0.624000
Kakwani & Pernia(2000)	0.07930	0.385234	-0.938617	-3.120555	3.987261
Ravallion & Chen (2003)	0.177724	0.046616	0.395156	0.247784	-0.040190
Kakwani, Khander & Son (2004)	0.018034	0.083223	-0.877315	-1.444816	2.488053

TABLE 5.2. General results of three measures in poverty line of \$1.90/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.227265	0.216033	0.934610	0.463000	0.624000
Kakwani & Pernia(2000)	0.196285	0.460806	-0.010598	-1.320063	1.694315
Ravallion & Chen (2003)	0.155262	0.046616	0.415445	0.238858	0.004513
Kakwani, Khander & Son (2004)	0.044609	0.099550	-0.009905	-0.611189	1.057253

Table 1 displays the general results of all the provinces selected in the survey, under the estimations of the three indexes in poverty line of \$1.25/day, while Table 2 shows the results of all the provinces in the survey under the three indexes in poverty line of \$ 1.90/day.

In Table 1, the results of KP are between 0 and 1 from 2000 to 2006, indicating that during this period, growth was of the trickle-down type. From 2006 to 2011, the results are negative, showing a non-pro-poor growth economy. From 2011-2015, the index lies above 1, indicating the growth being pro-poor. As for RC, the results from 2000 to 2011 are all above 0, indicating a weak pro-poor growth. However, none of the results are above the growth rate, implying that there's no reduction of inequality. From 2011 to 2015, the result is negative, contradicting the results from KP. According to KKS, the growth is trickle-down from 2000 to 2006. From 2006 to 2011, the results are negative, implying that the growth rate of the mean income declined and the growth is not pro-poor. From 2011 to 2015, the poverty equivalent growth rate is bigger than the growth rate, which indicates a pro-poor growth. To conclude, the poverty equivalent growth rate is consistent with the results of KP.

The only significant difference between Table 1 and Table 2 to recall is that, RC implies a pro-poor growth from 2000 to 2015, instead of just between 2000 to 2011 -- as Table 1 displays.

TABLE 5.3. Estimate results for coastal provinces in poverty line of \$1.25/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.355596	0.162140	0.875068	0.593855	0.511761
Kakwani & Pernia(2000)	0.487495	-0.056498	0.386317	-2.148523	-6.593001
Ravallion & Chen (2003)	0.276568	0.094434	0.420324	0.243952	-0.358352
Kakwani, Khander & Son (2004)	0.173351	-0.009160	0.338054	-1.275911	-3.374038

TABLE 5.4. Estimate results for coastal provinces in poverty line of \$1.90/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.355596	0.162140	0.875068	0.593855	0.511761
Kakwani & Pernia(2000)	0.515676	0.101041	0.597837	-0.544736	-3.355542
Ravallion & Chen (2003)	0.272002	0.093473	0.402519	0.278891	-0.227302
Kakwani, Khandar & Son (2004)	0.183372	0.016383	0.523148	-0.323494	-1.717234

For coastal provinces, under the poverty line of \$1.25/day, the results of KP show that growth was trickle-down from 2000 to 2004 and 2006 to 2009, while for the other years of the survey growth was not pro-poor. According to the index by RC, growth had always been weakly pro-poor despite of 2011 to 2015. Again, the results of KKS are consistent with the results of KP.

When considering a poverty line of \$1.90/day, the results for the coastal provinces from 2004 to 2006 are not consistent with the results found for a poverty line of \$1.25/day. For a poverty line of \$1.90/day, the estimations display growth being trickle-down from 2004 to 2006 according to KP and KKS, instead of being not pro-poor.

TABLE 5.5. Estimate results for non-coastal provinces in poverty line of \$1.25/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.128181	0.271888	0.987458	0.374332	0.734840
Kakwani & Pernia(2000)	-0.318360	0.471841	-1.458780	-3.613751	5.532124
Ravallion & Chen (2003)	0.126111	0.032317	0.384157	0.261646	0.066717

Kakwani, Khander & Son (2004)	-0.040808	0.128288	-1.440484	-1.352743	4.065226
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TABLE 5.6. Estimate results for non-coastal provinces in poverty line of \$1.90/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.128181	0.271888	0.987458	0.374332	0.734840
Kakwani & Pernia(2000)	-0.071923	0.522223	-0.270477	-1.697045	2.625709
Ravallion & Chen (2003)	0.097681	0.094570	0.421319	0.234285	0.088903
Kakwani, Khander & Son (2004)	-0.009219	0.141986	-0.267085	-0.635258	1.929477

For non-coastal provinces, the estimated results considering both poverty lines are consistent. When estimated by KP, growth is not pro-poor for the periods 2000-2004, 2006-2009 and 2009-2011, while from 2004 to 2006 growth is trickle-down, and from 2011 to 2015, growth is pro-poor. The results of KKS are consistent with these. When estimated by RC, growth is always weakly pro-poor. Besides, despite of the period 2000-2004, the growth rates of non-coastal provinces are higher than general growth rates.

Compared to coastal provinces, non-coastal provinces have more non-pro-poor periods under the poverty line of \$1.90/day, but also have a pro-poor period, unlike in coastal provinces where the periods are either not pro-poor or trickle-down, or weakly pro-poor.

TABLE 5.7. Estimate results for urban areas under a poverty line of \$1.25/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.256987	0.172900	0.883464	0.493810	0.610251

Kakwani & Pernia(2000)	-1.125431	0.132053	-1.060430	0.979013	2.852595
Ravallion & Chen (2003)	-0.228320	-0.112024	0.833453	0.027126	0.553781
Kakwani, Khander & Son (2004)	-0.289221	0.022832	-0.936852	0.483446	1.740800

TABLE 5.8. Estimate results for urban areas in poverty line of \$1.90/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.256987	0.172900	0.883464	0.493810	0.610251
Kakwani & Pernia(2000)	-0.487488	0.452287	-0.235497	0.752247	1.466043
Ravallion & Chen (2003)	-0.116647	-0.000212	0.740283	0.075811	0.537517
Kakwani, Khander & Son (2004)	-0.125278	0.078200	-0.208053	0.371467	0.894655

The results of urban areas are consistent for both poverty lines, whereas the results of KP and KKS are also consistent. The estimations for the two indexes imply that growth is not pro-poor for 2000- 2004 and 2006-2009, is trickle-down for 2004-2006 and 2009-2011, and pro-poor from 2011 to 2015. RC indicates that from 2004 to 2006 growth is not pro-poor and for the rest of the survey years it is a weak pro-poor growth.

TABLE 5.9. Estimate results for rural areas in poverty line of \$1.25/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.219715	0.242626	0.953746	0.349574	0.648637
Kakwani & Pernia(2000)	0.339274	0.415904	-0.906938	-6.321680	4.556913

Ravallion & Chen (2003)	0.256702	0.080260	0.289973	0.321508	-0.331382
Kakwani, Khander & Son (2004)	0.074543	0.100909	-0.864989	-2.209893	2.955783

TABLE 5.10. Estimate results for rural areas in poverty line of \$1.90/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.219715	0.242626	0.953746	0.349574	0.648637
Kakwani & Pernia(2000)	0.367796	0.442336	0.037979	-2.846806	1.804752
Ravallion & Chen (2003)	0.214924	0.110934	0.349760	0.275414	-0.175565
Kakwani, Khander & Son (2004)	0.080810	0.107322	0.036222	-0.995168	1.170629

The estimated results of rural areas under the two poverty lines are not consistent from 2006 to 2009, when assuming the poverty line of \$1.25/day, the results of KP and KKS suggest that growth is not pro-poor. However, when estimated by the poverty line of \$1.90/day, the results of the two indexes specify that growth is trickle-down. Apart from this, the results of KP and KKS indicate that growth is trickle-down from 2000 to 2006, not pro-poor from 2009 to 2011 and pro-poor from 2011 to 2015. RC suggests that growth is weakly absolutely pro-poor from 2000 to 2011 and not pro-poor from 2011 to 2015.

TABLE 5.11. Estimate results for Eastern provinces in poverty line of \$1.25/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.338341	0.117906	0.935038	0.607207	0.555417

Kakwani & Pernia(2000)	1.238956	-1.966009	-0.105990	-2.183867	-0.358459
Ravallion & Chen (2003)	0.408041	-0.208911	0.349291	0.256793	-0.189230
Kakwani, Khander & Son (2004)	0.419190	-0.231804	-0.099105	-1.326059	-0.199094

TABLE 5.12. Estimate results for Eastern provinces in poverty line of \$1.90/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.338341	0.117906	0.935038	0.607207	0.555417
Kakwani & Pernia(2000)	1.070255	-1.653290	0.419550	-0.627437	-0.848431
Ravallion & Chen (2003)	0.424285	-0.200176	0.385419	0.308070	-0.200431
Kakwani, Khander & Son (2004)	0.362112	-0.194932	0.392295	-0.380984	-0.471233

The results for Eastern provinces assuming the two poverty lines are not coherent from 2006 to 2009. With the poverty line of \$1.25/day, the two consistent indexes suggest a non-pro-poor growth, while the same two indexes indicate a trickle-down growth from 2006 to 2009 with the poverty line of \$1.90/day. Other than this, the two indexes specify a pro-poor growth from 2000 to 2004 and a non-pro-poor growth from 2004 to 2006 and 2009 to 2015. RC shows that growth is strongly pro-poor from 2000 to 2004 and not pro-poor from 2004 to 2006 and 2011 to 2015, which is consistent with the other two indexes. RC also indicates a weakly pro-poor growth from 2006 to 2011.

TABLE 5.13. Estimate results for Western provinces in poverty line of \$1.25/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.024048	0.202114	1.085496	0.252636	0.640385
Kakwani & Pernia(2000)	-12.112314	0.457845	0.043496	-2.286698	0.788641
Ravallion & Chen (2003)	-0.094945	0.044927	0.144716	0.334399	-0.347691
Kakwani, Khander & Son (2004)	-0.291275	0.092537	0.047215	-0.577703	0.505034

TABLE 5.14. Estimate results for Western provinces in poverty line of \$1.90/day

Pro-poor indexes	2000-2004	2004-2006	2006-2009	2009-2011	2011-2015
Growth rate	0.024048	0.202114	1.085496	0.252636	0.640385
Kakwani & Pernia(2000)	-6.385007	0.542362	0.368314	-0.893538	0.139427
Ravallion & Chen (2003)	-0.078991	0.100597	0.248856	0.318155	-0.258242
Kakwani, Khander & Son (2004)	-0.153545	0.109619	0.399803	-0.225740	0.089287

The results of the Western provinces under both poverty lines are coherent. KP and KKS indexes show that economic growth is not pro-poor from 2000 to 2004 and 2009 to 2011, and is trickle-down from 2004 to 2009 and 2011 to 2015. According to the RC index, growth is not pro-poor from 2000 to 2004 and 2011 to 2015, and is weakly pro-poor from 2004 to 2011.

To conclude, in all the provinces of the survey, from 2000 to 2009, under the poverty line of \$1.25/day, when estimated by KP and KSS, the growth is trickle-down from 2000 to 2006, not pro-poor from 2006 to 2011; when estimated by RC, the growth is weakly pro-poor from 2000 to 2011. Under the poverty line of \$1.90/day, when estimated by KP and KSS, the growth is pro-poor from 2011 to 2015; when estimated by RC, the growth is weakly pro-poor. What

should be brought to attention is, when estimated under the poverty line of \$1.25/day, the growth is not pro-poor from 2011 to 2015 by RC. While the results of the other two indexes being consistent.

From 2000 to 2015, the growth in non-coastal provinces is more pro-poor than the growth in coastal provinces, since the growth in non-coastal provinces is pro-poor from 2011 to 2015 and trickle-down from 2004 to 2006 by KP and KSS and always weakly pro-poor by RC. While in coastal provinces, the growth is not pro-poor from 2004 to 2006 and 2009 to 2015 by KP and KSS and not pro-poor from 2011 to 2015 by RC.

The situation of the growth in urban areas is similar to in rural areas: when estimated by KP and KSS, the growth in both areas is pro-poor from 2011 to 2015, and has two periods of trickle-down growth and two periods of non-pro-poor growth. When estimated by RC, they both have one period of non-pro-poor growth, while the rest of the survey years being weakly pro-poor.

During the survey years, the growth in Eastern provinces is more volatile and more pro-poor than in Western provinces. There is one pro-poor period that measured by all the three indexes in Eastern provinces, but the other periods are not pro-poor according to KP and KSS under the reference poverty line. In Western provinces, there is no pro-poor periods, although it only displays two non-pro-poor periods under the estimation of KP and KSS. When estimated by RC, both areas have two non-pro-poor periods, while in the Western provinces, the rest of the periods are weakly pro-poor, the Eastern provinces has one strongly pro-poor period. Thus, in general, the growth in Eastern provinces of the survey is more pro-poor than in the Western provinces.

6. Conclusions

To explore the pro-poorness of the growth in China since the 21st century and test if influence of poverty lines on the measurement of pro-poor growth is significant, this article applies the three indexes from Kakwani and Pernia (2000), Ravallion and Chen (2003) and Ravallion and Chen (2004) to the different regions of China from 2000 to 2015 under the poverty lines defined by the World Bank, which are \$1.25/day (since 2005) and \$1.90/day (since 2011). As results, in general, the growth in China from 2000 to 2015 is trickle-down or weakly pro-poor in most of the years. Growth in less developed areas is not pro-poor enough: growth in western areas is not as pro-poor as growth in eastern areas and the pro-poorness of growth in rural areas and non-coastal areas is similar to the one in urban and coastal areas. The results of pro-poorness when measured by the KP and KSS indexes are always consistent, while the RC index yields different or even contradictory results with the first two. As for the two poverty lines, the differences have significant influence on the results of 4 of the comparison groups of a total of 7 comparison groups, which indicates a necessity of considering the power of poverty lines when measuring pro-poor growth.

To deduct from above, the policies in China from 2000 to 2015 don't tend to be helpful on the asymmetry between more developed and less developed regions, therefore, the existing policies should be improved or more anti-poverty policies should be implemented to correct the asymmetry as well as inducing pro-poor growth. Taxes and subsidies are two essential tools in inequality decreasing. Hence, the policy implications according to the results can be mainly relieving the taxes burden and implement subsidies on regions with high concentration of the poor, especially in education and medical aspects. For example, the amounts of subsidies to the farmers need to be increased, because it's the most poor-concentrated group in China. Moreover, the gap of social security expenditure between rural and urban regions should be narrowed and well-designed infrastructure projects focus on the poor should also be applied. Since, after 2007, growth in rural areas wasn't pro-poor under both poverty lines and by all the indexes, growth in these regions was only pro-poor from 2011, indicating that the poverty alleviation achieved

by Dibao wasn't enough to induce a pro-poor growth. To improve it, a universal basic income scheme can be considered instead of a minimum living standard guarantee program.

Some limitations of this study can be pointed out. First, to some extent, the selected indexes are lack of diversity, since the results of two of the indexes are always consistent. Another limitation lies on the data used for the analysis, for the most up-to-date data is from 2015, which might not be up-to-date enough. Moreover, this study only considers the influences of poverty lines and regions on the measurement of pro-poor growth, however, there are other factors that can impact significantly on pro-poor growth. These limitations offer interesting paths for future studies to explore: applying more methods such as the poverty growth curve (Hyun Hwa Son, 2004) or just the decomposition of the changes of poverty to measure pro-poor growth and compare the differences; use more updated data on the measurement or choose a different database, the database used in this thesis comes from a nutrition and health survey and the data is of household level, future studies can extract data of different levels from other type of surveys with higher quality of data. Besides, the influences of other factors such as the headcount index and the poverty gap can be considered in the measurement of pro-poor growth as well.

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