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INTRA-PROVINCIAL INEQUALITIES
AND ECONOMIC GROWTH IN CHINA

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Intra-Provincial Inequalities and Economic Growth in China

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Abstract

This paper approaches the problem of inequalities in China. It is specifically focused on analyzing the effects of intra-provincial disparities on provincial economic development. Rising inequalities have been widely discussed in the literature on the examples of fast growing developing countries like Brazil, India. However, each of these countries existed in a different socio-political context. Should and is anything done to contain the rising inequalities? This is something the world is struggling now not only with respect to the Chinese case. In the broadest sense, there seem to be two kinds of answers. One, more “European”, or “social/Christian/democratic” is that too much inequality is morally hard to accept and also bad for social cohesion. Another, more neo-liberal or “American” says that while much should be done to alleviate poverty, economic inequality is not a reason for concern, that it is inevitable (reflecting varying endowments of individuals) and in some way also positive as motivating for work and innovation. Inequalities, as measured by Theil index, seem to be positively related to growth. However, a more profound analysis suggests highly diversified patterns, which suggests many conclusions about actual policy-making standards in China.

Keywords:

inequality, economic growth, Theil index, China

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1. Introduction

The economy of the People's Republic of China follows its own complex path of development since the early reforms of 1978. This country, accounting for a fifth of the world population, managed to shift the economic system towards openness and transform its economic system to a market oriented one, and at the same time achieve successful economic performance. In the last quarter of century, China has been the most rapidly growing economy in the world, with an average annual growth rate of 10% which remained rather stable, without any sudden variation. Rapid growth, combined with a population greater than 1,3 billion, drove China from the status of underdeveloped, low income country to the fourth place among the world's largest economies in 2006, following the United States, Japan and Germany, with a gross domestic product of US\$2,668 trillion (World Bank 2006). According to World Bank, in 2005, China, together with the United States, Japan, Germany and India, accounted for nearly half of the world's GDP.

One of the key forces of China's miraculous growth has been its progressive opening to the outside world through trade and foreign direct investment, culminating in 2004 with China's accession to WTO. China's trade expansion placed it as the world's third largest trading country in 2005. It is predicted (World Bank online resources) that in 2008, PRC will overtake Germany to become the world's second largest trading country, only losing the first place to the United States.

China's economy since over two decades has been of primary interest for its specific transition and development path, resulting in three decades of high economic growth, but accompanied by a marked inequality pattern. Aside of the Chinese case, the steadily growing inequalities observed all over the world have also been arousing concern and drawing increasing attention among the scholars and policy-makers. This paper is specifically focused on analysing the effects of intra-provincial disparities in China on provincial economic growth¹. Among all possible levels of data aggregation, from the country level to the household, the provincial level data has two main advantages. First, it allows a better depiction of the nature of the inequality to growth relationship than data at more aggregated levels, like regional data used in most previous studies. Second, individual level analyses – although frequently control for regional or provincial specificity – inquire more the nature of welfare evolutions than the direct policy choices and policy outcomes.

There are several motivations to study the relationship between income inequality and economic growth. Firstly, generally speaking, the relationship remains an issue of controversy in the literature – the causality direction along with the nature of the influence remain unclear. There are neither clear theories, nor definitive empirical evidence in favour of any causality direction and significance. In addition, there seems to be an influential group of researchers advocating an inverse quadratic relationship, which implies that at the initial stage increasing inequalities raise growth but this relationship changes and after some period of positive influence – having reached a certain critical level – the relationship inverts. Secondly, although in the past, empirical research has revealed a positive influence of inequality on economic growth, the trend has recently inverted. Yet, for China, it seems that unlike recent findings suggest, the influence of inequality on growth remains positive. Inequalities in China on aggregate level seem persistently increasing while economic growth is increasing as well.

This paper is structured as follows. The next section presents some theoretical foundations and up-to-date empirical evidence relating inequalities and growth. We further move to describing the specificity of Chinese case. Subsequently, results of the intra-provincial inequalities link with economic

¹ In this research, data does not cover the whole Chinese territory. The terms used in this project, People's Republic of China and China only refer to Mainland China, which does not include two SARs, Hong Kong and Macao, as well as the Taiwan Province of China. Special Administrative Regions, SARs, are administrative divisions set up by the People's Republic of China in Hong Kong, since 1997, and in Macau, since 1999.

performance of these provinces. Finally, we conclude suggesting some possible paths of further inequalities evolution in China.

2. Inequalities and economic development

Equality since a long time has been a philosophical concern, with a central question posed by Amartya Sen in his book *Inequality Reexamined*: “equality of what?”. One of the biggest issues of controversy is the relationship between inequality and economic growth. In the context of endogenous growth theories, inequality seems to be an embodied sub-factor, influencing growth in a complex way, through specific channels.

2.1 Theoretical foundations

The most popular view, proposed by Galor and Zeira (1993), asserts that inequality is not only a result of economic growth, but also plays an important role in determining its patterns. Recently, there has been much debate to determine the channels of inequality-growth interaction. Theoretical attempts focus on logical interconnections through accumulation, skills differences and arguments of political economy, stability or credit constraints. According to Barro (2000), these theories can be classified into four broad categories: saving rates and investments, credit-market imperfections, political economy and social instability. An additional category may be considered, concerning incentives. Comprehensive surveys of these theories include Benabou (1996), Aghion et al. (1999) and Bourguignon (2004). In the empirical field, many papers have attempted to determine the main sources of growth using cross-section or panel data for large samples of countries. A good summary of this empirical work as well as a brief discussion on theoretical models is performed by Rodríguez (2000), whereas Knowles (2005) and Aghnion et al. (1999) discuss extensively currently available empirical work.

The belief that inequality is a necessary condition to sustain accumulation and that equalizing society by redistribution will decrease growth is rejected by some studies including those of Alesina and Rodrik (1994), Persson and Tabellini (1994), Bertola (1993) and Thorbecke and Charumilind (2002). They propose an alternative explanation by *political economy* arguments, namely by fiscal channel. Two main lines of argument link inequality and growth in the context of political economy: the demand for fiscal redistribution, and democracy. Alesina and Rodrik (1994) and Persson and Tabellini (1994) took up the demand for fiscal redistribution path and assumed that inequality influences taxation through the political process of voting. They predict a positive correlation between inequality and tax rates. Rationale is as follows: a greater degree of inequality is an engine for redistribution policies. The most common redistribution tool is taxation. However, the expectation that taxes are higher in economies with a higher inequality appears very difficult to support empirically. The explanations based on the effects of income distribution on fiscal policy are not confirmed yet. Moreover, Perotti (1996) found out that in many cases, the effect is regressive, meaning that in a relatively unequal country, the taxes are not higher than in another, more equal one. A simple explanation may be that this situation occurs when the median voter is richer than the average voter, with an income higher than the mean income Benabou (1996). At this point, the magnitude and pattern of voters decisions, and their identity - all that shaped by the inequality of distribution - seem very important (Bourguignon and Verdier 2000)². The next possible channel of negative impact of inequality on economic growth discussed here is *socio-political instability*.

² Bourguignon and Verdier's (2000) model relates the effects of income inequality on economic growth through a process of democratization. This relation leads to smoothed inequalities and increased economic growth through human capital accumulation. In the model they propose, inequality is associated with democratic institutions, themselves determined by the political participation dependent on education. Thus education is a growth engine, as it shapes political participation. The

Approaches:

- 1) Benhabib & Russtichini (1991), Keefer & Knack (2000)
- 2) Alesina & Perotti (1996)
- 3) Alesina & Rodrik (1994), Bertola (1993), Persson & Tabellini (1994)
- 4) Perotti (1996)
- 5) Bourguignon & Vardier (2000)
- 6) Mirrlees (1971)

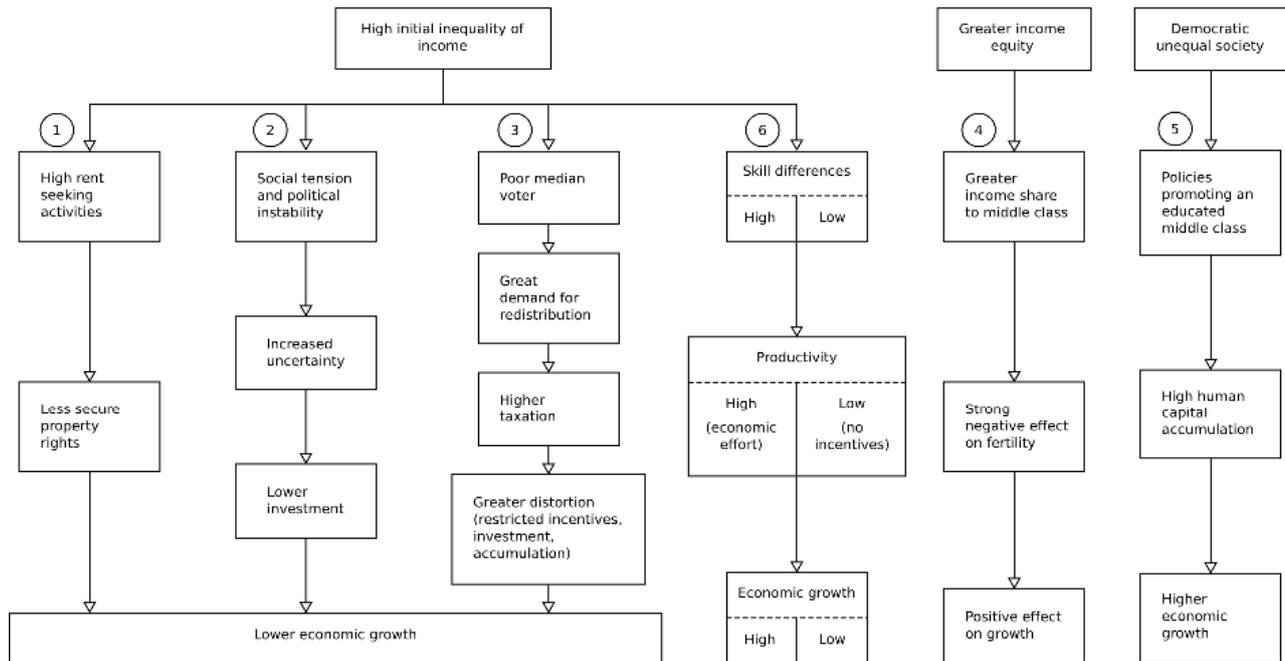


Figure 1. Theoretical approaches to the inequality-growth nexus

2.2 Empirical strategies

The theoretical ambiguities are in line with empirical findings, which generally tend not to be robust (Barro, 2000). Inequality is commonly seen, in existing empirical research, as a factor that indirectly influences growth. This view was followed by empirical papers by Persson and Tabellini (1994) and Alesina and Rodrik (1994), who first showed that initial inequality is correlated with lower growth levels. That reflects well known two-way relationship between inequalities and growth.

While the theoretical literature is divided on whether there is a causal growth to inequality relationship or not, the empirical literature quite consistently agrees that growth does not have a significant impact on inequality³. Existing cross-country studies failed to find a clear link from growth to inequality. Deininger and Squire (1996), Chen and Ravallion (1997), Easterly (1999) and Dollar and Kraay (2002) all suggest that growth does not influence inequality. This would hint that, on average, a typical pro-growth strategy would not be useful in reducing high levels of inequality.

On both the theoretical and the empirical fields, the inequality to growth link remains still doubtful, with some researchers concluding that inequality leads to faster growth, and some others suggesting that inequality is likely to lower growth. Concerning the link between income distribution and economic growth, Perotti (1996) finds strong empirical support through socio-political instability and the channel of education/fertility decision. Credit market constraints and investment in human capital receive some moderate support from the data, although it is very difficult to test. By contrast, much less empirical support exists for effects of income distribution on economic growth through fiscal

assumption of the model is that high levels of inequality favor social distortions and even revolution, and that to prevent it, the government pursues policies supporting middle class education. This result in human capital accumulation and implies faster economic growth as well as lower inequality levels. The serious limitation of the model is indisputably the omission of physical capital accumulation.

³ For the growth to inequality causality direction, there is generally no impact reported. For the inverse relation, inequality to growth, different studies give alternately a positive and a negative impact of inequality on growth. Empirical studies are generally focalized either on cross-country regressions or panel data analysis, and mostly consider developing countries.

policy. Easterly and Rebelo (1993), using several measures of redistribution, like marginal tax rates, average tax rates or social spending, find that redistribution has a positive impact on growth.

In addition, some evidence exists that asset inequality can undermine growth more seriously than income inequality. Deininger and Squire (1998) find that a high inequality in the distribution of land, which is commonly used as a proxy for income inequality, has a significant negative effect growth. Similarly, Birdsall and Londoño (1997) notice a strong relationship between growth and the initial distribution of assets. Moreover, they notice that once it is explained for a set of variables measuring the initial asset inequality, such as initial land distribution and the initial distribution of human capital, income inequality stops playing a significant role in determining growth.

Finally, economic growth rate decreases due to income inequality is an issue that has been explored in many empirical studies. Some of them find that there is a negative correlation between income inequality and economic growth. Others argue that the previous ones need to be reconsidered as the correlation appears to be positive⁴. What are the reasons for such different results? The discrepancies arise primarily from data quality concerns and country specificity. Different studies use models with different variables and different samples, along various time spans. In addition, omitted variable bias may play a role in the cross-sectional studies. Banerjee and Duflo (2003) add to the explanation of the variations in results some differently assumed time-lags, and, more importantly, a wrongly presumed linearity of the relationship between changes in inequality and changes in the growth rate. They argue that the growth rate is an inverted U-shaped function of net changes in inequality.

There also is a number of controversies around the methodology in this strand of empirical development research. The first controversy concerns income measurement. It is common in the empirical research to use data on income inequality as a proxy for wealth inequality (Aghnion et al. 1999). But, especially in developing economies with volatile markets, income in form of money does not reflect wealth accurately. However, it is generally accepted that this is not a major research problem, as the distribution is sometimes improved by land distribution proxy (Perotti 1996).

The second disputable issue is data quality. Knowles (2005) argues that research done earlier than Deininger and Squire (1996), who proposed a new data set on inequality in the distribution of income, suffered from data of “dubious quality”⁵. Furthermore, another potentially serious data problem is that most empirical work examining the effect of the income inequality on economic growth measures the distribution of income or expenditure in an inconsistent manner (Knowles, 2005)⁶.

The discussion on cross country empirical research suggests that there is a weak consensus on the lack of causality from growth to income distribution in any direction. However, on the potential causality from inequality to growth, views are much more divided, with some studies concluding that inequality leads to faster growth, and others suggesting that inequalities are likely to affect growth adversely. The partially confirmed inverted U-shape hypothesis suggests that above certain (and

⁴ Alessina and Rodrik (1994) and Perotti (1996) find a negative relationship from inequality to growth, while Barro (2000) and Lopez and Serven (2004) find no relationship. Finally, Li and Zhou (1998) and Forbes (2000) find a positive relationship between income inequality and economic growth.

⁵ “High quality” data set should include household surveys data preferably to national statistics, covering a representative share of the population, and the measure of income should include self employment income as well as non-wage earnings and non-monetary income. Those requirements are in most cases impossible to fulfil. Research using “dubious quality” data include Persson and Tabellini (1994), Alesina and Rodrik (1994), Clarke (1995) and Perotti (1996). “High quality” data was used by Deininger and Squire (1998), Li and Zou (1998), Rodrik (1999), Forbes (2000), Barro (2000), Keefer and Knack (2000), Castelló and Doménech (2002) and Banerjee and Duflo (2003)

⁶ Most studies use the Gini coefficient, which can be calculated for individuals, for households, provinces, regions or whole countries, taking into account distribution before taxation, after taxation, or the distribution of expenditure. Most studies mix those measures, which leads to inconsistent results. However Barro (2000) as well as Deininger and Squire (1998) argue that transforming the data makes little difference to the results.

probably society specific) thresholds there appears to be a growing consensus on policies fostering poverty reduction, which lowers observed inequalities to some more socially acceptable level.

2.3 The case of China in the literature

In the light of the presented theories, China's rising inequalities seem to be a natural consequence of its development, as a country that is transforming and developing at the same time. China's economy faces two important shifts, from an agricultural to an industrial society and from an underdeveloped to a middle-income economy. Moreover, inequality increased within the urban and rural sectors. There are several reasons for that. The booming market economy witnesses the expansion of entrepreneurship. In the reality of markets, non-centralized planning, productivity, skills and human capital matter. As different agents are differently endowed, inequalities appear in a natural consequence of development process.

The increase in inequality has been a remarkable phenomenon since early reforms in China. Much of this attention has been given to spatial inequality between coastal and inland regions, to the rural-urban divide as well as to inter-personal inequality, as skills levels started to matter. Therefore, the early literature focused on measuring inequality, like Tsui (1991), and on decomposing the data on the regional inequality (cfr. Kanbur and Zhang (1999) as well as Wan (2001)). Recently, the focus shifted to disaggregated analysis of measures of intra-regional or intra-provincial disparities, with for instance Khan and Riskin (2001), Gustafsson and Shi (2002), Wan and Zhou (2005), or the "nested decomposition analysis" by Aikita (2001, 2003).

With a discussion of the literature on sources of inequality in China, Kanbur and Zhang (2005) interconnect the rising inequality to globalization, openness, policy biases, decentralization, and geographical resources. Wan Lu and Chen (Wan et al. 2007) estimate the impact of globalization on the rising inter-regional income inequality in China. Wan's (2004) regression based decomposition analysis opens a broad research area and gets closer to the answers.

A few papers consider the role of inequalities in the context of economic growth. One of the first, by Ravallion (1998), uses Chinese rural household level data to test the effect of regional aggregation on inequality-growth regression. He finds a significant negative link between initial wealth inequality and individual consumption growth. Lu (2002) focuses on the causal direction from growth to inequality. He concludes that the effectiveness of economic growth raising per capita consumption is the most important mechanism to reduce inequality. Reuter (2004) tests the impact of inequality on industrial economic growth and finds that inequality is affecting technical efficiency and the level of technology. He is assessing the direct influence of inequality on growth. Finally, Wan et al. 2006 check if inequality is harmful to growth in China⁷. Fitting the model to aggregated province-level panel data from China, the authors find that inequality is harmful to growth regardless of the time horizon, and that the growth-inequality relationship is nonlinear.

3. Inequalities in China

Despite continuing GDP growth depicts years of successful economic reforms⁸ and constant improvement of living standards, inequalities related issues have raised a lot of interest since the

⁷ Assuming that the impact of inequality on growth depends on the time horizon, the paper introduces a new modelling method, the polynomial inverse lag framework, that enables the estimation of short, medium, and long-run impacts in a unified framework. Instead of a direct relation between inequality and growth, they use a system of simultaneous equations.

⁸ There are many resources available on China's transition and economic path. Lin, Cai and Li (1996) published a detailed report on the socialist era. Wu 2005 book is very comprehensive analysis of Chinese economic reforms, while McGregor (2007) presents those reforms from a business perspective. Farther from economics, Johnson (2004) provides a realist feeling of life in present-day China. Naughton and Yang (2004) supplement the analysis by adding the outside channels of influence on Chinese economic growth.

beginning of China's economic recovery. Notable progress was achieved in human development, with poverty rate decreasing from from 53% of the population in 1981 to 8% by 2001 (Ravallion 2006). However, uneven progress, as Ravallion and Chen (2007) call it, seems to be at least an equally dynamic phenomenon (see figures below). The most exemplary illustrations of the splendid growth of China are the very high GDP growth rate of 10% per year, slightly increasing each year, the constant increase in per capita household income and the drastic fall in number of individuals living in absolute poverty. The World Bank estimates that more than 60% of the population was living under its \$1 per day (PPP) poverty line at the beginning of the economic reform. That poverty headcount ratio had declined to 10% by 2004. Overall, China has achieved what the World Bank calls „the most dramatic poverty reduction in history”, lifting 500 million people out of poverty in just 20 years (World Bank 2005). For the past 30 years, China's economy has been the world's most rapidly growing. The trends in inequality have followed rapid economic growth, and have been marked by a steep increase. Between 1989 and 2001, the Chinese Gini coefficient sharply rose by about 30%, and, if we consider the change that occurred between 1981 and 2001, by almost 50%, amounting to more than 2% per year.

In addition, the social problems that China is facing that deepen or arose during the transformation are equally interesting. Together with the rapid growth, the issue of social inequality has become increasingly tangible. Over the same period of 25 years, the distribution of income has gone much more unequal. The Chinese society has become better off, less poor, but at the same time, its equity has worsened. Figure 2.3 depicts the poverty incidence in China with its Gini Coefficient measuring the increasing inequality.

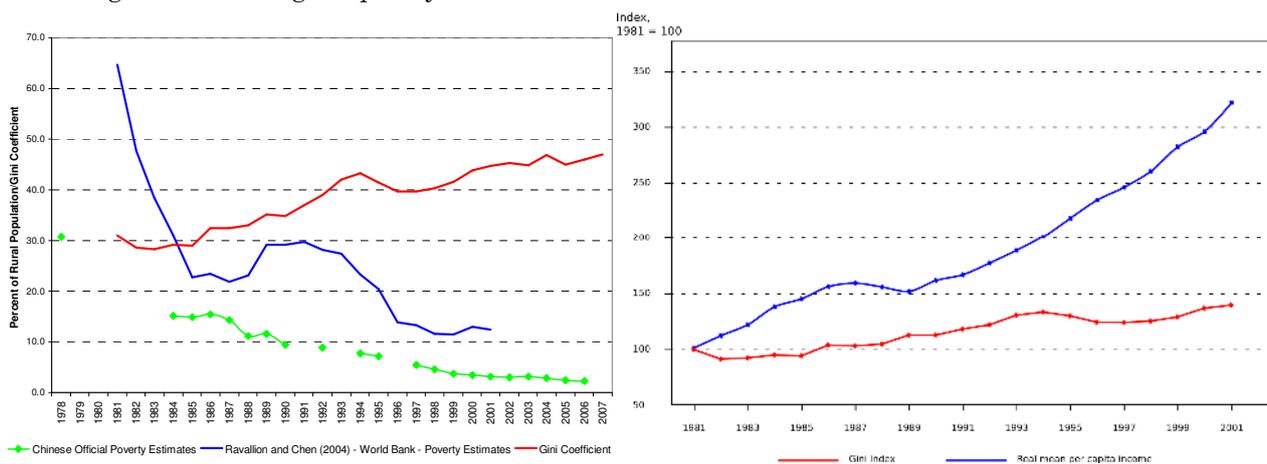


Figure 2. Inequalities and income dynamics in China. *Source:* China National Bureau of Statistics, Ravallion and Chen (2007), Human Development Report 2005, World Income Inequality Database⁹, CIA, World Bank (2006), Mitra and Yemtsov (2006).

Two measurements of the share of population living in absolute poverty are presented on Figure 2.3. The official Chinese data shows just 2.8% of the rural population living under the poverty line in 2004. However, the official Chinese poverty threshold is very low, only 627 yuan per person per year in 2002 (Naughton 2007), which equals to 75.8\$. Moreover, according to official data, there is no urban poverty, and it is only a very small problem of the agricultural sector. Taking into account the fact that the Chinese poverty line is much lower than the one proposed by the World Bank, Ravallion and Chen (2007) estimate that one comparable to the international standards measure, is 850 yuan¹⁰ in 2002 for Chinese rural areas (102.8\$ in 2002 prices). The estimates resulting from this adjustment are dramatically different from the official ones. Although we observe a steep decrease in poverty incidence, in the mid 80s this decrease slows down dramatically. Afterward, the share of people in absolute

⁹ Database available online: http://www.wider.unu.edu/research/Database/en_GB/database

¹⁰ The World Bank standard is equal to specific country's equivalent of 1 US\$ per day evaluated at PPP.

poverty falls, but less steeply, and even rises and stagnates between the mid 80s and the mid 90s, to fall again later on. By contrast, the Chinese data show a very smooth progress of poverty alleviation, without any uneven sub period. Besides, with the World Bank poverty threshold, the percentage of rural population in poverty is actually four times higher than showed by official data, as it accounts for 12.5% in 2002 instead of the official 3.2%.

One of the most important characteristics of the Chinese inequality pattern is the rural-urban gap. Rural-urban differences have persistently been accounting for a very large share of the overall income inequality in China¹¹. Although such a gap is usually present in developing economies, it is unusually large in the case of China. According to Figure 2.5, the per capita income in urban China is more than three times the one of rural areas. The consumption ratio shows an even higher record; it is more than 3.5 times higher in urban than rural areas. Those numbers give China one of the highest urban-rural income ratios in the world (Keung Wong et al. 2007; Eastwood and Lipton 2004).

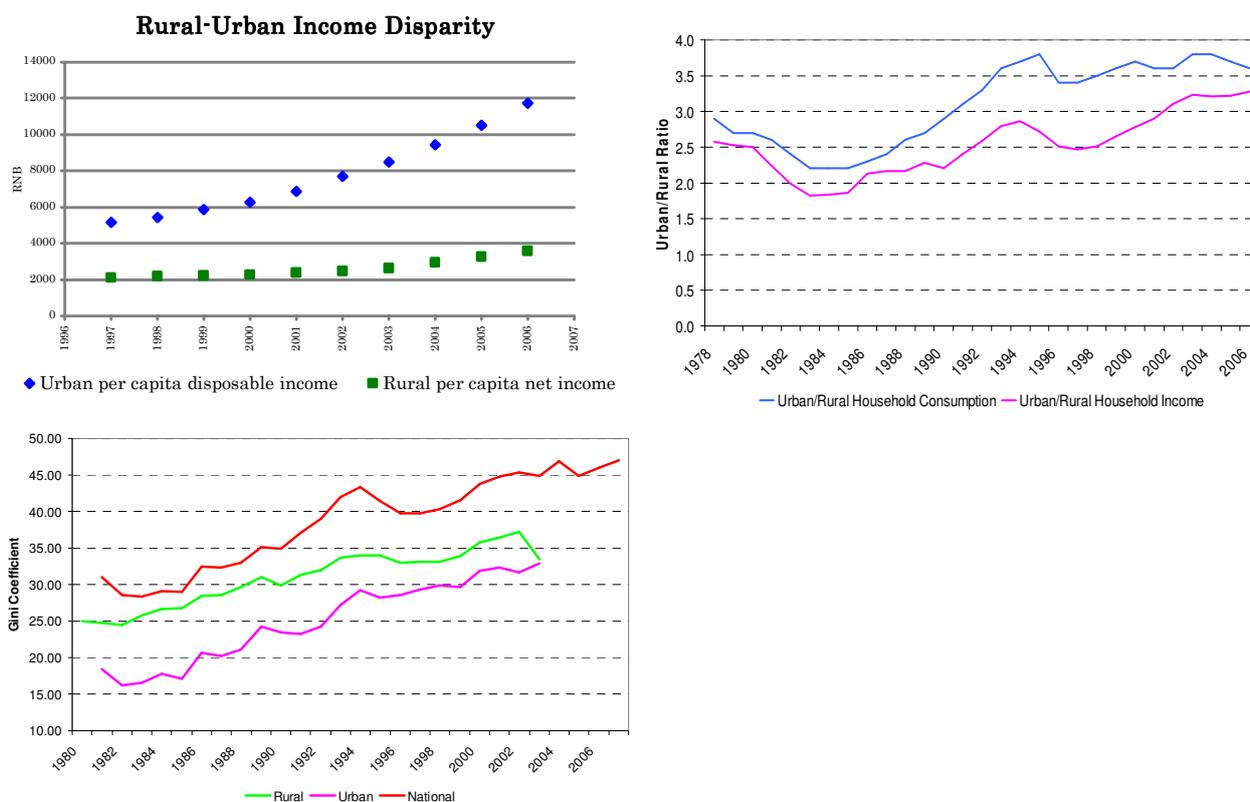


Figure 3. Rural-urban disparities. *Source:* The People’s Bank of China online resources, Statistical Yearbook of China 2007 (Household consumption), China Statistical Abstract (household income), National Bureau of Statistics of China, Ravallion and Chen (2007), World Bank (2006), CIA, World Income Inequality Database

There are several contributing factors, out of which the most important are extensive administration barriers yet in the 50s¹². The second very important dimension is regional diversification. Regional inequalities are the most commonly studied spatial inequalities in China. Although the term is not consistently employed to describe the same scale of analysis, it most often refers, in the literature, to the analysis of the differences between four main macro-regions: Eastern, Central, Western and Northeastern. Today, it is agreed that although China has experienced a rapid economic growth, it did not equally benefit the whole country in the geographical sense. While coastal

¹¹ It is ranging from 40%-47%, as estimated by the World Bank, to 25%, like in Sicular et al. (2007), depending on the time span and source.

¹² The party rule clearly separated rural and urban residents by different forms of citizenship, which until today and to some degree, determine the workplace of individuals, either in rural or urban areas. Those citizenships are called *hukou* and *danwei* (cfr. Lu and Perry, 1997 and Park, 2008).

provinces (Eastern region) have attracted a stupendous amount of foreign capital inflows and experienced strong economic booms, the inland provinces have been lagging behind.

3.1. Provincial disparities

This study analyses the influence of inequality on growth in China in the provincial context. China is divided in 31 provinces at the administrative level. They constitute the second level of division of China, below the macro-regional level. Notably, some Chinese provinces are more populous than most countries¹³. It seems reasonable to analyze the Chinese economy at a disaggregated level, as such a large country internally differs by many dimensions, not only economic¹⁴.

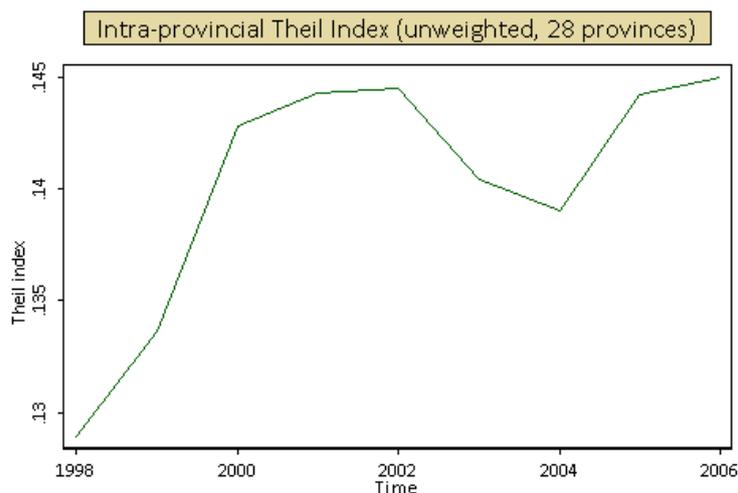


Figure 4. Intra-provincial Theil index evolution over time. *Source:* own calculation

Figure above represents the average annual value of intra-provincial Theil index calculated for 28 provinces in the sample. Although we observe changes in the value of this average, they do not seem to be of reasonable magnitude. However, it seems that the changes in the average reflect more the gradual evolution of striking differentiation among the provinces in terms of intra-provincial inequality.

Analysing the direct change of intra-provincial inequalities reveals that between 1998 and 2006 one may definitely state that pattern was not homogeneous. Notably, the level of intra-provincial inequalities increased in 20 provinces, and decreased only in 8. Moreover, an interesting pattern of inequality appears after grouping these provinces according to the regional division: the increasing trend of intra-provincial inequalities is mainly driven by widening disparities in provinces of the Central region, with the particularly puzzling case of the Anhui province, where inequalities increased by 238%. Regarding the other regions, intra-provincial disparities rather increased in Northeast and East China, while in the Western region, they decreased or remained almost unchanged.

¹³ For instance, Henan, the most populous province, recorded 97 million inhabitants in 2004 (more than France, Germany or the UK). It is Tibet, who has the smallest population: only 2.7 million people in 2004.

¹⁴ For instance, the strikingly uneven repartition of the Chinese population is so clear that its frontier draws a virtual line between Aihui and Tengchong, dividing the country in two halves. This line separates the „monsoon China”, a water abundant land with 260 people per square kilometre and situated in the southeast half, from the rest of the country with a population density of 11 people square kilometre (Naughton, 2007).

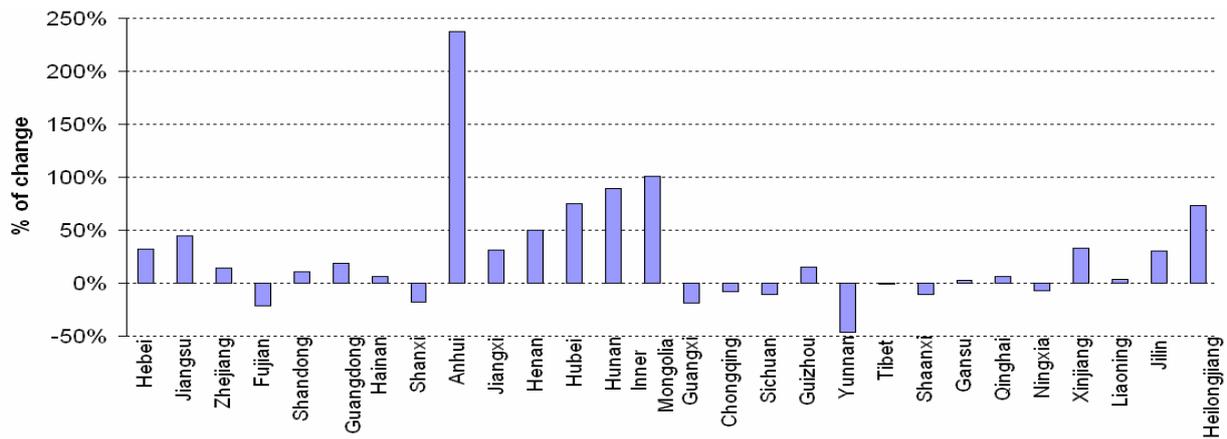


Figure 5. Change of intra-provincial inequalities 1998-2006 (Theil index). Source: Li and Xu (2008).

Chart below demonstrates the annual contributions of each province to Theil index. Majority of inequalities is placed in politically favored financial and development centers of China: Guangdong province and agglomerations of Beijing and Shanghai. The wealth of those places grows much faster than the wealth of others. In addition, Zhejiang, Jiangsu, Tianjin and Fujian contribute positively to the Theil index, as of mid 90s. All those provinces are located along the coastline. Almost all other provinces contribute negatively to the Theil index, with important roles of Hennan and Heilongjiang. Interestingly, in both of them inequalities have grown significantly over the analysed period (by 50 and 75% respectively), but they have started from an initially much lower level. The provinces of Anhui, Hubei, Hunan an Inner Mongolia – which too observed a drastic increase in Theil index of intra-provincial inequalities – are still below the zero line, which actually demonstrates the potential for further inequalities increase in China.

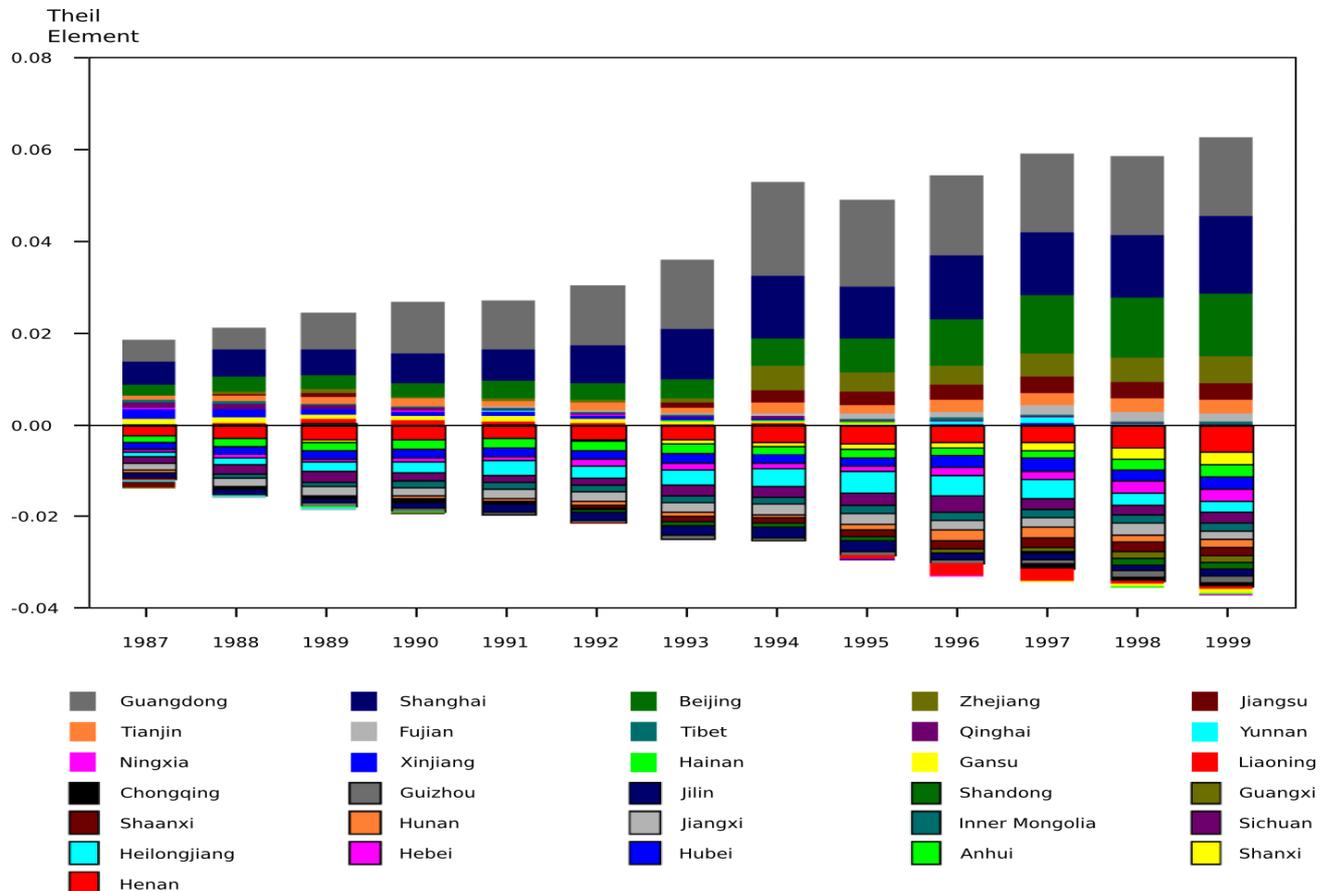


Figure 6. Contribution to Theil index. Source: Galbright et al. (2004)

The three leading regions of China are North China, Lower Yangtze and Northeast China. The most prosperous is the north part of China, situated along the Yellow River, predominantly agricultural with 2 metropolis. The core part of North China, the most densely settled area, lies at the junction of four provinces: Hebei, Shandong, Shanxi and Henan (provinces 3, 4, 14 and 15 on the map). North China is mostly, rural with its industrial centers in Beijing and Tianjin (provinces 1 and 2 on the map).

The most developed part of China, with the highest urbanization, is called Lower Yangtze, with its centres in Shanghai (province 6), south part of Jiangsu and north part of Zhejiang (provinces 5 and 7). The 10% of the Chinese population living in this part of the country produce 21% of the output. Historically, this part of China has been the richest one, and its growth recently seriously exceeded the national average. Moreover, and apart from its industrialization, fertility of soil in Lower Yangtze area contributes to traditionally high agricultural productivity.

As to natural resources, the most endowed region is Northeast China, more particularly the Liaoning province (province 13). Northeast China is also the centre of the Chinese heavy industry. It has substantial reserves of iron, coal and petroleum. This part of China is also gradually losing importance since China switched from heavy industrialization to an export oriented economy.

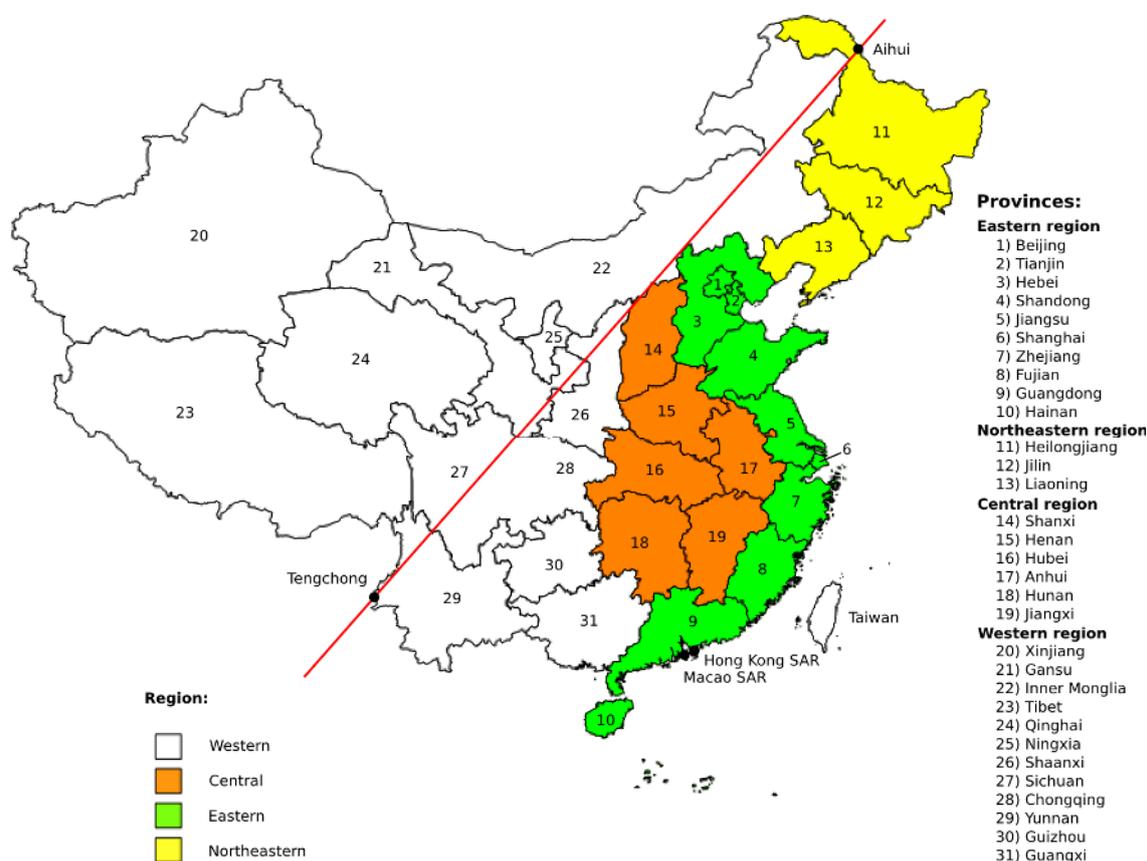


Figure 7. China's official administrative division (28 provinces and 4 macroregions). *Source:* NBS of China.

While China as a country has been oriented inward, strictly coastal areas have been outwards-oriented interfaces to international trade, and that situation favoured growth of this coastal part (Maritime China, comprising the coastal parts of provinces Zhejiang, Fujian and Guangdong with Hong Kong (7, 8, 9)). Its wealth is much linked to the prosperous neighbourhood of Taiwan and Hong Kong.

In Western China, provinces are more autarchic in economic structure, integrating to a smaller extent with coastal regions. Central provinces, like Hubei, Hunan or Jiangxi (provinces 16, 18, 19) lag behind due in terms of industrialisation. Sichuan and Chongqing (provinces 27 and 28) are entirely surrounded by mountains and, together with Yunan and Gizhou, (provinces 29 and 30) are very densely

populated while operating still mainly in low income agriculture. In provinces north from Sichuan, the population is concentrated along the rivers and focuses on subsistence agriculture as well. Poorer and drastically different, the western provinces of China, like Xinjiang and Qinghai (provinces 20 and 24) present few urban development: metropolitan centres are practically absent.

4. Data and results

For the purpose of this paper a new dataset was compiled basing on online and printed resources only available in Chinese from China National Bureau of Statistics (NBS) and Central Bank. Nonetheless, China's official statistics are broadly regarded as of questionable quality for both technical (statistics are compiled for a developing and transition economy, which is not an easy task) and political reasons. The data used in this project is panel data on industrial output, investment, employment and inequality for 28 Chinese provinces for years 1998 – 2006, excluding the Beijing, Tianjin and Shanghai municipalities. There are two main sources of data: for output, investment and employment measurements the sources are the official China Statistical Yearbooks¹⁵ (CSY) 1997 – 2007. The inequality measure, the Theil index, had to be obtained from the previous studies, as the data on population and income necessary to calculate it was unavailable at the minimally required prefecture level. Thus, the Theil index for 28 provinces and covering years from 1998 to 2005 was obtained from Li and Xu (2008).¹⁶

The industrial output for each province is measured by the *gross industrial output value* (GIOV), which reflects the total volume of final industrial products and industrial services provided within one year. This measure includes the value of finished products, intermediates and external processing income. It is supposed to catch an overall scale of the yearly industrial production¹⁷. The capital stock (CAPI) is measured by the *total assets* value that in most Statistical Yearbooks can be obtained in the same table as the gross industrial output value¹⁸. The total assets refer to all economic resources owned or controlled by the enterprises. The variable includes working capital, long-term investment, fixed and other assets.¹⁹ Employment is captured by the *annual average employed persons* (EMPI). The measure refers to whole labour force of enterprises, including full-time, part-time, seasonal workers, as well as foreigners and from SARs areas, like Hong Kong, Macao and Taiwan. It catches the average number of persons employed everyday during one year²⁰.

4.1. Empirical strategy

The theoretical and empirical arguments about the relationship between inequality and economic growth underline that inequality does not always have a direct effect on economic growth – whether negative or positive. The growth of the economy is influenced by a variety of factors, among which inequality appears rather of a secondary importance and operating through various indirect channels. However, in a great share of existing empirical studies on inequality and economic growth, the relationship is assumed to be direct. The analysis of the channels of influence and their correlation with

¹⁵ China Statistical Yearbook 2007 is available online at <http://www.stats.gov.cn/english/statisticaldata/yearlydata>

¹⁶ Li and Xu (2006) provide data for 1998-2006, while data for 2007 were extrapolated linearly.

¹⁷ It is obtained from the yearly China Statistical Yearbooks, chapter *Industry*, table *Main Indicators of All State-owned and Non-state-owned Industrial Enterprises above Designated Size*. The exact Chapter and table numeration vary depending on the yearbook. For CSY 2007, it can be found in table number 14-4.

¹⁸ In the case of year 2007, it is in the same table 14-4.

¹⁹ Data for years 1999-2006 is obtained directly from the CSYs, while for year 1998, as this indicator is lacking, it is calculated by summing up the total fixed assets and the total circulating funds.

²⁰ For years 2005-2006, this statistics is available in the above-mentioned table of the Statistical Yearbooks, *Main Indicators of All State-owned and Non-state-owned Industrial Enterprises above Designated Size*. For years 1998 – 2004, the indicator was calculated according to the formula provided by the Chinese National Bureau of Statistics, which is the ratio of value added of industry and overall labour productivity (both reported by NBS).

inequality, additionally to its relationship to economic growth would just be too complex to be tested empirically²¹. Therefore, standard empirical equation includes the dependent variable standing for economic growth (for instance, growth rate of GDP *per capita*), and explanatory variables: income *per capita*, investment measure, economic inequality measure and other potential controlling variables²². This form has been used by Alesina and Rodrik (1994), Deininger and Squire (1998), Li and Zou (1998), Barro (2000), Keefer and Knack (2000) in a pooling OLS, while among panel data analyses are for example Forbes (2000), Reuter (2004) or Li and Zou (1998)²³. All studies use cross-country data over a period of time of 3 to 15 years. In the case of China, Lu (2002) uses a slightly modified model as he analyses rural-urban consumption disparities. Ravallion (1998) is also interested in consumption and uses a consumption growth model²⁴ for testing the effects of asset inequality on growth. Reuter (2004) is specifically interested in the nature of the relationship between inequality and growth, and tests it using a growth model where inequality is directly influencing growth as an explanatory variable.

Since this study focuses on the effect of intra-provincial inequality on economic growth, it follows the empirical approach and analyzes the relationship between inequality and economic growth within a standard framework. However, we do not intend to derive implications of causal nature in the relationship between inequalities and economic growth. The specific interest of this paper is to analyse the type of this relationship (positive/negative/nonlinear) instead. Therefore, unlike Reuter (2004) we are not going to introduce any instrumental variables (we were unable to find reliable data), while the period of 8 years is definitely too short to allow any time-series approach to testing causality. It is assumed a dependent variable and inequality, an independent variable.

The regression model is as follows:

$$\Delta GIOV_{it} = a_1 + a_2 \Delta CAPI_{it} + a_3 \Delta EMPI_{it} + a_4 INEQ_{it} + \varepsilon_{it}, \text{ where} \quad (1)$$

t – time, i – province. This regression has been estimated for Theil index (INEQ) in both levels in growth rates. Each time growth rates are calculated as log at time $t-1$ subtracted from the log of a variable at time t . This model is essentially equivalent to Reuter (2004)

The rationale behind this formulation is the following. Theoretical approaches suggest that inequalities may influence accumulation, and thus enable/prohibit new investments. This justifies the presence of CAPI variable in the model. Secondly, theory also implies that higher inequalities are (dis)incentives to enhancing/lowering the labour productivity, which justifies the presence of EMPI variable. If these two variables were absent, omitted variable bias would be very likely. To overcome potential heteroscedasticity, generalised least squares (GLS) estimation technique was employed. In addition, since the number of observations is not too high (28 provinces over 8 years), we believe graphical analysis of the results may increase the reliability of the results.

4.2 Results and interpretation

The first batch of regressions tests the hypotheses regarding the *levels of inequality* (using THEIL and SQTHEIL measures of inequality). The results exposed in Table 1 suggest a positive and significant relationship between intra-provincial inequality and provincial economic growth. At the same time,

²¹ Knowles (2005) provides a comprehensive comparison of the empirical literature on inequality and economic growth and concludes that usually the causal link is assumed to be from inequality to growth.

²² *E.g.* average schooling years for male and female.

²³ Li and Zou (1998) took a five years panel data and fixed and random effects estimators. Forbes (2000) used a five years panel data and a generalized method of moments (GMM) estimator, while Reuter (2004), a thirteen years panel data and the GLS method, as well as lagged values and relative changes variables.

²⁴ Cass-Koopmans-Ramsey model extended by inequality measure. In his model, growth is the explained variable, while inequality influences growth directly as one of the explanatory variables. However, he uses a causal direction from growth to inequality.

Table 1 Regression results of testing the presence of a relationship between inequality and growth.

Dependent variable: Δ GIOV

Model	1	2	3	4	5	6	7	8
Hypothesis		Linear relationship			Quadratic relationship			
Δ CAPI	0.16**	0.54***	0.42***	0.46***	0.61***	0.73***	0.57***	0.25***
Δ EMPI	0.38***	0.23***	0.25***	0.24***	0.04	0.9	0.19**	0.37***
THEIL		0.47***		0.17				1.31***
THEIL_1			0.44***	0.45**				
SQTHEIL					0.64**		2.75**	-3.22***
SQTHEIL_1						1.09***	-1.56	
No of observations	224 (28)	224 (28)	196(28)	196(28)	224 (28)	224 (28)	196(28)	224 (28)
Wald statistic	38.1***	323.1***	194.2***	247.9***	50.8***	145.7*	155.9	66.5***

Notes: Cross-sectional time-series FGLS regression. Estimations without a constant, correlation among panels assumed (AR1), ***, ** and * denote significance at 1, 5 and 10 percent level respectively.

Column (1) represents the basic growth decomposition without any inequality measure. Although the coefficient of relative change in average capital stock (Δ CAPI variable) is significant, it is much lower in (1) than in any other specification (the difference is statistically significant). In every specification the linear coefficient on inequality is significant. Upon the inclusion of a lag it turns out insignificant suggesting that this relationship is rather persistent (explanatory power of Theil index and its lag is comparable). These results change if a quadratic function of inequality is chosen – although the size of the inequality estimator increases, the relative employment variable (Δ EMPI) turns insignificant. This is probably a statistical artefact, as it would be difficult to provide economic justification for such findings. However, including both the linear and the quadratic term – reported in column (8) confirms that the relation has an inverted U-shaped character. At the same time, results are very susceptible not only to variables inclusion (like in the case of Theil index lags), but also estimation method. Panel corrected heteroscedasticity and autocorrelation consistent standard errors – as suggested by Prais and Weinstein, produce counterintuitive results (negative CAPI and insignificant EMPI coefficients). GLS without AR(1) specification gives similarly fruitless outcomes. The rationale for AR(1) assumption is given by the behaviour of GIOV growth rates (see chart in the appendix). To have more confidence in these results the fit of this model with respect to provinces and time specific effects is depicted on a chart below.

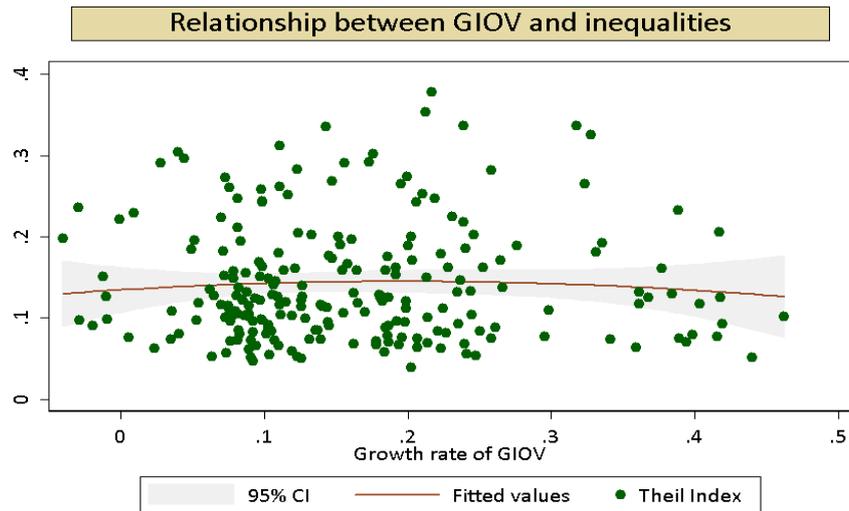


Figure 8. Regression results (panel estimates, all provinces)

Indeed, these results seem to confirm the inverted U shape only marginally, neither are they strongly affirmative to the suggested positive relationship. However, as suggested earlier in the text, China is highly differentiated. Therefore, we sought to see the evolution in time and evolution within each of the provinces. These relations are depicted on charts below.

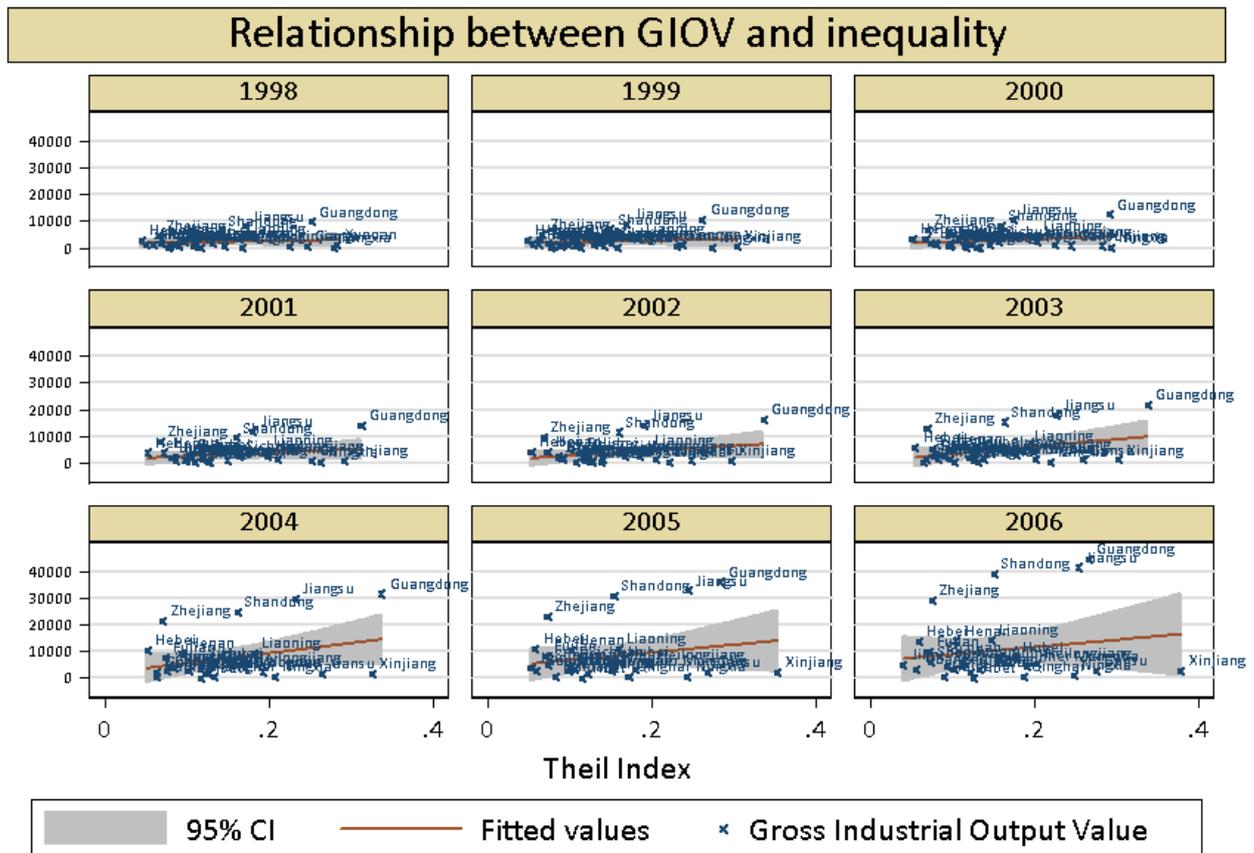


Figure 9. Regression results (by year)

The analysis of the main relationship shows that the significant and positive link can be confirmed for four cases only (provinces Zhejiang, Shandong, Jiangsu and Guangdong). Also, if one looks

at averages, one may believe that in China inequalities are constantly increasing. At the same time – in aggregates – economic growth rate remains high. It may appear that, despite that the results found are in approximation forming a straight line, suggesting a linear relationship, they are in reality the left hand side of the inverted-U curve. That would imply that China, despite its very high inequality level, has not yet reached the critical inequality defined by the inflection point of that curve. It may seem that, at the current development stage of the Chinese economy, inequality is an engine of growth. Some researchers and policy-makers claim a part of a likely explanatory schema implies that inequalities enhance growth by income concentration in the hands of the rich, who save and invest more. Consequently, this is believed to lead to an increase in innovation and a higher growth. However, case-by-case analysis demonstrates that patterns among provinces are indeed very differentiated, which is depicted on the charts below (these charts are lines instead of dots and fitted lines with confidence intervals for the reasons of clarity).

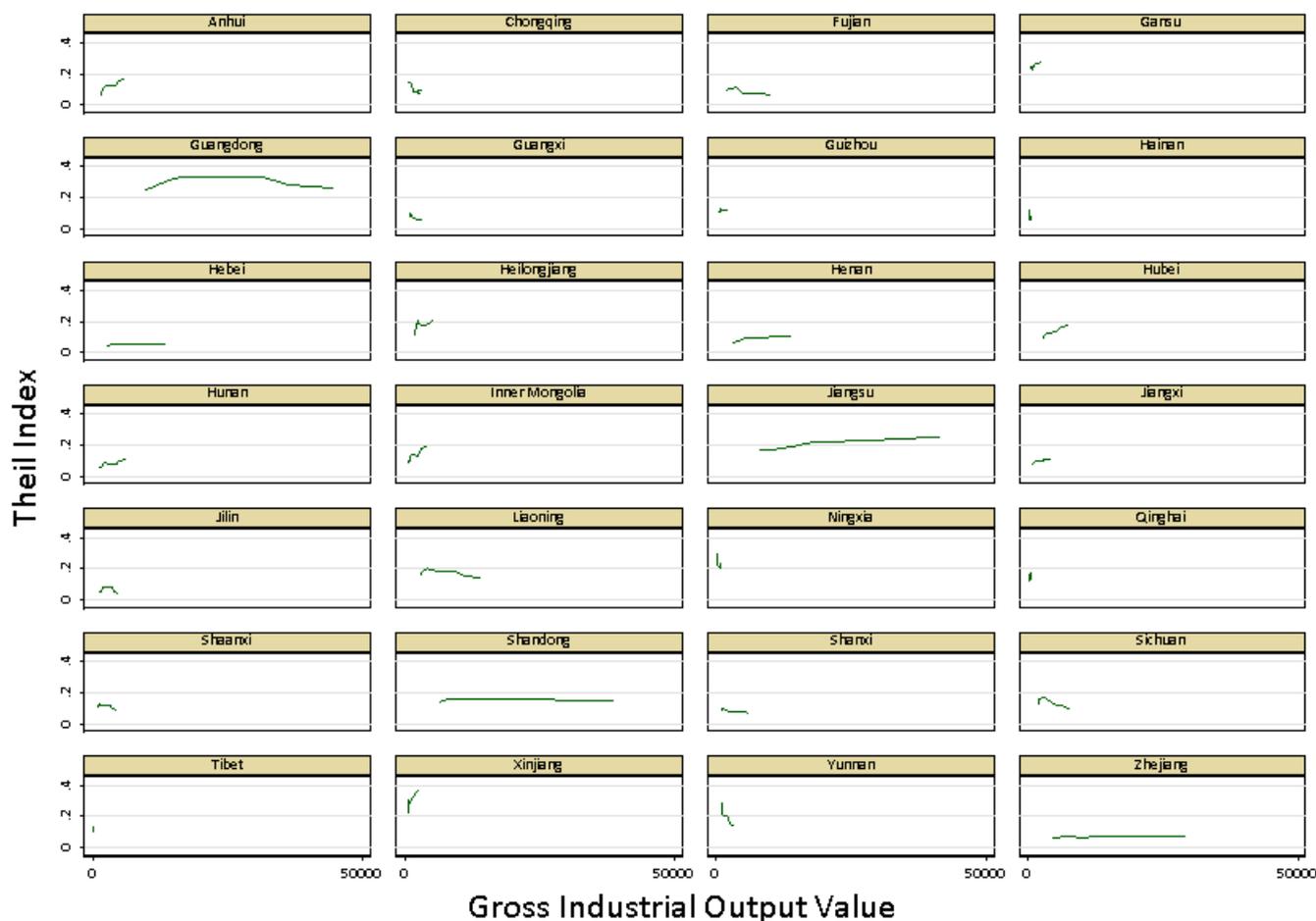


Figure 10. Regression results (by province)

The above scheme shows that many of with the largest improvements in as far as income levels are concerned (eg. Shandong and Zheijlang) have fairly stable and even relatively low inequalities scores. In the second group of provinces suggested by the previous chart Jiangsu demonstrates a still increasing trend, while and Guangdong confirms the inverted U shape pattern. At the same time, quite a few poorer provinces observe either increasing or ... decreasing patterns. In addition, some provinces experience high volatility of intra-provincial inequalities, which is may either reflect actual significant changes in institutional schemes (for example implementations of some redistributive policies) or data inconsistencies (eg. Heilonglang and Inner Mongolia). Summarising, this case-by-case analysis

combined with year-by-year one suggests that four cases actually “drive” the results obtained from an econometric study: Zhejiang, Shandong, Jiangsu and Guangdong. They are depicted on the chart below.

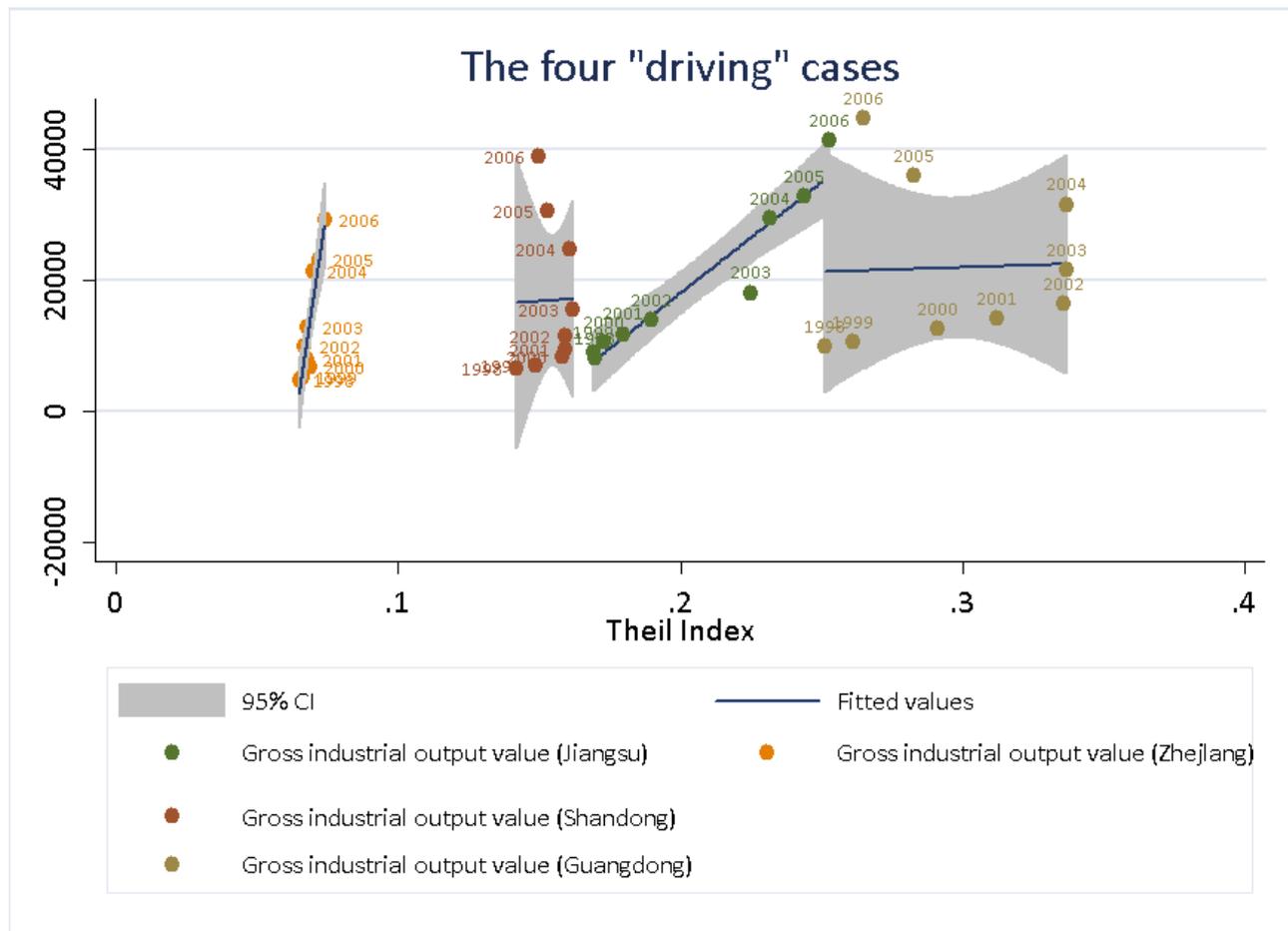


Figure 11. The four "driving" cases

The analysis of these four cases actually provides quite interesting insights. In the case of Guangdong (teal dots) the relation actually seems to be of inverted U shaped pattern. For Shandong we observe huge changes in GIOV with marginal changes in Theil Index. Jiangsu (green dots) seems to confirm the findings, but both the changes in Theil and in GIOV are rapid (low levels in the first half of the time period and high in the second), which might suggest some other phenomenon playing a role there. Zhejiang (teal dots) seems to be the combination of inverted U-shaped pattern (like in the case of Guangdong) and almost no change in inequalities (like in the case of Jiangsu).

The model would benefit greatly from extending the dataset (which is technically not feasible). As we demonstrated, the positive relationship between gross industrial output (GIOV) and inequality (THEIL) started to clearly emerge after 2002. This is a very interesting finding of the present research, as Reuter's dataset finishes in 2001. Although such conclusion may seem premature, this effect may be linked with China's accession to the WTO in December 2001, which jumpstarted the opening to the global economy. The first candidates among Chinese provinces for having benefited from the accession are located at the heart of coastal region; they are the most developed provinces and appear in the analysis as the ones with highest gross industrial output: Zhejiang, Shandong, Jiangsu and Guangdong. On the other hand, the analysis of four driving cases suggests that actually 2002-2004 is the period of most rapid changes (either trend reversion or relatively large changes in Theil index). Therefore, comprehending these phenomena topic requires further research.

Conclusions

China represents, in the broad sense, a transition economy, however its experience is unique in comparison with Central Europe, and results in an unexpected, unusual development process. China did not strictly follow any neoclassical prescriptions, seeing growth and development as a simple matter of adding more capital and labour. Its prices did not reflect the relative scarcity of goods. Institutions commonly recommended by the Western advisors were implemented in a different way, and capital markets were not formed. But China still performed well, even without following the privatization, marketisation or liberalization advices that are seen as key for achieving growth and transformation success - China succeeded in spite of not doing this and in spite it did not follow any of the prescriptions in the Washington Consensus. No one could expect that such a backward country as China would achieve so tremendous transformation results with this unsafe – or so was thought – strategy. By now, it is clear that the Chinese incremental reform model, or even the *Beijing Consensus* (Malik 2007) suited the needs of this particular economy and, combined with a steady economic progress, have lead to success. Indeed, China used extraordinarily the “window of opportunity” towards poverty reduction and economic progress, but at the same time, still experiences some of the highest inequality rates in the world.

China is a grandiose representation of the fundamental trade-off between economic growth and equity. As most economists have come to accept inequality as the price of growth, the degree of inequality necessary to always push forward a country's economy amount to a sacrifice to some when it remains acceptable to others. Will China, which seems to have very well tackled both the problem of absolute poverty and the one of economic growth, manage to graciously reduce its inequality level when time will come, without harming its unique economy? Will China on the long term prove that inequality can remain a motor of growth? This study proves that inequality enhances economic growth in China and any reversal of this trend seems a distant possibility with an open ending, as China is following its own, unique path of development.

This research casts a new light on the existing model. The first contribution lies in the usage of a *different, much more up-to-date dataset*. Contrary to Reuter, data for years 1998 to 2006 is used. This new data allows to catch distinctive recent phenomena such as the gross industrial output growing much faster in four coastal provinces (Zhejiang, Shandong, Jangsu and Guangdong) since 2002.

A second – but equally important – contribution pertains to the *consistency of the dataset used in this project*. Many researches on Chinese topics that use industrial data (specifically gross industrial output) are biased by some inconsistency. The problem appeared in 1998, when the Chinese government changed its coverage of industrial statistics. Before 1997, the industrial statistics were based on types of ownership. Since 1998, the coverage of industrial statistics in China was changed from the types of ownership to the size of enterprises. They are now categorized into two groups using a revenue threshold: all (state-owned or not) industrial enterprises with a revenue over 5 million yuan form the first group, while non-state industrial enterprises with a revenue from their principal business below 5 million yuan constitute the second. Freely available provincial data on industrial output (from 1998) covers only the first category, which combines state owned and private enterprises with a high revenue into one group. Previously, private enterprises were not included at all in the statistics, but state-owned enterprises with a revenue below 5 million yuan, now no more covered, were included. Mixing both types of industrial statistics may have seriously biased the analysis work performed in aforementioned research. This study does not have this problem.

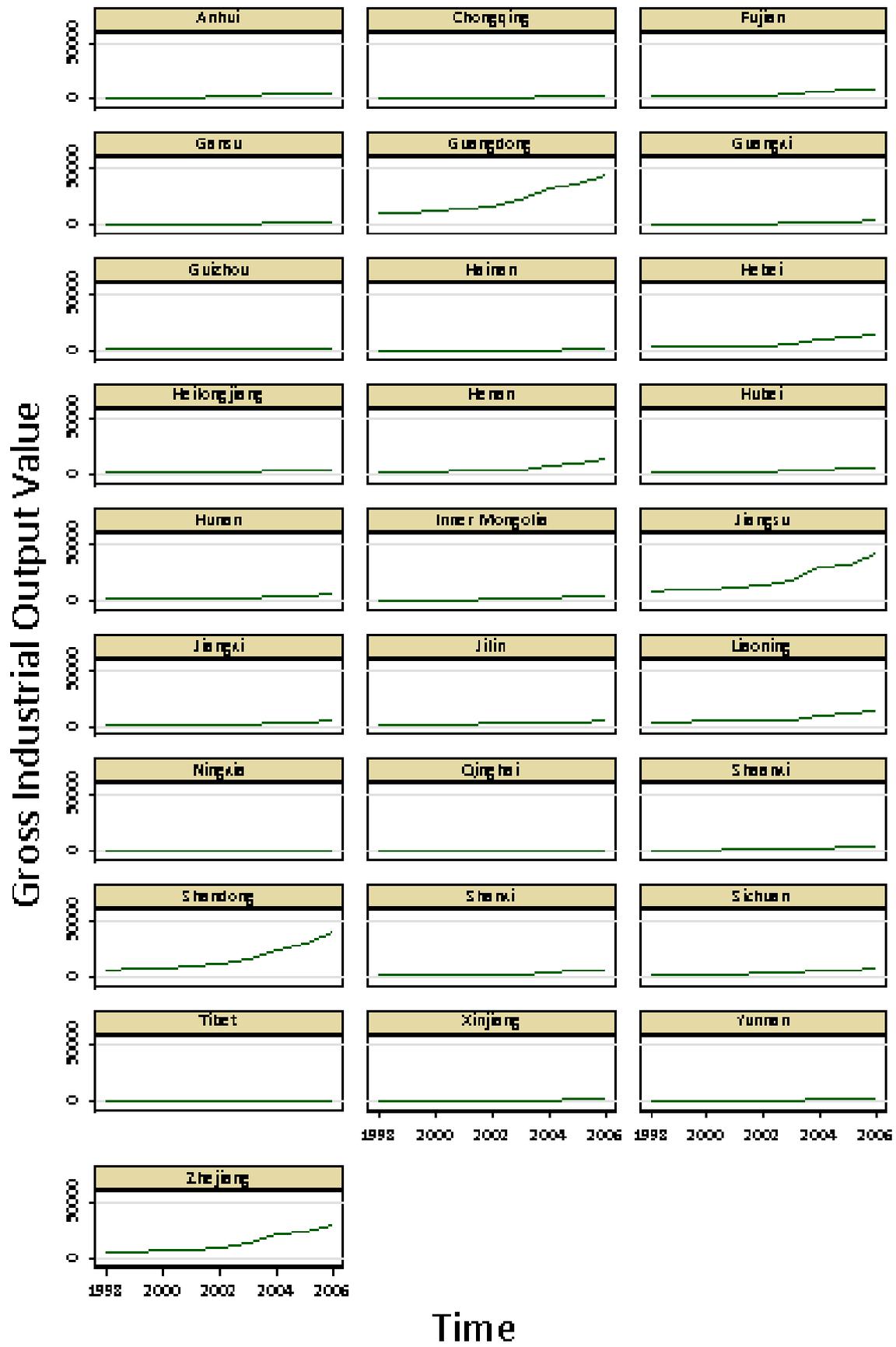
A third important contribution is the *larger coverage of provinces*. Contrary to many previous studies, such as Reuter's research, which covered 25 provinces, the author managed to get data on 28 provinces, mainly thanks to recent improvement of the National Bureau of Statistics of China.

One more important characteristic of this study is that the Theil index used as a measure of inequality, is prefectures level based, unlike in Reuter research, which is city level based. This allows to *capture differences between rural and urban areas* as both are covered within prefectures, whereas Reuter's city data used to calculate Theil index do not capture these differences. Furthermore, as the study is based on prefecture-level data, it *catches intra-provincial inequalities*. Research on the influence of intra-provincial inequalities on provincial economic growth is a relatively unexplored field, even in case of such a large country as China. However, a possible bias comes from the fact that the value of the factor used to calculate the Theil index was probably the average income within a given prefecture, although it is likely to differ between rural and urban areas. At that point, however, it seems important to underline that the author did not have an influence on the Theil index calculation, and used the available data while being fully aware of its limitations.

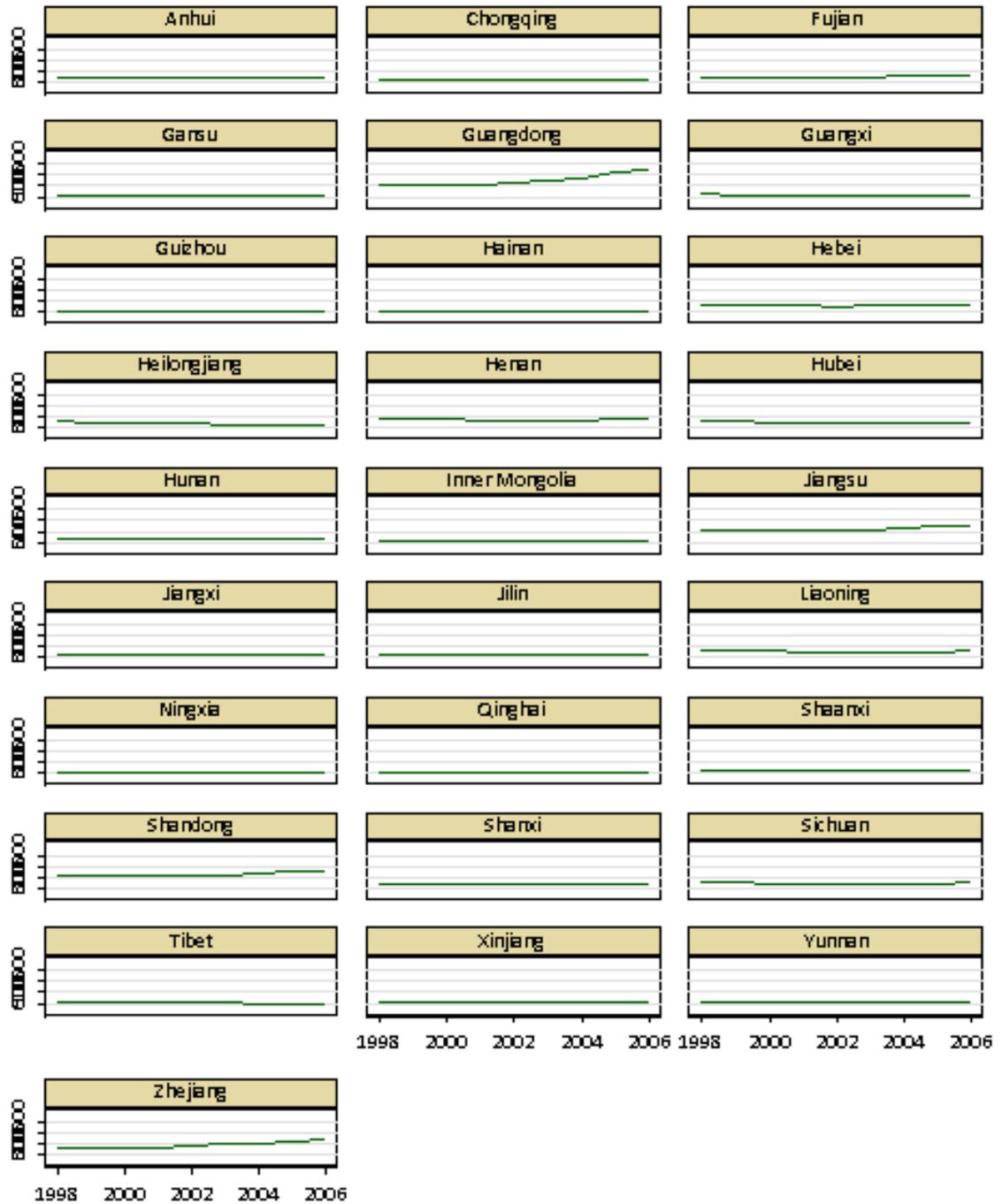
Lastly, and probably most importantly, despite the fact that this study applies an existing model, it is able to contribute to the existing knowledge on inequality-growth relationship in China by using a different, newer dataset. It is not a surprise that rising inequality may be an accompanying feature of the transition process from a socialist to a capitalist economic system, regardless of whether the transition is an economic success. Our findings show that indeed intra-provincial inequalities evolve in time in China, sometimes even confirming the inverted U shaped pattern suggested. Nonetheless, the patterns are not homogenous across the provinces, with some suggesting a negative relationship.

China's size and its diversity imply that income disparities are a multi-dimensional phenomenon. They appear between rural and urban areas, between coastal and inland territories, between regions, provinces, and obviously, between individuals. The inverted U shaped pattern implies directly that there is – so to say – an optimal level of inequalities (at least from the perspective of fostering economic growth), which in itself should raise doubts on ethical (if not only scientific) level. In addition, even if for the sake of argument we assume, that causality runs indeed from intra-unit inequality to growth on an individual (provincial level), Chinese provinces are at different stages of development (using growth theory framework: they were at different loci of the steady state, potentially also different steady states). This would imply – on theoretical grounds – that every province has their own steady state path of the relation between inequality and growth. Therefore, comparing them means comparing essentially very different phenomena. Consequently, any results should be treated with caution.

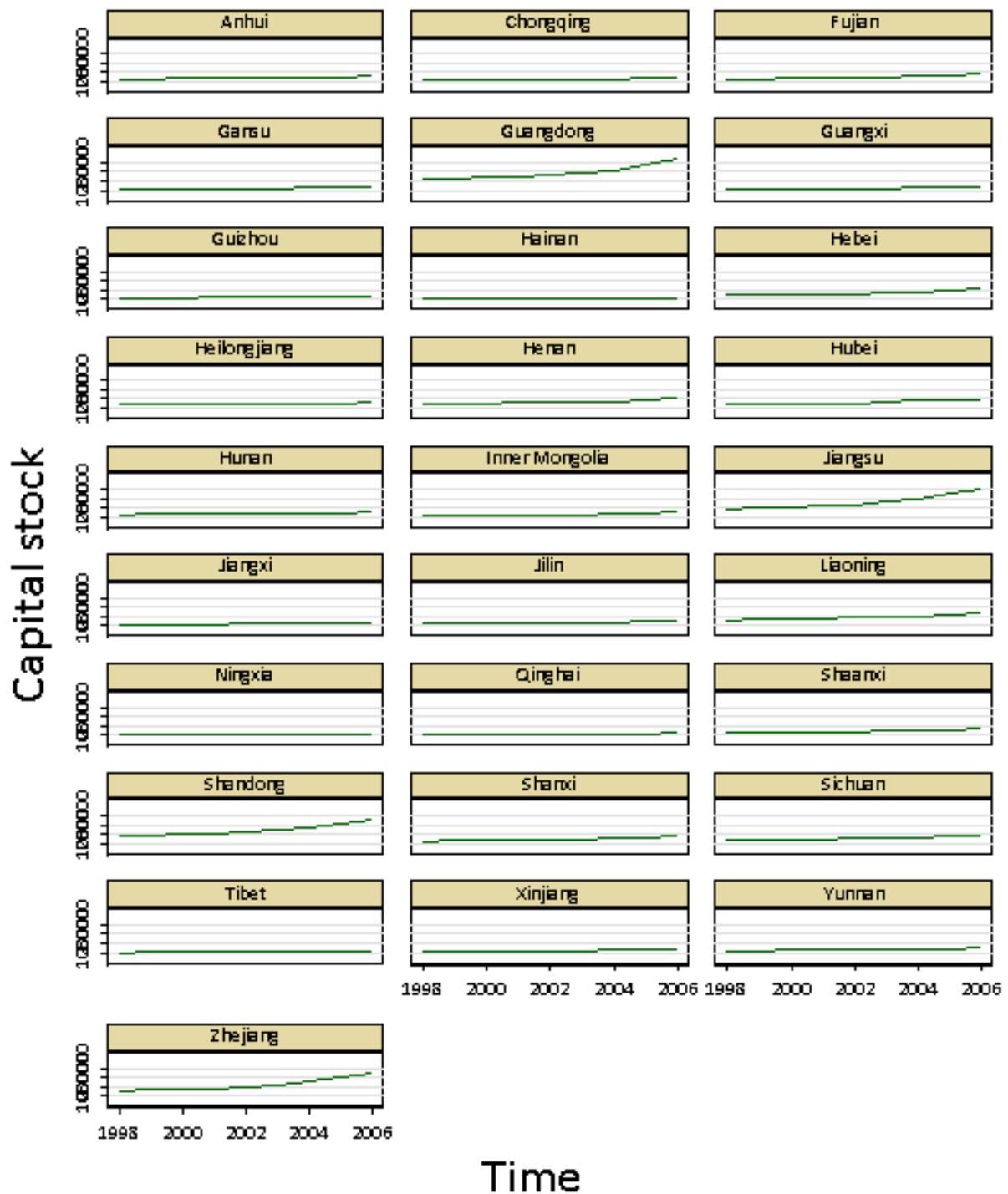
Appendix



Annual average employed persons



Time



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