

Xiaolu, Wang

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## Income inequality in China and its influencing factors

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Research Paper No. 2006/126

## **Income Inequality in China and its Influencing Factors**

Wang Xiaolu\*

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### **Abstract**

While the average level of income per capita has increased in China rapidly, income inequality is becoming a more serious problem that may threaten social stability and the sustainability of economic development. This paper examines the existence in China of an inverted U-shaped curve for income inequality and economic development (known as the Kuznets curve), and tests for the effects of a series of hypothesized factors influencing income inequality.

Panel data modelling based on provincial level data predicts an increasing trend of inequality in the future, but cannot confirm an alleviation of inequality in the long run. It is found that a series of factors relating to growth, institutional arrangements, income redistribution and social security systems, and provision of public goods and infrastructure, is either responsible for the increase, or contributes to the reduction, in inequality.

Keywords: inequality, China, Kuznets curve

JEL classification: O18, O53, P24

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\* National Economic Research Institute, China Reform Foundation, email: wangxiaolu@neri.org.cn

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UNU World Institute for Development Economics Research (UNU-WIDER)  
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

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## **1 Introduction**

During China's economic reform, especially since the 1990s, income inequality between rural and urban areas, among regions and between different social groups, increased rapidly. Gini coefficient in China was 32.0 in 1980, dropped to 25.7 during the period 1980-84, the initial stage of economic reform, then increased rapidly. In 1990, it was 35.5, and reached 44.7 in 2001 (World Bank 2004; WIID 2000). China is being transformed from a country with high equality in income distribution to one with large income gaps. According to the Gini coefficients in the World Bank 2004 report, China ranked the 85th (out of 120 economies). Nearest to China is a group of Latin American and Sub-Saharan African countries (32 out of 35), many of which have problems not only with a highly divided society, but also with long-term economic stagnation.

The deterioration of income distribution is a challenge to social justice, which can lead to social conflict, and further undermine economic growth. Of the 35 countries ranking below China, 13 had negative GDP per capita growth in 2002-03, constituting the majority of the 23 countries with negative growth. This is a warning that serious attention needs to be paid to the increasing income inequality.

This article attempts to answer the following questions. Is there likely an inverted U-shaped relationship (known as the Kuznets curve) between the level of economic development and income inequality in China, leading to less inequality in the future (Kuznets 1955). Furthermore, what factors are responsible for the widening income gap? What factors can reduce income inequality? Panel data analyses at the provincial level are carried out in the attempt to answer these questions. Policy implications are derived.

## **2 Literature review and hypotheses**

Fifty years ago, based on an analysis of historical data mainly from US, UK and Germany, Simon Kuznets (1955) raised his famous argument: income inequality in conjunction with economic development in the developed countries first tended to expand and then to shrink. This implies an inverted U-curve between the level of economic development and income inequality, known as the Kuznets curve. This has induced considerable debate in the half a century since the article published. Some economists have suggested that a widening income inequality is the necessary cost of economic development, and that there is no need to worry, as it will eventually be corrected by economic growth itself. This argument can be construed to imply that efficiency automatically leads to equity. However, other schools are seriously challenging this assumption on the basis of theoretical or empirical tools.

In fact, Kuznets himself does not imply that economic development would eventually and unconditionally reduce income inequality. On the contrary, he considers changes in income inequality to be the result of a series of economical, political, social and demographic conditions. He is critical of two different assumptions: first, that the later-blooming underdeveloped countries follow the development path of the industrialized countries and, second, that the contemporary developing countries are facing new set of problems that are totally irrelevant of the historical experiences of the industrialized

countries. He argues that both of these assumptions are to be questioned: what is needed is a careful analysis of past and present circumstances.

Kuznets also disagrees with the argument that the developing countries should show constraint and do nothing about the expanding income inequality, as was the case with the developed countries. According to this author, 'It is dangerous to argue that completely free markets, lack of penalties implicit in progressive taxation, and the like are indispensable for the economic growth of the now underdeveloped countries' (Kuznets 1955: 26).

Kuznets discusses the effects of a few factors on income inequality. Two important and correlated factors are industrialization and urbanization. He finds that under certain conditions, migration from the agricultural sector to non-agricultural sector and urban areas can lead to larger inequality, but reduce inequality afterwards. Changes in the saving rate, population growth pattern, and even political systems are also factors impacting on income inequality.

There have been many studies on income inequality after Kuznets. Some empirical studies, mainly in the 1970s, confirm the existence of the inverted-U curve (e.g., Paukert 1973; Ahluwalia 1976; Ahluwalia, Carter and Chenery 1976), but certain later studies indicate that this is not always true (e.g., Deininger and Squire 1996). Some authors argue that serious inequality causes political and social instability, and thus undermines investment and economic growth, as has happened in Latin America and Sub-Saharan African countries (Galor and Zeira 1993; Alesina and Perotti 1996; Rodrik 1997). However, if the inequality-induced social conflict eventually leads to political reforms promoting democracy and income redistribution, the country may be able to escape the trap of inequality and economic stagnation. This, however, is not a certainty for all countries (e.g., Acemoglu and Robinson 2002).

Several recent World Bank reports argue that economic growth plays a crucial role in poverty reduction, albeit with varying effects among countries, but the reports could not show a clear effect on the reduction of inequality. Furthermore, growth itself is, in fact, affected by severe inequality. Economic growth is a necessary but not sufficient condition in reducing inequality (World Bank 2001, 2003, 2004).

Bourguignon (2003: 17) concludes from a variety of country-data regressions that:

First, ... it may mean that the various channels through which growth affects distribution identified by economic theory are indeed valid but are more or less relevant depending on the initial conditions prevailing in a country. ... Second, country specificity may also mean that there is ample room for policy intervention in determining the distributional consequences of growth.

Based on the literature, we can assume that the fluctuations in income inequality associated during certain stages of economic development, as Kuznets proposes, are the result of many different factors having either a positive or negative impact on income inequality. Some of these play a more prominent role at lower levels of economic development, and others become more active at the higher levels of development.

We can hypothesize that there are four groups of factors that have an effect on income inequality, and we test these hypotheses for the direction and effectiveness of their impact on income inequality in China.

The first group of factors relates to economic growth. People commonly assume that economic efficiency and equity are a conflicting, and tradeoff pair. When efficiency is the central concern, economic growth may be faster, but social equity may be ignored, or vice versa. On the other hand, however, economic growth may create more employment opportunities, raise the incomes of the poor and thus alleviate poverty. Therefore the direction of their effect is uncertain. The variables being considered are the economic growth rate, investment ratio (investment to GDP), level of FDI (as a proportion of GDP), trade-dependence (ratio of import and export values to GDP), urbanization ratio (the share of urban population in total), labour migration ratio (the ratio of rural immigrant workers to urban employment), and registered urban unemployment rate.

With respect to urbanization and rural-urban migration, Kuznets points out that migration from the agricultural sector to non-agricultural and urban sectors can at first cause the low-income urban groups to expand, resulting in higher inequality in urban communities without correspondingly reducing rural inequality. Later, however, the incomes of the migrants, or of the next generation, can increase, thus reducing urban inequality. Furthermore, low-income rural population is reduced when massive migration occurs, resulting in a reduction of urban-rural inequality. This effect may be more evident in China because surplus rural labour is a serious problem. Urban unemployment rate reflects the growth of employment opportunities from the reverse direction.

The second group of factors relates to income redistribution and social security systems. Income redistribution under government guidance can reduce inequality, but its effectiveness depends on the rationality and efficiency of the system. In this study, the author tests the effects of the net transfer payment scheme amongst provinces operated through the fiscal system (see Wang and Fan 2003, 2004). Nevertheless, two issues should be noticed: first, net transfer payments might have played a role in reducing regional income disparity other than reducing inequality within provinces, but this cannot be tested by the panel data model in the current study. Second, other studies have shown that the current fiscal transfer system is not well designed and its function is not clearly defined. This might have undermined its effectiveness on the reduction of inequality (see, e.g., Wong 2005).

In the second group are income distribution schemes such as the basic pension system, the unemployment benefit system and the medicare system which are applied in urban areas (coverage does not extend to most rural areas). These systems have been established in recent years, and their effectiveness still needs to be tested.

The third group of factors is the provision of infrastructure and other public goods. A large volume of the literature stresses the positive effect of public education on the reduction of income inequality, because education can increase the stock of human capital within middle- and low-income groups and improve their employment and income-earning ability. Public infrastructure, such as transport and telecommunication facilities, may also benefit this group by bringing them more opportunities for employment and self-development. The variables being tested include the average years

of schooling, the density of highway and railroad network, and the telephone coverage rate.

The fourth group includes factors relating to institutional arrangements. China, along with other transitional economies, has experienced the privatization of public properties. In market economy, private property is an important means of earning income; consequently, privatization can lead to larger income inequality. However, there are also cases showing a reduction of income inequality from market development (see, e.g., World Bank 2003). The market-oriented rural reforms in the 1980s significantly increased rural incomes in China and reduced the urban-rural income gap at the time. Development of urban private sectors in other more advanced marketized areas in later periods also contributed to job creation and poverty reduction. By contrast, unemployment was observed as an important source of poverty and inequality in certain less market-oriented areas. In this context, the marketization index by National Economic Research Institute (NERI) (Fan and Wang 2001, 2003, 2004) is used to test its impact on income inequality.<sup>1</sup>

Inappropriate government intervention in the operations of enterprises, inadequate government levies and corruption have been criticized in China. These faulty institutional interventions may play role in income inequality. When political power is used in the allocation of resources without adequate public monitoring, it induces rent-seeking behaviour and leads to unfair income distribution. Three variables are used to test for possible effects: government intervention on enterprises (using the time proportion of entrepreneurs spend in dealing with various government departments), enterprises' non-tax burden (as a proportion of annual sales), and the 'grey income' index.<sup>2</sup> The first two variables are collected from the NERI survey data, covering more than 3,000 enterprises, and the grey index calculated from NBS data. All other data are from NBS (various years) unless otherwise identified.

### **3 Does the Kuznets curve exist in China?**

For an empirical analysis, timeseries data are insufficient for analysing the trends of income inequality. To carry out the analysis, the author uses panel data from 1996 to 2002 across 30 provinces (including the four autonomy regions and four municipalities that are under direct central administration; Tibet excluded due to shortage of data). There are variations among the different provinces, yet, due to their mutual history,

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<sup>1</sup> The author recalculates the indexes to make them basically comparable through the whole period, i.e., from 1997 to 2002. The 1996 indexes are estimated using a linear extrapolation method based on the later years' data.

<sup>2</sup> The 'grey income' is used to label income that recipients are unwilling to disclose. While not necessarily illegal income, however, they do relate to the latter. In circumstances of serious corruption and illegal income, the 'grey income' will certainly increase and may widen income inequality. The author calculates this index approximately from consumption expenditures in the following way: first defining the total final resident consumption expenses from the NBS provincial GDP account sheets as real resident consumption, then using the reported consumption expenses from the NBS urban and rural household surveys in different provinces, and the provincial urban and rural population data, to derive the reported resident consumption. The difference between the two types of consumption, as a percentage of the former, is defined as 'grey income index'. A higher grey income index may imply more serious corruption in the relevant province.

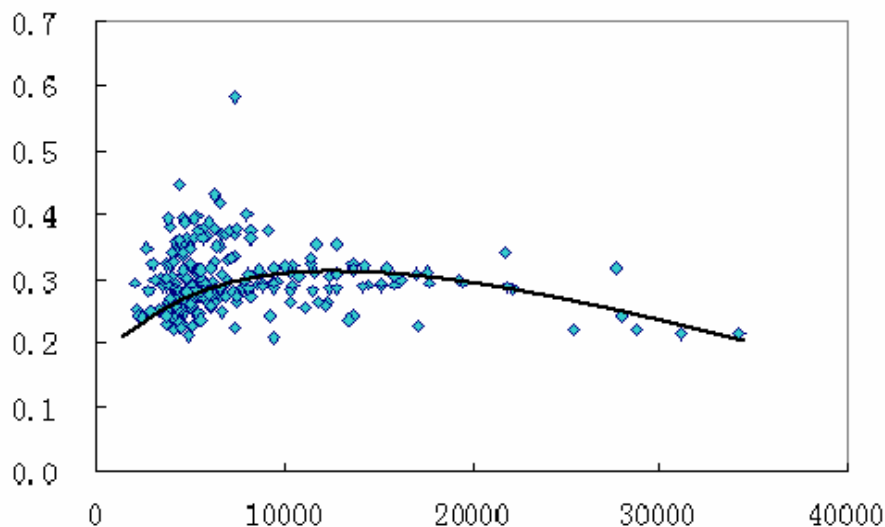
cultural tradition, economic and political systems, policy environment, similar experiences with economic reforms and common markets, their development paths should at least show some resemblance to each other. This is to say, the future of the less-developed provinces should, to a certain extent, resemble the present-day development level of the relatively more advanced provinces. This makes the panel data analysis valid.

Gini coefficients at the provincial level covering both urban and rural residents are not available. Instead, the author uses separate Gini coefficients for urban and rural residents as the dependent variables. For the urban-rural income gap, the author uses the ratio between per capita urban disposable income and per capital net rural income as the dependent variable. Thus, three functions are needed for income inequality in the urban areas, rural areas and between urban and rural areas, respectively.

Two alternative functional forms of the models are tested. Models 1.1, 2.1 and 3.1 (we can term these as ‘version-1’ of the models) include the provincial GDP per capita and its quadratic term at the LHS. This functional form implies an inverted U-curve, once it is concave, with symmetrical increasing and decreasing sections. However, the results of international empirical analyses obtain non-symmetrical curves (see, e.g., Deininger and Squire 1996). Some Chinese data also seem to indicate similar shaped curves (see Figure 1). For this possibility, a logarithm form of the models with a log-quadratic term GDP per capita is defined (models 1.2, 2.2 and 3.2; we term these as ‘version-2’). This functional form also allows non-decreasing trends of income inequality.

It is argued in the literature that a correct functional form should lead to zero inequality when income is zero (Wan 2002). For this reason, the constant term should be excluded for the ordinary quadratic models. However, given that the models are expected to represent real-world trends, it may be more important to keep the fitted values as accurate as possible within a realistic income range. For example, in the case of China,

Figure 1  
Relationship between rural Gini coefficient and GDP per capita (RMB)  
Provincial data, 1996 to 2002



Source: Data from NBS (various years).



this would probably imply RMB 1,000-10,000 per year. And whether they are accurate at the extreme values may not be important. The constant terms are, therefore, retained in order to avoid a forced change in the slopes of the fitted curve.

The followings are the two versions of the models respectively for urban, rural, and urban-rural income inequalities (fixed effect):

$$GINI_{u_{it}} = A_i^u + a_1 Y_{it} + a_2 Y_{it}^2 + \varepsilon_{it}^u \quad (1.1)$$

$$GINI_{u_{it}} = A_i^u + a_1 \ln Y_{it} + a_2 (\ln Y_{it})^2 + \varepsilon_{it}^u \quad (1.2)$$

$$GINI_{r_{it}} = A_i^r + b_1 Y_{it} + b_2 Y_{it}^2 + \varepsilon_{it}^r \quad (2.1)$$

$$GINI_{r_{it}} = A_i^r + b_1 \ln Y_{it} + b_2 (\ln Y_{it})^2 + \varepsilon_{it}^r \quad (2.2)$$

$$RUD_{it} = A_i^d + c_1 Y_{it} + c_2 Y_{it}^2 + \varepsilon_{it}^d \quad (3.1)$$

$$RUD_{it} = A_i^d + c_1 \ln Y_{it} + c_2 (\ln Y_{it})^2 + \varepsilon_{it}^d \quad (3.2)$$

where  $GINI_{u_{it}}$ ,  $GINI_{r_{it}}$ , and  $RUD_{it}$  are the urban and rural Gini coefficients and urban-rural income ratio, respectively, of the  $i$ th province in year  $t$ ,  $Y_{it}$  is per capita GDP of the  $i$ th province in year  $t$ ;  $A_i^u$ ,  $A_i^r$  and  $A_i^d$  are the constant terms for  $i$ th province in each model, respectively,  $\varepsilon_{it}^u$ ,  $\varepsilon_{it}^r$  and  $\varepsilon_{it}^d$  are the error terms.

Version-1 for urban and rural income inequalities indicates highly significant and positive estimates of per capita GDP, as well as significant and negative estimates of its quadratic term. This implies an inverted U-curve of income inequality. Some estimates of version-2 are insignificant, but all three models of version-2 have higher  $R^2$ s than their version-1 counterparts. Version-2 is therefore preferred. In particular, one should consider the fact that in version-1, Gini coefficients are forced to decrease earlier or later once a concave function is obtained, whereas version-2 leaves more room for different possibilities. Table 1 shows the results.

Table 1  
Estimates of the income inequality models (fixed effect)

|                         | Model 1.1               | Model 1.2             | Model 2.1              | Model 2.2              | Model 3.1             | Model 3.2          |
|-------------------------|-------------------------|-----------------------|------------------------|------------------------|-----------------------|--------------------|
| Dependent variable      | GINI <sub>u</sub>       | GINI <sub>u</sub>     | GINI <sub>r</sub>      | GINI <sub>r</sub>      | RUD                   | RUD                |
| Y                       | 1.98E-3<br>(10.765**)   |                       | 2.39E-3<br>(6.273**)   |                        | 6.08E-5<br>(3.423**)  |                    |
| Y <sup>2</sup>          | -3.52E-08<br>(-6.467**) |                       | -5.67E-8<br>(-5.044**) |                        | -6.71E-10<br>(-1.235) |                    |
| LnY                     |                         | 27.878<br>(2.174*)    |                        | 85.225<br>(3.067**)    |                       | -1.228<br>(-1.053) |
| (lnY) <sup>2</sup>      |                         | -0.9554<br>(-1.325)   |                        | -4.210<br>(-2.695**)   |                       | 0.0914<br>(1.376)  |
| C                       | 13.757<br>(13.161**)    | -144.942<br>(-2.543*) | 16.126<br>(7.465**)    | -393.023<br>(-3.182**) | 2.2632<br>(23.39**)   | 6.378<br>(1.246)   |
| R <sup>2</sup> (within) | 0.4829                  | 0.5460                | 0.1871                 | 0.2154                 | 0.1181                | 0.1236             |

Note: Numbers in parentheses are t ratios. \* are significant at the 5% level, and \*\* are at the 1% level.

According to the estimates, both version-1 and version-2 of the models predict increasing income inequality in urban and rural areas, and between urban and rural residents in a considerably long period, at least before reaching the per capita GDP level of RMB 20,000. According to version-1, income inequality in urban and rural areas, and between urban and rural residents, will reach the maximum at per capita GDP levels of RMB 30,000, 20,000 and 50,000, respectively, and then start to decrease. According to version-2, urban inequality will not diminish in the extreme long term, i.e., before a GDP per capita level of RMB 2 million is achieved. This is practically indifferent to a non-decreasing function. Rural inequality will achieve the maximum at a per capita GDP level of RMB 25,000 before contracting, and urban-rural income inequality will never decrease.

With regard to the above, we should note that most of the observations in per capita GDP are below the RMB 20,000 level except for the three mega cities, i.e., Beijing, Shanghai and Tianjin. This implies low creditability of the fitted Gini coefficient at per capita GDP level exceeding RMB 20,000, a level will not be reached at the national average until around 2012. Therefore, based on either versions 1 or 2, it is risky to predict a decrease in income inequality in the distant future.

To summarize, both versions of all three models predict an increase in inequality in the long term. Both the fitted urban and rural inequality functions show indications of the Kuznets curve only mathematically, but the decreasing phase cannot be predicted definitely for the foreseeable future. Version-2 of the urban-rural income inequality function is an increasing function and does not have the Kuznets characteristic.

#### 4 What factors are influential for income inequality?

In this section, the hypotheses of the four groups of factors affecting income inequality, mentioned earlier in this article, are tested with models expanded from the above. A number of variables are added to models 1-3 to estimate their effect on income inequality, and to test how much of the income effect on inequality can be replaced.

Again, both the ordinary quadratic version and the log quadratic version of the models are tested. They are called versions 3 and 4, expanding from versions 1 and 2, respectively. For simplicity, only version-4, i.e., the log functions, is specified in the following (fixed effect):

$$\begin{aligned}
 \text{GINI}_{it} = & A^u + a_1 \ln Y_{it} + a_2 (\ln Y)_{it}^2 + a_3 YR_{it} + a_4 RI_{it} + a_5 RFI_{it} + a_6 \text{OPEN}_{it} + a_7 \text{URB}_{it} + a_8 \text{UEM}_{it} \\
 & + a_9 \text{TRP}_{it} + a_{10} \text{RPES}_{it} + a_{11} \text{RUEM}_{it} + a_{12} \text{RMED}_{it} + a_{13} \text{RWD}_{it} + a_{14} \text{HWD}_{it} \\
 & + a_{15} \text{TEL}_{it} + a_{16} \text{ED}_{it} + a_{17} \text{MKT}_{it} + a_{18} \text{LM}_{it} + a_{19} \text{GI}_{it} + a_{20} \text{EB}_{it} + a_{21} \text{GY}_{it} + \varepsilon_{it}^u \quad (1.4)
 \end{aligned}$$

$$\begin{aligned}
 \text{GINI}_{it} = & A^r + b_1 \ln Y_{it} + b_2 (\ln Y)_{it}^2 + b_3 YR_{it} + b_4 RI_{it} + b_5 RFI_{it} + b_6 \text{OPEN}_{it} + b_7 \text{URB}_{it} + b_8 \text{UEM}_{it} \\
 & + b_9 \text{TRP}_{it} + b_{10} \text{RPES}_{it} + b_{11} \text{RUEM}_{it} + b_{12} \text{RMED}_{it} + b_{13} \text{RWD}_{it} + b_{14} \text{HWD}_{it} \\
 & + b_{15} \text{TEL}_{it} + b_{16} \text{ED}_{it} + b_{17} \text{MKT}_{it} + b_{18} \text{LM}_{it} + b_{19} \text{GI}_{it} + b_{20} \text{EB}_{it} + b_{21} \text{GY}_{it} + \varepsilon_{it}^r \quad (2.4)
 \end{aligned}$$

$$\begin{aligned}
RUD_{it} = & A_i^d + c_1 \ln Y_{it} + c_2 (\ln Y)_{it}^2 + c_3 YR_{it} + c_4 RI_{it} + c_5 RFI_{it} + c_6 OPEN_{it} + c_7 URB_{it} + c_8 UEM_{it} \\
& + c_9 TRP_{it} + c_{10} RPES_{it} + c_{11} RUEM_{it} + c_{12} RMED_{it} + c_{13} RWD_{it} + c_{14} HWD_{it} \\
& + c_{15} TEL_{it} + c_{16} ED_{it} + c_{17} MKT_{it} + c_{18} LM_{it} + c_{19} GI_{it} + c_{20} EB_{it} + c_{21} GY_{it} + \varepsilon_{it}^d \quad (3.4)
\end{aligned}$$

where GINI<sub>u</sub>, GINI<sub>r</sub> are urban and rural Gini coefficients, respectively; RUD is the urban-rural income ratio; YR is the GDP growth rate; RI is the investment ratio; RFI is the ratio of FDI in total investment; OPEN is the ratio of imports and exports to GDP, reflecting economic openness or trade-dependence; URB is the urbanization ratio; UEM is the registered urban unemployment rate; TRP is the per capita net transfer payment; RPE, RUE and RME are the coverage rates of the urban pension, unemployment benefit and medicare systems, respectively; RWD and HWD are the railroad and highway network densities; TEL is the telephone coverage rate; ED is the average year of schooling of the population above six years of age; MKT is the marketization index; LM is the labour migration ratio; GI is a variable of government intervention; EB is non-tax burden of enterprises; GY is the grey income index; A<sup>u</sup>, A<sup>r</sup>, and A<sup>d</sup> are the constants, and ε<sup>u</sup>, ε<sup>r</sup>, and ε<sup>d</sup> are error terms of the three models. The subscripts i and t represent province and year, respectively.

As data in a few provinces are missing for some of the years, these variables, the author estimated the data via linear projections.

Estimation results show that the logarithm version (version-4) has higher R squares than their version-3 counterparts, and the former has more estimates as significant in general, making it therefore preferred. Hausman tests favour the fixed-effect model for models 1.4 and 3.4, but the random-effect model for model 2.4. The variables that resulted in very low t ratios were dropped from the model. Considering that the quality of some data is not good (although being the best available), and that this may affect their level of significance, a 10 per cent significance criterion is accepted. Full results of both versions 3 and 4 are shown in the Appendix. The estimates from the preferred models are as follows:

$$\begin{aligned}
GINI_{u_{it}} = & -346.17 + C_i^u + 72.94 \ln Y_{it} - 3.731 (\ln Y)_{it}^2 + 0.0514 RI_{it} + 0.0602 RFI_{it} + 0.0343 OPEN_{it} \\
& + 0.3345 UEM_{it} - 0.0041 TRP_{it} + 0.1249 RPES_{it} - 0.0311 RUEM_{it} + 0.0192 RMED_{it} \\
& + 1.802 ED_{it} - 0.6531 MKT_{it} + 2.003 EB_{it} + 0.0509 GY_{it} + \varepsilon_{it}^u \quad (1.4)
\end{aligned}$$

$$\begin{aligned}
GINI_{r_{it}} = & -161.21 + C_i^r + 41.28 \ln Y_{it} - 2.166 (\ln Y)_{it}^2 - 0.2327 YR_{it} - 0.1360 RFI_{it} \\
& + 0.0074 TRP_{it} - 0.0450 RWD_{it} + 0.2544 TEL_{it} - 0.5118 MKT_{it} + \varepsilon_{it}^r \quad (2.4)
\end{aligned}$$

$$\begin{aligned}
RUD_{it} = & -30.64 + C_i^d + 7.839 Y_{it} - 0.4597 (\ln Y)_{it}^2 - 0.0053 YR_{it} + 0.0093 OPEN_{it} + 0.0002 TRP_{it} \\
& + 0.0035 RMED_{it} - 0.0035 RWD_{it} - 0.0085 HWD_{it} + 0.0403 TEL_{it} - 0.0658 ED_{it} + \varepsilon_{it}^d \quad (3.4)
\end{aligned}$$

Both the urban and urban-rural inequality models (1.4 and 3.4) show relatively high explanatory power; their R<sup>2</sup>s (within) are between 0.6-0.7. R<sup>2</sup> (overall) of the rural inequality model (random effect) is 0.43. Per capita GDP and its quadratic term, both in

logarithm, are significant in all three models. Meanwhile, a number of other factors are noted to have an impact on the Gini coefficient.

First, factors relating to economic growth show a possible, albeit unconfirmed, effect of expanding urban income inequality. In Model 1.4, the investment ratio, FDI ratio and trade dependence all have positive signs with t ratios above 1, although insignificant. Trade dependence has a positive and significant impact on urban-rural income inequality at the 1 per cent significance level, possibly due to its positive effect on urban incomes but less effect on rural incomes. Not surprisingly, urban unemployment rate is positively related with urban Gini coefficient, confirming that unemployment is one of the reasons causing inequality.

The effect of economic growth on rural inequality and the urban-rural income gap is negative, and significant for the rural inequality model at the 5 per cent level. These are likely due to the fact that higher economic growth generates more employment opportunities, thus helping to transfer rural labour to non-agricultural sectors, which reduces rural poverty.

The urbanization ratio and labour migration ratio are dropped from the models because of their low, although negative, t-ratios. Their insignificance is probably due to the reason discussed by Kuznets, i.e., their short-run and long-run effects on inequality have opposite impact. Another possible reason for the insignificance of the labour migration ratio may be that it originates within the destination provinces and thus includes cross-province immigrants but excludes emigrants to other provinces.

With regard to the second group, i.e., transfer payments and social security systems, the fiscal transfer payment is found to have a negative impact on urban Gini coefficient, but positive one on rural Gini and urban-rural income gaps, all significant at the 1 per cent or 5 per cent levels. This suggests that the transfer payment system was used by governments at the provincial and lower levels mainly in urban areas; and even when utilized in rural areas, it was not to help low-income residents (were, instead, targeted mainly to investments or to supplement the wage expenditures of local government and public sectors). However, according to our results, it does help low-income people in urban communities.

The objective of social security systems is to help reduce inequality. However, only the unemployment benefit scheme is shown to have a negative effect on the urban Gini, whereas surprisingly both the pension and medicare systems have positive and significant effects on urban Gini coefficient. The former effect once again indicates that unemployment is one of the factors causing income inequality, whereas the results for pensions and medicare suggest that the urban middle- and high-income groups may benefit more from these systems than the low-income groups. They may relate to shortcomings either in the system design or practice. According to the results of an unpublished NERI survey in 2005, the average medical expense reimbursement from the medicare system is higher for urban middle- and high-income groups than for low-income groups. The same is evident in the reimbursement ratio of the medicare system for per capita medical expenses, i.e., coverage is also higher for the middle-income group than for the latter. This indicates the existence of obstacles in the coverage of low-income residents within the system.

Figure 2.1  
The two urban inequality curves

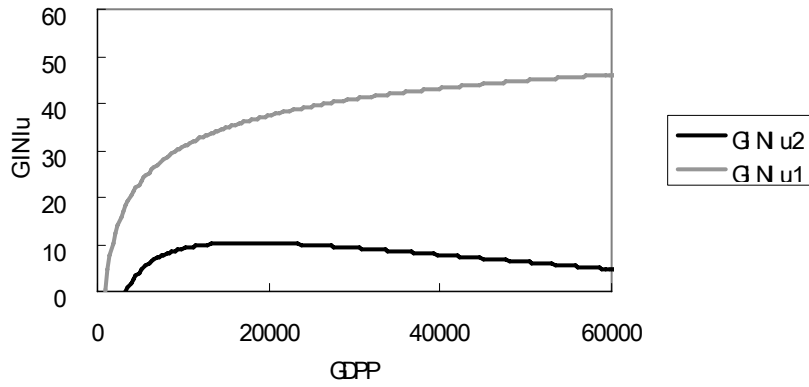


Figure 2-2  
The two rural inequality curves

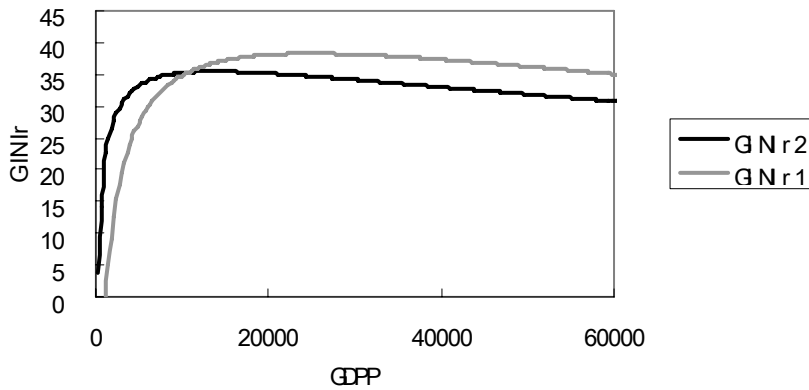
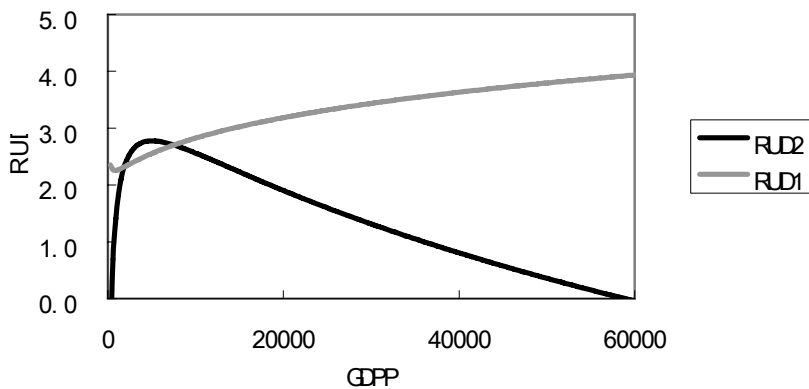


Figure 2.3  
The two urban-rural inequality curves



Note: The horizontal axis is GDP per capita (RMB), the vertical axis in Figures 2.1 and 2.2 indicates Gini coefficient (%), and that in Figure 2.3 indicates the ratio of urban per capita income to rural per capita income.

Source: Based on the modelling results.

In addition, these systems are yet to be established in most rural areas, and thus only urban residents benefit from these in general. This explains why the medicare system has a positive effect on urban-rural income inequality.

In connection with the third group, i.e., public goods and infrastructures, the average years of schooling surprisingly show a positive and significant impact on urban Gini. Its estimate for urban-rural inequality is negative, but insignificant. The former result is a strong indication of the fact that education opportunities are unequally distributed among different social groups, and the poor are disadvantaged with regard to education. The insignificance of the latter estimate may also indicate that delivery of rural public education is inadequate for reducing urban-rural inequality.

In terms of the relationship between transport and telecommunication facilities and income inequality, both the railroad and highway densities have negative estimates; the former on the rural Gini coefficient and the latter on the urban-rural income gap, both of which are significant at the 10 per cent level. These results suggest that the development of transport facilities helps rural residents. An unusual result is the positive and significant effects of telephone coverage on rural Gini coefficient and urban-rural income gap, although this is not the case for urban Gini. This may imply that telephone usage is basically limited to urban residents and middle- and high-income groups in the rural regions, where in 2003, only 45 per cent of the households had fixed telephones. However, the significant result, on the other hand, highlights the importance of telecommunications in the growth of household income.

Finally, with respect to institutional factors, the marketization index indicates a likely negative effect on both urban and rural Gini coefficients. The estimates are not significant, although both t ratios are greater than 1, and statistical tests reject the null hypothesis. The non-tax burden and the grey income index have positive estimates on urban inequality. The former is significant at the 5 per cent level, and the latter close to the 10 per cent level. These imply that inadequate government levies and corruption can change income distribution, leading to greater inequity.

The fitted curves of versions 2 and 4 for the three models are illustrated in Figures 2.1, 2.2 and 2.3, respectively. In each of the figures, the grey curve represents version-2 of the models (with only  $\ln Y$  and  $(\ln Y)^2$  at the LHS), and the black curve represents version-4 (with other explanatory variables). As one can see from Figure 2.1, there is a large difference between the two inequality curves for urban communities. This means that when more explanatory variables are included, a large portion of urban inequality, formerly explained by the GDP per capita and its quadratic term, is now explained by other variables. But as shown in Figure 2.2, the two rural inequality curves are similar, indicating that only a limited part of the rural inequality is accounted for by non-income variables. The two urban-rural inequality curves are quite similar at the lower income level, but diverge greatly at the higher income level. This indicates that the urban-rural inequality is heavily influenced by explanatory variables at the higher income levels.

The 2002 values of various variables at the provincial level are introduced in the estimated functions (models 1.4, 2.4 and 3.4) to indicate the magnitude of their contribution to income inequality. Note that the contributions to both urban and rural Gini coefficients are percentage points (defined similarly to the Gini coefficient, i.e., 100 per cent equals extreme inequality and 0 per cent perfect equality), and the contributions to urban-rural inequality are the values as a part of the urban-rural income ratio. Table 2 shows the calculation results.

Table 2  
Contribution of variables influencing inequality (2002)

| Influencing factors                              | Variable           | Average value | Contribution to inequality |         |             |
|--|--------------------|---------------|----------------------------|---------|-------------|
|  |                    |               | Urban %                    | Rural % | Urban-rural |
| GDP per capita (RMB, 1996 prices)                | Y                  | 10087         |                            |         |             |
| log GDP per capita                               | lnY                | 9.22          | 672.41                     | 380.56  | 72.27       |
| Square log GDP per capita                        | (lnY) <sup>2</sup> | 84.99         | -317.10                    | -184.09 | -39.07      |
| GDP growth rate (%)                              | GDPR               | 11.72         |                            | -2.73   | -0.06       |
| Investment ratio (investment/GDP, %)             | RI                 | 39.70         | 2.04                       | 0.00    |             |
| FDI ratio (FDI/total investment, %)              | RFI                | 6.48          | 0.39                       | -0.88   |             |
| Trade dependence (import&export value to GDP, %) | OPEN               | 29.02         | 1.00                       |         | 0.27        |
| Urban unemployment rate (%)                      | UEM                | 3.86          | 1.29                       |         |             |
| Net transfer payment (RMB, 1996 priceZ)          | TRP                | 106.94        | -0.44                      | 0.79    | 0.03        |
| Coverage of the pension system (%)               | RPE                | 20.75         | 2.59                       |         |             |
| Coverage of the unemployment benefit (%)         | RUE                | 64.06         | -1.99                      |         |             |
| Coverage of the medicare system (%)              | RME                | 60.32         | 1.16                       |         | 0.21        |
| Railway density (km/100 km <sup>2</sup> )        | RWD                | 24.87         |                            | -1.12   | -0.09       |
| Highway density (km/100 km <sup>2</sup> )        | HWD                | 17.74         |                            |         | -0.15       |
| Telephone coverage (sets/100 people)             | TEL                | 18.02         |                            | 4.58    | 0.73        |
| Years of schooling above 6 yrs old (person/year) | ED                 | 7.82          | 14.10                      |         | -0.51       |
| Marketization index                              | MKT                | 5.98          | -3.91                      | -3.06   |             |
| Non-tax burden to enterprises' sales (%)         | EB                 | 2.42          | 4.85                       |         |             |
| Grey income index (%)                            | GY                 | 6.56          | 0.33                       |         |             |
| Constant   | C                  | 1.00          | -346.17                    | -161.21 | -30.64      |
| Contribution of GDP p.c.+unidentified+error      |                    |               | 7.19                       | 34.49   | 2.55        |
| Sum contribution of other factors                |                    |               | 21.41                      | -2.41   | 0.42        |
| Aver. urban/rural Gini and urban-rural ratio     |                    |               | 28.60                      | 32.08   | 2.97        |

Notes: The railroad and highway densities are calculated as the length of network lines (km) per 100 km<sup>2</sup> of provincial territory, both converted into standard length of grade II highway. The conversion factor between railway and standard grade II highway is 14.7.

Gini coefficients measured in percentages, and urban-rural income ratio is the urban per capita disposable income to rural per capita net income.

Source: Calculated from the estimation results and NBS (2003, 2004).

Table 2 presents some noteworthy findings. For example, the urban income inequality is explained by the following:

- In 2002, the provincial average of the Gini coefficient is 28.6 per cent, of which three-quarters can be explained by factors other than GDP per capita;
- Education or the lack of it (should be explained as unequal opportunities of education) is the most important factor leading to greater inequality, and increased the urban Gini coefficient 14.1 percentage points;
- Another important factor is the combined effect of non-tax burden of enterprises and grey income index. This indicates inadequate government levies and corruption, and expanded the urban Gini coefficient by 5.2 percentage points;

- The current pension and medicare systems do not reduce urban inequality, but instead enlarge it, because middle- and high-income groups acquire greater benefit from these systems than low-income residents. The effect on urban Gini coefficient is 3.7 percentage points. This indicates that the current social security systems need to be improved and coverage extended to low-income groups;
- It is likely that urban inequality expands via short-run economic growth factors (investment ratio, FDI ratio and economic openness), the effects of which jointly contributed to the 3.4 percentage point expansion in urban Gini. However, economic growth also creates more employment opportunities and increases the income of all resident groups, a fact which is not fully reflected in this modelling exercise. The employment effect on inequality reduction is partially reflected from the reverse impact of urban unemployment rate, which the affected urban Gini coefficient by 1.3 percentage points;
- Of the factors reducing inequality, marketization seemingly plays an important role, making a 3.9 percentage point contribution to the reduction of urban Gini. But it does not fully offset other institutional effects that increase inequality. This implies that under a transparent, well-designed institutional framework, marketization may contribute to the reduction of inequality;
- The unemployment benefit system makes an important contribution to inequality reduction in urban areas, and reduces the urban Gini coefficient by 2 percentage points.
- Fiscal transfer payments reduce urban Gini by 0.4 percentage point. Considering its large scale, the contribution is modest. Furthermore, it increases rural inequality, and urban-rural inequality. This highlights the importance of redefining the functions of the fiscal transfer system and of increasing its efficiency for both supporting local development and reducing income inequality.

The above outcomes indicate that income inequality will not automatically decrease as the economy improves. To the contrary, the fluctuations in income inequality are the results of many factors, which may either increase or decrease inequality under certain conditions. The critical issue is to reform and finalize the public policy framework in order to maintain a relative equity society with low efficiency losses.

## **5 Conclusion and policy implication**

The empirical analysis in this study leads to the following conclusions and policy implications:

- The modelling analysis using China's provincial level panel data from 1996 to 2002 predicts a continued increase in income inequality in the coming decade, but cannot firmly predict a reduction of inequality in a foreseeable future, and thus is unable to verify the existence of the Kuznets curve in China;



- As discovered in this study, increases in inequality in China are closely related to a series of non-income factors;
- While short-run economic growth factors are shown to have possible positive effect on Gini coefficients, the creation of employment opportunities, resulting from by economic growth, is crucial for reducing inequality, especially in the rural areas, and for bridging the gap in rural-urban incomes;
- The positive and significant effect of education level on inequality implies the existence of unequal education opportunities among different social groups, between urban and rural residents, and among regions. The completion of nine-year compulsory education needs to be reexamined, and the necessity of twelve-year compulsory education may need to be considered;
- The density of railway and highway systems is observed to have negative effect on rural Gini and urban-rural inequality. In China, there are still 173 towns and townships and 56,000 villages not connected to the highway network (Ministry of Transportation 2004), and the lack of transport infrastructure is an important reason for rural poverty and income inequality. While huge investments have been made to freeway construction, the rural road systems needs improvement, for both reducing inequality and developing the economy;
- Institutional factors can have both positive and negative roles in income inequality. Marketization does not necessarily lead to increases in inequality, but may under certain circumstances lead to its alleviation. It is, therefore, important to improve the institutional framework supporting the market system, in order to eliminate inadequate government behaviour, and to fight corruption;
- Currently, development of the urban social security systems has shown a trend of ignoring the low-income urban groups, increasing the urban Gini coefficient. This trend needs to be reversed, and a minimal security system for rural residents should be considered; and
- While the current fiscal transfer system shows a minor effect on reducing urban inequality, it is noted to have increased rural, and urban-rural inequalities. This indicates inadequate usage of the transfer payments scheme, and its function needs to be redesigned.

## Appendix: Estimation results

| Dependent variable      | Model 1.3                      | Model 1.4                      | Model 2.3                     | Model 2.4                     | Model 3.3                      | Model 3.4                      |
|-------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
|                         | (fe)                           | (fe)                           | (fe)                          | (re)                          | (fe)                           | (fe)                           |
|                         | Giniu                          | Giniu                          | GINlr                         | GINlr                         | RUD                            | RUD                            |
| lnY                     |                                | 72.937<br>(3.092**)            |                               | 41.28<br>(1.878')             |                                | 7.839<br>(4.242**)             |
| lnY2                    |                                | -3.731<br>(-2.795**)           |                               | -2.166<br>(-1.699')           |                                | -0.4597<br>(-4.212**)          |
| Y                       | 0.000389<br>(0.986)            |                                | 0.00163<br>(1.935*)           |                               | -9.11E-05<br>(-2.639**)        |                                |
| Y2                      | -9.62E-09<br>(-1.247)          |                                | -3.22E-08<br>(-2.203*)        |                               | 1.04E-09<br>(1.570)            |                                |
| YR                      |                                |                                | -0.2280<br>(-2.319*)          | -0.2327<br>(-2.419*)          | -0.00681<br>(-1.751')          | -0.00532<br>(-1.396)           |
| IR                      | 0.1296<br>(2.925**)            | 0.0514<br>(1.116)              |                               |                               |                                |                                |
| FIR                     | 0.0390<br>(0.697)              | 0.0602<br>(1.118)              | -0.1758<br>(-1.543)           | -0.1360<br>(-1.714')          |                                |                                |
| OPEN                    | 0.0130<br>(0.409)              | 0.0343<br>(1.124)              |                               |                               | 0.00716<br>(2.675**)           | 0.00930<br>(3.599**)           |
| UEM                     | 0.1782<br>(1.059)              | 0.3354<br>(2.060*)             |                               |                               |                                |                                |
| TRP                     | -0.00371<br>(-2.618**)         | -0.0041<br>(-3.085**)          | 0.00760<br>(3.626**)          | 0.00738<br>(4.113**)          | 0.000384<br>(4.159**)          | 0.000238<br>(2.297*)           |
| RPES                    | 0.0889<br>(1.662')             | 0.1249<br>(2.407*)             |                               |                               |                                |                                |
| RUEM                    | -0.00796<br>(-0.517)           | -0.0311<br>(-1.948*)           |                               |                               |                                |                                |
| RMED                    | 0.0360<br>(3.133**)            | 0.0192<br>(1.631')             |                               |                               | 0.00367<br>(4.159**)           | 0.00352<br>(4.071**)           |
| RWD                     |                                |                                | 0.1012<br>(0.982)             | -0.0450<br>(-1.620')          | -0.00209<br>(-0.485)           | -0.00354<br>(-0.873)           |
| HWD                     |                                |                                |                               |                               | -0.0112<br>(-1.809')           | -0.00854<br>(-1.681')          |
| TEL                     |                                |                                | -0.0614<br>(-0.315)           | 0.2544<br>(2.427*)            | 0.0421<br>(5.468**)            | 0.0403<br>(5.487**)            |
| ED                      | 2.498<br>(3.516**)             | 1.802<br>(2.556*)              |                               |                               | 0.0173<br>(0.316)              | -0.0658<br>(-1.198)            |
| MKT                     | -0.7309<br>(-1.378)            | -0.6531<br>(-1.302)            | 0.8918<br>(0.812)             | -0.5118<br>(-1.047)           |                                |                                |
| EB                      | 1.844<br>(2.112*)              | 2.003<br>(2.389*)              |                               |                               |                                |                                |
| GY                      | 0.0827<br>(2.582*)             | 0.0509<br>(1.600)              |                               |                               |                                |                                |
| C                       | -3.675<br>(-0.712)             | -346.17<br>(-3.294**)          | 16.552<br>(2.523*)            | -161.21<br>(-1.698')          | 2.653<br>(6.728**)             | -30.643<br>(-3.924**)          |
| R <sup>2</sup> (within) | 0.5914                         | 0.6245                         | 0.2773                        | 0.2495                        | 0.6790                         | 0.6973                         |
| (between)               | 0.0011                         | 0.0003                         | 0.0051                        | 0.6541                        | 0.1903                         | 0.0008                         |
| (overall)               | 0.0231                         | 0.0222                         | 0.0165                        | 0.4312                        | 0.2436                         | 0.0399                         |
| Hausman test            | $\chi^2(14)=72.89$<br>p=0.0000 | $\chi^2(14)=74.11$<br>p=0.0000 | $\chi^2(8)=16.65$<br>p=0.0340 | $\chi^2(8)=10.05$<br>p=0.2615 | $\chi^2(10)=15.03$<br>p=0.1310 | $\chi^2(10)=42.53$<br>p=0.0000 |

Note: Numbers in parentheses are t ratios. Those with ' are significant at the 10% level, with \* are significant at the 5% level, and with \*\* are at the 1% level.

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