



DEPARTMENT OF ECONOMICS
DISCUSSION PAPER SERIES

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Number 816
December, 2016

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Abstract: The inequality of wealth in China has increased rapidly in recent years. Prior to 1978 all Chinese households possessed negligible wealth. China therefore presents a fascinating case study of how inequality of household wealth increases as economic reform takes place, marketisation occurs, and capital accumulates. Wealth inequality and its growth are measured and decomposed using data from two national sample surveys of the China Household Income Project (CHIP) relating to 2002 and 2013. Techniques are devised and applied to measure the sensitivity of wealth inequality to plausible assumptions about under-representation of and under-reporting by the wealthy. An attempt is made to explain the rising wealth inequality in terms of the relationships between income and wealth, house price inflation, differential saving, and income from wealth.

Keywords: China; wealth inequality and its decomposition; top-tail income correction; relationships between income and wealth; house price inflation; differential saving; income from wealth

JEL Classification: C80; D31

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1. Introduction

Which country in the world has the most dollar billionaires? If you are willing to believe the *Hurun Rich List 2016* and its sources, the answer is China, with 570 (mainland 470), now surpassing the United States by 30. Which city in the world has the most dollar billionaires? The answer is Beijing, with 100, now exceeding New York. Is this a matter for national pride or for policy concern?

Our main argument is that the inequality of wealth in China has increased rapidly in recent years. Prior to the economic reform that began in 1978, all Chinese households possessed negligible wealth. China therefore presents a fascinating case study of how inequality of wealth increases rapidly as economic reform takes place, marketization occurs, and capital accumulates. Wealth inequality and its growth deserve examination using data from two 21st century China Household Income Project (CHIP) surveys.

We proceed as follows. Section 2 of this chapter sets out the relevant literature on wealth inequality. Section 3 outlines the possible reasons why inequality is hypothesized to have increased. Section 4 explains the two, comparable, data sets which will be used to test the hypotheses. Owing to the economic differences between urban and rural China and the differences in survey design and implementation, we distinguish urban and rural wealth throughout, as well as reporting national wealth. The national wealth estimates require a weighting of the urban and rural samples.

In Section 5 we examine the level and structure of wealth in our two survey years, 2002 and 2013, and its growth over that period. Section 6 measures the distribution of wealth in the two years, by decile and by other indicators of inequality. This leads on in Section 7 to a decomposition of wealth inequality in the two years. Section 8 contrasts the urban and rural sectors, distinguishing between- and within-sector wealth inequality.

Section 9 attempts to explain the results, in particular examining the processes by which wealth inequality increased over the eleven years. Several hypotheses are tested. Section 10 provides two estimates of wealth inequality in 2013 - both without and with correction for under-reported wealth at the top of the wealth distribution. Section 11 draws out the implications of the research and concludes.

2. Literature

Little has been written on the inequality of wealth in China, mainly for lack of data. In the pre-reform period China had virtually no private property or personal wealth. However, the economic reforms – relating to land use, housing, finance, entrepreneurship, etc. – allowed Chinese people to become property owners. The changes were rapid, making it difficult for the accurate collection of data to keep up.

McKinley (1993) and Brenner (2001) analysed the inequality of rural (net) wealth using the 1988 and 1995 CHIP surveys respectively. Rural households did not (and do not) own their land; they merely had (and have) use of land - holding it on long leases. Nor was there an active rental market in the early stages of reform. The value of land to the household had to be calculated on the basis of output from their land. The policy of ensuring rough per capita equality of land holding within a local community made land ‘ownership’ an equalizing force. Financial assets had a disequalizing effect on total wealth but the effect was small as financial assets accounted for only 3% of wealth in 1988 and 11% in 1995. When measured on a comparable basis, the Gini coefficient of wealth in rural China rose from 0.30 in 1988 to 0.35 in 1995.

Urban analysis became possible only after the privatization of urban housing, which was begun in the early 1990s and was largely completed in the late 1990s. The first urban study was based on the 1995 CHIP survey (Gustafsson et al, 2006). Only 42% of

households reported a positive housing value: the urban wealth Gini reflected that source of housing inequality at this time of ongoing privatization. Official selling prices to urban resident households were very low and simply based on house area and not quality or location, but as market prices were established values became more unequal. In 1995 the ratio of market price to official selling price averaged 7.7 to 1 (Zhao and Ding, 2008: 128). Inequality of housing values was created because housing had been allocated according to official rank and political power. The windfall gains meant that housing became owned unequally.

Li and Zhao (2007) and Zhao and Ding (2008) examined rural, urban, and national wealth inequality by drawing on the 2002 CHIP survey, and Sato et al (2013) used the 2007 CHIP survey to examine housing inequality. Xie and Jin (2015) estimated China's inequality of household wealth per capita by means of the China Family Panel Study (CFPS) survey of 2012. However, China's degree of wealth inequality and its evolution deserve increasing research attention as this inequality becomes more pronounced, more obvious, and politically more important.

Our analysis in much of this chapter is fairly descriptive and is based on household microdata. Thomas Piketty recently published an important book *Capital in the Twenty-First Century* (2014). In it he analyzed why inequality of wealth has risen in western countries since about 1980 and - he predicted - will go on rising. It was central to Piketty's argument that wealth increases more rapidly than income, and that it increases more rapidly for the more wealthy. He used sources of data, such as statistics on estates and income tax, which differ from our's. Nevertheless, in Section 9 we shall attempt by means of household surveys to examine whether his ideas have relevance to China.

3. China's rising inequality of wealth and its possible causes

Table 1 reports the basic facts of national wealth inequality as measured by the Gini coefficient. Wealth inequality is shown both on a household basis (the first three columns) and on a household per capita basis (the last three columns). The Gini coefficient of household wealth per capita is generally 3 or 5 percentage points higher than that per household. Consider the per capita results. The Gini coefficient expressed in nominal terms rose from 0.51 to 0.62 over the period.¹ Expressing 2002 wealth in 2013 consumer prices makes little difference: the 2002 Gini falls by about one percentage point as a result. However, when wealth is corrected for province, urban and rural consumer price differences (based on Brandt and Holz (2006) and adjusted to our two years), the 2002 Gini becomes 0.45 and the 2013 Gini 0.57. Wealth inequality did indeed increase sharply, by some 11 or 12 Gini percentage points, over those eleven years, i.e. by about one percentage point a year.

To put China's inequality of wealth in international perspective we draw on Davies et al (2008). The authors report estimates of the Gini coefficient of household wealth in major economies, centering on the year 2000. The degree of wealth inequality is generally higher than that of income inequality. China's unadjusted Gini of 0.62 in 2013 is exceeded by no fewer than 20 of the 26 countries. The average value of the Gini for all the countries is 0.68. China's degree of wealth inequality is moderated by its remarkably high rate of home ownership in both urban and rural areas compared to most countries, and by its relatively high – almost universal - rate of land 'ownership' in rural areas. The inequality of wealth in China is not exceptional. What might be exceptional, however, is its rate of increase.

A combination of various factors might be responsible for this rising inequality of wealth. China has experienced very rapid physical capital accumulation: since 2000 the proportion

¹ The Gini of 0.62 in 2013 contrasts with a Gini of 0.76 in 2010 obtained by Li and Wan (2014) using the CFPS Survey 2010. This high figure is sensitive to the inclusion of some 300 implausibly or suspiciously large housing values. If they are excluded, the Gini falls by some ten percentage points.

of GDP that is invested has generally exceeded 40%. Wealth has therefore risen rapidly: the question is whether the increase in wealth has accrued unequally among households.

Inequality of household income per capita has grown fast, with the Gini coefficient rising from 0.42 in 2002 to 0.49 in 2007. It fell to 0.45 in 2013 but mainly because the ratio of urban to rural incomes narrowed: within both urban and rural China inequality rose (Luo et al, 2016). If wealth is positively related to income, the rise in income inequality over the period 2002-2013 might have contributed to the rise in wealth inequality.

A relative rise in the price of wealth goods – property and in particular housing – enriched those who held wealth and enriched most those who held most wealth. China has experienced a great surge in house prices, and this is likely to have increased the inequality of housing wealth. Financial markets in China remain imperfect, so providing opportunities to acquire wealth for those with preferential access to funds or with the ability to save a high proportion of their income. If the saving rate is positively related to income, this provides a channel that is likely to disequalise wealth holding.

The share of profits in national income has been high throughout the period, being 37% in 2007 (Knight and Ding, 2012: 164). Some profits accrued to the state, some accrued to shareholders, and some were saved. Some of this saving raised the value of personal holdings of company shares. If shareholding were unequally distributed among households, paid-out profits and capital gains would probably contribute to the rising inequality of household wealth in China. If there is a higher saving rate out of income from wealth than out of other income, that too can increase wealth inequality.

Such hypotheses to explain the observed rise in inequality of wealth are examined in Section 9.

4. The data

We decided to compare wealth inequality using the 2002 CHIP and 2013 CHIP national surveys. We opted for 2002 rather than 2007 because the 2002 CHIP survey is the first comprehensive data source on wealth and because it is more interesting to take a longer term view of trends in wealth. We need the 2002 and 2013 data to be as comparable as possible. Fortunately the variables relating to wealth are very similar in the two surveys. Thus the estimates of wealth distributions can be compared given appropriate weighting. The weightings used were almost the same as those applied generally in the CHIP 2002 and 2013 surveys to achieve national representativeness.²

Nevertheless, various issues had to be resolved. Some issues were simple to deal with. For instance, because the NBS changed its definition of ‘migrants’ in 2012, we reclassified the affected 2013 migrants to be comparable with 2002. All provinces in each survey are covered, with one exception. Because the 2013 Xinjiang sample lacks information on wealth, both Xinjiang samples are excluded. Thus, 21 provinces are included in 2002 and 14 in 2013.

Other issues were more difficult. Valuing wealth – and in particular housing and land wealth – inevitably encountered problems. Net housing is housing value minus housing loan. This is based on respondents’ reported values (of both owner-occupied and other houses) in each year, despite the weakness of the housing market in rural China.

No information was gathered in the surveys on the asset value of rural land: households merely have user rights to their land. It is possible to base the valuation of

² The CHIP samples were stratified by two criteria: urban/rural and east/centre/west. A set of sampling weights was created on the basis of population numbers in each stratum in 2002 and in 2013. Our samples are representative of urban and rural areas and of provinces, and representative within each province.

rural land (defined as cultivated land, pasture and forest) on reported net agricultural income. As is explained in the appendix describing the components of wealth, the formula for the conversion from net agricultural income to the value of rural land is based on previous research findings. Land assets in urban areas are defined to be zero.

Missing values had to be interpolated. For instance, where a housing value is missing, the imputation of housing value is on the basis of price per square metre at the local (county or city or municipality district) level. Local averaging is also used for missing financial assets. Where value of net income from agricultural operations is missing, we use the county-level value. Where consumer durables are listed but not valued, they are valued by using local consumer durable prices, derived from households which reported both values and quantities.

Comparative real wealth is obtained by reflatting 2002 nominal wealth by the NBS's consumer price indexes, so as to express the 2002 values in 2013 prices. We use province-level consumer price indexes, distinguishing also between urban and rural indexes. Throughout the paper our discussion of wealth is real wealth, i.e. measured at 2013 constant cpi-adjusted prices. The wealth concept of most interest is not total household wealth but household wealth per capita. Thus, when we refer to the term wealth, we mean real household wealth per capita.

It will become evident below that the growth of housing wealth has made a considerable contribution to the growth of inequality of household wealth. It is therefore important to examine the role of house price inflation in this process. The task is complicated by the fact that our two data sets do not constitute a panel.

Two approaches were tried. One was to use data published by the Ministry of Housing and Construction, which show the value of sales of commercialised buildings, and the

corresponding sold floor space, at district and county level. From this information it was possible to construct a housing inflation index. The other approach was to calculate house prices from the CHIP surveys for each of the urban and rural areas within each included province. Districts within cities were used in the case of metropolitan areas. Reflecting the data available, each subsample was divided into ranked subgroups based on average house value per square metre, and these subgroups were compared in 2002 and 2013. If an area was not included in both years another location with very similar housing price was substituted. The resultant house price inflation index was then applied to all households in each area. Robustness tests were passed. The results obtained by the two approaches were fairly similar. Our estimates of house price inflation are based on the second approach.

Because wealth in 2002 and 2013 is calculated in real terms using 2013 constant prices, 2002 house prices are already reflatd by the consumer price index, It would be incorrect to make this adjustment twice. Our interest is therefore in the relative house price inflation, measured as house price inflation divided by consumer price inflation.

At several points in this chapter household wealth is related to household income, both expressed in per capita terms. We follow the CHIP income definition in the 2013 survey except that imputed rents on owner-occupied housing are not included. Partly owing to the NBS's reform of statistics in 2012, income in 2002 and in 2013 was defined differently. We adjust the 2002 definition of income to be consistent with that of 2013.

We confine our analysis to the rural and urban samples of CHIP. Although there was a rural-urban migrant sample in both 2002 and 2013, the 2002 migrant questionnaire contained little information relating to income and, especially, wealth. Since our objective is to examine the rise in wealth inequality between the two years and its causes, it is necessary to exclude rural-urban migrants from the analysis. Insofar as the

rural surveys include households containing absent migrants, their wealth is covered by the rural questionnaire.

5. The level of wealth and its growth, 2002 and 2013

Table 2 has six columns: the first three (A-C) relate to the level of wealth per capita in 2002, the next two (D and E) to the level of wealth in 2013, and the final column (F, derived from D and B) shows the real annual growth rate of wealth over the eleven years. National, urban and rural wealth per capita are shown separately, and wealth is reported by type as well as total wealth.

We begin with urban wealth. Overall real net wealth per capita grew at 16.8% per annum. The fastest growth is seen in net housing (19.4%), followed by consumer durables and productive fixed assets. Further insight is obtained by Table 3, which shows the structure of household wealth in the two years. We see that the share of urban net housing in total urban wealth rose from 62% in 2002 to 78% in 2013. This was the most striking change. The next largest share was financial assets, but this share fell, from 27% to 14%.

Total net wealth per capita in rural China grew by 14.1% per annum (Table 2). This growth rate was fastest for net housing (17.9%), followed by financial assets (16.6%). Again, net housing was the predominant form of wealth holding, rising from 41% to 59% of the total (Table 3). The share of land wealth fell drastically, from 29% to 10% of the total.

Similar patterns are to be found at the national level. Overall net wealth per capita increased by 16.7% per annum, and net housing increased fastest (20.1%). The share of net housing rose from 53% to 73% of the total. Clearly, housing plays a central role in China's accumulation of wealth. It will be important to enquire whether it also plays a central role in the rising inequality of wealth.

6. The distribution of wealth, 2002 and 2013

The distribution of household wealth by wealth per capita decile is reported in Table 4. Consider first the urban decile shares. Remarkably, the poorest wealth decile of households held 0.44% of total wealth in 2002 and 0.58% in 2013. By contrast, the richest decile owned 32% in 2002 and 42% in 2013, a rise of 10 percentage points. In fact, only the top decile experienced a substantial increase in share over the period. A similar pattern is to be found in rural China. The top decile increased its share from 29% to 43%, and the shares of the lowest eight deciles fell. At the national level, the share of the richest decile rose from 37% to 48% and the share of the lowest nine deciles again fell.

The final column of Table 4 reports the national wealth per capita by decile. The ratio of the highest to the lowest decile was 32 times in 2002 and no less than 91 times in 2013. The ratio of the tenth to the ninth decile rose from 2.0 to 2.9.

Figures 1, 2 and 3 show the Lorenz curve for wealth per capita of urban, rural and national households. In each case, the 2013 curve is more bowed than the 2002 curve throughout its range, indicating a rise in inequality throughout the wealth distribution.

Table 5 reduces the Lorenz curve to a single figure, that is, the Gini coefficient. In urban China the Gini coefficient increased by 9 percentage points, from 0.47 to 0.56 over the eleven years. In rural China the increase was even greater, by 17 percentage points, from 0.38 to 0.55. Rural wealth inequality is almost the same as urban wealth inequality in 2013 whereas the rural Gini had been lower (by 9 percentage points) in 2002. The national Gini (rising from 0.49 to 0.62) exceeds both the urban and rural Ginis because of the difference between average urban and average rural household wealth per capita extends the wealth range.

Table 6 illustrates the degree of sensitivity of the Gini coefficient to the upper and lower tails of the wealth distribution. It highlights the importance of the share of the top wealth decile, both in its level and in its rise. In 2002 the Gini coefficient of wealth inequality falls by 11 percentage points if the top decile is excluded from the sample, and in 2013 its fall is by no less than 15 percentage points, from 0.62 down to 0.47.

Relating the share of wealth to income deciles instead of wealth deciles, Table 7 reports the share held by each household income per capita decile. With only a trivial exception, there is a monotonic rise in this share with income per capita. For instance, at the national level, in 2002 the share of the lowest income per capita decile was 2.9% and that of the highest decile 26.6%, and in 2013 the share varied from 2.9% to 36.1%. The ninth decile and, in particular, the tenth decile increased their share of total wealth in all three cases. Figure 4 shows clearly how inequality of wealth among income groups increased in the urban, rural and national samples.

7. Decomposition of wealth inequality, 2002 and 2013

Table 8 (2002) and Table 9 (2013) employ the standard method for the decomposition of inequality among different components, in this case forms of wealth holding. In each table, the first column shows the share of each item in total wealth, the second column the Gini coefficient for that item, the third column the concentration rate, reflecting the correlation between income of that item and total income. The final column is derived from the product of these three variables, yielding the result of most interest: the contribution of each item to overall wealth inequality.

We examine first the urban results. Net housing makes by far the greatest contribution to wealth inequality in 2002 (66%). It is followed by financial assets (24%). Productive fixed assets are very unequally held but their contribution to total wealth inequality is small (3%) owing to their small share of the total. The contribution of net housing is as high as 83% on

2013, increasing because all three components - its share of wealth, its concentration rate, and its Gini coefficient - rose. The contribution of financial assets fell over the period (to 11%) because its share of total wealth fell. Other wealth assets contributed only 6% to total inequality of wealth. The extreme importance of housing in explaining the inequality of urban wealth is clear.

Housing made the largest contribution also the rural wealth inequality. Its contribution increased from 48% in 2002 to 65% in 2013. By contrast, the contribution of land fell from 17% to 5%, essentially because the share of land in total rural wealth fell. The contributions of other wealth assets were both minor and stable.

The urban and rural results are reflected in the national pattern. The contribution of net housing rose, being 64% in 2002 and 78% in 2013. The only other form of wealth holding of importance was financial assets, and its contribution fell, from 25% to 13%, reflecting the rising contribution of net housing.

8. Wealth inequality within and between the urban and rural sectors

Table 10 uses the Theil index of inequality because it can decompose inequality precisely into between-group and within-group inequality, whereas the Gini coefficient cannot do so. The groups in this case are urban and rural China. In 2002 within-group inequality of household wealth per capita accounted for 78% of national wealth inequality, and between-group inequality for the remaining 22%. In 2013 the contributions were 75% and 25% respectively. The proportions of the total contributed by within-urban and within-rural wealth inequality fell a little, whereas the contribution made by the difference between urban and rural wealth rose correspondingly. The more important point, however, is that the Theil index, and both of its components, rose substantially between 2002 and 2013.

In both years the national Gini coefficient exceeded both the urban and the rural Gini coefficient because the difference between urban and rural household wealth per capita extends the wealth range. Recall that in 2002 the national, urban and rural Gini coefficients for household wealth per capita were 0.49, 0.47 and 0.38 respectively, and that in 2013 the corresponding values were 0.62, 0.56 and 0.55.

The ratio of urban to rural wealth per capita increased over the period, from 2.69 to 3.20. This widening spatial wealth disparity contributed to the rise in national inequality of wealth. That is consistent with the absolute rise (from 0.10 to 0.18) and the rise in the share (from 22.5% to 24.9%) of between-group inequality in the Theil index. The findings for the wealth Gini contrast with those for the income Gini: the urban-rural disparity in income per capita narrowed after 2007, and this was mainly responsible for the fall in China's income Gini during the period 2007-2013 (Luo et al, 2016).

9. Explaining the results

(i) The wealth-income ratio

How does wealth relate to income? Do households with higher income per capita have proportionately higher wealth per capita? If that is the case, what are the mechanisms that produce this result? Table 11 shows the wealth/income ratio by income decile (both expressed in per capita terms) in 2002 and 2013. Its information is more easily absorbed by examining Figure 5. Causation cannot be attributed to the relationship: causation might run from income to wealth or from wealth to income, or in both directions. Nevertheless, the results are informative.

We see from the figure that in 2002 the wealth/income ratio was very similar for the urban, rural and national samples. The ratio was highest for the poorest income decile but beyond

the second decile the ratio was fairly constant, declining only slightly. In China as a whole the average ratio was 4.9. The high ratio for the poorest two income deciles might be due to the egalitarian system of land holding and the possibility that income fluctuations raised the ratio of wealth (for instance, land and housing) relative to the income of households in temporary income poverty (for example, instances of negative net income). The analysis by income decile reveals a relationship that might otherwise be obscured.

The wealth/income ratio was generally higher in 2013, notably for the poorest and the richest households. In particular, the urban ratio increased beyond the median income level, and the same U-shape is seen in the national sample. A tendency for the wealth/income ratio to rise with income (beyond a low income level) is observable in 2013 but not in 2002. The country's wealth/income ratio in 2013 was 7.4, having increased rapidly - by no less than 2.5 - over the eleven years. China's ratio then exceeded the private wealth/income ratio in developed economies, which generally varied between 5 and 6 (Piketty, 2014: 50).

The same exercise is conducted for housing wealth/income ratio in Table 12. Again, the patterns are best absorbed in Figure 6. In 2002 the ratio is highest for the poorest income decile, is similar for all three cases, and is fairly constant beyond the second decile. For the 2013 sample, the middle deciles are pivotal. Beyond them, the rural ratio is fairly constant but the urban ratio, and thus also the national ratio, tends to rise. Thus, there is a tendency for the housing wealth/income ratio to rise with income decile in the upper half of the urban and national income distribution.³ Over the period 2002-2013 the housing wealth of households outpaced their incomes in China as a whole.

³ The curious fall in the ratio in the 2013 rural sample is likely to have an institutional explanation, e.g. the difficulty of owning more than one house in the village, or the difficulty of reporting a market-based rather than a cost-based value.

Table 13 reports the growth of real wealth per capita by income per capita decile, as does Figure 7. In the rural sample the lowest decile shows the highest growth rate and in the urban and national samples it is the highest decile that grows fastest. In the national and urban samples the growth rate rises after the third or fourth decile, and in the rural sample after the sixth. There is a tendency for China's income-rich to become relatively wealth-richer.

(ii) The role of house price inflation

Table 14 divides the increase in housing wealth into that part which is due to relative house price inflation and that part due to a real increase in housing. However, our measure of relative house price inflation necessarily includes the value of house improvements per square metre: it is not a pure price effect. Thus the real increase (the increase in housing quantity) represents an increase in the average number of square metres reported. Insofar as part of the increase in house values is due to housing improvements, these improvements represent a form of wealth holding that yields high returns to the investment.

In China as a whole, after eliminating the effect of relative house price inflation (74.3 % of the increase), 25.7 % is due to the increase in the volume of housing wealth. We see that the proportions are very similar to the national case in both urban and rural China. Much of China's rapid growth in housing wealth can be attributed to a relative increase in house values..

The effect of relative house price inflation seems important enough to examine its effect on the growth of household wealth as a whole. Thus, Table 15 divides the change in household wealth over the eleven years into that part which is due to house price inflation (relative to consumer price inflation) and other factors. In urban China, 62.4% of the rise in household

wealth is due to (relative) inflation of house prices and 37.6% to other factors. In rural China we see that 46.5% of the rise resulted from house price inflation and 53.5% from other factors. At the national level, 56.9% of the increase in household wealth reflects the relative house price index and 43.1% reflects other influences. We see the great importance of relative house price inflation for the growth of household wealth in China.

Figure 8 shows the housing price (per square metre) in 2002 on the horizontal axis, with regions (county, city, or district of municipality) of the country, ordered from the lowest priced region in 2002 on the left to the highest priced on the right; the prices (in 10,000 yuan) range from 0 to 0.6. The regions to the far right are the four included municipalities Beijing, Shanghai, Tianjin and Chongqing. The vertical axis (also measured in 10,000 yuan, but ranging from 0 to 4.0) shows the housing price of each region in 2013. The best fit to the points is curvilinear, curving upwards. Areas with initially higher house prices benefited from proportionately faster house price inflation.

Table 16 shows the impact of house price inflation on the Gini coefficient. Columns A and B report the Gini as previously estimated. Column C reports the Gini for 2013 if wealth is deflated by the relative rise in house prices between 2002 and 2013. Column D shows the rise in the undeflated Gini over the eleven years (B-C). Columns E and F measure the contributions to the rise in the Gini that are due to the rise in house prices (B-C) and to other factors (C-A). Relative house price inflation accounted for 55% of the rise in urban China, 17% in rural China, and 45% at the national level. Again, it is clear that the excess of house price inflation over consumer price inflation is very important to our story.

An underlying question that deserves further research is: why has house price inflation been so rapid? One possible explanation is the rapid increase in demand for housing and housing land in relation to its supply. Another possibility is that the housing market has grown stronger over time. Part of the house price inflation over this period might have

represented some market undervaluation in 2002 and subsequent movement towards equilibrium market values.

(iii) Differential saving

Another channel by which wealth inequality can increase is through differential saving: the rich might save a higher proportion of their income than do the poor. Saving is defined as disposable income per capita minus consumption per capita, with imputed rent excluded from both income and consumption. Expenditure on consumer durables is not part of measured consumption, being treated instead as an addition to wealth.

Table 17 and Figure 8 show the saving rate (i.e. saving as a percentage of income) by income per capita decile, and Table 18 and Figure 9 do the same by wealth per capita. Table 17 displays a monotonic rise in the saving rate in all six columns as we move up the income deciles. At the national level, in 2002 the saving rate rose from -15.8% in the lowest decile to 31.7% in the highest, and in 2013 it rose from -51.8% to 57.2%. Some negative saving is to be expected in the lowest decile if there is transient poverty.

Similarly there is a general upward trend in the saving rate as we move up the wealth per capita deciles. For instance, at the national level in 2002 the saving rate rises from 0.7 % in the lowest wealth decile to 20.8% in the highest, the corresponding figures in 2013 being 17.3% and 48.7% respectively. In both years the difference in saving rate between the lowest and the highest wealth decile exceeds 20 percentage points.

In general, even though wealthy households might on average be closer to their target wealth levels, the wealthier tend to accumulate more quickly. Thus, households with higher income, and also those with higher wealth, save a higher proportion of their income. These disparities in saving rates contribute to the rising inequality of wealth among households.

(iv) The ratio of wealth income to non-wealth income

Piketty (2014) examines the ratio of wealth to income (β) over time: $\beta = K/Y$. Income from wealth (Y_k) is a proportion (α) of national income: $\alpha = Y_k/Y$. This can be expressed as $\alpha = r\beta$ where r is the rate of return on wealth. The proportion α increases, by definition, if the return on wealth exceeds the growth rate of income (i.e. if $r > g$). Piketty argues that as α , the share of Y_k , rises, the inequality of wealth increases. As wealth accumulates, so the income derived from wealth rises. If the saving rate for income from wealth is higher than that for income from non-wealth, this generates proportionately faster growth of wealth for those with more of their income derived from wealth. Thus, *ceteris paribus*, the saving rate of households is greater, the higher is their ratio of wealth income to total income. Piketty (2014) regards this mechanism to be an important explanation of the rise in wealth inequality in the advanced economies.

Nevertheless, this effect is unlikely to be important in the Chinese case. We define income from wealth as interest, dividends and rent received.⁴ In 2002, for the urban sample the proportion of income from wealth was very low, at 4.6% for the urban sample, 3.0% for the rural sample, and for the two combined it was 3.6%; in 2013 the corresponding figures were 9.5%, 4.0%, and 6.3% respectively (Table 19). Thus, it is to be expected that in 2002 the proportion of income from wealth would have a negligible effect on saving, and even in 2013 only a small effect.

Is the proportion of income from wealth as a percentage of total income related to income level? Table 20 and Figure 10 report this proportion by household income per capita decile. Beyond the first decile, the proportion increases little as we move up the deciles in 2002 but tends to increase more in 2013. For instance, for the 2013 national sample the share

⁴ We exclude imputed rent because it dominates the series, especially in the lower income deciles, and imputed wealth income is unlikely to affect saving to the same extent as wealth income actually received.

rose from 3.8% in the lowest three income deciles to 8.7% in the highest three. However, even in 2013 the effect is modest.

In order to investigate Piketty's argument further, we estimated OLS equations with the saving rate as the dependent variable and the share of income from wealth as an explanatory variable. In 2013 at least, there is a higher propensity to save out of income from wealth than out of other income. However, this significant positive coefficient on income from wealth could be a non-causal association resulting from the positive relation between the share of income from wealth and income on the one hand and between income and the saving rate on the other hand. Indeed, the addition of income per capita in the estimated equation removed the significant positive effect of the share of income from wealth.

Table 20 and Figure 11 show that China's proportion of income from wealth, although rising with income, is not sufficiently large to have a substantial effect on income inequality. However, income from wealth is defined there as income from interest, profits and rents, and does not take account of income in the form of capital gain derived from the increase in real house prices. The rate of house price inflation relative to consumer price inflation averaged 14.9% per annum. Recall that housing wealth constitutes the major part of total household wealth, being 53% of wealth in 2002 and 73% in 2013 (Table 3).

NBS data indicate the average household real income per capita increased by 10% per annum between 2002 and 2013. It is therefore plausible that, when real house price inflation is included, the annual return on wealth exceeded the growth of income ($r > g$). It is moreover the case that the capital gains from housing wealth increase with income per capita. This is apparent from Table 21 and Figure 11, which show, by income per capita decile, the percentage increase in real house price inflation (derived for each household by the method explained above) over the eleven-year period in urban areas, rural areas and

China as a whole. In urban sample the relationship is U-shaped but the percentage increase rises with income beyond the fourth income decile. Owing to changing weights the rise is more pronounced at the national level. For instance, this rise is from 134% in income per capita decile 1 to 202% in decile 10.

If we accept Hicks' (1946: 178) concept of income, real capital gain during a period is included as income. Thus, a rise in real housing wealth is part of income. We have shown that this rise increases proportionately with income as conventionally measured. Once the role of real house price inflation is taken into account, it is possible that $r > g$. If that were the case, Piketty's mechanism would be relevant in China.

11. Correction for under-representation and under-reporting in 2013

China has enough dollar billionaires to influence measures of income and wealth distributions if they are included in the national household surveys on which estimates of inequality are based. However, it is most unlikely that any are included and, if any are included, that their wealth can be accurately recorded. It is worth exploring scientific ways of correcting for survey inaccuracies near the top of the income distribution.

Atkinson et al. (2011), using income tax data for major economies, wanted to measure the income share of the top 5 or 1 or 0.1%. They identified these precise top shares by imputing them using the Pareto distribution. They used the actual distribution below 5 (or 1 or 0.1) % but applied the Pareto distribution for the top incomes. Their justification was that 'a number of top income studies conclude that the Pareto approximation works remarkably well'.

The Pareto law for top incomes is given by the cumulative density function $F(y)$:

$$1 - F(y) = (k/y)^\alpha \quad (k > 0, \alpha > 0)$$

where α is the Pareto parameter. The corresponding density function $f(y)$ is:

$$F(y) = \alpha k^\alpha / y^{(1+\alpha)}$$

The key property of Pareto distributions is that the ratio of average income $y^*(y)$ of individuals with income above y , to y , does not depend on the income threshold y .

$$y^* = \alpha y / (\alpha - 1)$$

i.e., $y^*(y)/y = \beta = \alpha/(\alpha-1)$

Thus, if we know β , we can calculate α . A higher value of β implies a fatter upper tail.

Atkinson et al. (2011) assumed that records are accurate (i.e. there is no non-response and no under-reporting), but our concern is to conduct simulations that assume under-representation and under-reporting.

Consider first correction for under-representation. Given that top households tend to avoid a survey of this sort, reweighting can be used to correct for this non-response bias. Assume that non-response rate among top wealth households is (say) 50%. We can then expand the top 5% of households to become the top $7.5/102.5 = 7.32\%$, and so get a new frequency distribution of household wealth. It involves randomly repeating every second high wealth household. It is then possible to calculate the Gini with assumed non-response uncorrected and also corrected, and to measure the sensitivity of the Gini to this assumption.

Table 22 reports the results of this exercise. The rows indicate the top percentile to be expanded. The first row shows no expansion, then expansion of the top 0.5%, 1.0%, and 5.0% of the wealth distribution. The columns show the mean value of the simulated sample and its Gini coefficient if the top sub-sample is first doubled and then tripled. Consider the effect of doubling the number of wealthy households. The Gini coefficient of the actual sample is 0.62. It rises to 0.65 when the top 5% of households is doubled in number. If instead a tripling is assumed, the Gini rises to 0.67 in the case of the top 1% of households but actually falls to 0.66 in the case of the top 5%. As a kernel density function suggests, beyond about 1% of households a tripling of top households begins to dilute inequality.

Now consider correction for under-reporting of their wealth by respondents. Semi-parametric analysis can be used: actual data below the top $x\%$ and simulated data for the top $x\%$, with values taken from the corresponding Pareto function. The observed and the simulated frequencies should be the same at the changeover point. We now have the means to correct for possible under-reporting of household wealth. The actual value of β is derived from the survey. A higher value - a fatter tail - can be assumed on the assumption that there is under-reporting.

Table 23 shows four rows. In the first row there is by assumption no under-representation of the wealthy, i.e. no expansion of the richest sub-sample takes place. In the other three rows it is assumed that the number of those in the top 0.5%, 1.0% and 5.0% respectively of the sample are tripled. The value of β in the actual sample is 1.51. Column 1 shows the results if the value of β takes almost its actual value (assumed $\beta=1.5$), column 2 assumes a fatter tail ($\beta=2.0$) owing to assumed under-reporting of wealth, and column 3 a still fatter tail.

As might be expected, simply replacing the actual data with simulated data has little effect on the Gini coefficient. This is evident in the Gini value (0.613) of the (first row, first column) cell in the table. Looking across the first row, the Gini coefficient increases from 0.62 (actual distribution) to 0.64 when $\beta=2.0$ and to 0.66 when $\beta=0.25$. This row shows the degree of sensitivity of the Gini to possible under-reporting. When the assumption of under-reporting is combined with the assumption of under-representation, the effect is magnified. Consider a tripling of the top 1% of wealthy households (row 3). The Gini rises from 0.67 with the actual value of β to 0.69 with $\beta=2.0$ and to 0.71 with $\beta=2.5$. On that last assumption, the Gini coefficient is nine percentage points above its reported value. Expanding the top 5% is again found to dilute inequality.

The table cannot produce the ‘true, corrected’ Gini coefficient of wealth. However, it does show considerable sensitivity of the Gini to plausible assumptions of the degree of under-representation of and under-reporting by wealthy households.

A different method of correcting for underrepresentation at the top of China’s wealth distribution was employed by Xie and Jin (2015). They used the *Hurun Rich List 2012*, which reported the wealth of the thousand richest households in China. The Pareto distribution was then applied to estimate the wealth of the top 0.1% and, with appropriate weights, this was combined with wealth data from the CFPS national survey of 2012 for the remaining 99.9% of households (Xie and Jin, 2015: 209). The unadjusted Gini coefficient of wealth among households was estimated to be 0.64 and the Gini adjusted for underrepresentation at the top was 0.73 – a difference of 9 percentage points (Xie and Jin, 2015: table 2). Their estimates correspond well to our unadjusted Gini in 2013 (0.62) and our adjusted estimate when based on the assumptions that the top 1% is tripled and that $\beta = 2.5$ (0.71) – also a difference of 9 percentage points.

11. Conclusion

Between 2002 and 2013 (real) household net wealth per capita in China increased by 17% per annum, and net housing wealth by no less than 20% per annum. Our comparison of China's inequality of household wealth per capita in the two years showed that this inequality has risen rapidly in the twenty first century. For instance, the share of the top wealth decile increased from 37% to 48% of total wealth. A decomposition of the sources of wealth inequality showed the great importance of net housing in its share of wealth and in its contribution to wealth inequality, and to their rise over time: the share rose from 53 to 73% and the contribution from 64 to 79%.

This paper may be one of the first attempts not only to describe China's rapidly rising inequality of wealth but also to explain the phenomenon. Setting aside the poorest income groups, we found a tendency for the wealth/income ratio to rise with income in 2013, and for the wealth/income ratio to rise sharply over the eleven-year period under examination. The rise in relative house values played an important part in widening the distribution of wealth. The tendency for saving to rise with income and also with wealth provides a mechanism for wealth inequality to grow, with those having more income and more wealth saving more proportionately and thus accumulating wealth more rapidly. Although Piketty (2014) emphasized higher saving out of wealth income in his explanation of rising wealth inequality in advanced economies, China's income from wealth as a share of total income is still small and so its effects on saving can be only minor. However, if we regard real capital gain as part of income, Piketty's mechanism has credence in China.

Although China's inequality of income appears from the 2007 and 2013 CHIP surveys now to be on the decline, we have suggested reasons to expect that the inequality of

wealth will continue to rise. This rising inequality is a phenomenon of growing socioeconomic importance, and it deserves more extensive study in future.

Possible policy implications also deserve attention. These might include reform of the banking and financial system: reform can have the effect of reducing inequality in opportunities to secure access to funds, and so at least to reduce unfair wealth inequality. It is worth exploring the feasibility of introducing serious wealth and inheritance taxes. Corruption among the powerful is likely to have increased wealth inequality. The current anticorruption campaign (described by Manion, 2016) which was introduced in 2013 is likely to temper the rise in wealth inequality which would otherwise stem from this source.

APPENDIX: Measurement of wealth per capita in CHIP 2002 and CHIP 2013

In all cases we divide each component of wealth by the number of household members to obtain household wealth per capita. For 2002 we follow very closely the definitions set out in the data appendix to Zhao and Ding (2008: 140-4). The definitions used in 2013 are set out below.

Net housing value

Net housing value is calculated as housing value minus housing loan. As a few households (3.5% of all households) have more than one house, we sum the net value for each household - the reported market value of both owner-occupied and any other owned housing. For those who report housing area but not housing value, we multiply by the average value per square metre in the county. Those who have no ownership rights but report housing area are recorded as having a housing value of zero.

Net financial assets

The questionnaire asks separately for the total value of financial assets and for the separate components. Where the sum of the components is not equal to the reported total value, we use the sum of the components. Financial assets include spot cash, demand deposits, time deposits, endowment insurance, government bonds, other bonds, stocks, funds, futures, money lent (not including business loans), and other financial assets.

Non-housing debt

Comparing reported gross non-housing debt with the sum value of its components, we use the value of debt components when the two are not equal. Missing values are treated as zero.

Fixed productive assets

We take the estimated net present value of agricultural and non-agricultural fixed productive assets as reported in the questionnaire to record fixed productive assets.

Consumer durables

We take the estimated market value of household ‘movable properties’ from the questionnaire as the value of consumer durables, which comprises private (non-business) cars and various other consumer durables.

Rural land value

The variable household net agricultural income, recorded in the NBS survey, is used to calculate rural land value in 2013. However, because we lack direct information on net

household agricultural income in 2002, we follow Zhao and Ding (2008) in assuming that one acre of irrigated land equals two acres of dry land, and calculating net household agricultural income as gross agriculture income minus production costs. Furthermore, following earlier research we assume that 25 percent of net agricultural income comes from land and the return rate of land was 8 percent (McKinley 1993, Zhao and Ding, 2008). Therefore, we get land value from net household agricultural income times 25/8.

Other assets

The questionnaire items ‘other precious metals and jewellery (including gold ornaments)’, and ‘other assets’ are not included in either financial assets or fixed productive assets or consumer durables. Accordingly, we define these items as our variable ‘other assets’.

Total net wealth

The total value of net wealth is the sum of the wealth components listed and defined above: net housing wealth, net financial assets, non-housing debt, fixed productive assets, consumer durables, rural land value, and other assets.

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Table 1 Gini Coefficient of Wealth and Income Inequality

	Household level			Household per capita level		
	actual	cpi adjusted	ppp+cpi adjusted	actual	cpi adjusted	ppp+cpi adjusted
2002 wealth	0.453	0.441	0.402	0.506	0.494	0.445
2013 wealth	0.583	0.583	0.541	0.617	0.617	0.574
2002 income	0.384	0.371	0.329	0.437	0.424	0.370
2013 income	0.417	0.417	0.388	0.448	0.448	0.418

Source: In this and in all subsequent tables and figures the estimates for 2002 are derived from the 2002 CHIP survey and those for 2013 from the 2013 CHIP survey.

Table 2 Level and Growth of Wealth per Capita

Category	actual 2002 (A)	cpi adjusted 2002 (B)	ppp+cpi adjusted 2002 (C)	actual 2013 (D)	ppp adjusted 2013 (E)	annual real growth rate, 2002-2013 $F=(D-B)$
Urban						
Overall net wealth	36764	49517	36042	273841	195607	16.8
Financial assets	9921	13357	9731	38996	28697	10.2
Net housing	22639	30483	22146	214021	151423	19.4
Productive fixed assets	712	973	761	4041	3181	13.8
Consumer durables	3088	4160	3006	15071	11085	12.4
Other assets	648	878	652	2334	1708	9.3
Non-housing debt	-244	-334	-254	-622	-487	5.8
Rural						
Overall net wealth	13666	19576	20521	83489	80127	14.1
Land	3862	5590	5903	8263	8297	3.6
Financial assets	2076	2972	3122	16112	15906	16.6
Net housing	5680	8074	8406	49336	46430	17.9

Productive fixed assets	1192	1722	1812	4931	4772	10.0
Consumer durables	1072	1529	1602	5690	5550	12.7
Non-housing debt	-216	-311	-324	-843	-828	9.5
National						
Overall net wealth	21565	29815	25829	162829	128261	16.7
Land	2541	3678	3884	4819	4839	2.5
Financial assets	4759	6523	5382	25650	21238	13.3
Net housing	11480	15738	13105	117978	90192	20.1
Productive fixed assets	1027	1466	1452	4560	4109	10.9
Consumer durables	1761	2429	2083	9600	7857	13.3
Other assets	222	300	223	973	712	11.3
Non-housing debt	-225	-319	-300	-751	-686	8.1

Notes: In this and all subsequent tables and figures wealth is defined as household wealth per capita. Comparison with the NBS's macroeconomic data on total household financial savings (47 trillion yuan) in 2013 suggests that the survey estimate of household per capita financial savings when multiplied up by the population (3.5 trillion yuan) is an understatement.

Table 3 Structure of Household Wealth by Type of Wealth Asset (%)

Category	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
Overall net wealth	100	100	100	100	100.0	100.0
Land	-	-	28.6	9.9	12.3	3.0
Financial assets	27.0	14.2	15.2	19.3	21.9	15.8
Net housing	61.6	78.2	41.2	59.1	52.8	72.5
Productive fixed assets	2.0	1.5	8.8	5.9	4.9	2.8
Consumer durables	8.4	5.5	7.8	6.8	8.1	5.9
Other assets	1.8	0.9	-	-	1.0	0.6
Non-housing debt	-0.7	-0.2	-1.6	-1.0	-1.1	-0.5

Notes: In this and all subsequent tables and figures we show only cpi deflated wealth, i.e. both 2002 and 2013 wealth is reported in constant 2013 prices.

Table 4 Household Wealth Share by Wealth Decile (%)

Wealth decile from lowest to highest	Urban		Rural		National		National wealth per capita (yuan)	
	2002	2013	2002	2013	2002	2013	2002	2013
1	0.4	0.6	2.2	0.7	1.2	0.4	3742	7688
2	2.0	1.9	3.8	2.1	2.6	1.4	8223	22575
3	3.6	2.8	5.0	3.1	3.6	2.2	11584	33397
4	5.0	3.8	6.1	4.1	4.6	3.0	15003	45232
5	6.5	4.9	7.2	5.2	5.7	4.0	18858	59417
6	8.3	6.4	8.6	6.6	7.0	5.4	23577	77474
7	10.5	8.4	10.1	8.3	8.9	7.4	30210	104428
8	13.6	11.6	12.3	11.0	11.8	10.7	40365	148946
9	18.5	17.9	15.8	16.4	17.5	17.2	59001	238683
10	31.5	41.8	29.0	42.7	37.1	48.4	119630	701955

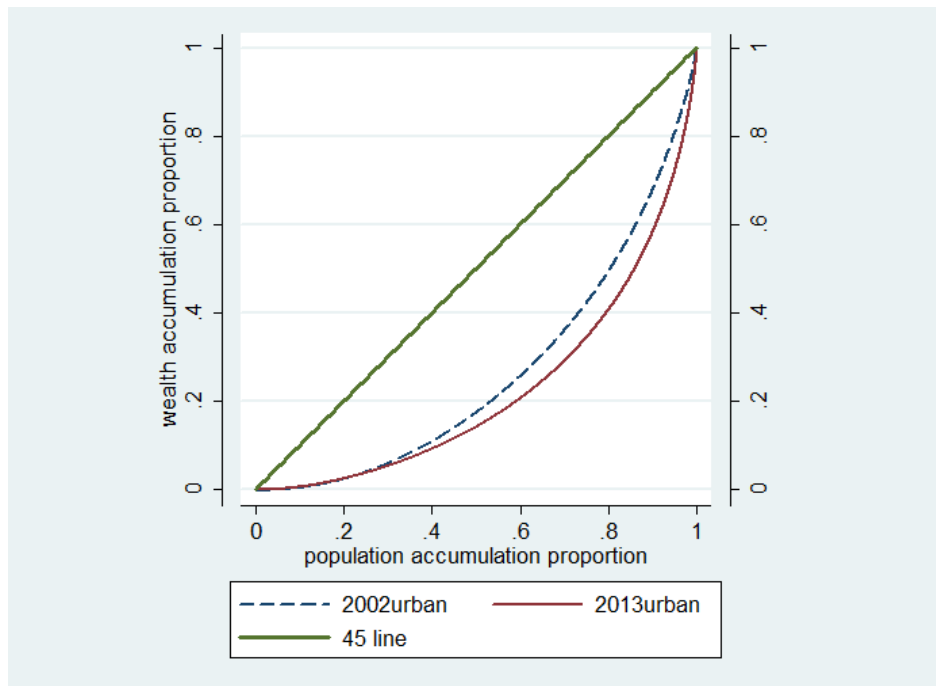


Figure 1 Wealth Lorenz Curves for Urban Households

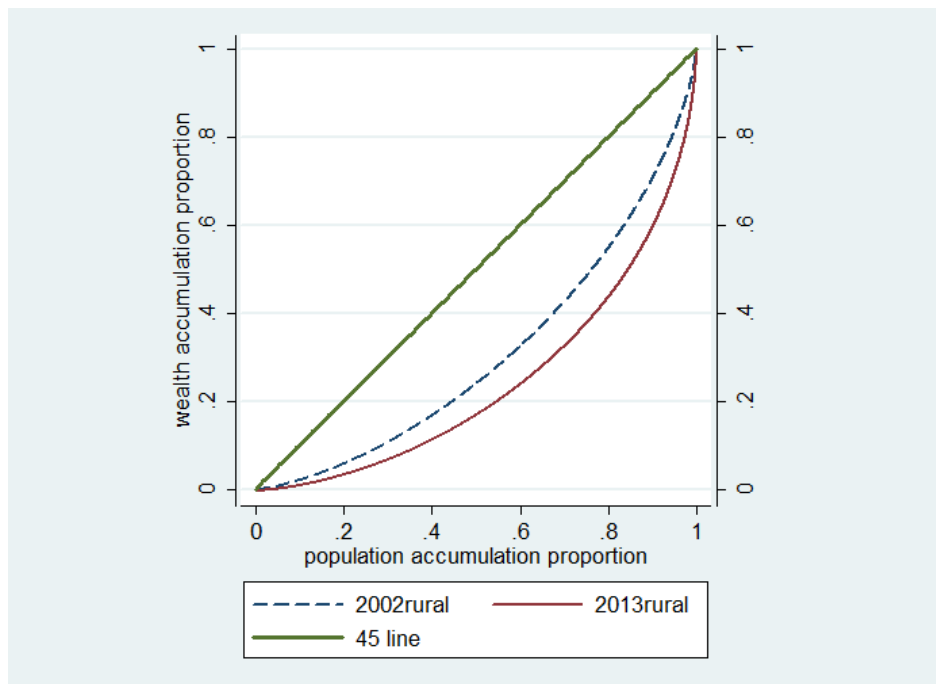


Figure 2 Wealth Lorenz Curves for Rural Households

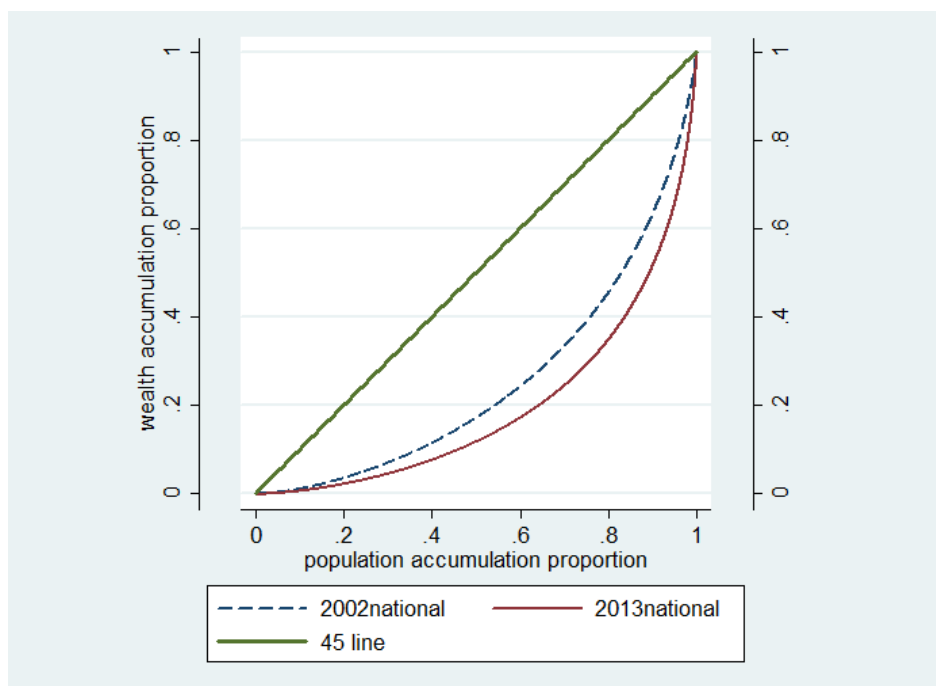


Figure 3 Wealth Lorenz Curves for National Households

Table 5 Wealth Gini Coefficients, 2002 and 2013

Sample	2002	2013	Change 2002-2013	
			Percentage points	Percentage
Urban	0.472	0.557	0.09	18.03
Rural	0.384	0.548	0.16	42.54
National	0.494	0.617	0.12	25.06

Table 6 The Sensitivity of Wealth Level and Wealth Inequality to the Tails of the Wealth Distribution

Category	wealth level (yuan)		wealth inequality (Gini)	
	2002	2013	2002	2013
Entire sample	29815	162829	0.494	0.617
Excluding highest 1%	27971	144433	0.470	0.581
Excluding highest 5%	23905	113573	0.419	0.518
Excluding highest 10%	20848	93429	0.380	0.473
Excluding lowest 1%	30147	164693	0.487	0.611
Excluding lowest 5%	31289	171358	0.472	0.598
Excluding lowest 10%	32733	180135	0.456	0.582

Table 7 Household Wealth Share by Income per Capita Decile (%)

Income per capita decile from lowest to highest	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
1	4.2	3.0	4.2	5.2	2.9	2.9
2	5.4	3.7	5.3	4.7	4.1	2.8
3	6.0	4.8	6.4	5.3	4.9	3.3
4	7.2	5.6	7.3	5.8	6.0	4.4
5	8.7	6.6	8.0	7.3	7.1	5.2
6	9.5	8.2	9.0	7.8	8.4	6.8
7	10.5	9.9	10.3	9.8	10.5	9.0
8	12.0	12.2	11.8	11.8	13.4	12.1
9	14.7	16.6	14.8	16.4	16.3	17.5
10	21.9	29.5	23.0	25.9	26.6	36.1

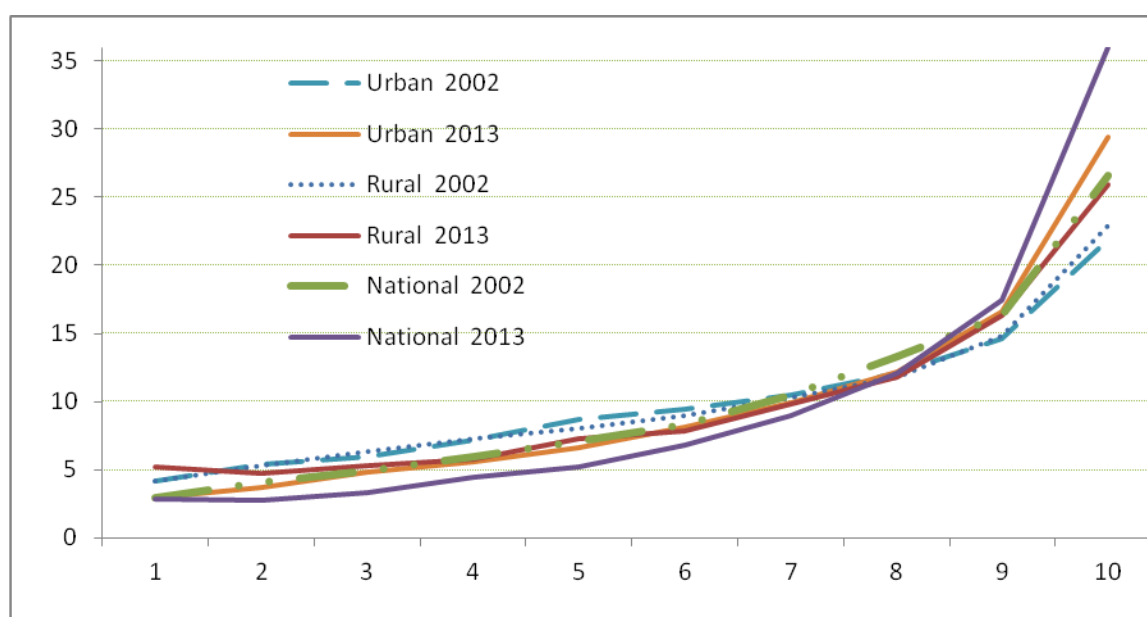


Figure 4 Household Wealth Share by Income per Capita Decile

Table 8 Household Wealth Inequality and its Decomposition, 2002

	Category	Wealth structure	Gini index	Concentration rate	Contribution to overall wealth inequality
Urban	Financial assets	0.269	0.596	0.707	0.237
	Net housing	0.617	0.561	0.911	0.661
	Productive fixed assets	0.021	0.982	0.626	0.027
	Consumer durables	0.084	0.555	0.566	0.056
	Other assets	0.017	0.913	0.411	0.014
	Non-housing debt	-0.008	-0.975	0.365	0.006
Rural	Land	0.281	0.455	0.522	0.172
	Financial assets	0.155	0.641	0.755	0.193
	Net housing	0.416	0.533	0.843	0.481
	Productive fixed assets	0.087	0.675	0.594	0.089
	Consumer durables	0.078	0.466	0.642	0.060
	Non-housing debt	-0.016	-0.918	0.140	0.005
National	Land	0.101	0.691	0.004	0.001
	Financial assets	0.228	0.688	0.796	0.250
	Net housing	0.545	0.636	0.914	0.636
	Productive fixed assets	0.044	0.847	0.424	0.032
	Consumer durables	0.082	0.569	0.672	0.063
	Other assets	0.011	0.963	0.625	0.014
	Non-housing debt	-0.011	-0.951	0.254	0.005

Table 9 Household Wealth Inequality and its Decomposition, 2013

	Category	Wealth structure	Gini index	Concentration rate	Contribution to overall wealth inequality
Urban	Financial assets	0.145	0.606	0.681	0.108
	Net housing	0.778	0.608	0.967	0.828
	Productive fixed assets	0.016	0.979	0.608	0.017
	Consumer durables	0.055	0.704	0.580	0.041
	Other assets	0.008	0.765	0.451	0.005
	Non-housing debt	-0.003	-1.482	0.201	0.001
Rural	Land	0.114	0.552	0.412	0.050
	Financial assets	0.189	0.618	0.730	0.164
	Net housing	0.580	0.635	0.907	0.646
	Productive fixed assets	0.061	0.909	0.699	0.075
	Consumer durables	0.067	0.728	0.648	0.061
	Non-housing debt	-0.011	-1.085	0.215	0.005
National	Land	0.039	0.714	-0.012	-0.001
	Financial assets	0.160	0.647	0.763	0.130
	Net housing	0.711	0.702	0.960	0.785
	Productive fixed assets	0.031	0.942	0.608	0.029
	Consumer durables	0.059	0.746	0.685	0.049
	Other assets	0.006	0.915	0.695	0.006
	Non-housing debt	-0.005	-1.212	0.203	0.002

Table 10 National Wealth Inequality Decomposition: Urban and Rural

	Year, index	National inequality	Within-group inequality	Between-group inequality
2002	Theil index	0.429	0.332	0.096
	Proportion (%)	100	77.5	22.5
2013	Theil index	0.728	0.547	0.182
	Proportion (%)	100	75.1	24.9

Table 11 Wealth/Income Ratio by Income per Capita Decile

Income per capita decile from lowest to highest	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
1	6.4	9.5	7.1	11.5	6.6	11.2
2	5.1	7.3	5.7	9.0	5.6	8.1
3	4.7	7.4	5.5	7.5	5.1	6.8
4	4.7	7.1	5.3	6.6	5.0	6.9
5	4.8	7.3	5.0	6.7	4.7	6.4
6	4.5	7.7	4.8	5.9	4.5	6.4
7	4.5	8.1	4.7	6.2	4.6	6.6
8	4.4	8.4	4.4	5.8	4.5	6.7
9	4.2	9.0	4.3	5.9	4.3	7.0
10	4.2	9.6	4.0	4.5	4.1	7.9

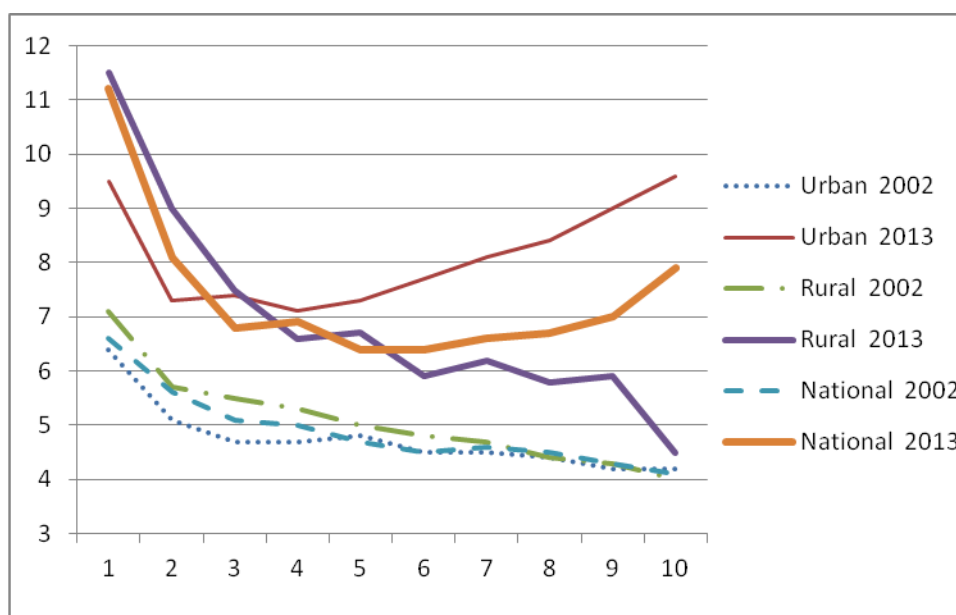


Figure 5 Wealth/Income Ratio by Income per Capita Decile

Table 12 Housing Wealth/Income Ratio by Income per Capita Decile

Income per capita decile from lowest to highest	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
1	4.4	6.9	3.1	7.7	2.8	7.3
2	3.3	5.6	2.3	5.3	2.4	4.8
3	3.0	5.8	2.2	4.4	2.2	4.0
4	3.0	5.5	2.1	3.6	2.2	4.0
5	3.0	5.7	2.0	3.9	2.2	4.0
6	2.9	6.0	1.8	3.3	2.3	4.3
7	2.8	6.3	1.8	3.5	2.5	4.8
8	2.7	6.8	1.7	3.5	2.6	5.0
9	2.5	7.2	1.8	3.8	2.5	5.3
10	2.4	7.6	1.8	2.7	2.4	6.1

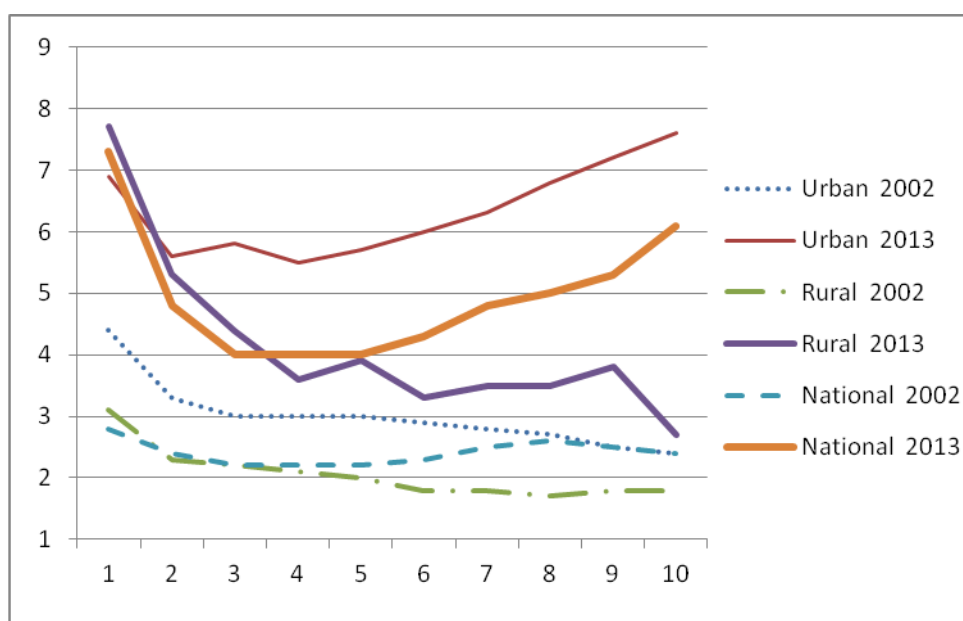


Figure 6 Housing Wealth/Income Ratio per Income per Capita Decile

Table 13 Wealth Level and Annual Percentage Increase by Income per Capita Decile

Income per capita decile from lowest to highest	Urban			Rural			National		
	2002	2013	Increase per annum 2002-2013 (%)	2002	2013	Increase per annum 2002-2013 (%)	2002	2013	Increase per annum 2002-2013 (%)
1	21064	77822	12.6	8365	40334	15.4	9195	43208	15.1
2	26940	98446	12.5	10673	36102	11.7	13176	40231	10.7
3	30411	128693	14.0	12846	40218	10.9	15781	47325	10.5
4	36222	147125	13.6	14725	43739	10.4	19487	62470	11.2
5	43703	177166	13.6	16236	53904	11.5	22985	75292	11.4
6	46781	219433	15.1	18303	57839	11.0	27328	95799	12.1
7	54147	266466	15.6	21183	74994	12.2	34705	127277	12.5
8	60823	329424	16.6	23936	86381	12.4	43783	169678	13.1
9	72324	449767	18.1	30106	118358	13.3	54507	239901	14.4
10	109256	792049	19.7	46450	173419	12.7	87791	501407	17.2

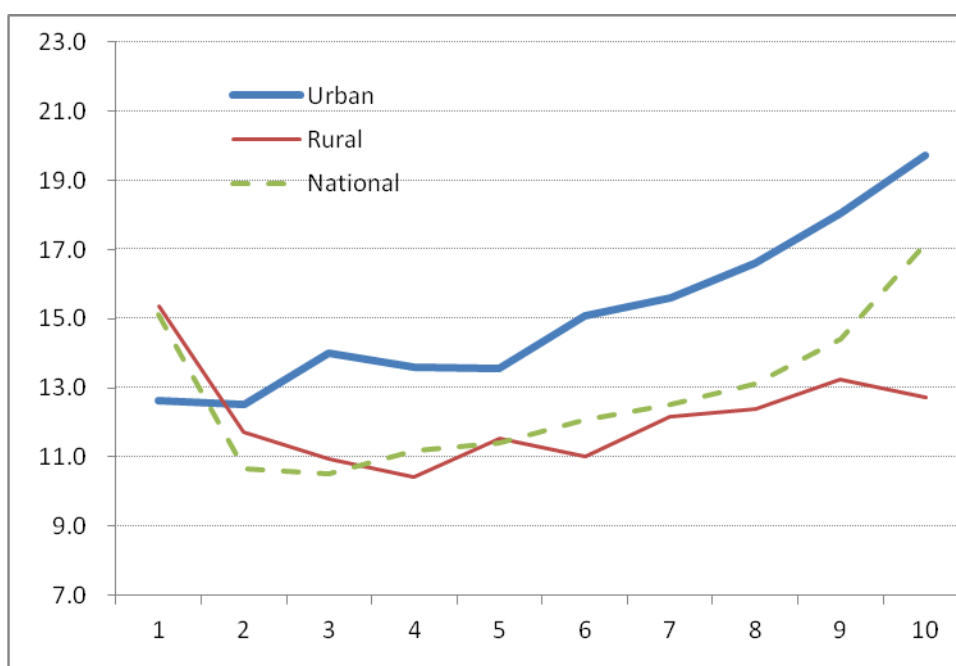


Figure 7 Annual Percentage Increase in Wealth by Income per Capita Decile

Table 14 Growth of Net Housing per Capita: Simulation with Deflated House Prices

Sample	Level of household wealth			Change in housing wealth 2002-2013	Contribution to change in housing wealth (%)	
	2002	2013	2013(housing price deflated)		Housing price	Housing quantity
	(A)	(B)	(C)	(B-A)	(B-C)/(B-A)	(C-A)/(B-A)
Urban	30483	214021	73322	183538	76.7	23.3
Rural	8074	49336	19618	41261	72.0	28.0
National	15738	117978	42002	102240	74.3	25.7

Table 15 Growth of Household Net Wealth Per Capita, 2002- 2013: Simulation with Deflated House Prices

Sample	Level of household wealth			Change in wealth 2002-2013 (B-A)	Contribution to change in wealth (%)	
	2002 (A)	2013 (B)	2013 (house price deflated) (C)		House price (B-C)/(B-A)	Other (C-A)/(B-A)
Urban	49517	273840	133786	224323	62.4	37.6
Rural	19575	83488	53747	63913	46.5	53.5
National	29815	162829	87108	133014	56.9	43.1



Figure 8 Housing Price by Common Area in 2002 and 2013

Table 16 Impact of Relative House Price Inflation on Wealth Inequality

	Gini coefficient of household wealth			Change in Gini	Contribution to change in Gini (%)	
Sample	2002 (A)	2013 (B)	2013(house price deflated) (C)	2002-2013 D=(B-A)	House price inflation (B-C)/(B-A)	Other (C-A)/(B-A)
Urban	0.472	0.557	0.510	0.085	55.1	44.9
Rural	0.384	0.548	0.520	0.164	17.2	82.8
National	0.494	0.617	0.561	0.124	45.3	54.7

Table 17 Saving Rate by Income per Capita Decile (%)

Income decile from lowest to highest	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
1	-2.6	7.0	-29.8	-65.9	-15.8	-51.8
2	9.1	32.8	7.0	-12.2	11.5	1.1
3	13.8	38.9	12.9	6.5	18.9	17.4
4	16.1	41.3	17.9	16.1	25.8	25.5
5	19.9	42.4	21.9	22.1	26.6	31.3
6	22.7	46.6	28.9	29.3	26.0	38.2
7	23.4	48.2	33.8	31.7	24.3	43.6
8	23.9	50.2	33.0	39.9	26.1	44.8
9	27.3	53.5	34.9	46.8	27.2	49.3
10	34.2	60.1	38.8	52.6	31.7	57.2

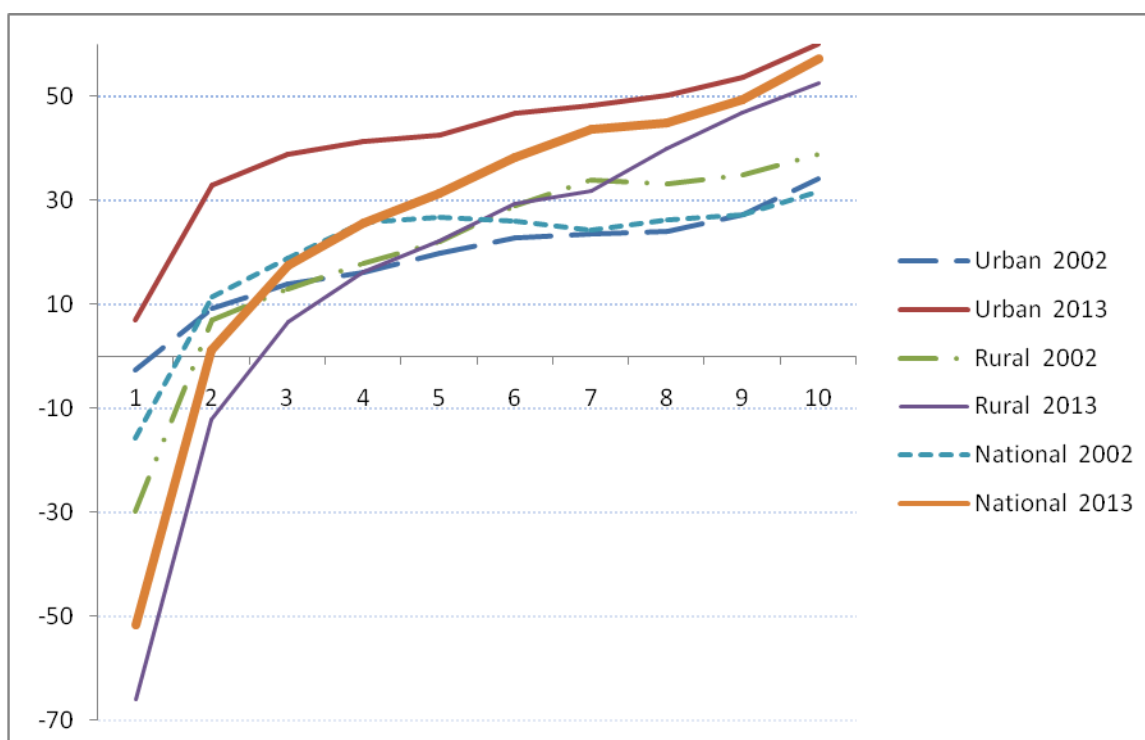


Figure 8 Saving Rate by Income per Capita Decile (%)

Table 18 Saving Rate by Wealth per Capita Decile (%)

Wealth decile from lowest to highest	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
1	20.9	37.6	6.9	31.2	11.5	31.6
2	23.4	40.4	10.9	29.2	13.1	31.4
3	23.4	43.9	13.1	30.8	14.5	32.5
4	25.2	43.3	13	30.8	16.4	34.3
5	24.4	45.2	16	33.1	18.5	37.8
6	25.3	43.9	16.7	34.5	20.9	38.3
7	25.8	44.3	18.4	37.1	22.5	41.6
8	27.5	44.6	20	36.1	24.3	43.4
9	26.8	49.4	22.1	40	26	44.6
10	28.6	53	24.7	45.7	28.1	50.0

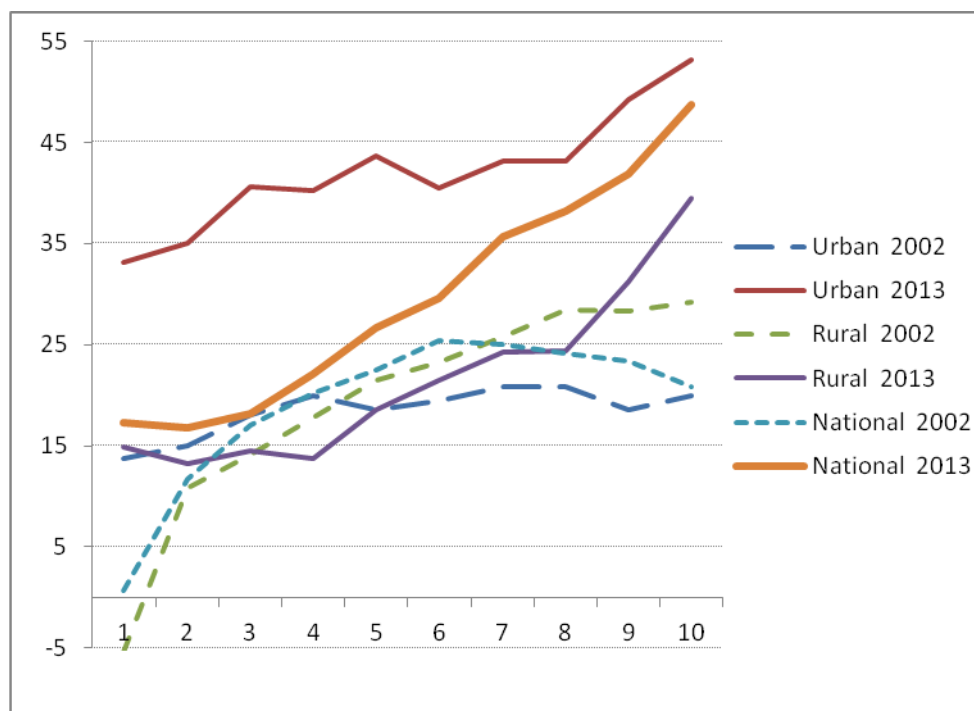


Figure 9 Saving Rate by Wealth per Capita Decile (%)

Table 19 Income from Wealth as Share of Household Income

	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
Percentage (%)	4.64	9.54	3.04	4.04	3.59	6.34

Note: We use cpi-deflated wealth and income, both household per capita. Income from wealth is here defined as interest, dividends, and actual rent.

Table 20 Share of Income from Wealth in Total Income by Income per Capita Decile

Income decile from lowest to highest	Urban		Rural		National	
	2002	2013	2002	2013	2002	2013
1	4.4	9.6	3.4	5.6	3.2	5.5
2	4.7	8.1	2.7	2.6	2.5	3.1
3	4.2	8.5	2.4	2.6	2.7	2.9
4	4.7	8.8	2.3	2.1	2.8	3.5
5	4.3	8.5	2.7	2.8	3.3	4.7
6	4.5	9.9	2.6	2.6	3.8	6.2
7	4.5	10.3	2.5	3.6	4.3	7.2
8	4.2	10.1	3.3	4.8	4.5	8.1
9	5.1	10.6	4.0	5.9	4.5	8.6
10	5.9	11.0	4.8	5.5	5.5	9.5

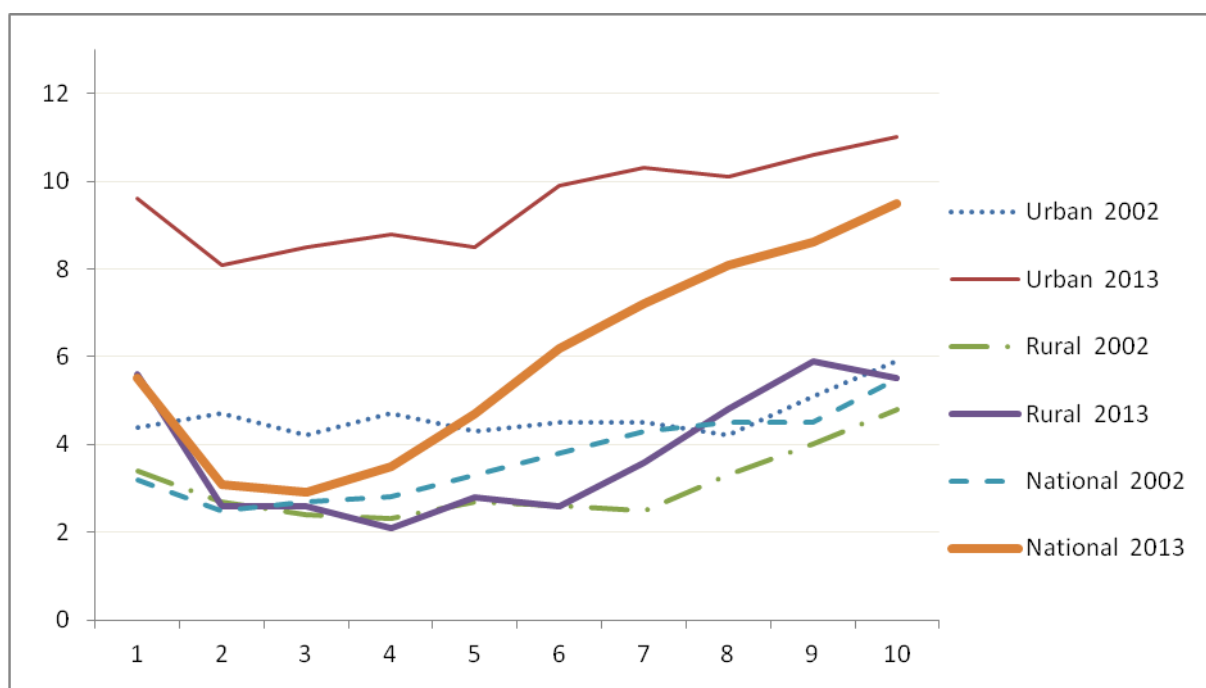


Figure 10 Share of Income from Wealth in Total Income by Income per Capita Decile

Table 21 Real Housing Growth Rate by Income per Capita Decile in 2002(%)

Income decile from lowest to highest	Urban	Rural	National
1	183.0	132.0	133.6
2	178.4	132.7	136.6
3	177.2	133.7	135.5
4	171.0	131.8	145.8
5	177.3	132.0	149.1
6	177.4	136.8	161.9
7	185.7	134.1	163.9
8	192.3	133.9	172.2
9	201.0	139.5	186.3
10	207.6	139.6	202.4

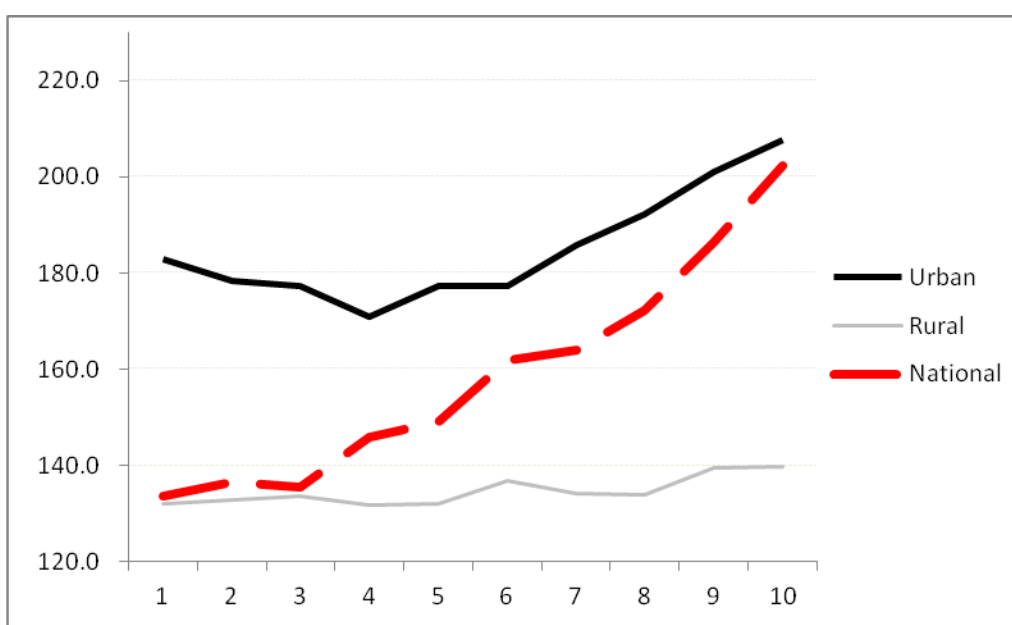


Figure 11 Real Housing Growth Rate by Income per Capita Decile (%)

Table 22 Simulated Correction for Non-Response by the Wealthy in 2013

	Top subsample doubled		Top subsample tripled	
	Mean	Gini	Mean	Gini
No expansion	162829	0.617	162829	0.617
Expand top 0.5%	176310	0.639	189621	0.657
Expand top 1%	183888	0.647	204423	0.668
Expand top 5%	212058	0.650	255719	0.657

Table 23 Simulated Correction for Non-Response plus Under-Reporting by the Wealthy in 2013

The top sub-sample is tripled	$\beta=1.5$		$\beta=2.0$		$\beta=2.5$	
	Mean	Gini	Mean	Gini	Mean	Gini
No expansion	160679	0.613	172353	0.637	184028	0.659
Expand top 0.5%	190583	0.659	201664	0.677	212745	0.693
Expand top 1%	205039	0.669	222775	0.694	240511	0.715
Expand top 5%	256270	0.657	272737	0.677	289204	0.694