Feng WANG,
Xin LIU

URBAN INCOME INEQUALITY, TIME AND INCOME SOURCES ANALYSES IN CHINA

Abstract

This paper studied the income mobility and income sources with a sample from the city of Shenzhen, the special economic region of China. The empirical results show that Chinese urban residents' long term income inequality is less than short term inequality. The aggregate households' income inequality is less than the income in single income source. The income mobility of Shenzhen is closing to the mobility of the developed countries. The mobility of income from a single source is higher than the mobility of the aggregate household's income. The short term income mobility is less than the long term.

Key words:

Income inequality; Income source; Income mobility.

JEL: D31; E64.

Wang Feng, College of Economics and Business Administration, Chongqing University, China.
Liu Xin, College of Economics and Business Administration, Chongqing University, China.

1. Introduction

With rapidly accumulating social wealth in China[1], the proportion of salary in Chinese household income is decreasing. Other income sources, such as operational income, property income, and transfer income, become more significant. On the other hand, the pay roll shows more rigidity comparing to other income sources. The traditional empirical studies, which rely on the salary data, may be misleading. This paper is going to study the income source structural change and its influence on income distribution.

Like any dynamic economy, labour markets show great mobility. The broad concept of mobility includes job change, geographic migration, ups and downs in income rankings, and so on. Not like western countries, Chinese labours are normally paid monthly. Frequently changing jobs and locations make monthly data more accurate than annual data. Another goal of this paper is to study the monthly income mobility.

Shorrcks (1978a, b), Chakravarty, Dutta and Weymark (1985), Atkinson and Morrisson (1992), Fields and OK F (1996, 1999) pioneered the study of income mobility. Short term mobilitys are not necessarily significant for the long term economic performance. In a financially mature economy, loans and deposits can eliminate short term income mobility. The inequality in the short term can also be eased off in the long term.

Wang (2005) analysed Chinese family income mobility with the CHN data of 1989–1997. It shows that the income mobility in the 90s is from the marketisation. Khor and Pencavel (2006) found that Chinese income mobility in 1995 was higher than that of the USA. Yi, Li and Deng (2006) spotted a significant income decrease in lowly-educated, retired and community enterprises employees, and an equally significant increase in financial sector, government agencies and institutions employees. During 1998–2002, the differentiation became stable and lead to an enlarged long term income inequality. Sun, Lu and Bai (2007) studied the rural residents' income mobility using data of 6 provinces during 1986–2001. The results suggest that rural mobilitys were larger than those of urban areas. The annual inequalities are significant, but long term inequalities are relative smaller. This result confirmed the long term stable theories. Unfortunately, above 2 papers lack the support of precise continuous data.

We carried out the research based on a big sample with continuous monthly observation from 2005 to 2006 in the special economic district of Shenzhen, the frontier of Chinese economic reform. Any Chinese problem is amplified in Shenzhen because it is supposed to be a big laboratory for China. The sample is grouped with age, gender, education and industries to observe

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[1] There were 64 mainland Chinese in the Forbes Rich List, only second to the USA.

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the various income mobilities. Detailed income sources may provide a lively picture of income distribution.

The following section will describe the sampling data and methodology. Section 3 will decompose the inequality with difference income sources. Section 4 compares monthly and annually calculated Gini Coefficient. Section 5 calculates the mobility and compares mobility caused by various income sources. Section 6 concludes the paper.

2. Data and methodology

The selected sample is from the survey of 600 households' monthly income and income sources in the city of Shenzhen during 2005 to 2006[2]. It is stratified random sample, which are fixed and continuous.

We adopted continuously tracking panel data, thus the sample points with discontinuity were removed. The efficient sample consist 561 households for the 12 months in 2005, 574 households for the 12 months in 2006, and 343 households for both years. We use the 2006 data for the study of households with various income sources.

The study on individual income may neglect the redistribution between family members. This paper adopts the average household income (households aggregate income divided by family members) to describe average income without interference from family size. The minors (under 16 years of age) are excluded.

$$income = \frac{total\ income}{pop - pop_{\min prs}}. \qquad (1)$$

Pop is the total number of the family. Pop_{minors} is the family population under 16. Income is the average income, while total income indicates all the income of a household combined. The minors are not supposed to work, thus we don't include this subset into our income study. Although the senior citizens don't work on regular basis, they could have positive income of pension, retirement security, etc., Their income should be considered positive.

We use Gini coefficient (GC) to measure inequality in this paper. GC are calculated as

$$G(y) = \frac{2}{n\bar{y}} \text{cov}(y, r(y)). \qquad (2)$$

$\bar{y}$ is the mean of y. $r(y)$ is the cardinal of y. When there are n observations, the minimal y is defined as $r(y) = 1$, the second to minimum is $r(y) = 2$,

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[2] This sample is from a research by national bureau of statistics.

and the maximum is $r(y) = n$. We decompose GC following Fei, Rainis and Kuo (1978). Assume one of the income sources is $x_i (i \in N)$, then the total income is $y = \sum x_i$. The income can be decomposed as

$$G(y) = \sum \phi_i R(y, x_i) G(x_i) \qquad (3)$$

Where $G(y)$ is the GC of resident's income. $\phi_i = \dfrac{\overline{x_i}}{y}$ is the characteristics of weighted gain, showing the ratio of the the ith income and the total income of the family. $R(y, x_i)$ is the ordinal correlation ratio of the ith income and total income, where $R(y, x_i) = \dfrac{\text{cov}(x_i, r(y))}{\text{cov}(x_i, r(x_i))}$. $G(x_i)$ is the GC of the ith income.

Time span can be crucial in temporary income mobility. In the mid-long run, short term mobility can be omitted. In a sample with large income mobility like ours, long-term and short term inequality indicators are different significantly. Income transformation matrix is used to quantitatively estimate the income mobility. The matrix devide the sample into n groups by income. The proportion of the individuals end up in other groups would be recorded and calculated. The comparative rise, fall and stand still indicate the magnitude of mobility.

Figure 1

Income transformation matrix

$$\begin{bmatrix} p_{11} & p_{12} & \cdots & p_{1n} \\ p_{21} & p_{22} & \cdots & p_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ p_{n1} & p_{n2} & \cdots & p_{nn} \end{bmatrix}$$

p_{ij} indicates the proportion of the individuals start in group *i* but end up in group *j*. We define quintile grouping in the matrix to observe the income move. The higher the indicator, the more mobile is the income.

$$\frac{1}{5} \sum_{i=1}^{5} \sum_{j=1}^{5} |j - i| p_{ij}. \qquad (4)$$

$$j, i \in \{1,2,3,4,5\}$$

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Immobility ratio is the indicator that describe the proportion of the individuals whose incomes do not move during the observation period. It is the mean of all the elements along the diagonal, negatively related to the income mobility.

$$\frac{1}{5}\sum_{j=1}^{5} p_{jj}.$$ (5)

$$j, i \in \{1,2,3,4,5\}$$

Stayers+1 movers shows the proportion of the individuals that the incomes stay the same or move only 1 group away from the ignition position. It shows the ratio of the individuals that have relative stable income. It is positively related to the income immobility.

$$\frac{1}{5}\sum_{i=1}^{5}\sum_{j=i-1}^{i+1} p_{ij}.$$ (6)

$$j, i \in \{1,2,3,4,5\}$$

Note that $p_{10} = p_{56} = 0$.

3. Decomposition

The national bureau of statistics (NBS) categorises Chinese income sources into salary, operational income, property income and transfer income, where the transfer income includes pension, retirement pay, insurance and social assistant income.

Table 1

Gini Coefficient decomposed by income sources

Income Sources	φ_i	$R(y,x_i)$	$G(x_i)$	CO_i	Contribution
Salary	0.7202	0.7841	0.4483	0.2532	78.72%
operational income	0.1391	0.2450	0.8505	0.0290	9.01%
Property income	0.0580	0.5359	0.8885	0.0276	8.59%
Transfer income	0.0827	0.1916	0.7478	0.0119	3.68%
Total	0.3216				100%

Table 1 shows the GC decomposed by income sources[3]. The sample is the households average income of Shenzhen, 2006. $G(x_i)$ denotes GC. The table implies that the salary is the major income source at a proportion of 72%. The GC is relatively small at 0.45. The other sources are much higher than salary.

The interesting finding is that the annual GC is 0.32, significantly lower than any of the single income source. The multiple income sources deminish the inequality from salary. Based on the data used in this paper, 20% of the income is from property and operational income. They played positive roles in decrease distribution inequality. The Shenzhen experience is a role model for the areas with severe inequality problems. The policy-makers may encourage the labour force to participate in operating activities or investment, which may decrease the income disparities.
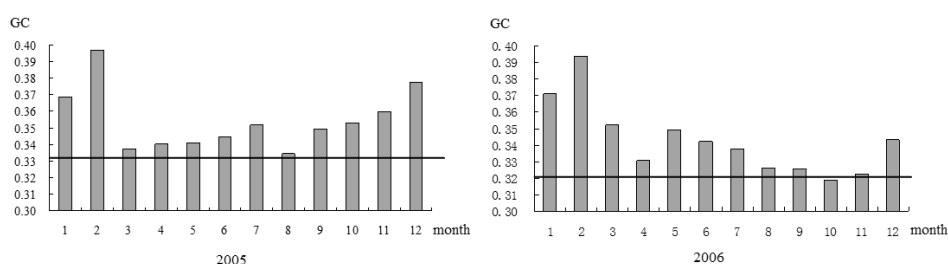
4. Monthly and annual income disparities

There are two tasks in this section. Firstly we are going to sum up the monthly individual income and measure the disparity by comparing the aggregate income and short-term income. The existing theories suggest that long-term income inequality is lower than that of the short term. Secondly we are going to measure and analyse the dynamic income mobility. The income transformation matrix will be used for quantitative measure.

Annual income data is usually used in GC measure. However, most urban residents are paid by month. Monthly income inequality can be more perpetually apperceived. We compare the monthly income GC and aggregate monthly income GC, in order that time factor could be observed.

Figure 1

GC by month

[3] See Fei, Rainis and Kuo (1978)

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The annual GC is the horizontal curve parallel to the time axis. Apparently from the graph, the monthly income GC is higher than the annual GC, which is coherent to the theory. The average difference between monthly GC mean and annual GC are 6.88% in 05, and 6.56% in 06. Long term inequality is lower than the short term empirically.

To confirm above argument, the monthly GC by income sources and annual GC are shown below.

Table 2

**Monthly income GC and aggregate monthly income GC,
decomposed by income sources**

	Total income GC	Salary GC	Operational income GC	Property income GC	Transfer income GC
2006 in total	0.3216	0.4483	0.8505	0.8885	0.7478
January	0.3709	0.4817	0.8731	0.9272	0.8513
Feburary	0.3937	0.5007	0.8780	0.9284	0.7002
March	0.3522	0.4688	0.8717	0.9232	0.8620
April	0.3308	0.4564	0.8629	0.9164	0.8039
May	0.3489	0.4690	0.8594	0.9265	0.8787
June	0.3422	0.4636	0.8646	0.9195	0.8656
July	0.3374	0.4618	0.8569	0.9223	0.8462
August	0.3262	0.4613	0.8627	0.9224	0.8426
September	0.3255	0.4638	0.8581	0.9094	0.8898
October	0.3186	0.4515	0.8613	0.9114	0.8474
November	0.3225	0.4500	0.8624	0.9149	0.8386
December	0.3431	0.4694	0.8625	0.9170	0.8476
Monthly mean	0.3427	0.4665	0.8645	0.9199	0.8395

Most monthly income GCs are higher than the annual GC. The empirical results prove that short term inequality may decline in the long run. Time span is significant for not only total household income, but also for decomposed income sources. Thus we should be very careful when reporting GC. Time span should be addressed for the result. For instance, our research result should be «sample data shows that the **annual** GC of urban households in Shenzhen is 0.32 in 2006», rather than «the GC of 2006 is 0.32». Monthly mean data of all sources are higher than the annual GC by 4.06%, 1.65%, 3.53% and 12.26%.

It also implies that transfer income shows the highest mobility in all income sources. Considering the tremendous difference in pension and retirement arrangements between different groups, it is not difficult to understand.

The annual GC obtained in table 2 is 0.32 for 2006 and 0.33 for 2005. They are much lower than 0.4, the estimate GC of China from most researches. This paper studies a sample from Shenzhen. Because Shenzhen is one of the richest cities of China, it has a lower GC than the national mean. We also use household mean to observe income inequality. Because the families redistribute the income to family members, disparity is lowered comparing to residents' income inequality. Shenzhen is one of the most dynamic and prosperous economies in China. A GC of 0.3 is coherent to its speedy growth and social harmony.

As observed in table 2 and figure 1, the income inequality in February is significantly higher than other months. That's because Chinese New Year is in February for 05 and 06. The annual bonuses show more inequality than monthly salary. Hence there occurs the highest income mobility. The higher inequality and higher income in the second month of the year prove the importance of time factor in income distribution measure. The time-span and time-point have significant influence on the measurements.

5. Income sources

We use income transformation matrix to quantitatively measure income mobility, in which time plays a crucial role. The vertical axis indicates the income grouping at the beginning of the period, and the horizontal axis indicates the income grouping at the end of the period. For example, the upper-left block of table 3 shows the income transformation matrix from January, 2006 to December 2006. p_{ij} indicates the proportion of the individuals initially at group i end up in group j. The income mobility during the two vector is measured. The proportion of the bottom 20% low income individual staying in the income group is 71%. 17.4% of the bottom 20% got better paid and rose to the higher 20%. 8.7% moved to the middle 20% and 2.6% moved to the 20% second to the top. On the other hand, 67.7% of the top 20% income individual stayed in the group after 12 months. 0.9% of them fell to the bottom 20%.

Table 3 below shows the calculated results from the quintile grouping transformation matrix. The indicators include weighted average mobility ratio, immobility ratio and stayer+1 immobility ratio. If any element in the matrix indicates 0, no income mobility exists. On the other hand, perfect mobility is Table 4 The higher the value, the income is more mobile.

Above table shows that the 2005 sample is least mobile, the biennial sample of 2005–06 is the most mobile, while the income mobility increases as the duration of observation increases. The income correlation decreases with the increase of the observation duration. Thus as the observation duration increases, the income mobility increases. In accordance with this theory, the monthly income mobility indicates that the biennial mobility is significantly larger than the annual mobility of the same sample.

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Table 3

Households monthly income transformation matrix, Shenzhen

2006 sample of 574 households						2005–2006 sample of 343 households					
	December 2006						December 2006				
January, 2006		1	2	3	4	5	January 2005		1	2	3	4	5
	1	0.713	0.174	0.087	0.026	0.000		1	0.739	0.203	0.043	0.015	0.000
	2	0.191	0.591	0.165	0.035	0.018		2	0.159	0.536	0.174	0.103	0.029
	3	0.044	0.157	0.548	0.209	0.044		3	0.087	0.145	0.493	0.176	0.103
	4	0.044	0.044	0.130	0.522	0.263		4	0.000	0.043	0.246	0.485	0.221
	5	0.009	0.035	0.070	0.209	0.675		5	0.014	0.072	0.043	0.221	0.647
2005–2006 sample of 343 households						2005–2006 sample of 343 households					
	December 2005						December 2006				
January 2005		1	2	3	4	5	January 2006		1	2	3	4	5
	1	0.797	0.145	0.029	0.015	0.015		1	0.783	0.130	0.072	0.000	0.015
	2	0.130	0.594	0.203	0.059	0.015		2	0.159	0.667	0.130	0.029	0.015
	3	0.043	0.188	0.594	0.132	0.044		3	0.014	0.116	0.580	0.235	0.059
	4	0.014	0.029	0.159	0.603	0.191		4	0.000	0.043	0.087	0.618	0.250
	5	0.014	0.043	0.014	0.191	0.735		5	0.043	0.043	0.130	0.118	0.662

Table 4

Weighted average mobility

Sample	Period	Weighted average mobility	Immobility ratio	Stayer+1 immobility ratio
2006 sample of 574 households	2006.1–2006.12	0.509	0.610	0.909
2005-2006 sample of 343 households	2005.1–2006.12	0.560	0.580	0.889
	2005.1–2005.12	0.432	0.665	0.933
	2006.1–2006.12	0.466	0.662	0.907
Sufficient mobile matrix		1.6	0.2	0.52
Sufficient immobile matrix		0	1	1

From table 5, the income motilities of the developed countries are close to the numbers of table 4. As the observation duration is less than those five-year observations, the immobility of Shenzhen may be higher. Shenzhen is a city with high growth rate, so high income mobility is expected. Long term income inequality is significantly lower than the short term income inequality. Moderate income mobility may create positive incentive without serious social injustice.

Table 5

Compare income mobilities[4]

References	Sample	Weighted average mobility	Immobility	Stayer+1 immobility
Khor, Niny and John Pencavel (2006)	1990–1995, China	1.056	0.334	0.711
	1993–1998, US	0.624	0.522	0.888
	1986–1991, US	0.660	0.514	0.868
	1986–1991, UK	0.660	0.514	0.868
	1986–1991, Sweden	0.684	0.505	0.866
	1986–1991, Italy	0.685	0.503	0.857
	1986–1991, Germany	0.647	0.523	0.876
	1986–1991, France	0.683	0.530	0.854
	1986–1991, Denmark	0.812	0.462	0.810
Yi, Li and Deng (2006)	1998–2002, Chinese urban residents	0.69	0.49	0.87
	1991–1995, Chinese urban residents	0.98	0.36	0.75
Sun, Lu and Bai (2007)	1986–1990, Chinese rural residents	0.94	0.76	0.94
	1991–1995, Chinese rural residents	1.52	0.23	0.54
	1997–2001, Chinese rural residents	1.53	0.22	0.55

Table 6 shows the income transformation matrix decomposed by income sources in January and December in 2006. Table 7 shows the motilities calculated based on table 6. Interestingly, the result is coherent with The Gini coefficient decomposed by income sources. The operational income and property income show lower mobility, the wage income is relatively higher, and transfer income shows the highest mobility.

Higher income mobility creates more opportunity, and in turn decreases the social conflicts. The wage immobility reflects the active labour market and relative free movements of labors. Wage accounts for 72% of residents' annual income. Thus wage mobility plays positive role in income distribution.

The operational and property income show obvious income inequality with low mobility. The GC in each group are 0.85 and 0.89. The thresholds of the two income sources are so high that not many households are able to benefit from. The survey shows that only 23% of the households have operational income, and 16.7% of the households have property income. A large proportion shows 0 from these two sources. Transfer income shows great mobility. However, the scale is small.

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[4] The data are from table 7 of Khor, Niny and John Pencavel (2006), wide-caliber statistic result of Yi, Li and Deng (2006), and Table 3-1 of Sun, Lu and Bai (2007).

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Table 6

Household income transformation matrix decomposed by income sources

Wage						operational income					
	December, 2006						December, 2006				
January, 2006	1	2	3	4	5	January, 2006	1	2	3	4	5
1	0.791	0.139	0.035	0.017	0.018	1	0.983	0.000	0.000	0.009	0.009
2	0.104	0.704	0.157	0.035	0.000	2	0.017	0.948	0.000	0.000	0.035
3	0.061	0.096	0.661	0.157	0.026	3	0.000	0.052	0.939	0.000	0.009
4	0.017	0.043	0.122	0.652	0.167	4	0.000	0.000	0.061	0.896	0.044
5	0.026	0.017	0.026	0.139	0.789	5	0.000	0.000	0.000	0.096	0.904
Property income						Transfer income					
	December, 2006						December, 2006				
January, 2006	1	2	3	4	5	January, 2006	1	2	3	4	5
1	0.983	0.000	0.000	0.000	0.018	1	0.496	0.000	0.096	0.365	0.044
2	0.017	0.939	0.000	0.000	0.044	2	0.504	0.209	0.052	0.139	0.096
3	0.000	0.061	0.913	0.000	0.026	3	0.000	0.583	0.261	0.104	0.053
4	0.000	0.000	0.087	0.913	0.000	4	0.000	0.209	0.443	0.287	0.061
5	0.000	0.000	0.000	0.087	0.904	5	0.000	0.000	0.148	0.104	0.746

Table 7

Household income mobility decomposed by income sources

	Weighted income mobility	Immobility	Stayer+1 immobility
Aggregate income	0.509	0.610	0.909
Wage	0.373	0.720	0.936
operational income	0.091	0.934	0.988
Property income	0.101	0.930	0.981
Transfer income	0.940	0.400	0.770

From our sample, the mobility of aggregate income is smaller than the motilities of each income sources. It suggests that the combination of income sources reduce income mobility.

6. Conclusion

Income is a dynamic process with various sources. Thus studying income from a dynamic and multiple-source perspective may show us a full picture. This paper examines the income distribution of Shenzhen urban households. From a dynamic perspective, the long term income inequality is lower than short term disparity. The household's aggregate income inequality is lower than the single-source income inequality. The income mobility in Shenzhen is relatively high, which shows the economic momentum in «the special economic area».

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