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Household Income Dynamics in Rural China

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Abstract

This paper examines changes in agriculture and livelihood system in four Chinese villages, on the basis of two waves village-wide household surveys conducted over a decade interval. To identify the factors that are important in accounting for variation in household income change, an income dynamic model is estimated. It is found that education is a main factor affecting household income growth. Increase in schooling years of earners will make the household a larger increase in per capita income. Moreover, industrialization has created more non-agricultural jobs for rural households, while urbanization promoted development of service sector that absorbs a number of rural labors. The results of income dynamic model analysis shows that the initial poor farm gained the most in terms of increase in per capita income over the past a decade. Industrialization and urbanization may provide rural poor more opportunities for their increases in per capita income and help them escaping poverty.

JEL Classification:

Keywords: Income growth, Rural, China

I. Introduction

The policies of economic reform have been implemented in China for three decades now. The Chinese government formally proclaimed that the objective of Chinese economic reform is to establish a market economy with Chinese characteristics in 1992. Since then, China's economic development has entered a new era, with the transition from a centrally planned economy to a market-oriented one. China's economy has been growing substantially with an annual growth rate of 9.0% in the period from 1995 to 2005 (NBS, 2006).

Successful transformation of China's economy is based on stable growth in the agricultural sector (Nyberg and Rozelle, 1999). Despite the healthy expansion of agriculture, however, the even faster growth of the industrial and service sector during the reform period has begun to transform the rural economy, from agriculture to industry. During this process, agriculture sector has made important, but declining contributions to national economic development in terms of gross value added, employment, capital accumulation, and foreign exchange earnings (Huang, 2001).

The process of transition is expected to last for a long period of time. With further implementation of reforms, however, the economic structure and pattern of economic growth have undergone profound changes in rural China. The non-agricultural sector has been increasing and this helps providing opportunity for rural employment and increasing farmer's income, the major concerns now for policy makers in China.

The objective of this paper is to relate the household income dynamics to the resource endowments and characteristics of rural household, and to make an attempt to identify the factors that are important in accounting for variation in income change and poverty alleviation in rural China.

The paper has five remaining sections. Section II describes the source of data and methodology applied in this study. Section III presents a descriptive analysis on characteristics of the sample households and changes in agriculture and livelihood system. A discussion on the results of regression analysis of the determinants of change in household income is presented in Section IV, followed by summarized findings of analysis in Section IV. Finally, the Section VI concludes the paper.

II. Data and Methodology

Data source

A survey of all households belonging to four selected villages in China was conducted in early 1996 and a repeat one was completed by the end of 2005. The four villages were purposively chosen from three provinces. Fangquan village of Fuyang county is located near Hangzhou, the capital city of Zhejiang province, with good infrastructure. Xieleqiao village of Ninxiang county is located near the Nin-Hui Highway in Changsha, the capital city of Hunan province. Changjiang village of Jiashan county is

located in the Hangzhou-Jiaxing-Huzhou Plain of Zhejiang province; and Fuxia village of Nanchang county is situated in Jiangxi, a less developed hinterland province. Xieleqiao has relatively less access to infrastructure among the four villages.

A balanced panel data set with 342 households matched for 1995 and 2005 is used for estimating income dynamic model to identify the factors that are important in accounting for variation in income change in the sample villages.

Estimation of income dynamic model

Rural household income in this paper is measured in monetary value and includes receipts both in kind and in cash from various economic activities. The income from crop production activities is estimated as the value of the main product and the by-products net of the cost on account of seeds, fertilizers, pesticides, irrigation charge, payment to the hired labor, and rental charge of animal labor and agricultural machinery. For business enterprises, incomes are estimated as gross returns minus business-relates expenses.

The income in this paper is broadly categorized into two components: agricultural income and non-agricultural income. Agricultural income includes income from crop farming, non-crop production (livestock, poultry, fisheries, and forestry), and agricultural wage income. Non- agricultural income includes income from industry, transportation, construction, trade and businesses, services (salaried and personal services), and other non-farm income (government allowances, remittances and pensions, etc.).

To approximate percentage change in income, we have taken change in log currency units. Measuring income change in the log scale is more appropriate than using the absolute scale in the context of poverty analysis, because log transformation compresses income at the higher levels and thus gives more weight to changes at the lower income levels. First, we apply ordinary least squares (OLS) method of estimation to explain variations in log per capita income change using the base year log per capita income and the base-year levels and changes in the same set of explanatory variables. The following equation is estimated:

$$\ln y_t - \ln y_{t-1} = \beta_0 + \beta_1 \ln y_{t-1} + X_t \Pi + \varepsilon_t$$

where, $\ln y$ stands for log of per capita income, X is the vector of explanatory variables other than base year per capita income, ε is the random independently and identically distributed disturbance term with zero mean and constant variance, and t stands for the year of observation.

To correct for measurement error in the income variables, the log of base-year predicted income is used for estimating the income change regression function above.

The following income regression function is employed to estimate predicted income for each year:

$$\ln y_{it} = X'_{it} \beta + \xi_{it}, \quad i = 1, 2, \dots, N;$$

where y_{it} stands for per capita income of household i in year t . X is a vector of household specific characteristics such as household size, number of family labor, age and education level of household members, landholding, non-land fixed assets, and local social-economic conditions such as the development of rural infrastructure. The β is the coefficient to be estimated for calculating the predicted log income ($\ln \hat{y}_{it} = X'_{it} \beta$); ξ is the error term.

III. Characteristics of the sample households

1. Demographic characteristics of households

There were a total of 2479 people in the sample villages in 2005, with an average annual population growth rate of 0.32 percent for the period of 1995-2005. The females account for 48.3% of the total population in 2005 (Table 1).

The average age of villagers in the study area increased from 32.4 years old in 1995 to 37.0 years old in 2005 (Table 1). The proportion of the population with ages 16-65 and above 65 years old increased from 71.7% and 6.3% in 1995 to 74.8% and 8.7% in 2005, respectively. The changes in the age composition of the population indicated a substantial decline in the natural rate of population growth. The size of the 1-15 age group declined substantially during the period from 1995 to 2005, As a result, the total dependency ratio reduced from 39.6 in 1995 to 33.7 in 2005, implying that it became more favorable potential for improving the economic status of household.

Table 1. Population, average age and distribution of population by age group and sex, 1995-2005

Population and Age group	Male		Female		Total	
	1995	2005	1995	2005	1995	2005
Population						
No. of people	1257	1282	1142	1197	2399	2479
Percentage (%)	52.4	51.7	47.6	48.3	100	100
Average age (years old)	31.9	36.6	33.1	37.6	32.4	37.0
Below 16 years old						
No. of people	281	210	247	198	528	408
Percentage	22.3	16.4	21.6	16.6	22.0	16.5
16-65 years old						
No. of people	907	975	812	879	1719	1854
Percentage	72.2	76.0	71.1	73.4	71.7	74.8
Above 65 years old						
No. of people	69	97	83	120	152	217
Percentage	5.5	7.6	7.3	10.0	6.3	8.7
Dependency ratio^a					39.6	33.7

Note: ^aDependency ratio = (population aged below 16 and over 65 ÷ population aged 16-65) × 100.

73% of total households in the sample villages had a size of 3-5 people in 2005, while about 83% had a same size in 1995 (Table 2). Contrast to the increase in the number of total household, the number of household with a size of 4-6 members and above declined in the period of 1995-2005.

Table 2. Distribution of households by size, 1995-2005

HH Size (person/hh)	No. of household		Percentage (%)	
	1995	2005	1995	2005
≅ 2	73	156	11.4	22.0
3	195	204	30.6	28.8
4	209	195	32.8	27.6
5	123	119	19.3	16.8
≅ 6	38	34	5.9	4.8
Total	638	708	100	100

It is showed in the Table 3 that more than 90% of households were headed by male over the time. Reducing in household size was mainly caused by decreasing in

number of Children per household. The average number of children per family has decreased from 1.55 in 1995 to 1.27 in 2005. As a result, the average family size reduced from 3.8 persons per household in 1995 to 3.5 persons per household in 2005.

Table 3. Average number of household members by relationship with head, 1995-2005

Relationship with head	1995			2005		
	Male	Female	All	Male	Female	All
Head	0.92	0.08	1.00	0.91	0.09	1.00
Spouse	0.05	0.86	0.91	0.04	0.82	0.86
Child	0.87	0.68	1.55	0.71	0.56	1.27
Others	0.15	0.19	0.34	0.15	0.22	0.37
Total	1.99	1.81	3.8	1.81	1.69	3.5

Note: Others include head's parents, brother and sister, grandchild, and other relatives.

The average schooling of villagers in the study area is 6.6 years in 2005, an increase of 1 year over last decade (Table 4). The increasing in average schooling varied from 0.8 – 1.2 years across the villages. In general, male villagers are more educated than females, 6.1 years vs 5.1 years in 1995 and 7.0 years vs 6.1 years in 2005. People in Xieleqiao village are the best educated, with an average 7.7 years of schooling, whereas villagers in Changjiang and Fangquan are less educated, with an average about 6 years of schooling.

Table 4. The average schooling years of villagers, by sex, 1995-2005

Village	Male Population		Female Population		Total Population	
	1995	2005	1995	2005	1995	2005
Fangquan	5.2	6.5	4.6	5.6	4.9	6.1
Xieleqiao	7.1	8.0	6.6	7.4	6.8	7.7
Changjiang	5.9	6.6	4.4	5.3	5.1	5.9
Fuxia	6.3	7.0	4.8	6.3	5.6	6.7
All	6.1	7.0	5.1	6.1	5.6	6.6

2. Landholding and distribution of household by landholding

The average size of landholding in the sample villages was 4.13 mu (0.28 ha) in 1995 and 3.35 mu (0.22 ha) in 2005 (Table 5). The average size of landholding reduced in all four villages during the period of 1995-2005. The proportion of household with a size of landholding 2 mu and below increased over time in all four villages. On

average, 56% of total households had a small size land (less than 3.01 mu or 0.20 ha) and operated with only 30% of the total land area in 2005.

Table 5. Changes in distribution of landholding size and its pattern, 1995-2005.

Size (<i>mu</i> ^a) of landholding	Percentage of households (%)		Share of land area (%)	
	1995	2005	1995	2005
< 2.01	13	34	4	13
2.01-3.00	19	22	12	17
3.01-4.00	22	16	19	16
4.01-5.00	16	10	17	14
5.01-6.00	13	6	17	10
6.01-7.00	7	6	10	12
≥ 7.0	10	6	21	18
Total	100	100	100	100
Average size	4.13	3.35		

Note: ^a 1 mu = 1/15 ha.

There was a deterioration of landholding distribution in the sample villages during the period of 1995-2005 (Table 6). The landholding share of the bottom 40 % of the total households fell from 21.2% to 16.4, while the share of the top 10% of households rose from 21.8% to 26.9%. The Gini ratios for concentration of landholding in all four villages increased obviously. On average, the value of the Gini concentration ratio rose from 0.29 to 0.38.

Table 6. Degree of inequality in the distribution of landholding, 1995-2005

Land group ^a	Share of Landholding (%)									
	Fangquan		Xieleqiao		Changjiang		Fuxia		Total	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
I	22.6	21.3	22.8	21.5	25.6	23.9	25.5	15.4	21.2	16.4
II	45.0	40.6	46.9	42.9	43.9	41.3	41.1	45.3	42.4	40.5
III	15.4	13.7	15.9	14.6	14.7	14.2	14.7	18.6	15.6	17.0
IV	18.9	26.1	17.9	22.6	17.6	23.5	18.7	25.6	21.8	26.9
Gini ^b	0.251	0.317	0.252	0.290	0.211	0.263	0.216	0.375	0.289	0.380

Note: ^a Land group I, II, III, and IV ranked bottom 40%, middle 40%, ninth decile, and top 10% with respect to size of landholding, respectively.

^b Gini concentration ratio.

3. Employment and income distribution

Table 7 presents the changes in occupation of household head. The number of household head with non-agriculture as primary occupation rose from 265 in 1995 to 325 in 2005, i.e. from 41.5% in 1995 to 45.9% in 2005 in terms of percentage. The number of household head with agriculture as primary occupation decreased, specially, the household head with crop farming as primary occupation had a substantial decline from 283 in terms of number and 44.4 % in terms of percentage in 1995 to 155 and 21.9% in 2005, respectively.

Table 7. Occupational distribution of household head, 1995-2005

	No of Household Head		Percent of total households	
	1995	2005	1995	2005
Agriculture	305	303	47.8	42.8
Crop	283	155	44.4	21.9
Wage labor	0	128	0	18.1
Non-crop	22	20	3.4	2.8
Non- agriculture	265	325	41.5	45.9
Industry/trade	117	134	18.3	18.9
Services	48	57	7.5	8.0
Transport	55	50	8.6	7.1
Construction	45	84	7.1	11.9
Others	68	80	10.7	11.3
Total	638	708	100	100

Note: Others include housekeep and looking for job.

Table 8 shows the changes in occupation of household members. Share of family workers with non-agriculture as primary occupation increased from 26% in 1995 to 33% in 2005, while share of family workers with agriculture as primary occupation dropped from 35.4% in 1995 to 23.6% in 2005.

Table 8. Changes in Occupation of household members, 1995-2005

Occupation	No. of people		Percentage (%)		Person Per Household	
	1995	2005	1995	2005	1995	2005
Agriculture	850	586	35.4	23.6	1.3	0.8
Non-agriculture	623	813	26.0	32.8	1.0	1.2
Others	926	1080	38.6	43.6	1.5	1.5
Total	2399	2479	100	100	3.8	3.5

Note: Others include student, housekeep and looking for job.

As occupational changes in the sample villages, the rural household income structure has shifted away from agriculture to non-agriculture sources over last decade. The

proportion of household income derived from non-agriculture source increased substantially for all villages in the study area, although the income share varied largely across the villages with the smallest in Fangquan (66%) and the largest (82%) in Fangquan in 2005 (Table 9).

Table 9. Changes in composition of household income by village, 1995-2005

Source of income	Share of Household Income (%)									
	Fangquan		Xieleqiao		Changjiang		Fuxia		Average	
	1995	2005	1995	2005	1995	2005	1995	2005	1995	2005
Agriculture	27.4	18.3	53.7	29.4	78.5	33.9	57.5	32.9	58.3	27.3
Crop farming	14.5	4.6	47.9	13.2	34.3	16.1	26.5	16.3	31.1	11.4
Non-crop	12.0	2.9	4.2	9.8	43.3	9.1	28.9	6.2	26.0	6.5
Agri. labor	0.9	10.8	1.6	6.4	0.9	8.7	2.1	10.4	1.2	9.4
Non Agri.	72.6	81.7	46.3	70.6	21.5	66.1	42.5	67.1	41.7	72.7
Industry Trade	30.3	45.2	12.4	14.6	7.6	42.8	7.0	22.7	13.7	37.1
Transportation	14.4	8.1	11.1	9.8	4.4	6.9	11.6	11.6	9.2	8.4
Construction	6.7	5.3	6.2	13.3	1.0	4.2	5.1	16.3	4.0	7.5
Services	14.4	18.1	11.6	29.1	2.8	10.2	6.1	15.4	7.8	16.5
Other non-agri	7.0	5.0	5.0	3.8	5.7	2.0	12.7	1.1	7.0	3.2

Note: Other non-agri incomes include government allowances, remittances and pensions, etc.

On average, the proportion of household income derived from crop farming decreased from 31 percent in 1995 to 11 percent in 2005. The non-agricultural income accounted for 73% of total household income, a drastic increase from only 43% in 1995, due to expanding of non-agricultural sectors, especially industry and trade/business sector in the study area.

IV. Determinants of changes in per capita income

The Ordinary least squares (OLS) method of estimation is applied using a balanced panel data set draw from a two wave of village surveys to explain the variation of changes in log per capita income across households.

We ran Ordinary Least Squares (OLS) regressions using both log of base-year reported per capita income and the log of base-year predicted per capita income as well.

The coefficient on the log of base-year per capita income variable in the income change regression is interpreted as follows. Full conditional convergence holds if the coefficient is equal to -1; partial conditional convergence holds if the coefficient is between -1 and 0; independence holds if the coefficient is equal to 0, conditional divergence holds if the coefficient is greater than 0.

Table 10 presents the results of the income dynamic model. Controlling other factors, statistically significant partial conditional convergence occurred for both log of reported and predicted base-year per capita income, implying that on average, the households that started above the expected income in 1995 fell closer to the expected income in 2005 and those that started below the expected income in 1995 rose closer to the expected income. In other words, increase in per capita income would be larger if the initial level of per capita income was lower.

Table 10. Estimated coefficients of determinants of change in per capita income, 1995-2005

Variable	Reported		Predicted	
	Coefficient	t-ratio	Coefficient	t-ratio
Log PCI95	-0.85***	-17.13	-0.98***	-18.4
land95	0.01	0.62	0.05***	3.6
Capital95	0.00*	2.48	0.00**	1.77
Labor95	0.06	1.08	0.01	0.27
Hsize95	-0.07	-1.41	-0.13***	-5.02
Head age95	-0.01*	-1.76	-0.01***	-4.23
Education95	0.04**	2.06	0.07***	7.85
Elder95	-0.12	-1.52	-0.21***	-5.07
Land change	0.03*	1.93	0.04***	5.52
Capital change	0.00*	1.93	0.00**	2.01
Labor change	0.08**	1.88	0.01	0.57
Hsize change	-0.14***	-3.98	-0.15***	-8.72
Edu change	0.04***	2.78	0.08***	11.51
Elder change	-0.08*	-1.68	-0.18***	-7.12
Job mobility	0.21**	2.08	0.11**	2.09
Constant	6.81***	15.63	7.89***	17.58
N		342		342
R ²		0.55		0.80

Note: ***, **, and * refer to significant at 1%, 5%, and 10% level, respectively.

Aside from the initial per capita income, initial level of education of earning members, change in size of landholding, change in education level of earning members, and

change in primary occupations of earning members, i.e. job mobility from crop farming to industry and service, had a statistically significant positive effect on the changes in per capita income, while the age of household head, changes in household size and number of elder members had a negative effect. For both reported and predicted income regressions, the household with one more year of schooling in 1995 or with one year increase in average schooling of the earning member commanded 4-7% or 4-8% higher per capita income increase in 2005, while household with one more years old of the head or with one year increase in average age of elder members commanded 1% or 8-18% less increase in per capita income in 2005. The most important factors were job mobility and change in household size. Household with a head who shifted his primary occupation from crop farming to industry/trade/business has increased per capita income by 11-21% compared to per capita income in 1995. In contrast, household with one additional member increase has reduced per capita income by 14-15% for the period of 1995-2005.

The capital is found to have little effect on the increase in per capita income, as the value of coefficients on both initial capita and change in capita endowment is almost equal to 0 and it is statistically significant.

V. Summary and Implications

The rural household income structure has shifted away from agriculture to non-agriculture sources. The proportion of household income derived from land decreased from 31 percent in 1995 to 11 percent in 2005, indicating the decline in economic importance of land and the increase in economic importance of human capital.

The results of income dynamic model analysis show that partial conditional convergence hold. Increase in per capita income would be larger for the household with small per capita income in the base-year, i.e., the initial poor got ahead by more.

Increase in per capita income would be larger as farmers shift their occupation from crop farming to industry or service sector. Structural change of household income is associated with increased relative profitability of non-agricultural activities.

Education is a main factor affecting household income growth. Increase in schooling years of earners will make the household a larger increase in per capita income. Moreover, households with a reduction in number of family members are more likely to gain in terms of increase in per capita income. In contrast, households with more number of elder members are more likely to get difficulty in growth of household income.

VI. Conclusions

Education really matters. Households with more educated members will gain more from the increase in per capita income. As far as economic impact is concerned, human capita, especially the quality of human capita -- education of earning population has been a major factor of increase in household income. In contrast, land resource has become a less important factor.

The initial poor farm gained the most in terms of increasing in per capita income over the past a decade.

Industrialization and urbanization may provide rural poor more opportunities for their increase in per capita income and help their escape poverty. Industrialization has created more non-agricultural jobs for rural households, while urbanization promoted development of service sector that absorbs a number of rural labors.

As development of the economy and improvement of the living conditions in rural area, the expected life has increased a lot, so that the proportion of elder population rose fast. It is disadvantage factor for income increasing, because that as people gets old, one's ability for earning declined. To address it, the government should establish an effective and efficient social security system in rural area as soon as possible.

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