The Forecast and Analysis of Average Income Difference between urban and rural residents

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Abstract

In recent years the problem of enlargement of gap of income between urban and rural residents has been paid increasingly more attention to by Chinese society. In order to predict if the ratio of the urban per capita income to the rural is increasing, this thesis makes use of Holt-Winter non-seasonal exponential smoothing model to predict urban and rural income in 2006, finding that the ratio will be larger than that of previous year and the gap is still enlarging. By analysis on the data of urban and rural income of China, this thesis discovers that the main cause of enlargement of the gap is the slow growth of rural residents' income. To resolve the problem, this thesis set up multivariate linear model of determination of rural residents' income to do regression analysis, acquiring the estimate of the influence of price indices of farm produce, value of productive fixed assets of rural household and per capita nominal wages of rural household on per capita income of rural households, and give the advices on policies.

Key words: per capita annual income of urban and rural household   gap of income multivariate linear regression model

Contents

Introduction

Since reform and opening, the average GDP of China has increased rapidly and stably accompanying the rapid development of national economy and the level of living condition's improvement. However, the income difference of dwellers especially the gap between urban and rural residents has become more and more large which have been a problem and has drawn lot of experts' attention. If the income difference between urban and rural residents can't be effectively solved, it will be a threat to China's sustainable development in economy and maybe leads to deeply bad influence to social stability. It is very necessary to analyze this problem deeply and find some efficient solution.

The revenue sharing task group of Chinese Society and Science Economy Institute has tracked the problem a long time since 1988 and spread three investigation of the whole country's dweller in 1988, 1995, 2002 respectively which made abroad and thorough research of the hotspot problem (the income difference of urban and rural residents).Li Shi, which is the researcher of Chinese Society and Science Economy Institute considers that the average income ratio can't reflect the practical difference income between urban and rural residents truly. The income which has not influence with coin of dwellers in cities don't take into consideration. If take the variance practical allowance factor such as hospitalization insurance which dwellers in city can feast into consideration, the income difference between urban and rural residents may reach to four to six times which is the highest difference in the world[A]. In the following years, the problem whether the average income difference between urban and rural residents will be larger and larger makes experts having different idea. According to the forecast of "Country Economy Green Book" delivered by Chinese Society and Science in 2006, the farmer's income will keep a little bit fast increase in 2006 which maybe reach to increase pace greater than 5%. But contrast to last year, this pace wills fallback, that is to say, the income difference between urban and rural residents become larger[B]. Some researcher emphasize particularly on human capital invest to analyze difference between urban and rural residents. Doctor Li Chunling quoted the data as follow in the report "Modern Chinese Society Flow": "The Chinese whole country education invest in 2002 is more than 580 billion Yuan, 77% in use for city, while dwellers' population which account for more than 60% of the whole population only get 23% of the education invest." Li thinks that, the essence in Chinese education has baffled the flow between the upper-class and lower-class in Chinese society and has enlarged the difference between urban and rural residents[C]. Scholar Lu Shujun thinks that, the duality economy structure between urban and rural residents is the important reason of the larger income difference between urban and rural residents.

To solve this problem, it should strengthen the transfer strength of surplus labor force and accelerate appropriate scale of operation of farmer's soil so as to solve the division of labor

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[A] Tencent news channel, invoke Xin Hua newspaper office. April 14th.
   Reporter: Yu Jingbo http://news.qq.com/a/20060414/001627.htm
[B] Government Online: Macro economy http://www.hh.gov.cn/jj/hgjj/2004/2004-02/2004-02-27/1077871158_94/
[C] Sohu Culture Channel http://cul.sohu.com/20040922/n222182061.shtml

force market and advance farmer to employ[D]. Besides, there also has a lot of literature analyze the problem in other aspect such as through system arrange between urban and rural residents, through different social welfare between urban and rural residents, through different transitivity income between urban and rural residents.

This essay use exponential smoothing method to forecast the average income between urban and rural residents in 2006 and find that the ratio difference is still enlarging. Through the quantitative analysis of income between urban and rural residents to find that the main reason leads to the larger difference is the slowness farmer's income increase. To find the solution method, this essay emphasize particularly on base decision model of the farmer's average net income through demonstration analyze. We will use a multiple linear regression to analyze the reason why the farmer's income increase slowly and give advices to accelerate farmer increasing income.

[D] "Duality Economy Structure is the Important Reason to the Larger Income Difference between Dweller Live in Urban and rural residents" Lv Shujun. "Culture and History Read Extensively"(2005)

Section 1 the Review and Criticism

It is a long-term problem that China has income gap between urban and rural residents because of history and system. After foundation, we get surplus from agriculture to industrial development through depressing the price of produce forcedly to achieving China's rapid industrialization which had been the long-term economical policy before China establishing market economy. From 1952 to 1986, China got 582.374 billion Yuan capital from agriculture through the disparity between industrial products and farm produce. If plus 104.438 billion Yuan agricultural tax capital, China got 686.812 billion Yuan mint capital from agriculture in these 34 years, a majority of which were used in industry development[E]. This economy measure has fill out the income difference between urban and rural residents.

Figure 1 is the PolyGram of the urban income and rural income of China from 1989 to 2005. From the picture we can see that the average income of dwellers live in cities at all times higher than that live in country. Furthermore, the utterly difference was fill out all along from 1989. Straightly seeing, the increase pace of the income of dwellers in cities was faster than that of country obviously in the lasted 15 years.
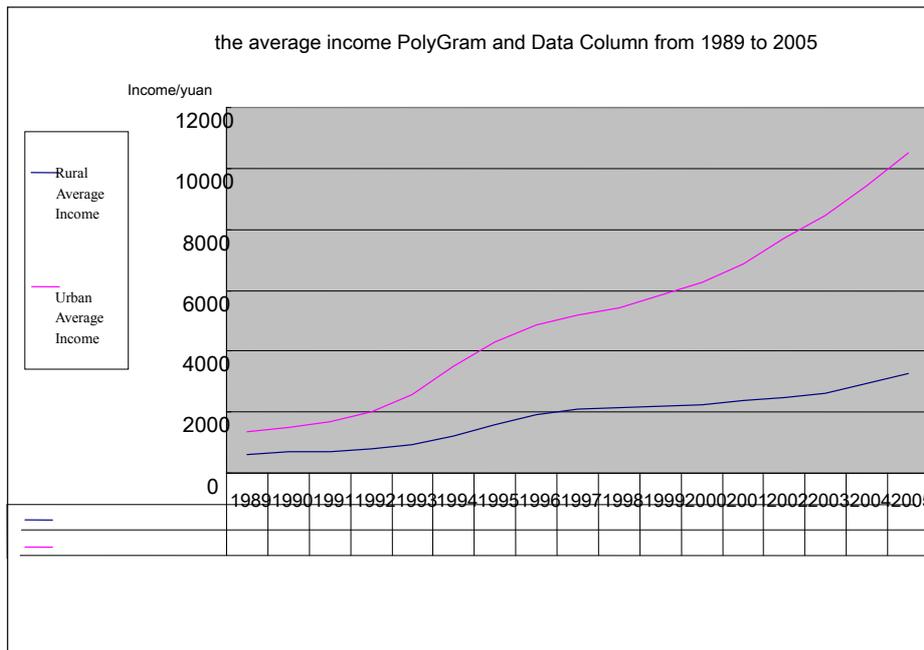

Figure 1：the average income PolyGram and Data Column from 1989 to 2005

Data source: "Chinese Statistical Yearbook 2005", Chinese Statistical Publishing Company

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[E] Wang Ying: "Critic the Income Difference between Urban and rural residents of China again", "Transaction of Yunnan Administration College", 2004(4)

2005 Data source: "National Economy and Social Development Statistical Communiqué, China, 2005"

http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20060227_402307796.htm

The ratio of the average income between urban and rural residents from 1978 to 2005 is displayed in Figure 2. The column type denotes the ratio of the urban dweller's disposable income and the rural dweller's average net income. From Figure 2 we can see that, the ratio of the average nominal income between urban and rural residents is 2.57 in 1978. In 1980, it declined to 2.50. From 1980 to 1985, the ratio difference of the average nominal income between urban and rural residents have had large decline and it declined to 1.86 in 1985. That was mainly because the country reform earlier than the city reform after the Reform and Opening. The productivity level of country has had big improve after a contract system with remuneration linked to output put into practice. From 1985 to 1989, the income of urban residents has had big improved because of the acceleration of city reform process and the ratio fill out to 2.284 in 1989.

From 1989 to 2004 the multiple difference of the average income between urban and rural residents was changed basically billowing. The multiple differences accretion promptly from 1990 to 1994 and the ratio difference shorten gradually from 1994 to 1997. We find that it mainly because the zoom of urban residents' average disposable income declined obviously when deducting fluctuate in price by looking at Table 1. The ratio fill out rapidly from 1997 to 2003 and reach the peak to about 3.231 in 2003 when the average income ratio between urban and rural residents was the biggest from Reform and Opening. This ratio had slightly decline in 2004 maybe for the reason of the canceled agriculture tax decision in the following 5 years made by State Department. From 2003 to 2005, this ratio remained stable at the level slightly over to 3.20 and didn't have obvious change.
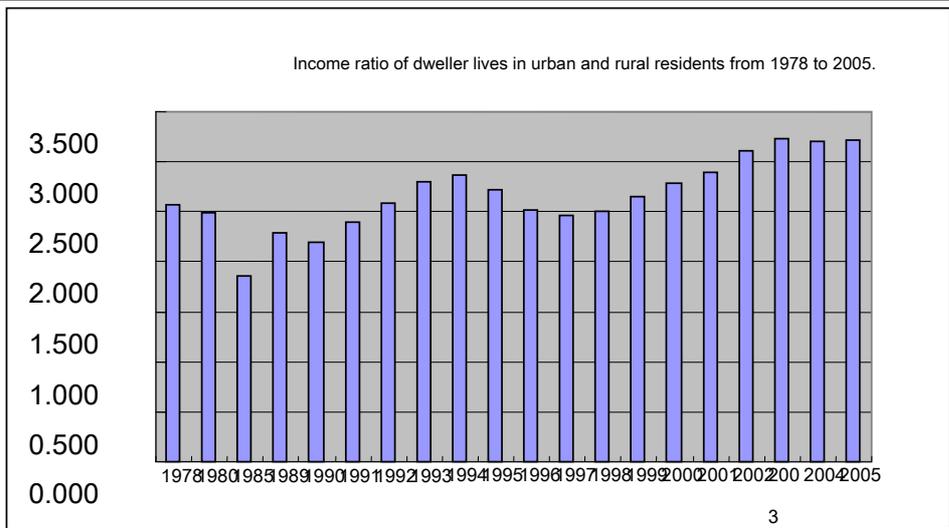
Figure 2：the histogram of the average income ratio of urban and rural residents from 1978 to 2005.

Data source："Chinese Statistical Yearbook 2005", Chinese Statistical Publishing Company, by calculating.

The huge income gap between urban and rural residents will have threaten to our sustainable development of national economy. United Nations Development Programmer warned in Dec 20th 2005 that the distance between rich and poor is bigger and bigger which maybe threaten social stable. The distribution of income difference problem is very austerity and the important reason is the huge income difference between urban and rural residents.

We can scale our average degree of distribution of income by using gini coefficient. From the data of World Bank which displayed in Figure 3 we can see that, our gini coefficient had increase continuously from 90 age last century. It was 0.360 in 1990 and reached to 0.410 in 1998 which exceed the international recognize guard line. Henceforth, the data went on increasing. In 2004, it reached to 0.472 and in 2005 it reached to 0.474. Liu Guoguang, the economist thinks that, the gini coefficient start to decline when the average GDP reach to 1500$ by using other country's experience[F]. But our average GDP in 2005 was about 13944 Yuan through statistical communiqué 2005. Calculated by the norm exchange rate between Yuan and Dollar in April 11th 2006 it reached to about 1740$. But despite so, from the current of Figure 3 we can see that, our gini coefficient still lied in the increasing moment of the up

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[F] Chen Liuqin http://www.chinavalue.net/showarticle.aspx?id=24848

side down U-scale curve and the distribution of income distance is still become bigger and bigger.
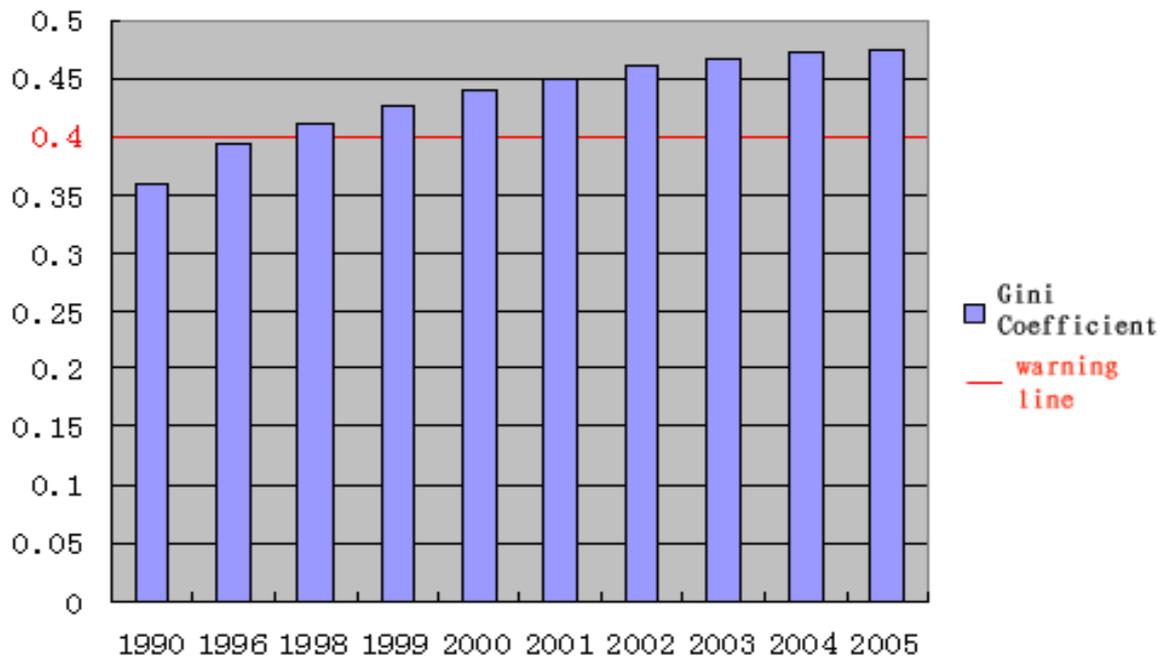
Figure 3：the histogram of our gini coefficient from 1990

Data source: the website of World Bank
http://siteresources.worldbank.org/INTEAPHALFYEARLYUPDATE/Resources/appendix.pdf

Table 1: the gini coefficient table of our urban residents and rural residents and whole dweller from 1990 to 2004

	the gini coefficient of country dweller	the gini coefficient of city dweller	the gini coefficient of whole dweller
1990	0.31	0.23	0.36
1991	0.31	0.24	-
1992	0.31	0.25	-
1993	0.32	0.27	-
1994	0.33	0.30	-
1995	0.34	0.28	-
1996	0.32	0.28	0.39

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1997	0.33	0.29	0.41
1998	0.34	0.30	0.43
1999	0.34	0.30	0.44
2000	0.35	0.32	0.45
2001	0.36	0.32	0.46
2002	0.37	0.32	0.47
2003	0.37	0.33	0.47
2004	0.33	0.37	0.47

Data source: "the annual report of Chinese dweller's distribution of income 2005", editor in chief: Kong Jingyuan, economy and science publishing company; World Bank Website: http://siteresources.worldbank.org/

From Table 1 we can see that, if seeing about rural residents and urban residents' inner gini coefficient purely, they both didn't excess the guard line and were both in the admitted range. However, the whole gini coefficient of China was very high. We can take 2005 as example. In 2005 the rural residents' gini coefficient is 0.33 and the one of urban residents is 0.37 while the whole gini coefficient is very large which is 0.474. It is obvious that the problem which the distribution of income's difference was very big is mainly because the differences of income of urban and rural residents was very greatly and only narrow the difference could solve the problem basically.

Section 2 Analysis of the Average Income of Urban and rural residents in 2006

If put the data which rural residents' average net income and urban residentss average disposable income from 1989 to 2005 into the work files of Eviews to analyze and named as **RI** (Per Capita Annual Net Income of Rural Households) and **UI** (Per Capita Annual Disposable Income of Urban Households) respectively.

We can use exponential smoothing method to analyze serial RI and UI. Due to series RI and UI are both have long term current and they are both the annual data series, so we choose the unseasonable model Holt-Winter to analyze. Holt-Winter unseasonable model is similar as quadratic exponential smoothing model and is apt to the analysis of short time liner current series. This model includes two smoothing coefficient α and β and analysis model is

(1) $\hat{Y}_{t+k} = A_t + B_t \times k$, $A_t = \alpha \times \hat{Y}_t + (1 - \alpha) \times (A_{t-1} - B_{t-1})$, $B_t = \beta \times (A - A_{t-1}) + (1 - \beta) \times B_{t-1}$.

We can find the smoothing parameter of series RI and because of that the above exponential smoothing model actually both are

(2) $\hat{Y}_{t+1} = \hat{Y}_t \times 2 - \hat{Y}_{t-1}$. [G]

The analysis results of above model are shown in Table 2. We can find the rural residents' average net income is 3573.6 Yuan in 2006 which increase 9.79% than 2005. To analyze urban residents' average disposable income is 11564.4 Yuan which increase 10.21% than 2005. To analyze the ratio of average income between urban and rural residents is 3.236.

[G] This model is demonstrated in Appendix 3.

Table 2 the analysis result of average income between dweller live in city and country in 2006 by using exponential smoothing model.

The estimated value of rural residents' average net income in 2006.	3573.6
The estimated value of urban residents' average disposable income in 2006.	11564.4
The estimated increasing rate of rural residents' average net income in 2006.	9.79%
The estimated increasing rate of urban residents' average disposable income in 2006.	10.21%
The estimated value of the ratio of urban residents' income to rural residents in 2006.	3.236

Data Source: "China Statistic Yearbook "(From the old data to analyze the new data)

The analysis value of ratio difference income between urban and rural residents in 2006 is higher than the value 3.224 in 2005 and the biggest ratio difference from reform and opening in 2003. According to Simon's analysis about the income difference problem, the relationship between average GNP (now the treasury stock) in distribution of income and imparity assumed the scale of up-side-down U. That is to say when average income is increasing, imparity will aggravate in early days of industrialization and reach to peak in medial income level and start to decline when income level has the characteristic of industrialization country[H]. From above analysis result we can see that, the income difference between urban and rural residents still didn't start to reduce. Despite that the average GDP of China has exceeded 1700$ in 2005, China still not comes into the declining area of the up-side-down U curve. It's still a long way to reduce the income difference between urban and rural residents.

[H] Malcolm Gillis and others, " economics of development", Renmin University of China publishing company, 2003 P76

Section 3 the main reason Analysis of Income Difference Enlarge

Figure 4 is the increasing rate to last year of the average income deducting the price fluctuates from the 90 age last century. We can see that except from 1995 to 1997 the increasing rate of rural residents' average net income was higher than urban residents' average disposable income, the rural residents' average income increasing rate was lower than the one of city dweller obviously in other years. Directly seeing that, farmer's income has slow increasing rate is the most direct reason of income difference between urban and rural residents enlarge in recent years.
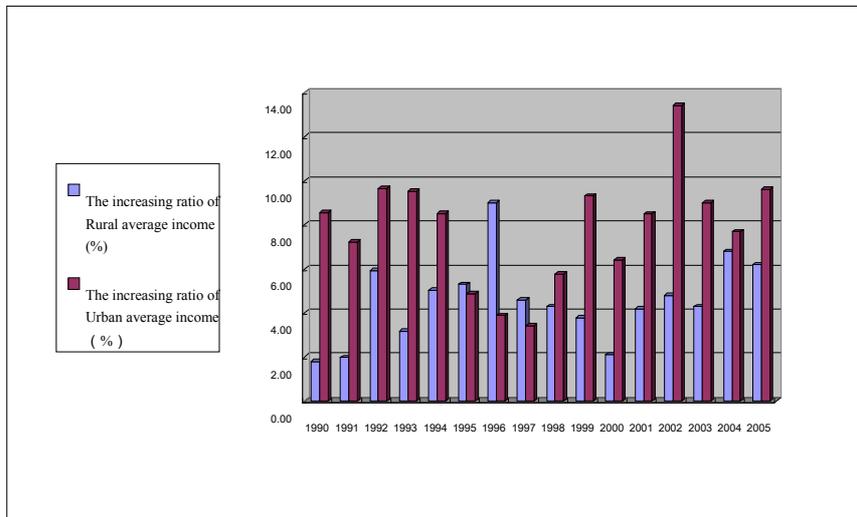
Figure 4: the bar chart of the actually increasing rate to last year of average income between urban and rural residents from 1990 to 2005.

Data source: "Chinese Statistical Yearbook 2005", Chinese Statistical Publishing Company, "National Economy and Social Development Statistical Communiqué, China, 2005"

Let the utterly difference of average income between urban and rural residents be GAP, obviously,

(3)**GAP=UI-RI.**

GAP、UI and RI all are function of time value T. If let GAP diminish while T is increasing, the

derivative must less than 0. That means

(4)d**GAP**/d**T**=d**UI**/d**T**-d**RI**/d**T**<0.

(5)d**RI**/d**T** >d**UI**/d**T**

It indicates that the increment of every-year urban residents' income should be higher than the one of urban residents. From 2002 to now, every year urban residents' income is at least 3 times higher than rural residents' income. It is obviously unrealistic that to let the increasing rate of farmer become 3 times larger than urban residents' in the following years. So the absolute income difference between urban and rural residents will still enlarge in a long period in the future.

Let the ratio of average income between urban and rural residents be RAT, RAT=UI/RI, this series is the function of T. If you want to let the ratio smaller, it must satisfies dRAT/dT. Because that

(6) d**RAT**/d**T**=(**UI**×d**RI**/d**T**-**RI**×d**UI**/d**T**)/(**RI²**) ,

if you want to let the derivative of RAT to T be negative, it must satisfies

(7) d**RI**/**RqI**>d**UI**/**UI**

That means the annual increasing rate of RI is bigger than UI. So only when the average income of rural residents has the bigger annual increasing rate than that of urban residents, the income ratio difference between urban and rural residents will become smaller. By calculation we can know that, the average income increasing rate between urban and rural residents from 1990 to 2005 are 7.76% and 4.75% respectively and the increasing scope of city income is higher than that of country obviously. So the income difference between urban and rural residents is not become smaller but bigger and bigger from 1990.

That is easy to see that from 90 age last century, the main reason of income difference between urban and rural residents become bigger and bigger is the low increase of rural residents' average net income. The key point of solving this problem is to advance the urban residents' income increase.

Section 4 the demonstration analysis of the problem that farmer's income has slow increase

4.1 The influence factor analysis of farmer's income

4.1.1 the generally analysis of farmer's income

The net income is the total income which is the rural residents get from every source in the same year minus some corresponding charge. The method for calculation is that: net income=total income - expenses of taxation payout - family manage payout - producibility capital depreciation - investigation allowance - layout of denote towards friend and relative who live in country. Rural residents' average net income can be divided into waged income, family manage income, wealthy income and transitivity income by there origin. The calculation formula is: the average net income=waged income + family manage income + wealthy income + transitivity income. Different original income has different influence factor. So we must analyze every kind of income alone.

From 1990 to 2004, the rural residents' average net income has increased 110.49%. There into 51.35% because of the increase of waged income, 49.58% because of the increase of family manage income and 9.55% because of the increase of wealthy income and transitivity income. In the part of farmer income increasing in this 14 years, 46.47% was contributed by the increase of waged income, 44.88% was contributed by the increase of family manage income and 8.65% was contributed by the increase of wealthy income and transitivity income.

From Table 3 we can see that the break up of the increasing ratio of rural residents' average net income from 1991 to 2004. This column is to scale if the increase of different part of net income has the advance effect to net income. From column 3 we can see that waged income is become the biggest advanced factor to the increase of farmer's income. How to reduce barrier for farmer to find work in city , to create convenience, to maintenance peasant-worker's lawful rights and interests actively and especially to solve the defaulting peasant worker's wage problem are the important way to advance the increase of farmer's income. At the same time, the increase of country's family manages income still is one of the important premises to guarantee the farmer's income has stable increase. Wealthy income and transitivity income

have the fewer ratios in net income than other two kinds of income and have the limited advanced effect. But it can advance farmer's income increasing straightly by increase sustain from financial funds to agriculture especially strength the transfer payment power to farmer. Further more, because that financial funds always give some country area which drop behind especially the area which should be supporting the poor and some minority area, it is necessary to larges the sustain from financial funds to farmer and it can do good to reduce poor people and to improve the condition that the distribution income has so wide gap.

Table 3 table of proportions of the revenue from various sources in per capita net income of rural residents

Region	Family operating income	Family operating income in the primary industry	Wage income	Income of property and transfer
1990	75.6%	68.5%	20.2%	4.2%
1991	70.9%	63.4%	24.6%	4.5%
1992	68.1%	60.5%	27.3%	4.6%
1993	68.2%	60.9%	26.9%	4.9%
1994	69.5%	59.9%	24.5%	6.0%
1995	71.4%	62.0%	22.4%	6.2%
1996	71.8%	58.3%	22.3%	5.9%
1997	71.2%	57.1%	23.8%	5.0%
1998	68.1%	53.8%	26.2%	5.7%
1999	65.5%	52.5%	28.6%	6.0%
2000	63.3%	48.4%	31.2%	5.5%
2001	61.7%	47.6%	32.6%	5.7%
2002	60.0%	45.8%	33.9%	6.0%
2003	58.8%	45.6%	35.0%	6.2%
2004	59.5%	47.6%	34.0%	6.5%

  4.1.2、Analysis of the income from primary industry.

The majority of farmers' income from primary industry is the net family operating income in the primary industry. Net family operating income indicates the income of production planning and management in family units, which consists of the operating income from both the primary industry and other industries. Since 1990, within the family operating income, the income from the primary industry has been accounted for more than 75%, and the proportion of which in farmers' net income is decreasing generally, from 68.5 in 1990 to 47.6 in 2004.

The main factors influencing net family operating income from primary industry are the

prices of the agricultural products, the prices of agricultural means of production, agricultural production conditions represented by the volume of farm machinery and other indicators, and the agricultural tax burden.

Traditional economic theories reckon that the lack of elasticity in agricultural demand curve and competing with price means due to the substantial increase in agricultural production, often lead to a phenomenon that increasing output without increasing income, and even the "cheap grain farmers." Therefore it is generally believed that the price index of agricultural products is an important factor affecting the family income and agricultural output often does not directly affect the income of the farmers. Let agricultural production price's fix-based index (1977 = 100) is a variable denoted by PP.

Improving agricultural production conditions in rural areas will contribute to the family income growth. Effective acreage, which is the total area planted minus the area destroy by natural disasters, is a basic indicator of the conditions for agricultural production. In addition, the degree of mechanization of agriculture, improving rural infrastructure so as to improve agricultural production conditions for farmers to increase their income. Statistically speaking, the total power of agricultural machinery and effective irrigation area, consumption of farm chemical fertilizer and rural electricity consumption is important indicators to measure the conditions for agricultural production. In addition, the total power of agricultural machinery can also serve as an indicator to measure the stock of fixed capital in agricultural production, reflecting capital investment in agricultural production. Let the total power of agricultural machinery be a variable, named MACH, counted in hundred million kilowatts.

The tax burden on farmers will affect rural household operating income directly, and scholars consider from the 1990s to 2004, before the central government decided to reduce or cancel agricultural tax, the slow growth of China's farmers' income and the expansion of the agriculture tax burden on farmers have a strong correlation. From statistical data, the main agricultural tax burden on farmers, including agricultural and animal husbandry tax, land use tax, and the agricultural specialty tax and contract tax, and the village retention and other expenses. Since 2004 the Chinese government promised to implement new agricultural policy and agricultural taxes within five years, China has significantly reduced the burden on peasants, and the per capita net income in rural areas has increased rapidly in 2004, with an increase rate of 11.97% over the previous year, which is the fastest growth rate since 1997. Thus the income gap between urban and rural areas has also been slightly smaller. And as reflected in the book "Survey of Chinese Peasants", the burden on peasants is much more serious than the book cases. The data of real tax burden on peasants is hard to acquire, and indicators "various agricultural tax" in "China Statistical Yearbook" does not truly reflect the value of the actual tax burden on peasants.

On the labor inputs in agricultural production, the present studies generally believe there is a huge amount of rural surplus labor, and the input of labor force in agricultural production has been continuously in a sufficient state, and the number of workers in the primary industry in rural areas is not an accurate measure of labor input in agricultural production. According to the current number and speed of transfer of rural laborers to non-agricultural industries, it is estimated that the transfer of rural surplus labor force in the near future will not have significant negative effects on agricultural production.

4.1.3, analysis of the income from the second and tertiary industries

Family net income and wages in other industries operating income mainly from the second and tertiary industries, the income of some of the main factors affecting the rural secondary and tertiary industries in the total rural population in the labor force and wage levels. Its per capita formula : = net income from secondary and tertiary industries in rural laborers engaged in the secondary and tertiary industries judged the average wage engaged in the secondary and tertiary industries in rural / rural population.

Family operating income from other industries can be understood as the wages paid to farmers for their own business, assuming that they are virtually employed by themselves, and the average wage have the same level of the average wages of migrant workers in cities. Because of lower average level of education of rural migrant workers comparing with average urban workers, the situation of China's labor market segmentation and the household registration system barriers of discrimination against migrant workers, labor forces can not flow freely between the urban and rural labor market and migrant workers' average wage level is significantly lower than urban workers. The average wages of rural migrant workers are hard to obtain due to the lack of relevant statistical data and access, but theoretically speaking the average wage of migrant workers and the average money wage for workers in China should have a strong correlation. Therefore we assume the average wages of migrant workers is equal to the average level of money wages multiplied by a constant **k**, in which **k** is greater than 0 and less than 1. According to the analysis above we obtain a formula as follows:

(8) $PCNI= k \cdot AW \cdot (NL/RP)$

In (8), **PCNI** denotes "Per capita net income from secondary and tertiary industries", AW denotes "average monetary wage of workers in China", **NL** denotes "number of laborers engaged in the secondary and tertiary industries in the rural area", and **RP** denotes "rural

population".

According to the above formula, we set the result of AW⨯(NL/RP) as a variable named

PCWA, called theoretical farmers' per capita income on the assumption that the farmers engaged in the secondary and tertiary industries officers have been able to obtain an average level of monetary wages rural per capita wages income, with unit of Yuan.

$$(9) \quad PCWA=AW \ (NL/RP)$$

4.2. Identify the variables and model forms

In order to find out the impact of the increase in the per capita net income of rural residents and quantitative factors, we decide to create rural income multiple regression models for analysis.

According to the analysis above, the price index of agricultural production will have significant impact on net income of farmers, and the total power of agricultural machinery can effectively assess the capital input to agricultural production, therefore we set farmers' net income denoted by RI as a function of price index for agricultural production denoted by PP, the total power of agricultural machinery denoted by MACH and rural per capita wages denoted by PCWA. Since factors affecting family operating costs are more complicated and difficult to explain using the three variables, we add constants in the model denoted by C.

It is shown in table 4 that the correlation coefficient matrix of these four variables. From the matrix, we found that correlation coefficient of the dependent variable RI and three independent variables PP, PCWA, MACH in the model are 0.8731, 0.9113 and 0.9760 respectively, with a strong correlation. So PP, PCWA, MACH are very likely to be factors affecting RI.

Table 4 the correlation coefficient matrix of RI, PP, PCWA, MACH

	RI	PP	PCWA	MACH
RI	1.000000	0.873124	0.911345	0.975985
PP	0.873124	1.000000	0.651724	0.813833
PCWA	0.911345	0.651724	1.000000	0.931320
MACH	0.975985	0.813833	0.931320	1.000000

Let RI be dependent variable with unit in Yuan and set PP, MACH, PCWA as independent variables. Then we collect time-series data of the 4 variables above, and construct a linear

regression model as follows:

$$RI=\beta_0+\beta_1\square PP+\beta_2\square MACH+\beta_3\square PCWA+u \qquad \textbf{Model (1)}$$

In this model, β_0 denotes the constant term and β_1,β_2,β_3 denote the coefficients for the variables respectively, reflecting the impact of each independent variable on the income level. u is random error, which is the description of the interference of factors except the model variable. From a theoretical perspective, the signals of β_1,β_2 and β_3 should be positive.

4.3、the selected sample data

We use time-series data in the model. According to the " Statistics compiled 50 years of New China" and the "China Statistical Yearbook 2005", as well as "rural China Statistical Yearbook" of the years from 1983 to 1990, we record or calculated the data for these variables collected from 1978 to 2004 from the corresponding statistical materials. And the corresponding data of theoretical per capita wages of rural residents in 1979 were not included in the above statistics, so it can not be calculated. Therefore we get a total of 26-year time series data. Data from 1978 to 1999 is obtained in the "Statistics compiled 50 years of New China" and data from 2000 to 2004 come from the "China Statistical Yearbook 2005". Since the base year of the price index of agricultural production in these two statistics are different, we set 1977 as the base year, and obtain the index using corresponding transformation.

4.4、parameter estimate

According to the model form, we do regression analysis using least squares estimate to estimate the model parameters. Then we get the following parameters of multivariate linear model.

Table 5 parameters' estimates and related test multivariate linear model

	R² adjusted	F-value
Model	0.975455	332.184358
	Coefficient	t-value
PP	197.024528	5.127339*

MACH	277.022878	3.548544*
PCWA	0.231993	2.754423**
C	-577.791715	-4.538971*

*Explanatory variable or constant term passes the T-test in the 1% significant level

** Explanatory variable passes the T-test in the 5% significant level

As shown in table 5, F-value of the model is very significant, so the overall model is set meaningfully. Explanatory variable PP and MACH, and the constant term C pass the T-test in the 1% significant level. T values of the variables PCWA is 2.7544, which passes the T-test in the 5% significant level. R^2-adjusted of the model is 0.9755, which demonstrating that the effect of fitting of the model is very good.

4.5、model analysis and interpretation

The elasticity of farmers' income to respective variables can be calculated according to model. According to the formulas of mid-point arc elasticity and point elasticity, we can compute each independent variable' arc elasticity of RI from 1978 to 2004 and point elasticity of 2004 respectively, as shown in Table 6.

Table 6 the elasticity of per capita net income of rural residents to each independent variable

	Arc elasticity from 1978 to 2004	Point elasticity of 2004
Price index of agricultural products	0.3816	0.3293
Total power of farming machinery	0.6838	0.6040
Theoretical per capita wages of farmers	0.3072	0.3194

As can be seen from the table, the model elasticity of the three variables to the income of farmers are all less than 1%, which reflects the increasing of peasants' income is relatively difficult. The arc elasticity of MACH to RI from 1978 to 2004 is the greatest, which indicates that every 1% growth in the total power of agricultural machinery leads to 0.68% net income growth for farmers. Since the total power of agricultural machinery is used to measure the variables of rural fixed capital stock, it is reflected the significance of increasing investment in fixed assets in rural areas and the need to accelerate the building of rural infrastructure. Since the beginning of reform and opening up, every 1% growth of agricultural production price

indices will stimulate the 0.38% growth of peasant incomes, reflecting the importance of increases in the prices of agricultural products is an effective means of income for farmers. Every 1% growth of PCWA pull 0.31% income growth of farmers' income, indicating that the increase of theoretical per capita wages of farmers will effectively raise wages for farmers to increase their income. Theoretical per capita wages of farmers is defined in this essay. According to the formula to compute PCWA, it is necessary to promote rural per capita wage growth, raising the proportion of surplus rural labor to non-farming industries accounting for the rural labor force, and the government should vigorously encourage farmers and their migrant workers facilitate, and promote the flow of labor between urban and rural areas; Meanwhile, the government and the community should protect the legitimate rights and interests of migrant workers from encroachment and make greater efforts to resolve the problem of wage arrears for migrant rural workers.

Section 5 Policy recommendation

5.1, to increase the investment in fixed assets in rural areas, strengthening the building of rural infrastructure

As can be seen from the above analysis, promoting investment to rural areas so as to increase the stock of fixed capital for farmers is the most effective mean to increase per capita income of rural residents. Therefore, China's government should implement corresponding policies to accelerate the building of rural infrastructure.

5.2, to encourage rural surplus labor force to work in urban areas strongly, and to protect the legitimate rights and interests of migrant workers

From 1990 to 2004 the increase in the per capita net income of rural residents contribute to a 46.47% growth of wage income, and we can see that promotion of the transfer of surplus rural labor to cities and towns played an very important role of raising the wage incomes of peasants. The obstacles between urban and rural areas caused by China's current household registration system should be removed to promote the flow of labor resources and to eliminate discrimination against rural migrant workers.

5.3, appropriately support prices of agricultural products and promote exports of agricultural products with comparative advantages

Raising prices can increase peasants' family operating income, especially the two substantial increases for the purchase of agricultural products in China contribute to increase the income of the peasants. However, the prices of major agricultural products especially crops has reached or exceeded the world prices, and because of the restrictions of WTO rules and the liberalization trend on world trade, increasing the prices of agricultural products have little room to increase the income of peasants. It should be continued to implement the grain subsidies, in order to protect the enthusiasm of peasants to grow grain, and to stabilize grain production. Meanwhile, we should also encourage China's export of vegetables, fruits and other agricultural products that have a comparative advantage in labor-intensive to increase the income of peasants' operating income from the primary industry.

Section 6   Conclusion

By the prediction using exponential smoothing model, in 2006 the per capita net income of China's rural residents will rise to 3573.6 Yuan, with a growth by 9.79% compared with that in 2005; and per capita disposable income for urban households will rise to 11564.4 Yuan, with a growth of 10.21%. We forecast that in 2006 the ratio of per capita income urban residents to that of rural residents will reach 3.236, with a slight increase over 2005.

In conclusion, in order to resolve problems of China's income gap between urban and rural residents, the key lies in promoting the growth of the income of farmers. We should speed up the growth rate of net income of farmers, especially increase investment substantially in fixed assets in rural areas, strengthen the constructing of rural infrastructure; give stronger support to the surplus rural labor force to work in urban areas, and protect the legitimate rights and interests of migrant workers; provide appropriate support to the prices of agricultural products and encourage exports of agricultural products that have a comparative advantage. China's government should also provide a substantial increase of transfer payments to farmers, improve the provision of public goods in rural areas, and provide completely free compulsory education in rural areas.

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Appendices

Appendix 1   table of the per capita income of urban and rural residents and Engel's coefficient 1978-2005

Year	The per capita net income of rural households		The per capita disposable income of urban households		Rural households	Urban households
	Absolute value (Yuan)	Index (1978=100),	Absolute value (Yuan)	Index (1978=100),	Engel coefficient (%)	Engel coefficient (%)
1978	133.6	100.0	343.4	100.0	67.7	57.5
1980	191.3	139.0	477.6	127.0	61.8	56.9
1985	397.6	268.9	739.1	160.4	57.8	53.3
1989	601.5	305.7	1373.9	182.5	54.8	54.5
1990	686.3	311.2	1510.2	198.1	58.8	54.2
1991	708.6	317.4	1700.6	212.4	57.6	53.8
1992	784.0	336.2	2026.6	232.9	57.6	53.0
1993	921.6	346.9	2577.4	255.1	58.1	50.3
1994	1221.0	364.4	3496.2	276.8	58.9	50.0
1995	1577.7	383.7	4283.0	290.3	58.6	50.1
1996	1926.1	418.2	4838.9	301.6	56.3	48.8
1997	2090.1	437.4	5160.3	311.9	55.1	46.6
1998	2162.0	456.2	5425.1	329.9	53.4	44.7
1999	2210.3	473.5	5854.0	360.6	52.6	42.1
2000	2253.4	483.5	6280.0	383.7	49.1	39.4
2001	2366.4	503.8	6859.6	416.3	47.7	38.2
2002	2475.6	528.0	7702.8	472.1	46.2	37.7
2003	2622.2	550.7	8472.2	514.6	45.6	37.1
2004	2936.4	588.1	9421.6	554.2	47.2	37.7
2005	3255	624.6	10493	607.4	45.5	36.7

Primary data sources : " China Statistical Yearbook 2005" ,China Statistics Press,
" PRC 2005 national economic and social development statistics"

Appendix 2 table of the required data in Model (1)

Year	The per capita net income of rural residents (Yuan)	Theoretical per capita income of rural residents (Yuan) *	The total power of agricultural machinery (hundred million kilowatts)	Fix-based price index of agricultural production (1977 = 100)
1978	133.6	23.0	1.175	1.039
1979	160.7	-**	1.338	1.269
1980	191.3	25.2	1.475	1.359
1981	223.4	27.6	1.568	1.439
1982	270.1	38.3	1.661	1.471
1983	309.8	45.9	1.802	1.535
1984	355.3	65.7	1.950	1.597
1985	397.6	95.4	2.091	1.734
1986	423.8	124.6	2.295	1.845
1987	462.6	153.5	2.484	2.066
1988	544.9	182.2	2.658	2.542
1989	601.5	197.7	2.807	2.923
1990	686.3	220.6	2.871	2.847
1991	708.6	246.3	2.939	2.790
1992	784.0	311.5	3.031	2.885
1993	921.6	434.4	3.182	3.271
1994	1221.0	633.7	3.380	4.577
1995	1577.7	813.2	3.612	5.487
1996	1926.1	950.8	3.855	5.718
1997	2090.1	1039.7	4.202	5.460
1998	2162.0	1241.7	4.521	5.024
1999	2210.3	1422.7	4.900	4.411
2000	2253.4	1758.1	5.257	4.252
2001	2366.4	2155.6	5.517	4.169
2002	2475.6	2625.5	5.793	4.156
2003	2622.2	3235.7	6.039	4.339
2004	2936.4	4042.6	6.403	4.908

*Calculated by the formula (Theoretical per capita wage of rural residents) = (the number of

labor force engaged in the secondary and tertiary industries in rural areas) × (average monetary wage of workers in China) / (rural population)

** Theoretical per capita wage of rural residents is missing due to lack of corresponding data
Source : "New China 50 years compiling statistical information," and "China Statistical Yearbook 2005" and rural China Statistical Yearbook "(1983 -1990).

Appendix 3　　demonstration of Euqation(2)

According to the correlograms of RI and UI, it is found that the autocorrelations of RI and UI are both tail-off, and the partial autocorrelations of them are both one-order cut-off. Therefore RI and UI are both easily demonstrated by AR(1) model. We can also find that about 99% of the value of both RI and UI can be illustrated by the only variable AR(1) in simple regression.

Eviews automatically find coefficients of Holt-Winter moving smoothing under the principle that the model should make the absolute values of estimate errors as little as possible. In this essay, we get extremes of Holt-Winter method with α and β both equal to 1. It indicated that the income of last year have very strong influences on the income of this year.

Appendix 4　　the test of multi-collinearity

Table 4 shows the correlation coefficient of PCWA and MACH is 0.9313, which indicates it is very likely that there exists multi-collinear in the model. Hence we analyze the multi-co linearity problem in model. We use least squares regression to analyze by setting a variable as dependent variable and the other two as independent variables among the three variables in the model, and the results of the analysis are shown in Table 4.　As can be seen from Table 5, the R^2 exceeds 0.9 when MACH or PCWA is set as dependent variable, indicating there are close-to-multi-co linearity problems. The least squares estimate of multiple linear regressions is still valid when multi-co linearity exists, but the problem would reduce the T-value of corresponding variables, resulting in non-significant coefficient. As can be seen from Table 4, all the coefficients at 5% significance pass T-test, with correct signal and reasonable numerical coefficients, which illustrates this is a healthy result. And the three variables are included in the model as a result of theoretical analysis, and each measuring different factors, therefore we will not change the model form, ignoring the impact of multi-co linearity.

Table 7 multiple linear test results of model (1)

	R² of regression with the other two	Variance Inflation Factor

	as independent variables	
PP	0.747	3.958
PCWA	0.901	10.077
MACH	0.942	17.167

Appendix 5   Corresponding test of OLS of Model(1)

Table 8   the result of test of Heteroskedasticity
 White Heteroskedasticity Test:

F-statistic	5.157238	0.002680
	Probability	
Obs*R-squared	16.10881	0.013182
	Probability	

As shown in Table 8, according to the result of White heteroskedasticity test, we can find that the associated probability of F statistic is 0.00268, therefore the null hypothesis is rejected with the 5% level's significance. This shows that there is heteroskedasticity in Model(1).

The value of Jarque-Bera statistic of the residual of Model(1) is 1.814597, and the associated probability is 0.403613. Thus we can not reject the null hypothesis that the residual of Model(1) is normally distributed.

DW Statistics of Model(1) is 0.268008, which is far less than 2 and shows that there is a problem of serial correlation in of the sequence of residuals of Model(1).

Corresponding test of Model(1) above show that the model has problems of serial correlation and heteroskedasticity, thus all the assumptions of OLS are not met and the set form of Model(1) needs to be improved.