
Review on Pulling Force of Agricultural Labor and Its Effectiveness in China*

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Abstract:

China's urban-rural income gap has become a dominant "pulling force" for rural labor's migration to urban cities. The paper points out that when one calculates the income gap, consumption costs should be taken into consideration, for it can also be regarded as one "pulling force". In accordance with this way, the urban-rural income gap is reassessed and the panel co-integration model is constructed, which presents the relationship between income gap and transfer of labor out of agriculture, thus proving that income gap is a key "pulling force" to attract agricultural laborers' migration to urban areas. Our results suggest that income gap has been narrowing during 2004-2009. In addition, there is a co-integration relationship between income gap and migrant workers, which plays an important role for rural labor to flow into urban cities.

Key Words: Urban-rural income gap, Agricultural labor flow, Consumption differences, Flow costs

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1. INTRODUCTION

Urban-rural migration has become a universal trend in the world during the process of economic development. In this case, fewer and fewer rural labor taking agricultural jobs and advancement of urbanization have been common phenomena, which are also the symbols of modernization. Widely accepted representative theories of the explanations for migration are listed as follows: labor force migration from rural to urban is an inevitable phenomenon in the dual economic structure of urban and rural areas; income gap has become the crucial pulling force for the migration, which has been approved by analyses of researches and studies from numerous countries and areas.

Studies have shown that widening income gap between urban and rural areas largely contributes to the mass migration. And the income gap in China is much larger and is still growing after the reform and opening-up in 1978. In that period of time, China's urban economy was booming under the guidance of Chinese policy, which greatly attracted the transfer of labor out of agriculture, and changed the supply and demand of labor market in urban and rural areas, and promoted the migration from urban to rural areas.

In China, scholars and experts have set indicators to conduct analysis on the measurement of the income gap between urban and rural areas, such as Fang Cai, Dewen Wang, Yang Du (2001), Shaoping Wang, Zhigang Ouyang, etc. (2007) who used Theil Index; the research group organized by Department of Rural Social and Economic Survey under National Bureau of Statistics (1994), Lingfen Gao (2008), etc. who calculated urban-rural income ratio to measure the income gap between urban and rural areas.

The author agrees that it is not reasonable to solely calculate and compare urban and rural residents' income with the above-mentioned measurement indicators as the "pulling force" of rural-urban income gap are being reassessed as one factor in influencing agricultural labor force flow. Because numerous studies have shown that even though income gap is still widening, it cannot well explain the fact that agricultural labors' migration back to rural areas in large-scale in the second half year of 2007. Therefore, the author believes that current studies neglect the effect of consumption costs, which play a crucial role in affecting agricultural labor flow. Reasons are listed in the following:

Population's flow is usually accompanied by consumption's transfer, and the consumption disparity between urban and rural areas can be an important factor affecting people's migration. For agricultural labor, whether to migrate to urban area or not, largely depends on the "net income gap", which is similar to Todaro's "expected urban-rural income gap" theory. In general, when rural labors flow into urban areas, they have to face the high consumption costs, and in this way, their economic consumption level has not been improved. In 2007 and 2009, the author made researches based on statistics in 2006 and 2008 respectively, and the result

showed that for Beijing migrant workers, the migrant workers' Engel's coefficient (the proportion of income spent on food consumption) was above 60 percent, which was much higher than that of rural residents. Moreover, in general, statistics indicate that in terms of consumption, the proportion dedicated to means of subsistence, food and clothes, for instance occupies a large part, and that dedicated to development and enjoyment consumption is only a slice share. That is one reason why even though the income inequality exists between urban and rural areas, yet, rural labors don't migrate to urban cities in large-scale.

When analyzing urban-rural income gap, the author takes consumption into the framework of urban-rural income gap, and demonstrates a brand new standpoint of the income inequality and its changes. Besides, the author presents the influences of the income gap on agricultural labor's migration and finally gives extensive studies on the "pulling force" of rural agricultural labor.

2. URBAN-RURAL INCOME GAP AND ITS CHANGES

2.1 Introduction of the index and data sources

The above analysis shows that the "net income gap between urban and rural areas" has become an important factor affecting the agricultural labor's transfer to urban areas. Net income is the residual income of a firm or a household, after adding total revenue and gains and subtracting all expenses and losses for a certain period. Urban residents' net income is their disposable income minus all costs; and rural residents' net income is the net income minus all cost during the year. In the thesis, the Theil Index is used to measure the urban-rural income gap.¹

There are some points needed further explanations: all the statistics which refer to urban residents' net income released by China authorities employ "income available for cost of living" before 1993, and they change into disposable income after the year. However, China authorities always use "net income" to refer to rural residents' income. (Lingfen Gao, 2008). In this thesis, the author studies people's net income during 1993-2009 and all the statistics stem from China Statistical Yearbooks, except those with further explanations.

2.2 Analysis of the result

After analyzing the statistics, the author finds that the calculated Theil Index is much lower than the one which only compares urban residents' disposable income with rural residents' net income without considering consumption costs. The result demonstrates that the higher consumption costs in urban areas, to some extent, lead to that the lower rural residents' motivations of flowing to urban areas.

¹Ying Li (2004). Income Difference of Rural Residents of China and Determinants (D). China Agricultural University:19-26

2.2.1 Theil Index of China’s residents’ net income gap between urban and rural areas

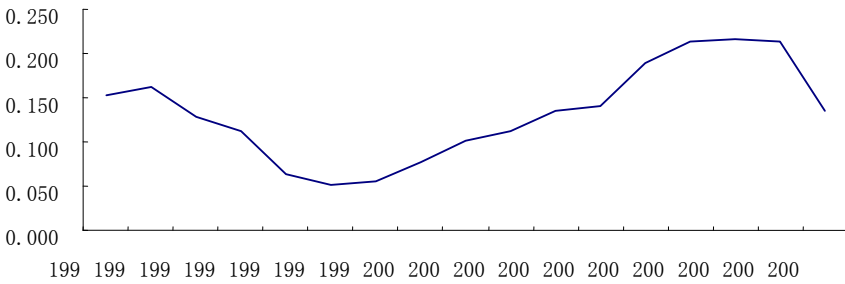


Diagram 1 Theil Index of China’s residents’ net income gap between urban and rural areas

Data sources: calculated by the author based on China Statistical Yearbooks

In this diagram, from the overall trend, it can be seen that Theil index indicates an inverted "N"-shaped form which means there are three stages of residents’ net income gap between urban and rural areas in China, namely, first contraction, then expansion, then contraction again. Besides, in the year of 1998 and 2007, there were two turning points: Theil index shows a lowest point in 1998 and a highest point in 2007. Moreover, the fact that the widening urban-rural income gap has been noticeable since 1998, which exerts a negative influence on raising consumer demand, China’s building of a harmonious society, and the economic development of the whole society. In this context, Chinese government has made preferable policies to improve people’s livelihood, and raise low-income households’ income, and in consequence, the income gap has been narrowing since 2007.

2.2.2 Theil Index of Analyzing China’s regional net income gap between urban and rural areas

2.2.2.1 Divergences of regional income gap between urban and rural

After analyzing Theil Index of different regions, it can be seen that income gap in western regions, such as Yunnan, Shanxi, Qinghai, Gansu, Guizhou, Guangxi, Xinjiang, and Xizang, is relatively larger than that of middle and eastern regions; eastern regions income gap is the smallest, including Tianjin, Beijing, Liaoning, Shanghai, Hebei, Heilongjiang and Jiangsu; middle regions’ income gap is just in the middle. This finding is in accordance with the conclusion of the ratio of urban-rural net income ratio². The ratio of urban-rural net income is

²Ratio of urban-rural net income is a relative number. And urban residents’ net income divided by rural residents’ net income is the relative number, which is the easiest, frequently used statistical indicator when calculating urban-rural income gap. If the relative number is over 2, it means the gap is too large. Besides, nowadays, there is no author employing Theil Index to measure urban-rural income gap, therefore, the author’s make a contribution from a brand new perspective. Moreover, the author also uses the ratio of urban-rural net income to support the conclusion drawn by employing the means of Theil Index.

over 3 in Western provinces, and the ratio is below 2 in eastern regions, and the ratio of Middle regions is between 2 and 3.

2.2.2.2 Chinese government giving top priority to improve people's livelihood and narrow urban-rural income gap

Since 2000, Theil Index has shown an increasing trend in all areas with different degrees in China. Facing the situation, Chinese government determined to give top priority to improve people's livelihood by making lots of preferable policies, which play essential roles in narrowing income gap between urban and rural areas. Observing the diagram, it can be seen that the income gap was starting to widen during 2000 and 2004, and the gap was starting to narrow during 2004 and 2009.

3. REVIEW ON "PULLING FORCES" OF ATTRACTING RURAL LABOR'S MOBILITY

In terms with the relative theory, regional income gap can induce labor's flow without considering flow costs (transportation costs, job search expenses, etc.). The larger the gap is, the stronger the pulling force will be, and in this case, there will be more and more rural labor migrating to urban areas. Zhu (2002), Zhang and Song (2003), Wu and Yao (2003) have made extensive studies on it, and have proved that. But, Zhao (2005) also pointed out there are few empirical researches analyzing the effect of income gap on labor mobility.

The author sets out to construct the panel co-integration model presenting the relationship between income gap and the transfer of labor out of agriculture, thus to prove income gap is a key "pulling force" to attract farmers to migrate to urban areas.

3.1 Empirical model building

The panel co-integration model of rural-urban income gap and number of agricultural labor mobility is set as:

$$\text{LOG}(NFP_{it}) = \beta_0 + \beta_1 \text{LOG}(ORIG_{it}) + \varepsilon_{it}$$

Among them, $\text{LOG}(NFP_{it})$ indicates the logarithm of the number of floating people in permanent population within the time period t as the cross section area unit, and it is used to measure the flow of agricultural labor force; β_0 is the intercept; $\text{LOG}(ORIG_{it})$ indicates the logarithm of urban-rural net income gap Theil index, its corresponding slope coefficient β_1 reflects the relative changes in urban-rural income gap leading to the relative change of agricultural labor force flowing from countryside to cities and towns; ε_{it} is the residual.

The description of the model variables

- (1) the number of floating people in permanent population (NFP)

The indicator shows the flow status in permanent population in each region. As the main body of the floating people in permanent population is agricultural labor flowing into cities, therefore, the model use its approximation to replace the inflows of agricultural labor force to cities and towns in every region (from rural areas all over the country). In general, the larger the index value in an area indicates that the stronger it attracts floating population; on the contrary, the smaller the index value in an area, indicates that the weaker it attracts floating population. In the case of China's, the index value of the eastern provinces which are close to the coastal areas is relatively larger, and that of the western provinces is relatively smaller.

According to National Bureau of Statistics' "the System of Sample Survey on Population Changes"³, it divides the sample survey population of the resident population each year into four types, accordingly, the actual number of floating people in permanent population in each area is calculated as follows⁴: first of all, add the type of people ② and ③ over the years to obtain the sample of number of floating people in each area; then, with the sample of number of floating people divided by sample population in each area, the sample flow ratio can be calculated and obtained; last, multiply the permanent population in each area and sample flow ratio to get *NFP*. Among them, the number of people of the type of people ② and ③ and the sample population in each area can be directly obtained from China Statistical Yearbook over the years (including the "China Statistical Yearbook 2002" without the statistic of the year 2001 and the number of the people of type ② and ③, so the *NFP* cannot be calculated in the demonstration of each region in 2001).

(2) Based on the definition of *NFP*, the floating population in a certain region might come from rural areas across China, then "pulling force" refers to the force of the cities and towns in the region to pull agricultural labor force from all over the country, therefore, the urban-rural net income gap here calculated in the model ($ORIG_{it}$) will be represented by calculated Theil index of urban net income in every region and rural net income across China.

(3) Since the obtained data period was short, the cross-section and panel data formed of mixing time of evIEWS6.0 was used in the estimation process to conduct model

³National Bureau of Statistics, "Sample Survey on Population Changes" (2009 Statistical Bulletin) "Household registration status" in Section 10 (6).

⁴The number of floating people in the region's permanent population also should include "people who live in the village, town, street less than six month and leave their household registration village, town or street which is in other place less than six month", as this part of the data is absent, which may lead to the obtained index value smaller in this, but in this paper, here is mainly to test the effect of the "pulling force", the lack of data would not affect the conclusion of the whole paper.

estimation and test of the data of 31 provinces (autonomous region, direct-controlled municipality) in China between 1996 and 2009.

3.2 Model estimation, testing and results analysis

The model is estimated as follows:

3.2.1 Stationarity test of the variables

In the stationarity test of the two variables of $LOG(ORIG)$ and $LOG(NFP)$, due to various test methods have advantages and disadvantages, this paper takes five main methods (LLC test, Ips test, Fisher-ADF test, Fisher-PP tests and Hadri test) at the same time of panel unit root test for stationarity test to avoid negative impact as there are limitations of each test method and to meet more than three test results are set as the standard of unit root test. Test results are in Table 2. Accordingly, it shows that the two variables are 1 order single whole sequence and their co-integration can be tested.

Table 2 Stationarity Test of Panel Data

Variables	LLC	IPS	Fisher-ADF	Fisher-PP	Hadri
$LOG(ORIG_{it})$	-2.55485***	-0.82191	61.8462	43.824	8.31537***
$\Delta LOG(ORIG_{it})$	-17.08***	-12.7823***	256.501***	252.729***	-0.00944
$LOG(NFP_{it})$	-1.84306**	1.7573	43.2249	30.7349	13.1012***
$\Delta LOG(NFP_{it})$	-10.3973***	-4.40882***	89.9841**	125.8***	28.2047***

Note: (1) By observing the panel sequence timing diagram of the gap of urban-rural net income after taking logarithm, it can be determined that it contains intercept and there is no obvious time trend, so the given test results in the table are all based on the methods containing the intercept; while after observing the panel sequence timing diagram of the floating people number in permanent population after taking logarithm, it can be determined that it contains intercept and there is obvious time trend, so the given test results in the table are based on the methods containing the intercept and trend term; (2) ***indicates that it passed 1% level of significant test, ** indicates that it passed 5% level of significant test; * indicates that it passed 10% level of significant test.

3.2.2 co-integration test

This paper takes the two-step method (EG test) of Engle and Granger (1987) to test the co-integration between the variables: step 1: to conduct least squares estimation (OLS) of the co-integration regression model $LOG(NFP_{it}) = \beta_0 + \beta_1 LOG(ORIG_{it}) + \varepsilon_{it}$ and obtain the residual sequence and coefficients of each variable; step two: to conduct stationarity test of the obtained ε_t , the method is the same as the above panel data stationarity test methods, the results are shown Table 3.

Table 3 Stationarity Test of Residual Sequence ε_t

Variables	LLC	IPS	Fisher-ADF	Fisher-PP	Hadri
\mathcal{E}_t (containing intercept)	-3.34322***	-2.51379***	87.5338***	86.9882**	6.84206***

Note: (1) by observing the panel sequence timing diagram of \mathcal{E}_t , it can be determined that it contains intercept and there is no obvious time trend, so the given test results in the table are all based on the methods containing the intercept; (2) ***indicates that it passed 1% level of significant test, ** indicates that it passed 5% level of significant test; * indicates that it passed 10% level of significant test.

According to Table 3, the sequence of the residual ε_t can be comprehensively determined as 0 order single whole sequence and it can meet stationarity requirement, and the long-term co-integration relationship exists between the urban-rural income gap and the number of floating people in permanent population, this long-term co-integration relationship can be expressed as:

$$LOG(NFP_{it}) = 5.7398 + 0.1573LOG(ORIG_{it})$$

(77.36) (5.96)

$$R^2 = 0.860499 \quad \bar{R}^2 = 0.848651 \quad F=72.62828$$

The basic conclusion is: in the long term, the net income gap between urban and rural areas increase every 1%, the number of floating people in permanent population will increase about 0.16%.

3.2.3 Causality test

To further illustrate the causal relationship between the variables, this paper establishes panel data error correction model to determine that the “pulling force” effect of the net income gap between urban and rural areas is the cause of agricultural labor mobility. Panel data error correction model (*ECM*) is as follow:

$$\Delta LOG(NFP_{it}) = \alpha \Delta LOG(ORIG_{it}) + \lambda ecmt + \varepsilon_t$$

Among them, *ecmt* is the error correction term ($= LOG(NFP_{it-1}) - \gamma LOG(ORIG_{it-1}) - \delta$). The model shows that $\Delta LOG(NFP)$, the short-term fluctuation of $LOG(NFP)$ is co-determined by the short-term fluctuation of explanatory variable $\Delta LOG(ORIG_{it})$ and error correction term. Theoretically, if the virtual assumption $\alpha = \lambda = 0$ was established, the causal relationship between urban-rural net income gap and agricultural labor mobility would not exist, if not, the causal relationship would exist.

The *ECM* model is estimated, the result is expressed as:

$$\Delta LOG(NFP_{it}) = 0.102409 \Delta LOG(ORIG_{it}) - 0.816217 ecmt$$

(2.882251) (-13.25113)

$$R^2 = 0.621873 \quad \bar{R}^2 = 0.565612 \quad F=11.05334$$

The result of panel granger causality test shows that: in the error correction model in which the logarithm of the number of floating people in permanent population is set as dependent variable, the regression coefficient of the error correction term is negative, and it passed the 1% significant level test which proves that in a long term the urban-rural net income gap has obvious greater causal relationship with the number of floating people in permanent population; meanwhile error correction mechanism happens, and current population flow is reversely influenced by early error correction term. For instance, if the number of early migration population exceeds the balance of urban-rural income gap's influence, the current number of population migration will decline and approach the equilibrium level, 81.62% for adjustment; and the lag coefficient of first order difference is not significantly zero, indicating that in the short term the urban-rural income gap is the granger cause of the number of floating people in permanent population. Under the premise of the other conditions remain unchanged in short-term changes, the short-term fluctuation of urban-rural net income gap increase every 1%, the short-term fluctuation of the number of floating people in permanent population increase about 0.1%.

4. CONCLUSION

In this thesis, the author takes a large proportion to calculate the urban-rural income gap, and construct the panel co-integration model presenting the relationship between income gap and the transfer of labor out of agriculture with considering consumption costs. After analyzing the model, a co-integration relationship between income gap and migrant workers is revealed, this also approves the "pulling force" of attracting rural labors' migration to urban areas, with considering consumption costs. It can also explain the fact, actually it is an important reason, that in the second half year of 2007, and after the financial crisis in particular, under the background of inflation, more and more rural labor living in urban cities have to go back home, or slow their transfer to urban cities, for they have been aware that the consumption costs placing great pressure on them, and they had to balance the situation.

1) In this thesis, the author employs Theil Index by considering consumption costs to measure China's urban-rural income gap, which draws a precise real picture of China's income gap between urban and rural areas. The findings are presented as follows: In 1993-2009, Theil index indicates an inverted "N-Shaped" form, which means there are three stages of China's residents' net income gap between urban and rural areas, namely, first contraction, then expansion, then contraction again. And in 2004-2009, most regions in China all show a contraction trends, which should attribute to the government's beneficial policies to people, for with China's economic and social boom, the government decides to give top priority to improve people's livelihood. Besides, from the perspective of regional income gap, it can be seen that western regions' situations are most serious, and the eastern provinces' income gap is

the smallest, and the middle regions are just in the middle of western and eastern regions. From these, it can make a conclusion that, in order to narrow urban-rural income gap, promote the development of a harmonious society, and stabilize the current policy of people's livelihood and improving the groups of low income, it is very important to strengthen the enforcement. Meanwhile, the investment within the policy should be increased in the whole society, especially to the central and western rural regions, and the consumer market targeting the migrant workers should be established.

2) The urban-rural income gap with considering consumption costs is in accordance with the number of floating people in permanent population. The diagram shows that since 1993, Theil Index has been increasing until 2005-the highest point, and later it shows a decrease trend. In addition, a long-term co-integration relationship between income gap and migrant workers' number is shown in the linear estimation and test results of the panel co-integration model of rural-urban income gap and the number floating people in permanent population, which confirms that urban-rural net income gap is a "pulling force" and has positive effects for rural labors to flow into urban cities. The phenomenon indicates that when state and local government designs industrial layout and plan, projects and constructs of cities and towns, they should be fully conscious of the pulling force inducting rural labor's migration to urban cities due to income gap. Besides, the government should rationally lead the urban-rural population's migration and achieve labor's balance between supply and demand, especially for those labor intensive enterprises.

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