An Economic Analysis of the Rural-Urban Migration in China

Zhijun LIIU [1] and Bing PENG [2]

1- Zhijun LIU, Associate Professor of the Dept. of Sociology at Zhejiang University, Hangzhou, China. Email: liuzhijun@zju.edu.cn

2- Corresponding Author**:** Bing PENG, Associate Professor of Lishui University, Lishui, China. Email: 42214033@qq.com

Abstract: The purpose of this paper is to do an elementary economic probe into the rural-urban migration in China with respect to China's particular realities. After introducing the Harris-Todaro Model, the Minquan LIU Model and doing some extended discussions. The author analyzed the insurance role of the rural sector under the uncertainty of employment in the modern sector and did some comparative statics analysis by examining the influences of several "push" forces from the rural sector and "pull" forces from the urban sector, etc. on rural-urban migration decision-making.

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1. Introduction

A large part of China's population began to migrate from rural to urban areas following the Third Plenary Session of the Eleventh Central Committee of the Communist Party of China in 1978. For instance, China National Rural Survey (CNRS) showed that the off-farm labor force expanded steadily between 1981 and 1995. From around 15 percent, i.e. less than 40 million peasants, in 1981, this survey estimated that by 1995, 32 percent of rural labor force, i.e. more than 150 million farmers, found some off-farm employment. (Brauw *et al.* 2002. pp.19) There has been no previous experience of urbanization on such a large scale in the entire world. It is a new and important field of study in China and is previously and currently absorbing the attention of social scientists and demographers both in China and abroad.

Generally, the migration of population links the rural areas with urban areas and is affected by "push" forces from rural areas and "pull" forces from urban areas. Different degrees of these forces determine the different paces, patterns and processes of migration and urbanization and the transition of population. So the purpose of this paper is to do an elementary economic probe into several "push" and "pull" forces and other related factors, and to introduce and reexamine two related models.

Briefly, in this paper, I intend to analyze rural-urban migration in China with respect to China's particular realities. Section 2 will introduce the Harris-Todaro Model, the Minquan Liu Model and do some extended discussions. Section 3 is supposed to analyze the insurance role of the rural sector under the uncertainty of employment in the modern sector. Section 4 will be allocated to do comparative statics analysis by examining the influences of several "push" forces from the rural sector and "pull" forces from the urban sector, etc. on rural-urban migration decision-making based on those assumptions made in section 3. Section 5 is subject to a supplementary note.

2. The Harris-Todaro Model, Minquan LIU Model and some extended analysis

In section 3 and 4, I will do some elementary analysis of rural-urban migration by considering the rural sector as a kind of self-provided insurance of countryside residents. This model can explain the different influences of some "push" forces and "pull" forces in both sectors. But this model is awkward in analyzing the equilibrium of rural-urban migration. In fact, some scholars have constructed some useful model to pursue this kind of explanation. Here I will only introduce two related models, the Harris-Todaro Model and Minquan Liu Model, and do some extended discussions.

2.1. The Harris-Todaro Model

According to HT Model, rural-urban migration is due to the wage gap between the modern sector and the rural sector. In equilibrium, there exist an equation:

$$W_R=WL_M/(L-L_R)$$

Where

L is the total labor force.

L_M is the labor employed in the urban sector.

L_R is the labor employed in the rural sector.

$L-L_R$ is the total labor force in the urban sector.

$L-L_R-L_M$ is the total unemployment in the economy and in the urban sector according to this model's assumption.

This model assumes that the immigrant is risk-neutral and act rationally to maximize his expected income. So only when the maximized expected incomes in both sectors are equal,

rural-urban migration will cease.

Derived from this model, trying to create more jobs in the urban sector, i.e., the increase of urban employment L_M will not drive down the unemployment as long as free migration exists. Because from the equation above $W_R=WL_M/(L-L_R)$, we can find out that:

$L_R=L-L_M W/ W_R$

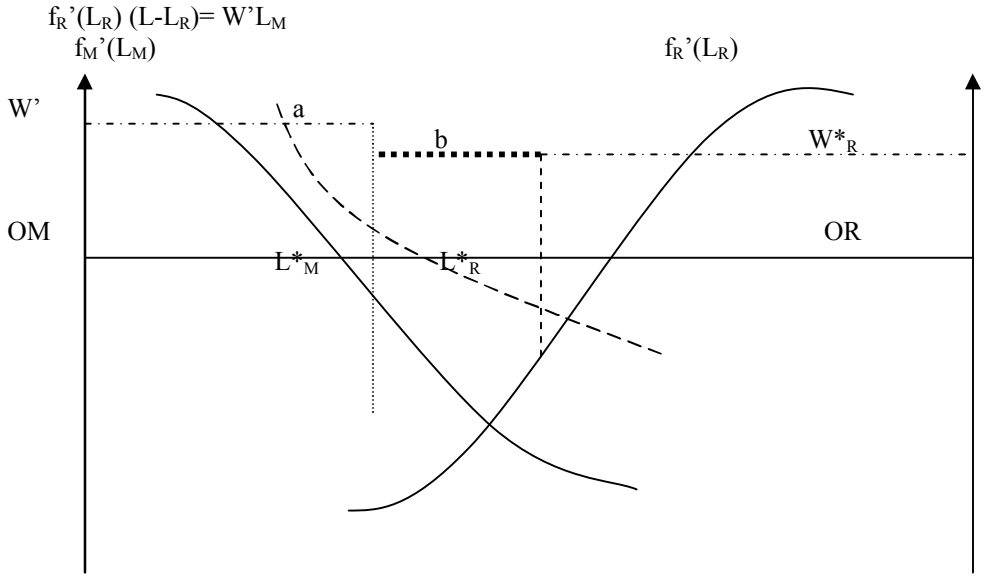
$\rightarrow dL_R/dL_M = -W/ W_R$

Because

$W > W_R$

$\rightarrow dL_R/dL_M < -1$

This inequation implies that more than 1 rural resident will migrate to urban areas when 1 more job is created in the modern sector. Given the condition that the urban wage is a rigid wage W', and assuming that the wage rate of the rural sector W_R is equal to the marginal product of labor $f_R'(L_R)$, HT Model illustrates the situation in a beautiful creative graph.



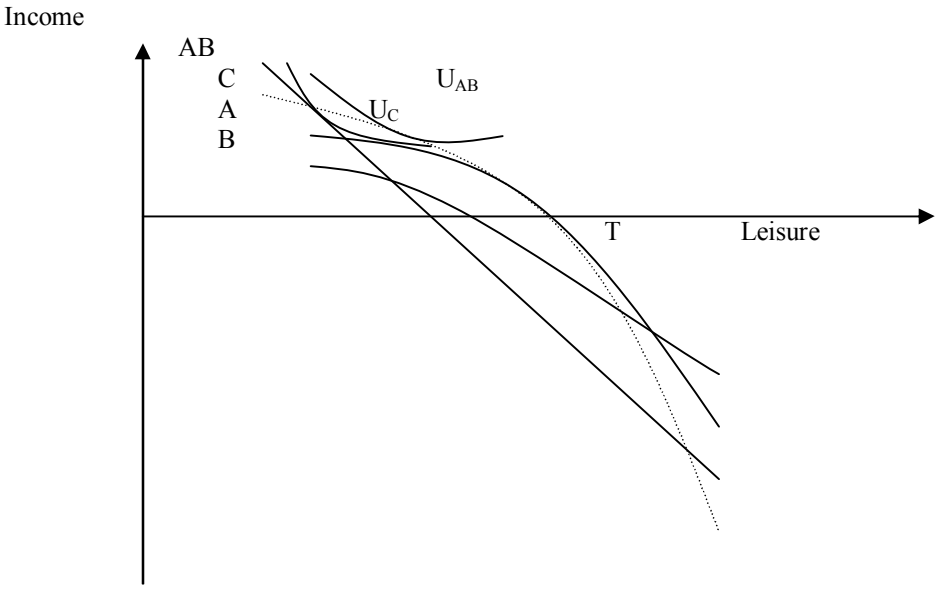
2.2. The Minquan Liu Model

HT Model assumes that there exists a unique wage rate in the rural sector and doesn't take time constraint into account. In order to make up these limitations, Dr. Minquan Liu forwarded a model to probe into these problems. His model separates non-farming from farming activities and focuses on time constraint in order to get the theory closer to the reality.

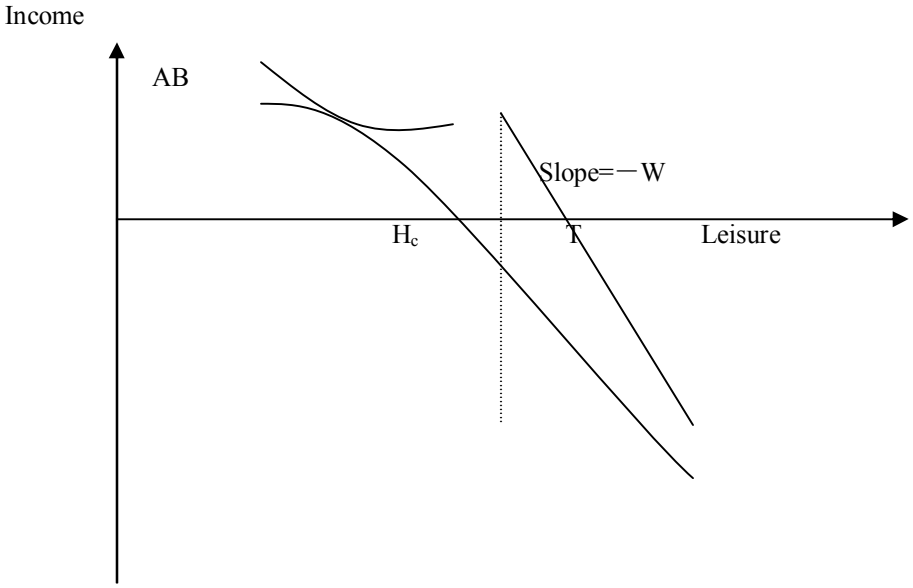
In short, his model is developed based on the assumption that a farmer allocating time between three activities, farming, non-farming and urban employment, under conditions of small family farms. He also assumes if a farmer can only engaged in either farming activities or non-farming activities in the rural sector, his maximized expected utility will be less then he get through urban employment. But in fact, a farmer can undertake both farming and non-farming activities simultaneously to get higher expected utility. Thus the rural sector can compete with the urban sector in the rural labor market. The graph follows is given by Dr. Liu to illustrate one possible situation according to his model as the following.

As illustrated in the map, though farming activities A and non-farming activities B can't provide for a farmer enough utility to attract him to stay in the rural sector respectively, the utility supplied by A and B, $U_{AB,}$ is higher enough to persuade him not to migrate to urban areas.

In fact, in contemporary China, quite a few peasants manage to improve their earnings by investing their own limited funds in constructing rural handicrafts, manufactures, and commerce and services in local rural areas or rural towns. Luo (1988, pp. 13-14) also indicates that many peasants "liberate" themselves from agriculture to construct rural industries. These people don't completely divorce from agriculture but have given up agricultural work as their major occupation in order to earn their living mainly from non-agricultural work. Fang (1984, pp. 17-19) and Yan (1986, pp. 4-6) express the view that such a population of worker-peasants completes the first step in the transition of this segment of the population from agriculture. This initial transition fits the current situation and the characteristics of rural surplus labor, because the family responsibility system for production makes it difficult for entire families to move.



Even when the expected utility provided by urban employment U_C is higher in every stage along with its function curve C then U_{AB}, Dr. Liu argues that if we take the time constraint into consideration, it is also possible that the farmer will select to stay in the rural sector as illustrated in the graph follows:



Because of the time constraints H_c in the urban sector, the farmer can get higher expected utility from the rural sector. Thus migration will not happen though the urban wage rate W is higher in all stage.

2.3. Some extended discussions

Both models introduced above simplify the problem by exclude the migration costs and the policy obstacles and some social factors out of consideration.

However, as far as China is concerned, the migration costs is much higher than many countries. In fact, it is very closely related to some governmental policies. For example, Zhong and Lu (1987, pp. 21-29) and Li *et al.* (1987, pp. 16-23) suggest that the family responsibility system constrains rural people from divorcing themselves completely from agriculture and migrating to urban areas, because each family has to plant the land which is its responsibility (it is apportioned taking account of the size of the family) and pay the grain tax. The land which is the family's responsibility holds the family on the land, not allowing it to migrate easily or, at most, to migrate

only partially. Brauw *et al.* also pointed out that some researchers believe that the household registration (Hukou) system, land tenure arrangements, and mandatory marketing quotas hinder the movement of labor. (Brauw *et al.* 2002. pp.19) In addition, the system of identity cards, differentiated social security systems and social welfare systems between rural and urban residents, effectively block rural people from migrating to urban areas. All these factors can be considered as the increase of migration costs or the decrease of the urban wage W.

What's more, seasonal and partial migrations are also excluded in these two models. As a matter of fact, in China today, population mobility is much higher than before, daily circulation; seasonal mobility and semi-permanent migration are all common phenomena in reality. Just as pointed out by Goldstein (1984, pp. 100-103) that circulation has become a major mechanism which enables rural areas to cope with their surplus labor force and to improve their standard of living. So in the model which will be constructed in section 3, seasonal and partial migrations will play important roles in it.

3. The insurance role of the rural sector and its impact in immigrants' decision-making.

In my point of view, the rural sector can be regarded as a kind of insurance for rural residents' expected revenue. Though there actually exist many kinds of risks in agrarian sector just as in the urban sector, the risks are usually far more less than those in the modern sector. In order to make the problem simple enough to extend my analysis, I assume that there is no production risk and unemployment risk in the rural sector.

Also for the convenience of analysis, here I use the family as the decision-making unit. Though some scholar point out that the separate family will not last for a long time, so the possibility of different family members work in different sectors so small that we can ignore it. But in fact, this phenomenon is very common in China and looks less likely to disappear in a short period. Anyway, if we take the family as the unit, and take partial migration into account, then it's possible to allow the free allocation of labor between the rural sector and the modern sector.

If a family gives up the rural sector and engages only in the modern sector, it will have different annual revenue according to different states. Let's just simplify this problem by assuming that the family will have two states, i.e. whether be employment or not. Then without allotting any labor in the farming sector, its total revenue will be:

$$Y_1=B+(W-C) \quad L \qquad (1)$$

$$Y_2=B-CL \qquad (2)$$

Where

Y1, Y2 represent its revenue in state 1, be employed, and state2, out of work.

B represents its income endowment.

W represents the wage rate in the modern sector.

C represents the migration cost rate. Here I assume that the migration cost is a positive function of the labor transformed to the modern sector from the rural sector.

L represents the total available labor of the family.

In fact, these two equations can be represented in one equation:

$$Y_s=B+(W_s-C)\ L \qquad (3)$$

Where

In state 1, $W_1=W$;

In state 2, $W_2=0$.

According to this equation, we can find out that the family faces a very similar situation as the insured encounter in insurance market. It will lose its wage income at state 2.

Then, can the rural sector act as a kind of self-provided insurance in the family's point of view.

At first, let's introduce the rural sector into the equation (1) and (2):

$$Y_1=B+(W-C)(L-q)+pq$$
$$=B+(W-C)\ L-\ (W-p-C)\ q \qquad (4)$$

$$Y_2=B+(W-C)(L-q)-W(L-q)+pq$$
$$=B-CL+(p+C)q \qquad (5)$$

Where

p represents the wage rate in the rural sector.

q represents the labor quantity allocated in the rural sector.

Compare with insurance market, we can see that the insurance role of the rural sector is a little different because this "insurance" is self-provided by the family itself but not be provided by others.

By analyzing how much "insurance" the family will choose under different situations, we can find out how many labors will be allocated to the rural sector and how many will migrate to the urban sector. Many scholars have analyzed the role of wage gap between countryside and urban areas in the migration decision-making of farmers. But few people have pointed out the insurance role of the rural sector in China's urbanization process.

By intuition, more labors will stay in the rural sector as long as the rural wage rate p is higher, and there exist an optimal p which will attract all family labors stay in the rural sector. Another problem arises. Is there a p which will drive all family labor forces into the modern sector? It is very likely to happen in reality. It is also likely to happen in this model when the net wage gap "W-p-C" is wide enough and the possibility of state 2 $\prod_2$ is high enough.

Under what conditions will the family's

rural-urban migration of cease? That is, when will q be equal to L. According to the principle of insurance market, if the insurance is fair, then the insured will select the full insurance as long as he is risk averse.

Let's assume that the family has the utility function V(Ys) and maximizes expected utility over states of nature.

$$\text{Max}_{q} \quad V=E\,V(Ys)=\prod_1 V(Y_1)+\prod_2 V(Y_2) \qquad (6)$$

Where

$\prod_1$ is the possibility of state 1. $\prod_2$ is the possibility of state 2. $\prod_1+\prod_2=1$.

Let's also assume that the family is risk averse. So $V' > 0$, $V'' < 0$.

According to FOC:

$$Vq= -\prod_1 V'(Y_1)(W-p-C)+\prod_2 V'(Y_2)(p+C)=0$$

Implying:

$$-\prod_1 V'(Y_1)/\prod_2 V'(Y_2)= -(p+C)/(W-p-C) \qquad (7)$$

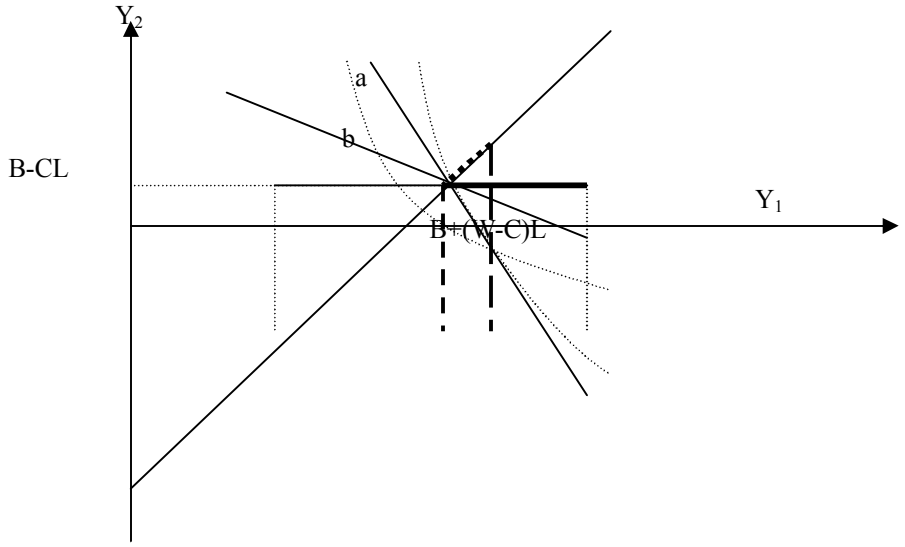
The LHS of equation (7) is the slope of the family's indifference curve. How about the RHS? It's the slope of the family's budget constraint line. Because:

$dY_1/dq=-(W-p-C)$

$dY_1/dq=p+C$

$dY_2/dY_1=-(p+C)/(W-p-C)$

to illustrate this situation directly:



In fact, only when the "insurance" if unfair, in this particular case, that is:

$\prod_1[B+(W-C)L]+\prod_2(B-CL) > \prod_1[B+(W-C)L-(W-p-C)q]+\prod_2[B-CL+(p+C)q]$, then rural-urban migration will happen within the family. From this inequation:

$\rightarrow\prod_1(W-p-C)q > \prod_2(p+C)q$

$\rightarrow(1-\prod_2)(W-p-C)q > \prod_2(p+C)q$

$\rightarrow p < W-C-\prod_2 W$

If the "insurance" is fair, then the total expected utility with and without "insurance" must be equal. That is:

$\prod_1[B+(W-C)L]+\prod_2(B-CL) = \prod_1[B+(W-C)L-(W-p-C)q]+\prod_2[B-CL+(p+C)q]$

$\rightarrow\prod_1(W-p-C)q=\prod_2(p+C)q$

$\rightarrow(1-\prod_2)(W-p-C)q=\prod_2(p+C)q$

$\rightarrow p=W-C-\prod_2 W= -C+(1-\prod_2)W$

$\rightarrow p=\prod_1 W-C$

Under this condition, the slope of the family's BC

$-(p+C)/(W-p-C)=-(\prod_1 W-C+C)/(W-\prod_1 W+C-C)$

$=-\prod_1 W/(1-\prod_1)W=-\prod_1/\prod_2$

And because the slope of the family's indifference curve is equal to the slope of its BC in order to maximize its expected utility, which means:

$-\prod_1 V'(Y_1)/\prod_2 V'(Y_2)= (p+C)/(W-p-C) =-\prod_1/\prod_2$

$\rightarrow V'(Y_1)=V'(Y_2)$

$\rightarrow Y_1=Y_2$

Implying

$B+(W-C)L-(W-p-C)q= B-CL+(p+C)q$

$\rightarrow W(L-q)=0$

$\rightarrow q^*=L$

That means the family will select to allocate all its labor in the rural sector. Then there will be no rural-urban migration in this family. Let's use a graph

$\rightarrow p < \prod_1 W-C$

Under the condition $p < \prod_1 W-C$, we can derive that

$(p+C)/(W-p-C) < \prod_1/\prod_2$,

Because $-\prod_1 V'(Y_1)/\prod_2 V'(Y_2)= (p+C)/(W-p-C)$

$\rightarrow V'(Y_1)/V'(Y_2) < 1$

$\rightarrow Y_1 > Y_2$

This implies that at the equilibrium point, $Y_1 > Y_2$, which means this point lies to the southeast of the line $Y_1=Y_2$.

4. Comparative statics analysis:

Now let's perform comparative statics analysis by examining the relations between q* and the family's income endowment B, the wage rate in the rural sector p, the migration cost rate C, the possibility of the state 2 $\prod_2$, the wage rate in the modern sector W. By analyzing their impacts on q*, we can find out the influences of these factors on the migration decision-making of a family.

4.1. Effect of B on q*:

Because $dq/dB=-V_{qB}/V_{qq}$, and by definition, $V_{qq} < 0$, the sign of dq/dB is the same as that of V_{qB}.

$V_q=-\prod_1 V'(Y_1)(W-p-C)+\prod_2 V'(Y_2)(p+C)$

$V_{qB} = -\prod_1 V''(Y_1)(W-p-C)+\prod_2 V''(Y_2)(p+C)$

From FOC $V_q=0$

$\rightarrow \prod_1 (W-p-C)=\prod_2 V'(Y_2)(p+C)$

$\rightarrow V_{qB} =-[\prod_2 V'(Y_2)(p+C)\ V''(Y_1)]/V''(Y_1) + \prod_2 V''(Y_2)(p+C)$

$=\prod_2 V'(Y_2)(p+C)[-V''(Y_1)/ V''(Y_1)+ V''(Y_2)/ V''(Y_2)]$

$=\prod_2 V'(Y_2)(p+C)[A(Y_1)- A(Y_2)]$

In the RHS of the equation, $\prod_2$ is positive, (p+C) is also positive, and by the definition given hereinbefore, $V'(Y_2)$ is positive, so the sign of this equation will be the same as that of $[A(Y_1)- A(Y_2)]$.

Thus

$dq/dB=-V_{qB}/V_{qq} > 0 \leftrightarrow A' > 0$ (IARA)

$dq/dB=-V_{qB}/V_{qq}=0 \leftrightarrow A'=0$ (CARA)

$dq/dB=-V_{qB}/V_{qq} < 0 \leftrightarrow A' < 0$ (DARA)

Usually, we assume diminishing absolute risk aversion in insurance market. Here I will also assume DARA. Then the sign of dq/dB is negative. That means the richer the family, the less the labor will be allocated to the rural sector, and more labor will migrate to the modern sector.

4.2. Effect of p on q*:

With the same reason as in part A, the sign of dq/dp is the same as that of V_{qp}.

$V_q=-\prod_1 V'(Y_1)(W-p-C)+\prod_2 V'(Y_2)(p+C)$

$V_{qp} = -\prod_1 V''(Y_1)(W-p-C)q + \prod_1 V'(Y_1) + \prod_2 V''(Y_2)(p+C)q+\prod_2 V'(Y_2)$

$= qV_{qB}+\prod_1 V'(Y_1)+\prod_2 V'(Y_2)$

In the RHS of the equation, qV_{qB} is negative, $\prod_1 V'(Y_1)$ and $\prod_2 V'(Y_2)$ are both positive, so the sign of this equation is ambiguous. On one hand, qV_{qB} is the income effect, which means the rise of the wage rate in the rural sector will increase the family's revenue in both state 1 and state 2, just like the rise of the family's income endowment, it will drive more labors migrate to the modern sector. On the other hand, $\prod_1 V'(Y_1)+\prod_2 V''(Y_2)$ is the substitution effect, which means the rise of the wage rate in the rural sector will attract more labors to stay in countryside, thus less labors will migrate to urban areas.

Here we can see the two-side effect of the agricultural development in China's countryside. Since economic and political reforms began in China in the late 1970s, the expansion of the rural sector has made the majority of Chinese farmers become richer than before. This can be seen as the rise of the ware rate in the rural sector. On one hand, their income endowments have increased which enable them to take more risks by migrating to the modern sector to find higher paid jobs. On the other hand, because the wage gap between the modern and rural sectors has decreased along with the development of the agrarian sector, migrating to urban areas became less attractive to farmers.

4.3. Effect of C on q*:

With the same reason as in part A, the sign of dq/dC is the same as that of V_{qC}.

$V_q=-\prod_1 V'(Y_1)(W-p-C)+\prod_2 V'(Y_2)(p+C)$

$V_{qC} =-\prod_1 V''(Y_1)(W-p-C)(q-L)+\prod_1 V'(Y_1) + \prod_2 V''(Y_2)(p+C)(q-L)+\prod_2 V''(Y_2)$

$= (q-L)V_{qB}+\prod_1 V'(Y_1)+\prod_2 V'(Y_2)$

In the RHS of the equation, $\prod_1 V'(Y_1)$ and $\prod_2 V'(Y_2)$ are both positive. Just as illustrated before, V_{qB} is negative. And because by definition, q is part of the family's total labor L, we can draw the conclusion that:

$(q-L) \leq 0$

$\rightarrow (q-L)V_{qB} \geq 0$

So the sign of this equation is positive. That means the higher the migration cost rate C is, the more the labor that stay in the rural sector. In contemporary china, because the migration cost rate is very high, many labors are discouraged to migrate to the modern sector.

4.4. Effect of $\prod_2$ on q*:

With the same reason as in part A, the sign of $dq/d\prod_2$ is the same as that of $V_{q\prod 2}$.

$V_q= -\prod_1 V'(Y_1)(W-p-C) + \prod_2 V'(Y_2)(p+C)$

$V_{q\prod 2} =V'(Y_1)(W-p-C) + V'(Y_2)(p+C)$

From FOC $V_q=0$

$\rightarrow V'(Y_1)(W-p-C)=\prod_2 V'(Y_2)(p+C)/\prod_1$

$\rightarrow V_{q\prod 2} =V'(Y_2)(p+C)\prod_2/\prod_1 + V'(Y_2)(p+C)$

In the RHS of the equation, $V'(Y_1)$ and $V'(Y_2)$ are both positive. So the sign of this equation is positive. That means the higher the possibility of the state 2 $\prod_2$ is, i.e. the more likely the labor will be unemployed in the modern sector, the more the labor that stay in the rural sector.

At the very beginning of China's Reformation and Opening to the World, the possibility of being employed in the modern sector is very high. We can

call it absorbing pattern because the demand for and supply of agricultural labor is near equilibrium or even when there is a shortage of agricultural labor. In fact, in the Pearl River Delta of Guangdong Province, many factories couldn't get enough workers in the first half 1980s. Nearly 100 percent of the immigrants could get jobs no matter what skills they have, or what levels of educations they received. This kind of golden chance attracted more and more rural residents to migrate to the Pearl River Delta and other first opened places.

As time goes by, when more and more rural residents migrate to urban areas looking for jobs, the possibility of being unemployed rises year by year. We can call it overflowing pattern now because the surplus labor force is much larger than the absorptive capacity of the urban sector. As reported, from the middle of 1990s especially after the Asian Financial Crisis which happened in 1997, the employment rate and wage rate in these areas dropped a lot. Thus the "pull" and "push" forces declined gradually and in some regions the rural sector even exerted a "pull" force. So many immigrants began to go back to countryside and local townships.

4.5. Effect of W on q*:

With the same reason as in part A, the sign of dq/dW is the same as that of V_{qW}.

$$V_q = -\prod_1 V'(Y_1)(W-p-C) + \prod_2 V'(Y_2)(p+C)$$

$$V_{qW} = -\prod_1 V''(Y_1)\ (W-p-C)(L-q) - \prod_1 V'(Y_1)$$

From FOC $V_q=0$

$$\rightarrow \prod_1 (W-p-C) = \prod_2 V'(Y_2)(p+C)/\ V'(Y_1)$$

$$V_{qW} = -\prod_2\ V''(Y_1)V'(Y_2)(p+C)(L-q)\ /\ V'(Y_1) - \prod_1 V'(Y_1)$$

$$= [-\ V''(Y_1)\ /\ V'(Y_1) + V''(Y_2)\ /\ V'(Y_2)]\ [\prod_2 V'(Y_2)(p+C)(L-q) - \prod_1 V'(Y_1)\ V'(Y_1)/\ V''(Y_1)]$$

$$= [A(Y_1)- A(Y_2)]\ [\prod_2 V'(Y_2)(p+C)(L-q) - \prod_1 V'(Y_1)\ V'(Y_1)/\ V''(Y_1)]$$

In the RHS of the equation, $\prod_2 V'(Y_2)(p+C)(L-q)$ and $-\prod_1 V'(Y_1)\ V'(Y_1)/\ V''(Y_1)$ are both positive. So the total sign is decided by $[A(Y_1)- A(Y_2)$.

Thus

$dq/dW = -V_{qW}/V_{qq} > 0 \ \leftrightarrow\ A' > 0$ (IARA)

$dq/dW = -V_{qW}/V_{qq} = 0 \ \leftrightarrow\ A' = 0$ (CARA)

$dq/dW = -V_{qW}/V_{qq} < 0 \ \leftrightarrow\ A' < 0$ (DARA)

Usually, we assume diminishing absolute risk aversion in insurance market. Here we will also assume DARA just as we did before. Then the sign of dq/dW is negative. That means the higher the wage rate of the modern sector, the less the labor that be allocated to the rural sector. This is obviously by our intuitive observation: the rise of the wage rate in the modern sector will attract more countryside residents to migrate to urban areas.

5. A supplementary note

In china, urban cities can very easily attract rural residents, because there are great differences in wage rates, living conditions, social facilities and cultural facilities between urban and rural areas. Nevertheless, there are many natural and institutional obstacles that prevent rural people from migrating to cities. What kind of impacts do these different factors have on the migration decision-making of rural population? What should we do in order to drive down or to accelerate the migration pace according to different situations of China? It still has a lot of work to do in this direction.

(1) All of these three models discussed above each focuses on some particular aspects of rural-urban migration and ignores some other indicators. It is very useful to do this kind of research because we can only grasp the whole essence of every social phenomenon step by step. But it is far from enough. We can't ignore other factors in our total retrospection upon the very complicated social movement of rural-urban migration in China.

(2) In addition to economic analysis, we also need to cherish the fruitful achievements obtained by other disciplines. It will be very helpful if we can take all those achievements into account in the formulating and implementing of related governmental agricultural and social policies.

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