

Canadian Social Science

Vol. 7, No. 3, 2011, pp. 133-137

ISSN 1712-8056 [Print]

ISSN 1923-6697[Online]

www.cscanada.netwww.cscanada.org

Analysis of Supply Factors of the Migrant Workers Based on Comprehensive Fuzzy Evaluation¹

ANALYSE DES FACTEURS D'OFFRE SUR LES TRAVAILLEURS
MIGRANTS FONDÉE SUR UNE ÉVALUATION GLOBALE FLOUE

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Abstract: The factors affecting the supply of the migrant workers are very complex, which is difficult to use a specific number to demonstrate due to factors such as different groups of people, different time and different degrees of effect. This paper adopts the comprehensive fuzzy evaluation method to simulate the main factors affecting the supply of migrant workers including income, cost, expectancy, having a quantitative analysis of their influence on the labor supply of migrant workers.

Key words: Comprehensive fuzzy evaluation; Migrant workers; Supply; Factors analysis

Résumé Les facteurs affectant la fourniture des travailleurs migrants sont très complexes, ce qui est difficile à utiliser c'est de démontrer un nombre spécifique en raison de facteurs tels que les différents groupes de personnes, de temps différents et les différents degrés d'effet. Ce document adopte la méthode d'évaluation globale floue pour simuler les principaux facteurs affectant l'offre de travailleurs migrants dont le revenu, le coût, l'espérance, ayant une analyse quantitative de leur influence sur l'offre de travail des travailleurs migrants

Mots clés: L'évaluation floue complète; Les travailleurs migrants; L'approvisionnement; L'analyse des facteurs

DOI: 10.3968/j.css.1923669720110703.021

INTRODUCTION

China is a populous country, and rural labor accounts for a sizeable proportion of the population. In 2006, the total migrant workers in China have reached 200 million (HU, ZHANG, 2007). But in recent years, "Labor Shortage" has taken place in some areas of China, not because China did not have sufficient surplus rural labor, but rather the factors affecting the flow of these labor resources had changed. The result is the less optimal allocation of labor resources. Therefore, a microscopic study of these factors affecting the flow of migrant workers becomes very important. These factors influencing the labor supply are not static. From the viewpoint of structure of migrant workers, there are considerable differences between the first generation of migrant workers and second-generation migrant workers (LIU, 2006), and the degrees of the impact of two generations of migrant workers are also different; from the viewpoint of time, 30 years of reform and opening up made people's living needs of food and clothing change greatly, and demand levels increased gradually. Once people achieve a certain level of demand, they will pursue a higher level of demand. Migrant workers, too, changed from the original order to meet the physiological needs, safety needs, gradually to meet the demand for respect, and self-fulfillment. Factors affecting migrant workers working in the city is ambiguous, and it is difficult to use a specific

¹ Supported by "The Fundamental Research Funds for the Central Universities"(JGK101677).

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*Received 27 March 2011; accepted 20 May 2011

figure to show the degree of these factors on the labor supply. This paper will use the comprehensive fuzzy evaluation tools to simulate the role of the size of each factor.

1. THE ECONOMIC ANALYSIS OF THE LABOR SUPPLY OF MIGRANT WORKERS

With the continuous reform and opening up, people's living standard has been rising. The supply of migrant workers are not only influenced by income levels, but also by the costs of migrant workers, salary expectations and other factors. For example: net income are affected by interaction of labor income, social security, social status, the city's identity; cost includes the opportunity cost of farming, urban living costs, transportation and communication costs, cost of moral damage due to the discrimination in the city, etc.; Salary expectations can be divided into four levels: high, comparatively high, normal, low. The response degrees of the first generation of migrant workers and the second generation of migrant workers to these factors are different.

1.1 The Microscopic Analysis of Labor Supply Behavior Impact of the First Generation of Farmers

The first generation of migrant workers shall be the traditional migrant workers, who are separating out from agriculture, but not completely out of agriculture. These people have more extensive farming experience, having similar lifestyle to traditional farmers, in the busy farming time they are still engaged in agricultural production activities. The first generation of migrant workers have heavier family burden, working out mainly for improving family income and living quality. Meanwhile, the state's preferential agricultural policy has "weakened"(JIA, 2007) the supply of migrant workers, so the opportunity cost of the first generation of migrant workers is relatively large. In addition, with only a small essential part for the maintenance of their own lives, the majority of income will be returned to his rural home. In this sense, the first generation of migrant workers have the substitution effect but not the income effect (HU, ZHANG, 2007). And their identification with the city is weak. They generally communicate with their fellow workers and ultimately return to rural areas.

As the first generation of migrant workers have low literacy, mainly for increasing income, so their wage expectations are relative low. From an economic point of view, as long as the income is greater than the cost of meals, they are still willing to be migrant workers, and precisely because of this point, the employer gives the migrant workers wages only a bit higher than agricultural income, but compared to the same labor income of urban workers it is much lower.

1.2 The Microscopic Analysis of Labor Supply Behavior Impact of the Second Generation of Farmers

Most of the second-generation migrant workers are rural young people who drop out of school or were born after the year 1980. Such people usually go into the ranks of workers soon after leaving school, almost no farming experience; and they become migrant workers mainly not for the living pressure and for increasing the family income, but more for the pursuit of quality of life and experience of city life; their income are mainly for their lives, very few sent home, so the opportunity cost of these migrant workers are very low. But compared with the first generation of migrant workers, second-generation migrant workers received higher education, more willing to, like the city people, enjoy the city life, and have a strong urban identity, and want to stay in the city.

2. FUZZY TEST OF BEHAVIORAL FACTORS AFFECTING THE SUPPLY OF MIGRANT WORKERS

The above analysis shows that the factors affecting the supply of migrant workers is complex, difficult to quantify. If we use the traditional evaluation method, give appropriate weight distribution according to the degree of importance of each factor, and then make a weighted average of the factors which each have a certain fraction, this fraction was difficult to reflect the real fuzzy fact. For example: To assess the influence of sense of identity of migrant workers in urban city on the supply of migrant workers, some people think that the influence will be large, some people think that the influence will be smaller, but it is a qualitative description, difficult to reflect its weight with a specific figure. Therefore, in order to more accurately reflect the proportion of each factor in the fuzzy conditions, the comprehensive fuzzy evaluation tools are introduced in this paper.

From the structure of evaluation, comprehensive fuzzy evaluation can be divided into two categories, one is a fuzzy comprehensive evaluation, the other is multi-level fuzzy comprehensive evaluation. A fuzzy comprehensive evaluation is relatively simple for a simple situation. For more complicated situations, more hierarchical considerations, and the fuzzier factors, multi-level fuzzy evaluation can well solve the problem. To simplify the multi-level fuzzy comprehensive

evaluation of labor supply behavior of farmers, this paper introduces the basic methods and steps taking two-level fuzzy comprehensive evaluation as an example.

Since the influence of the two generations of migrant workers on the behavior factors of supply are different, the weight given to each factor will be different. This paper will respectively test the factors affecting the supply behavior of migrant workers factors.

2.1 Test of Factors Influencing the Supply of First Generation of Migrant Workers

The set which constitutes the factors affecting the supply of migrant workers is called factor set, represented by U . Set up a factor set $U=\{U_1, U_2, U_3\}=\{\text{income, cost, expectations}\}$, in which $U_1=\{u_{11}, u_{12}, u_{13}, u_{14}\}=\{\text{labor income, social security, identity and status, sense of identity with the city}\}$, $U_2=\{u_{21}, u_{22}, u_{23}, u_{24}\}=\{\text{opportunity cost, urban living cost, transportation and communication cost, moral damage}\}$, $U_3=\{u_{31}, u_{32}, u_{33}, u_{34}\}=\{\text{highest, higher, normal, low}\}$.

Since the influence of each factor on the evaluation results is different, the more important factors should be taken into more consideration. Those less important factors could be taken into less consideration. In order to reflect the importance of each factor, each factor is assigned a corresponding weight. For the two-level fuzzy comprehensive evaluation, it is necessary to both consider the weight of all factors in the set, and consider the weight of the factors in each set. Two sets of weights should be set up: weight set and alternative set. Weight set is composed of category factor weight set and factor weight set.

Category factor weight set $\tilde{A}=(0.5, 0.4, 0.1)$,

Factor weight set $\tilde{A}_1=(0.7, 0.1, 0.1, 0.1)$, $\tilde{A}_2=(0.6, 0.2, 0.1, 0.1)$, $\tilde{A}_3=(0.1, 0.1, 0.2, 0.6)$.

Alternative set $V=\{v_1, v_2, v_3, v_4\}=\{\text{willing, tend to be willing, tend to be unwilling, unwilling}\}$.

Subjection of each factor in category factor weight set 1 to alternative set is shown in table 1.

Table 1: Subjection of Each Factor in Category Factor Weight Set 1 to Alternative Set

Factor	Willing	Tend to be willing	Tend to be unwilling	Unwilling
u_{11}	1.0	0.6	0.5	0.3
u_{12}	0.3	0.4	0.6	0.2
u_{13}	0.4	0.5	0.4	0.6
u_{14}	0.4	0.6	0.3	0.0

Subjection of each factor in category factor weight set 2 to alternative set is shown in table 2.

Table 2: Subjection of Each Factor in Category Factor Weight Set 2 to Alternative Set

Factor	Willing	Tend to be willing	Tend to be unwilling	Unwilling
u_{21}	0.8	0.7	0.9	0.6
u_{22}	0.8	0.7	0.6	0.0
u_{23}	0.7	0.8	0.6	0.2
u_{24}	0.6	0.6	0.5	0.1

Subjection of each factor in category factor weight set 3 to alternative set is shown in table 3.

Table 3: Subjection of Each Factor in Category Factor Weight Set 3 to Alternative Set

Factor	Willing	Tend to be willing	Tend to be unwilling	Unwilling
u_{31}	0.3	0.5	0.6	0.8
u_{32}	0.4	0.5	0.7	0.8
u_{33}	0.6	0.6	0.5	0.5
u_{34}	0.8	0.7	0.5	0.3

We can obtain $\tilde{R}_i = (u_{ijk})_{4 \times 4}$ as following

$$\tilde{R}_1 = \begin{pmatrix} 1 & 0.6 & 0.5 & 0.3 \\ 0.3 & 0.4 & 0.6 & 0.2 \\ 0.4 & 0.5 & 0.4 & 0.6 \\ 0.4 & 0.6 & 0.3 & 0 \end{pmatrix}, \tilde{R}_2 = \begin{pmatrix} 0.8 & 0.7 & 0.9 & 0.6 \\ 0.8 & 0.7 & 0.6 & 0 \\ 0.7 & 0.8 & 0.6 & 0.2 \\ 0.6 & 0.8 & 0.5 & 0.1 \end{pmatrix}, \tilde{R}_3 = \begin{pmatrix} 0.3 & 0.5 & 0.6 & 0.8 \\ 0.4 & 0.5 & 0.7 & 0.8 \\ 0.6 & 0.6 & 0.5 & 0.5 \\ 0.8 & 0.7 & 0.5 & 0.3 \end{pmatrix},$$

One-level comprehensive fuzzy evaluation are

$$\tilde{B}_1 = \tilde{A}_1 \circ \tilde{R}_1 = (0.7, 0.6, 0.5, 0.3), \tilde{B}_2 = \tilde{A}_2 \circ \tilde{R}_2 = (0.6, 0.6, 0.6, 0.6), \tilde{B}_3 = \tilde{A}_3 \circ \tilde{R}_3 = (0.6, 0.6, 0.5, 0.3),$$

here $\tilde{B}_i = \tilde{A}_i \circ \tilde{R}_i = (b_{i1}, b_{i2}, b_{i3}, b_{i4})$, $b_{ik} = \bigvee_{j=1}^4 (a_{ij} \wedge r_{ijk})$, $a \vee b = \max\{a, b\}$, $a \wedge b = \min\{a, b\}$.

By normalize them, we can obtain $\tilde{B}_1 = (0.333, 0.286, 0.238, 0.143)$, $\tilde{B}_2 = (0.250, 0.250, 0.250, 0.250)$, $\tilde{B}_3 = (0.300, 0.300, 0.250, 0.150)$. Therefore

$$\tilde{B} = (\tilde{B}_1, \tilde{B}_2, \tilde{B}_3) = \begin{pmatrix} 0.333 & 0.286 & 0.238 & 0.143 \\ 0.250 & 0.250 & 0.250 & 0.250 \\ 0.300 & 0.300 & 0.250 & 0.250 \end{pmatrix}$$

Two-level comprehensive fuzzy evaluation is $\tilde{D} = \tilde{A} \circ \tilde{B} = (0.333, 0.286, 0.250, 0.250)$, by normalize it, we can obtain $\tilde{D} = (0.298, 0.256, 0.223, 0.223)$.

We can know from the fuzzy comprehensive evaluation that in the first generation of migrant workers, some 29.8% are willing to be migrant workers, 25.6% tend to be migrant workers, 22.3% do not tend to be migrant workers, 22.3% are unwilling to be migrant workers. Those people who are willing and tend to be migrant workers account for 55.4%. those people who do not tend to be migrant workers is composed of those who have already become rich, and those who return home from the city due to certain reasons such as wage arrears and discrimination. To attract this group of people, the cost would be high, but there are some which who could be won. Those people who are unwilling to be migrant worker account for 22.3%. who may have been trapped by agricultural production, or other reasons. The cost of this group of people who would go to the city to be migrant workers would be the highest. because the first generation of migrant workers have more extensive farming experience, those people who stay in rural areas are mainly the first generation of migrant workers.

2.2 Test of Factors Influencing the Supply of First Generation of Migrant Workers

Like the test of factors influencing the supply of first generation of migrant workers, we will test the factors influencing the supply of second generation of migrant workers. Set up a factor weight set:

category factor weight set $\tilde{A} = (0.6, 0.1, 0.3)$,

factor weight set $\tilde{A}_1 = (0.6, 0.1, 0.2, 0.1)$, $\tilde{A}_2 = (0.5, 0.1, 0.2, 0.2)$, $\tilde{A}_3 = (0.6, 0.2, 0.1, 0.1)$.

Alternative set $V = \{v_1, v_2, v_3, v_4\} = \{\text{willing, tend to be willing, tend to be unwilling, unwilling}\}$.

Subjection of each factor in category factor weight set 1 to alternative set is shown in table 4.

Table 4: Subjection of Each Factor in Category Factor Weight Set 1 to Alternative Set

Factor	Willing	Tend to be willing	Tend to be unwilling	Unwilling
u_{11}	0.8	0.5	0.2	0.1
u_{12}	0.4	0.6	0.7	0.7
u_{13}	0.5	0.5	0.4	0.1
u_{14}	0.7	0.6	0.3	0.2

Subjection of each factor in category factor weight set 2 to alternative set is shown in table 5.

Table 5: Subjection of Each Factor in Category Factor Weight Set 2 to Alternative Set

Factor	Willing	Tend to be willing	Tend to be unwilling	Unwilling
u_{21}	0.6	0.5	0.3	0.1
u_{22}	0.5	0.6	0.6	0.3
u_{23}	0.2	0.3	0.7	0.1
u_{24}	0.6	0.5	0.6	0.1

Subjection of each factor in category factor weight set 3 to alternative set is shown in table 6.

Table 6: Subjection of Each Factor in Category Factor Weight Set 3 to Alternative Set

Factor	Willing	Tend to be willing	Tend to be unwilling	Unwilling
u_{31}	0.8	0.6	0.1	0.2
u_{32}	0.7	0.6	0.6	0.3
u_{33}	0.3	0.5	0.2	0.3
u_{34}	0.2	0.4	0.4	0.1

One-level comprehensive fuzzy evaluation are

$$\tilde{B}_1 = (0.429, 0.357, 0.143, 0.071), \tilde{B}_2 = (0.375, 0.375, 0.125, 0.125), \tilde{B}_3 = (0.316, 0.294, 0.235, 0.210).$$

Two –level comprehensive fuzzy evaluation is $\tilde{D} = \tilde{A} \circ \tilde{B} = (0.407, 0.357, 0.143, 0.125)$, normalize it, we can get $\tilde{D} = (0.407, 0.339, 0.136, 0.118)$.

This indicates that among the second generation of peasant workers, those people who are willing to and tend to be migrant workers account for a larger percentage (second-generation migrant workers accounted for 74.6%, while the first generation of migrant workers accounted for only 55.4%). The second generation of migrant workers lack experience in agriculture and long for urban life and have a higher expectation for the future, and have a strong willingness to be migrant workers. Only 11.8% do not want to be migrant workers.

However, in society, the employer generally provides lower pay and the discrimination exists in all kinds of social security and welfare and this can not meet their expectations, so more people hold the attitude of not willing to provide services. In the model, these people belong to those who are in the group “tend to be willing” and “tend to be unwilling”. As is shown in the model, the first generation of migrant workers accounted for 47.9% and the second generation of migrant workers accounted for 50.0%. To solve the "labor shortage" issues, we should hold up "the willing" group, to attract "tend to be willing" group, and to reach up to "tend to be unwilling" group. To attract migrant workers, we can improve the welfare and the social security of migrant workers, improve the employment service system of migrant workers, and increase the training and skills of migrant workers to attract migrant workers and enable their integration into city life and urban construction.

CONCLUSION

This paper adopts comprehensive fuzzy evaluation method to analyze the factors affecting the supply of migrant workers, and simulate the practical factors influencing the supply of migrant workers including income, cost, expectations, and have a quantitative analysis of the degrees of their influence on the supply of the migrant workers. It better reflects the qualitative influence of these factors on evaluation results, and provides a guideline for the further exploration of supply function.

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