THE MODEL OF EFFICIENT WAGES AS A FACTOR OF SUSTAINABLE REPRODUCTION OF RURAL PERSONNEL

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Abstract

The problem of reproduction of personnel in rural areas is quite relevant for the Russian economy. The dynamics of reproduction is influenced by many socio-economic factors, however, a special role among them is occupied by the differentiation in the level of wages between urban and rural territories. In addition, the low level of wages in the countryside does not allow creating conditions for the development of market infrastructure, which further reduces the attractiveness of such areas for living.

The purpose of this article is to develop a model for determining the effective level of wages, ensuring staff retention in the village and sustainable reproduction of the labor force. Methodologically, the model of effective wages is based on models of migration flows of the population, including the Todaro model, the model of individual investment in human capital and individual labour supply. The result of the model will be a mechanism for determining the critical level of wages on the basis of a multilateral model of reproduction of personnel, taking into account the behaviour of workers, employers, educational institutions and public policy.

Key words: labour market, migration, personnel reproduction, efficient wages

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Introduction

The scientific literature has gained considerable experience analyzing various aspects of the process of reproduction of agricultural personnel. The earliest (mentioned in the works of A. Smith), but not lost the relevance of the direction of research on reproduction in agriculture was the study of labor migration from the countryside. Modern models of the process of migration from rural areas are based on the methodology of G. Ranis and J.C.H. Fei (G. Ranis and J.C.H. Fei ,1961), D.W. Jorgenson (D.W. Jorgenson ,1966), M.P. Todaro (M.P. Todaro ,1969) ,O. Stark and D. Bloom (O. Stark and D. Bloom , 1991), and others. Most of these

studies take into account Different characteristics of the donor territory and the host territory as important factors of migration, while the specific set of factors varies significantly.

The second major direction of the methodology for analyzing the characteristics of the reproduction of labor resources in agriculture can be called the direction founded by Shultz (Shultz , 1975), G.S. Becker (G.S. Becker ,1964) and W.E. Huffman (W.E. Huffman ,1998) considered in their works the influence of education on the accumulation of human capital, including in the context of modernizing agricultural production. At the same time, the need for cooperation between interested parties was indicated as an essential feature of such investments, which raises the specific problem of motivation in collective production, which was considered in the works of R. Gibbons (R. Gibbons , 1998), G. S. Becker and K. M. Murphy (G. S. Becker and K. M. Murphy , 1992). A significant contribution to the further development of the methodology of research on reproduction in agriculture within the framework of the theory of human capital was made by the models of rural households I. Singh et al. (1 I. Singh et al. ,986) and W. E. Huffman (W. E. Huffman , 1988).

In this article, we will offer a multi-sided model of frame reproduction. In the first part of the paper, we will consider the behavior strategies of households as a basic element of the reproduction system. In the second part, the strategies of producer behavior will be considered. The third part of the article will be devoted to the influence of educational institutions and the state on the parameters of the model of reproduction. In the conclusion, results will be summed up and directions for further research will be proposed.

1 Household decision making model

To simplify, suppose that each household consists of one adult individual who makes decisions about the birth of one child and the choice of place of residence. Suppose that the decision on the birth of a child is made some fixed time after the formation of the household t. The subjective benefits of having children are constant and equal to C. The additional costs associated with raising a single child vary over time and are different for cities and villages. The first period is the period of childhood from the moment of birth to the end of general education. During this period, we assume that the costs are associated exclusively with ensuring acceptable living conditions and do not differ from those for adult members of the household. The costs associated with minimally acceptable living conditions are fixed in time and are defined as: шп the village: m_r in the city $m > m_r$. The second period is the period of vocational education. Suppose that it occurs after a fixed time τ. Since vocational education

institutions are always located in cities, the costs of educating children when a household lives in a village are higher than when living in a city: $e_r > e$. After receiving vocational education, we assume that the child begins an independent life and the costs are subsequently zero. This period begins after an exogenously given point in time φ. The second decision taken by the household is the decision to choose a place of residence. We assume that the decision on the choice of place of residence is taken by adults at any time of independent life. Also suppose that for a household that survives in rural areas the decision to move is irreversible. When making a move, households compare the respective benefits and costs. The costs of relocation are fixed over time and are calculated per household member as the difference in the cost of an acceptable standard of living in a city and village. Benefits represent the level of income earned by the household in each local labor market. Here we assume that there is no uncertainty about incomes in the village and they grow at a constant rate of g, starting with some value of w_r. In the case of moving to the city at the time of the decision to move, there is uncertainty about the initial income level in the city. Suppose that the level of initial income in a city is characterized by a distribution with a mathematical expectation: $Ew > w_r$ and then it increases with the same village growth rate g. After the decision to move or subject to vocational education in the city, there is no uncertainty and the salary in the city is: w. Also in our model, we assume that in the event of a move, a household can claim only the initial level of income. This circumstance assumes that the stock of human capital accumulated in the countryside will be unclaimed in the conditions of the city. It is reasonable to assume that if an individual after receiving vocational education decides to return to rural areas, uncertainty also arises as to income upon subsequent relocation to the city, which is also explained by the loss of specific human capital. At the same time, the mathematical expectation of income of an individual who has had experience of living in a city is lower than the actual past value of income in a city: $E(w|city) > w$. Household preferences are characterized by the following parameters. All households are neutral with respect to risk, utility functions are thus linear with respect to the benefits and costs of decision making. The norm of intertemporal preferences is exogenously given and is ρ> g. The financial market is characterized by the absence of restrictions on borrowing and zero interest rates. The lifetime of the household is exogenously given and equal to T. Based on the previous analysis, 7 strategies of household behavior can be obtained, depending on the initial conditions. In the first case, we will consider a household that initially lives in a rural area at the time of making a decision (this is

possible, for example, for individuals who have not received a secondary specialized or higher education). Then a possible set of strategies and their values can be presented in tab. 1.

Tab. 1: Values of behavior strategies of a household initially living in a rural area.

Type of strategy	Value
Refusal to move to the city and the birth of children	$V = w_r \dfrac{1-\left(1+g/1+\rho\right)^T}{1-\left(1+g/1+\rho\right)} - m_r \dfrac{1-\left(1/1+\rho\right)^T}{1-\left(1/1+\rho\right)}$
Refusal to move to the city, the birth of a child	$V = w_r \dfrac{1-\left(1+g/1+\rho\right)^T}{1-\left(1+g/1+\rho\right)} - m_r \dfrac{1-\left(1/1+\rho\right)^T}{1-\left(1/1+\rho\right)} +$ $+C - \dfrac{m_r}{(1+\rho)^t}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-t}}{1-\left(1/1+\rho\right)}\right) - \dfrac{e_r}{(1+\rho)^\tau}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-\tau}}{1-\left(1/1+\rho\right)}\right)$
Moving to the city and refusal to give birth	$V = Ew \dfrac{1-\left(1+g/1+\rho\right)^T}{1-\left(1+g/1+\rho\right)} - m \dfrac{1-\left(1/1+\rho\right)^T}{1-\left(1/1+\rho\right)}$
Moving to the city with the subsequent birth of a child	$V = Ew \dfrac{1-\left(1+g/1+\rho\right)^T}{1-\left(1+g/1+\rho\right)} - m \dfrac{1-\left(1/1+\rho\right)^T}{1-\left(1/1+\rho\right)} +$ $+C - \dfrac{m}{(1+\rho)^t}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-t}}{1-\left(1/1+\rho\right)}\right) - \dfrac{m+e}{(1+\rho)^\tau}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-\tau}}{1-\left(1/1+\rho\right)}\right)$
Birth of a child with the subsequent move to the city	$V = w_r \dfrac{1-\left(1+g/1+\rho\right)^t}{1-\left(1+g/1+\rho\right)} - m_r \dfrac{1-\left(1/1+\rho\right)^t}{1-\left(1/1+\rho\right)} +$ $+C - \dfrac{m}{(1+\rho)^t}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-t}}{1-\left(1/1+\rho\right)}\right) - \dfrac{m+e}{(1+\rho)^\tau}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-\tau}}{1-\left(1/1+\rho\right)}\right) +$ $+Ew \dfrac{1-\left(1+g/1+\rho\right)^{T-t}}{1-\left(1+g/1+\rho\right)} - m \dfrac{1-\left(1/1+\rho\right)^{T-t}}{1-\left(1/1+\rho\right)}$
Birth of a child with relocation to the city for vocational education	$V = w_r \dfrac{1-\left(1+g/1+\rho\right)^\tau}{1-\left(1+g/1+\rho\right)} - m_r \dfrac{1-\left(1/1+\rho\right)^\tau}{1-\left(1/1+\rho\right)} +$ $+C - \dfrac{m_r}{(1+\rho)^t}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-t}}{1-\left(1/1+\rho\right)}\right) - \dfrac{m+e}{(1+\rho)^\tau}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-\tau}}{1-\left(1/1+\rho\right)}\right) +$ $+Ew \dfrac{1-\left(1+g/1+\rho\right)^{T-\tau}}{1-\left(1+g/1+\rho\right)} - m \dfrac{1-\left(1/1+\rho\right)^{T-\tau}}{1-\left(1/1+\rho\right)}$

Moving to the city after raising a child	$V = w_r \dfrac{1-\left(1+g/1+\rho\right)^{\varphi}}{1-\left(1+g/1+\rho\right)} - m_r \dfrac{1-\left(1/1+\rho\right)^{\varphi}}{1-\left(1/1+\rho\right)} +$ $+C - \dfrac{m_r}{(1+\rho)^t}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-t}}{1-\left(1/1+\rho\right)}\right) - \dfrac{m_r+e_r}{(1+\rho)^\tau}\left(\dfrac{1-\left(1/1+\rho\right)^{\varphi-\tau}}{1-\left(1/1+\rho\right)}\right) +$ $+Ew \dfrac{1-\left(1+g/1+\rho\right)^{T-\varphi}}{1-\left(1+g/1+\rho\right)} - m \dfrac{1-\left(1/1+\rho\right)^{T-\varphi}}{1-\left(1/1+\rho\right)}$

Sourse: authors construction

In the second case, consider the household, initially living in the city, receiving vocational education at the time of the decision. Similar strategies correspond to this initial state, whose values can be obtained We have a corresponding modification of the values presented in Tab. 1. The first thing that can be noticed from the correlation of values is that for a household originally living in rural areas there are the most probable times for migration to the city. First, it is the migration at the beginning of independent life, that is, before the birth of the child, and in practice, often before marriage. In addition, the additional attractiveness of this strategy is that the uncertainty about the income in the city in this case is resolved before the birth of children, which makes this decision more rational. Secondly, this is the moment of the beginning of vocational education, since one of the advantages of the city over rural areas is the saving of costs for education. In practice, the time of relocation may occur several years before the beginning of vocational education in order to better prepare the city for final exams and university or college preparation, as well as softer adaptation to the urban environment. Thirdly, this is the point in time after the end of parenting or after the end of labor activity. In this case, the motive for temporary relocation to the city may be savings on the cost of obtaining education for children, or short-term higher income, and the motive for return may be lower cost of living and comfortable living conditions in rural areas if the household has adequate features of preference. Other aspects of the life of the household are less profitable because they are clearly less profitable from the point of view of cash flows than those indicated. Even if we consider that the relocation can be strongly influenced by non-price parameters of territories, this conclusion will not undergo significant changes as non-price parameters usually remain stable over time. Thus, mass migration of workers at other ages is primarily due to structural changes occurring in local markets in rural and urban areas, which violate the ratios of the basic parameters of the model and make immediate migration at any stage of the life cycle the optimal strategy. In general, from the correlation of values it can be seen that the age of the household has a negative effect

on the probability of migration due to the loss of human capital accumulated during work in agriculture. Also, this circumstance can be intensified by the presence of discrimination of older workers, which is characteristic of many local labor markets. The educational level of the household also has a negative effect on the likelihood of life in rural areas in the early stages of the life cycle. For example, when finding a household at the time of the initial decision in the city, for example, in the status of a college or university graduate, potential labor productivity (overall level of ability) has a negative effect on the likelihood of return. This phenomenon is primarily associated with higher salary expectations in the city and less uncertainty regarding wages due to adaptation to urban conditions during study, another argument in support of this pattern is the peculiarity of many local labor markets that allow a successful professional career in the absence of specialized education. The low educational level, for example, the lack of vocational education, contributes to maintaining the status of a rural resident due to the lower cost of living in rural areas and lower salary expectations in the event of moving to the city. In general, it can be concluded that education for both children and themselves is an important motive for migration. Another conclusion important for the model of reproduction is the decision on the presence and number of children. In this case, the ratio of values shows that in the case of initial residence in rural areas, the likelihood of children (their number) is higher than when living in urban areas, while it will also be higher subject to the refusal to finance the children's vocational education. This circumstance can be further strengthened by the argument that the costs of raising children in rural areas, in contrast to urban conditions, are characterized by increasing economies of scale due to more affordable housing and the availability of personal subsidiary farming. Thus, it can be concluded that the birth of children and moving from rural to urban areas can be both in the relationship of substitution, in case of costs of upbringing, and in the relationship of complementarity in the case of educational migration. The third important result from the point of view of the reproduction model is the ratio of the wages needed to retain the workers who make up the households of the specified age categories. So the lowest reserve wages correspond to the least probable periods of migration. If wages are set at this level, we should expect the retention in the territory of older workers with a low educational level and at the same time an outflow of young people. Higher reserve salary corresponds to the most probable moments of migration. However, even in this case, the ratio of model parameters may cause the appearance of deferred migration. For example, a household may initially decide on living in a rural area, motivating it with a lower cost of living and less uncertainty

about incomes, and then decide on moving in order to get better education for children and gain a foothold in urban environments. In this case, we should expect an outflow of the population of middle age with children and a high educational level or potential. Thus, for a stable retention of the population, it is necessary to establish a wage not lower than the reserve at all stages of the life cycle of the household.

2 Decision-making model agricultural enterprises

With regard to the reproduction of labor, agricultural enterprises have three basic strategies. The first strategy assumes a focus on increasing the capital intensity of production through the introduction of innovative technologies, automation and robotization of business processes. The second strategy assumes a focus on preserving the continuity of existing production technologies and a focus on providing production with local personnel. The third strategy implies a focus on ensuring the production of labor by attracting migrants and temporary workers. It is obvious that the second two strategies can be implemented in both the short and long term, while the first strategy involves making long-term investment decisions. Consider the model of producer behavior in the implementation of strategies in the short term. In this case, no investment decisions are made and the capital stock held by the manufacturer is assumed to be fixed. The object of choice for each strategy in this case is the level of wages. We now turn to a strategy focused on the use of migrants and temporary labor. In this case, we assume that all migrants and temporary workers are homogeneous and have the same productivity Rm. The number of migrants and temporary workers involved depends on the salary rate offered $L_m(w_m)$. Thus, the manufacturer of the problem takes the standard form of profit maximization problem:

$$\max \pi_m = p(R_m L_m(w_m) R_m L_m(w_m) - w_m L_m(w_m) \qquad (1)$$

In the case of strategies involving the hiring of local workers assume that because of differences in the specific human capital of local workers are characterized by different productivity depending on the age $R(x)$, where the R - average productivity of workers, x - the average age of an employee. Then the problem of the manufacturer takes the form:

$$\max \pi_m = p(R_m L_m(w_m(x)) R_m L_m(w_m(x)) - w_m L_m(w_m(x)) \qquad (2)$$

The assumption of the independence of labor productivity of migrants and temporary workers on age compared with local workers is reasonable and is explained by the lack of specific human capital and demographic homogeneity of such workers, which is confirmed by

many studies. On the basis of the profit functions presented, the short-term decisions of the manufacturer depend on the ratio of productivity and labor and labor costs for different types of workers. In the case of long-term decisions, the selection model is significantly complicated. So suppose that initially the manufacturer has a certain amount of money available for making investment decisions, we also assume that they initially selected the retention strategy with the lowest probability of migration and selected the lowest wage from the reserve ones accordingly. Under these conditions, the manufacturer has three long-term investment alternatives. The first strategy involves investing in the long-term reproduction of local personnel. This solution involves an increase in wages to the maximum reserve level. The second strategy involves investing in the attractiveness of the territory for migrants. First of all, this implies the creation of an appropriate infrastructure for temporary accommodation and provision of necessary social and living conditions. It should be noted that the realistic use of this strategy may raise some questions. For example, it is clear from statistics data that migrants choose large cities more than one million people and very rarely rural areas for settlement. Creating infrastructure that competes with the conditions of large cities is unlikely to be profitable and calls into question the feasibility of using migrants. The third strategy involves investing in the introduction of new technologies, automation and robotization of agricultural production. In this case, manufacturers will maintain the minimum wage level to ensure short-term market stability, regardless of the type of labor used. In the future, as the rural population is gradually squeezed out into the cities, it will increase wages to a level that ensures sustainable reproduction in the new conditions. From this it follows that the strategy of low investment in the reproduction of local personnel may be optimal for the producer; moreover, with a certain ratio of parameters, the strategy for meeting temporary labor requirements at the lowest cost in a long-term trend for compressing demand for labor may be socially optimal.

3 Impact on the reproduction of educational institutions and the state.

An important link in the chain of reproduction of personnel is certainly educational institutions. And if educational institutions of general education for the most part are agents of state policy and are severely limited in their ability to act independently, vocational education institutions have considerable financial and managerial autonomy. A feature of educational institutions is that they are included in the system of personnel reproduction indirectly, since the educational services market is largely isolated ort of the labor market. In particular, due to

the lack of direct funding by employers of educational institutions, the interrelation of the two markets is provided solely through the value of graduates in the labor market. At the same time, in the conditions of a market fiasco, the relationship between the quality of training and value may not be obvious. The key tools by which educational institutions influence reproduction processes include the provision of social infrastructure for students from rural areas during their education, which, on the one hand, reduces costs, on the other hand, increases the likelihood of obtaining them and subsequently fixing a specialist in the city ensuring the availability of education, including through the introduction of distance and online technologies, reducing the availability of education and improving quality by tightening the students' knowledge requirements; career guidance work with schoolchildren, etc. In general, it should be noted that, depending on the characteristics of the urban and rural labor markets, these tools can have both positive and negative effects on reproduction, even in the case of agricultural educational institutions. Also quite ambiguous is the role of the state in reproduction processes. The complexity of the choice of effective mechanisms of state policy, including the political component of government decisions.

Conclusion

The article proposed a multilateral model of reproduction of personnel in rural areas. The alternative behavioral strategies of its main participants were analyzed, factors influencing the choice of strategy and the mechanisms of their influence on behavior were identified. As a direction for further research, a deeper analysis of the non-price characteristics of rural areas can be offered, including the impact on the reproduction of unemployment in local markets, as well as a deeper account of the characteristics of rural employment, such as the seasonal nature of agricultural work.

References

Becker, G. S. (1964). Human capital A theoretical and empirical analysis, with special reference to education. New York: National Bureau of Economic Research.

Becker, G. S., & Murphy, K. M. (1992). The division of labor, coordination costs, and knowledge. Chicago: Center for the Study of the Economy and the State, University of Chicago.

Gibbons, R. (1998). Incentives in Organizations. The Journal of Economic Perspectives, 12(4), 115-132. Retrieved from http://www.jstor.org/stable/2646897

Huffman, W.E. (1988) Agricultural household models: Survey and critique. Saupe, W. E., & Gould, B. W. (1988). Multiple job holding among farm families: Results from the Wisconsin Family Farm surveys. Madison, WI: University of Wisconsin, Dept. of Agricultural Economics.

Huffman, W. (1998). Modernizing Agriculture: A Continuing Process. Daedalus, 127(4), 159-186. Retrieved from http://www.jstor.org/stable/20027527.

Jorgenson, D.W. (1966), Testing alternative theories of the development of a dual economy. Adelman, I., & Thorbecke, E. (1966). The theory and design of economic development. Baltimore: Johns Hopkins Press, in cooperation with the Center for Agricultural and Economic Development of Iowa State University.

Ranis, G., & John C. H. Fei. (1961). A Theory of Economic Development. The American Economic Review, 51(4), 533-565. Retrieved from http://www.jstor.org/stable/1812785

Singh, I., Squire, L., & STRAUSS, J. (1986). Agricultural household models: Extensions, applications, and policy. The John Hopkins University press

Stark, O., & Bloom, D. (1985). The New Economics of Labor Migration. The American Economic Review, 75(2), 173-178. Retrieved from http://www.jstor.org/stable/1805591

Todaro, M. (1969). A Model of Labor Migration and Urban Unemployment in Less Developed Countries. The American Economic Review, 59(1), 138-148. Retrieved from http://www.jstor.org/stable/1811100

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