SCALE EFFECT IN HIGH SKILLED LABOUR FORCE REPRODUCTION UNDER THE INSITUTIONAL PITFALL

Ivan Borisov – Natalia Sharapova – Valentina Sharapova

Abstract

The article deals with the problem of the reproduction of highly qualified personnel in the labour market. The purpose of this article is to study the role of the scale effect in the formation of demand and supply for qualification in the labour market in conditions of uncertainty and asymmetric information. Based on the analysis of the tripartite labour market equilibrium model (involving workers, firms and educational institutions), the author shows that in the situation of low concentration of highly qualified specialists in the labour market, the situation of an institutional pitfall may arise. Under these conditions, the optimal strategy of rationally operating economic entities is the reproduction of low-skilled labour resources, which is accompanied by the leaching of highly qualified specialists from the labour market. The work reveals the mechanisms and factors that influence the probability of the formation of an institutional pitfall. As a practical application, the situation of the Russian labour market is discussed.

Key words: economy of scale, high skilled labour reproduction, human capital, institutional pitfall

JEL Code: D00; J00

Introduction

The study of the problem of the reproduction of human capital occupies one of the most important places in the research of the labor market. An essential feature of this problem is the complex structure of the reproduction process, including a balance in the labor market and the market of educational services. Also, the study of this problem is complicated by the existence of a conflict of interests between stakeholders, uncertainty, asymmetric information and the complexity of direct coordination. At various times, a considerable amount of research has been devoted to this issue. Among the most noteworthy of the recent studies are Beladi, H., Marjit, S., & Weiher, K. (Beladi, Marjit, Weiher, 2011), Broecke, S., Quintini, G., & Vandeweyer, M. (Broecke, Quintini,Vandeweyer, 2017), Cacciolatti, L., Lee, SH, &

Molinero, CM (Cacciolatti, Lee, Molinero, 2017), Lall, E. (Lall , 2015), Lee, J., & Wie, D. (Lee, Wie, 2015), Peng, F., Anwar, S., Kang, L. (Peng, Anwar, Kang, 2017), Salha, O. B. (Salha, 2013), Tarlea, S., & Freyberg-Inan, A. (Tarlea, Freyberg-Inan, 2018). Problems of formation of demand for qualification in the Russian labor market were considered in the works of Gimpelson, V. , Kapeliushnikov, R. and Lukiyanova, A. (Gimpelson, Kapeliushnikov,Lukiyanova, 2010), Commander S. J. and Denisova, I. (Commander, Denisova, 2012) etc. This problem is especially important for countries with economies in transition, because it is in their case that on the one hand there are sharp changes in the mechanism of reproduction caused by the transition to market relations, and on the other hand, maintaining the inertia of institutional regulation inherited from the planned economy. It is these features that can give rise to specific inefficient economic states, called institutional pitfalls. The purpose of this article is to identify the causes of inefficiency in the process of reproduction of human capital, including employers' behavior and the peculiarities of state regulation. As a methodological basis, a tripartite model of reproduction is used. The first section describes the nature of the interaction of economic agents in the reproduction process, the second part shows the formal model of reproduction and shows the possibility of achieving an effective equilibrium, the third part gives the empirical signs of the institutional pitfall and discusses the reasons for its occurrence, concludes with conclusions and suggests possible ways to overcome inefficiencies models of reproduction.

1 General formulation of reproduction model

Let us turn to the analysis of the model of reproduction of qualified personnel.

Within the framework of this model, the reproduction of skilled personnel traditionally includes four main phases and three operating agents that make decisions at each stage of the of human capital transformation. Within the market model of reproduction, the equilibrium achieved on the market is determined by the goals and preferred behavior strategies of the three main participants in the reproduction model: households, educational institutions and employers.

Let every household be represented by a single individual, mechanizing the pure reduced value of economic rent throughout life. By economic rent here we mean the difference between the remuneration received by the employee for a specific period of time and the monetary equivalent of the costs incurred during the period of participation in the reproduction process.

Let employers as well as educational institutions, maximize the net present value of profits from participation in the reproduction process.

The first stage of reproduction of qualified personnel is the production stage. At this stage it is assumed that each of the interested parties is involved in the methods of participation and in the process of initial training of employees based on the goals set and the current institutional environment. Households have three alternative strategies for participation in the production process. The first strategy is refusing to participate in the production process. In this case, individuals do not acquire formal confirmation of having a certain qualification, but they also do not bear the costs associated with participating in the production process. The second strategy is a formal participation in the production process. In this case, individuals acquire only formal confirmation of qualifications. The main task of the individual at this stage is to minimize the costs associated with obtaining formal qualifications, including the acquisition of the minimum level of human capital necessary for getting a diploma. The third strategy is a real participation in the production process. In this case, for the individual, not only formal confirmation is valuable, but also competences acquired in the course of training, which leads to increased individual costs of getting education. At this stage of reproduction, the benefits of individuals include social incentives in the form of avoiding the public duties (call to military service), benefits for students, involvement in the youth social environment, in some cases material benefits in the form of scholarships and other types of material assistance. The costs may refer to the direct cash costs associated with paying for tuition and related costs, the indirect costs caused by rejection of alternative allocation of time and money, the moral costs associated with efforts to get education. Also, when choosing a strategy of behavior, individuals take into account the risks of not getting education due to expulsion. Firms at this stage of reproduction play a passive role in the basic model. All costs of the human capital production are borne by third parties - households, the state. The employer in this case receives a positive benefit from the results of production, provided that it is implemented. The educational institution similarly to the households has three alternative behavior strategies. The first strategy is ensuring quality education and monitoring academic performance. In this case, only students who have really mastered the profession graduate from the educational institution. The advantage of using this strategy for an educational institution may be an increase in the status resulting in higher tuition fees, among the costs, higher expenses for training students and loss of profit resulted from expelling incapable students. The second strategy means quality education with formal control over academic performance. In this case, all the students can graduate, while the

educational institution bears higher expences to teach students. Influence on the status and cost of training is uncertain, since on the one hand the value of the diploma for the employer decreases, but on the other hand the value of the diploma for the student grows, since it allows getting education at a lower cost than in the first case. The third strategy means providing low quality educational services. In this case, the costs of training are reduced , there are no losses from students‘ expells, but the status of the institution is the lowest of the three options.

The second stage in the reproduction of human capital is distribution. At this stage, there is first-time employment of the graduates. At this stage, households represented by workers try to get a job, which can provide them with maximum of economic rent. Here and in all subsequent stages of reproduction, the economic rent of workers will be the difference between remuneration for labor and the costs of efforts, including working conditions and other parameters of the workplace. At this stage and subsequent stages of reproduction, workers will demonstrate opportunistic behavior, expressed in the desire to overestimate their real level of qualification in the eyes of the employer. Educational institutions at this stage and subsequent stages play a passive role, providing coordination between employers and graduates without bearing significant costs. The employer at this stage has two alternative strategies of behavior. The first strategy presupposes the demand for the qualification of hired workers through forming a high quality procedure of staff selection, including assessment of the applicants‘ competencies. In this case, the competence of the applicant should be the key factor for successful selection. Using this strategy requires the employer to bear significant costs of hiring. The second strategy involves refusing demand for skills and minimizing the costs of recruitment. In this case, the employer uses a cheaper recruitment system based on filtering based on formal characteristics, such as a diploma of education, work experience, certain demographic and personal characteristics. Evaluation of applicants‘ competence in this case acquires a secondary or even a formal character.

The stage of exchange means secondary movement of labor in the labor market. In this case, the behavior strategies of the interacting participants are similar to the strategies at the distribution stage. The main difference is the greater awareness of employees of their own qualification level due to their previous work experience. In the case of the distribution stage, an employee who does not have any work experience can better judge about his own academic achievement at the educational institution rather than the relevance of his skills to the labor market requirements.

The last stage of the qualified labor reproduction is consumption, when the accumulated human capital is used in the activities of the employing company. At this stage,

the employer also has two possible behavior strategies. The first strategy means being satisfied with the level of human capital of the workers and the using their competencies in the production process according to their qualifications. The control of employees‘ qualifications in this case is carried out through the recruitment process. The second strategy involves investing in improving the competencies through in-house training and development programs. In this case, the company bears appropriate costs of investing in human capital, actually carrying out its secondary production.

2 Formal model of reproduction

For simplicity, let us suppose that reproduction involves only two phases - production and consumption, each of them lasts one period, the discount rate is zero.

Let us consider the matrix of employee benefits.

Let the economy initially have L_h workers with high abilities and L_l with low ones.

Let in the phase of production the economic rent of an employee making a positive decision about training take the following form:

$$ER_{ED} = S - C - A \qquad (1)$$

where S - social benefits from training, C - the level of moral costs associated with training, A - the tuition fee for contract students. The value of social benefits is considered fixed and not dependent on the participants‘ behavior. Educational costs depend on the strategy chosen by the school or the student and the individual's abilitiesin in the following way: $C_{lh} >> C_{lh} > C_{ll} = C_{hl}$ where the first index shows the individual's abilities and the second is the quality of education received . That is, the costs of low-quality education are the same for both individuals, and the costs of quality education are significantly higher for an individual with low abilities. The economic rent of an employee who refused to get education equals to the reserve value R. At the consumption phase, the economic rent of an employee who has got education will take the form:

$$ER = W \qquad (2)$$

where W is the expected level of employee remuneration.

The economic rent of an employee who has not got education is still equal to R.

Let us consider the matrix of benefits for the educational institutions.

The profit of an educational institution is made up of two sources of financing - the state budget and students‘ fees. Thus, the profit will take the form:

$$\pi = A_g L_g + A \times (L - L_g) - L \times AC \qquad (3)$$

In this expression A_g - the budget funding per student, L_g - the number of students studying at the expense of the state, A - the tuition fee for a student, which depends on the status of the educational institution, L - the number of graduates, AC - the average costs of training, which depend on the quality of the education: $AC_h > AC_l$ high quality and low quality respectively. In the model, we assume that the tuition fee is set by the institution taking into account the least willingness to pay of all the students based on the following rule: $A = W + S - C - 2R$. As a result, the rent of an individual with the least willingness to pay for tuition is close to zero.

Let us consider the matrix of the employer's benefits.

Let it be that the employer‘s demand for labor coincides with the number of individuals with high abilities. The profit of an employer who does selection according to the formal criteria will take the following form:

$$\pi = (p - W(L_h, L_l)L \qquad (4)$$

where p is labor productivity.

The profit of an employer evaluating the qualification at selection:

$$\pi = (p_h - W_h)L_h - H(L_h + L_l + 1)\left(\frac{L_h}{L_h + 1}\right) \quad (5)$$

where H - the cost of one evaluation, $(L_h + L_l + 1)\left(\frac{L_h}{L_h + 1}\right)$ - the average number of evaluation episodes.

Let us uppose that the market level of labor exploitation is $1 - \alpha \in (0,1)$.

Note that in the profit we do not take into account the probability of hiring an uneducated individual before (in the period when others are getting educated). This circumstance shows that in practice the training period is much shorter than the working period and does not have a significant impact on the balance in the labor market.

Let us move on to the analysis of possible equilibria in labor markets and educational services. In order to simplify the analysis, we will examine the possibility of achieving a balance that ensures quality training of personnel. In this case, let us assume that the set of participants' strategies is the following:

The employer selects according to the formal criteria, having only information about the distribution of graduates by characteristics. The educational institution provides quality education and control of academic performance. Individuals with high abilities get trained, individuals with low abilities do not.

Let us see if this situation can be a Nash equilibrium.

For an employee with low abilities, the chosen strategy is optimal if:

$$2R \geq S - C_{lh} - A_{hh} + W_h \qquad (6)$$

For an employee with high abilities the strategy is optimal if:

$$2R \leq S - C_{hh} - A_{hh} + W_h \qquad (7)$$

Here and below: $A_{hh} = W_h + S - C_{hh} - 2R$

For an educational institution:

$$\begin{aligned} A_g L_g + A_{hh} \times (L_h - L_g) - L_h \times AC_h \geq A_g L_g + A_h \times (L_h + L_l - L_g) - (L_h + L_l) \times AC_h \\ A_g L_g + A_{hh} \times (L_h - L_g) - L_h \times AC_h \geq A_g L_g + A_l \times (L_h + L_l - L_g) - (L_h + L_l) \times AC_l \end{aligned} \qquad (8)$$

Here the level of payment is determined by the probability of employment: $A_h = W_E\left(\frac{L_h}{L_h + L_l}\right) + S - C_{hh} - 2R$, where, $W_E = \left(\alpha \frac{p_h L_h + p_l L_l}{L_h + L_l}\right)$, $W_l = \alpha p_l$.

For the employer:

$$(p_h - W_h)L_h \geq (p_h - W_h)L_h - H(L_h + L_l + 1)\left(\frac{L_h}{L_h + 1}\right) \qquad (9)$$

This situation can be a Nash equilibrium provided that the educational institution's limitations are met, which after the transformation take the following form:

$$\begin{aligned} \left(W_h - W_E\left(\frac{L_h}{L_h + L_l}\right)\right) \times (L_h - L_g) \geq A_h L_l - L_l \times AC_h \\ \left(W_h - C_{hh} - \left(W_l\left(\frac{L_h}{L_h + L_l}\right) - C_{ll}\right)\right) \times (L_h - L_g) - L_h \times AC_h \geq A_l L_l - (L_h + L_l) \times AC_l \end{aligned} \qquad (10)$$

Limitations of other players are complied with.

We should note that this system of inequalities proves to be true provided that the productivity of skilled workers is sufficiently high. The impact of budget financing in this case is negative, as it reduces the return on quality education by cutting the educational institution off the market. Indeed, it is easy to show that if the number of budget places is at least L_h, the educational institution will lose the incentives to provide quality control over academic performance, and if it is $L_h + L_l$, the optimal strategy will be low-quality education. It can also be noted that employer's introducing the procedure for assessing employee's competence will only strengthen this equilibrium, since getting education by incapable individuals will not bring them returns through employment. Thus, one can come to the conclusion that there is Nash equilibrium, which ensures quality training of skilled labor.

3 Institutional pitfall for the reproduction of human capital: empirical notes and causes

Nevertheless, as empirical evidence shows, for example, in the Russian labor market there are significant difficulties in achieving this equilibrium. As the data show, the quality of training in Russian vocational colleges and schools has remained quite low over the past few years and continues to decline. The key indicators of the decline in the quality of training for the last 30 years are: more than a twofold increase in the number of students, an increasing spread in the average scores of university applicants and a steady low percentage of students expelled for academic failure. On the labor market, in turn, there is a weak relationship between access to jobs and the quality of education, as shown by the data, the return on work experience is significantly higher, especially at the beginning of a career.

In our opinion, the main reasons for this situation in the labor market are the following ones. First, this situation may indicate a weak effect of education on labor productivity. In this case, the equilibrium in the labor market is effective. Secondly, this can be explained by the consequences of ineffective state regulation, which involves allocating budgetary financing and determining the size of training subsidies not taking into account the market parameters, which leads to the distribution of budgetary places to inefficient educational institutions. This reduces incentives for competition, especially in the field of technical specialties. Thirdly, the reason may be impossibility to adequately evaluate the qualifications of a graduate and the return from a qualified specialist. The third reason is the most interesting and there are three explanations. First, the assessment of qualification for recruitment selection requires a well-developed and expensive procedure, which pays off only for large employers who are mass recruiters. Small employers in this case act as followers, positively perceiving the fact that the applicant has got experience of working for a large employer. Second, the dissipation effect, which means that the employer's not having a threshold number of highly qualified employees does not give an opportunity to receive a return on qualification, as the condition for getting such a return can be a high level of the production culture as a whole sufficient to generate a synergistic effect. In this case, the marginal productivity of hiring a skilled worker is really not high. This circumstance is further strengthened by the effect of adaptation, which means that qualified specialists adapt over time to inefficient business processes, losing their initial qualification. From employee's point of view, this behavior is quite rational, since individual career considerations in this

situation are more important than potential benefits from protesting against the current management system. Finally, the third consideration is that employers have stereotypes that lead to discriminatory behavior.

Conclusion

In this work, the authors considered the model for the reproduction of highly skilled workforce. The model showed the possibility of achieving an equilibrium that suggests reproducing highly skilled personnel like in Nash equilibrium. As it was shown in the formal model, the growth of budget financing while maintaining its current model will lead to the opposite effect, moreover, it can be one of the causes of inefficiency. In any case, there is a need for further studying the role of economies of scale as a factor of employer's demand for qualifications.

References

Beladi, H., Marjit, S., & Weiher, K. (2011). An analysis of the demand for skill in a growing economy.Economic Modelling,28(4), 1471-1474. doi:10.1016/j.econmod.2011.02.032

Broecke, S., Quintini, G., & Vandeweyer, M. (2017). Explaining international differences in wage inequality: Skills matter.Economics of Education Review,60, 112-124. doi:10.1016/j.econedurev.2017.08.005

Cacciolatti, L., Lee, S. H., & Molinero, C. M. (2017). Clashing institutional interests in skills between government and industry: An analysis of demand for technical and soft skills of graduates in the UK.Technological Forecasting and Social Change,119, 139-153. doi:10.1016/j.techfore.2017.03.024

Commander, Simon John and Denisova, Irina, Are Skills a Constraint on Firms? New Evidence from Russia. IZA Discussion Paper No. 7041. Available at SSRN: https://ssrn.com/abstract=2189779

Gimpelson, V. , Kapeliushnikov, R. and Lukiyanova, A. (2010), Stuck between Surplus and Shortage: Demand for Skills in Russian Industry. LABOUR, 24: 311-332. doi:10.1111/j.1467-9914.2010.00483.x

Lall, E. (2015). Loss of Skill and Labor Market Fluctuations.SSRN Electronic Journal. doi:10.2139/ssrn.2691273

Lee, J., & Wie, D. (2015). Technological Change, Skill Demand, and Wage Inequality: Evidence from Indonesia.World Development,67, 238-250. doi:10.1016/j.worlddev.2014.10.020

Peng, F., Anwar, S., & Kang, L. (2017). New technology and old institutions: An empirical analysis of the skill-biased demand for older workers in Europe.Economic Modelling,64, 1-19. doi:10.1016/j.econmod.2017.03.004

Salha, O. B. (2013). Does economic globalization affect the level and volatility of labor demand by skill? New insights from the Tunisian manufacturing industries.Economic Systems,37(4), 572-597. doi:10.1016/j.ecosys.2013.07.006

Tarlea, S., & Freyberg-Inan, A. (2018). The education skills trap in a dependent market economy. Romanias case in the 2000s.Communist and Post-Communist Studies,51(1), 49-61. doi:10.1016/j.postcomstud.2018.01.003

Contact

Ivan Borisov
Ural State University of Economics, Ulitsa 8 Marta, 62, Yekaterinburg, Russia
borisovivan2006@yandex.ru

Natalia Sharapova
Ural State University of Economics, Ulitsa 8 Marta, 62, Yekaterinburg, Russia
sharapov.66@mail.ru

Valentina Sharapova
Ural State University of Economics, Ulitsa 8 Marta, 62, Yekaterinburg, Russia
sharapov.66@mail.ru