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N.K.Yemelina, c.ec.s., assistant professor

M.A.Assanova, PhD, lecturer

N.G.Kozlova , Master, senior lecturer Karaganda economic university of Kazpotrebsoyuz, Karaganda

Models for wages' formation in the republic of Kazakhstan

Introduction

Everyone has an individual ability to generate income. A specialist with extensive experience, as a rule, has a greater annual income than university graduate has. On average, the total earnings of a university graduate, received by him throughout his life, exceed the earnings of people with a secondary education. The combined earnings of college graduates vary depending on the subsequent training and career that they choose. In addition, as a rule, there are differences in the earnings of men and women, urban and rural residents, as well as individuals within the same country.

The main economic theory that determines the determinants of wages is the theory of human capital. The formation of human capital, like the accumulation of physical or financial capital, requires the diversion of funds from current consumption in order to generate additional revenues in the future.

In his writings, Adam Smith considered the relationship between income and investment in education or the costs associated with training, emphasizing that they can be incurred without day release [1].

T. Schultz [2] believed that in view of the influence of education on production, education itself can be considered one of the forms of capital. It is an capital, because it represents a source of meeting the needs in the future or future earnings. It can be called human, since this form of capital becomes an inseparable part of a person and his development.

The most comprehensive definition of the concept of "human capital" gave G. Becker [3], including in it the entire stock of knowledge, skills and motivation that the individual possessed. At

the same time, by investing in human capital, he thought education, work experience, as well as health, geographical mobility and information.

The first attempt to create an income generation model was made by J. Mincer, who believed that the distribution of personal incomes depends only on differences in the training of people [4]. Already later, he published the results of the research in which he studied the differences in individual income of Americans from the position of investment in training in the workplace [5]. He offered an income function that describes the relationship between the incomes of individuals from the level of education (the number of years of study) and work experience. The model made it possible to assess the impact of education and experience.

In a modern economy, as a rule, people who receive a thorough classical education tend to get more labor skills. This circumstance is supported by the confidence of employers that more educated people can be trained at lower costs, since they have already demonstrated their ability to learn. It should be noted that if more educated people acquire basic skills; their human capital accumulates more rapidly, which is reflected in the greater steepness of the "experience-income" curves than among less educated workers.

Main part

Econometric literature on the factors determining wages, for the most part, is based on the regression equation of the form

$$\ln y_i = f(s_i, x_i, z_i) + u_i, \quad i = 1, ..., n,$$

where $\ln y_i$ is the natural logarithm of earnings or wages for the i-th individual;

 s_i - level of education or educational

achievements;

 x_i - the contribution of professional experience to human capital;

 z_i - Other factors affecting earnings (gender, place of residence of a person);

 u_i - a random balance reflecting the influence of unobservable characteristics of abilities and the internal stochasticity of observed earnings values.

The return on education in the model of wages' formation.

The most general form of the earnings function can be written in the form [6]:

$$\ln Y_s = \ln Y_0 + rs + u \,.$$

It can be noted, if this equation is approximated by OLS (from data on education and logarithms of earnings), the estimated slope will provide an estimate of the private rate of return from learning, and the estimated free term will show the expected value of the logarithm of earnings in the absence of training.

S is the number of years of study, namely:

S = 9 - for basic secondary education (9-year school education, as a rule, is typical for people over 15 years old, taking into account that they go to school from the age of 6);

S = 11 - for secondary education (this takes 2 more years of training);

S = 15 for higher education (this takes 4 years);

S = 17 - for a master>s degree, and it takes 2 years of training (for some specialties, to be exact S = 17 for higher education - for example, for medicine, but since they do not have a master>s degree in any case, this assumption is correct also for them);

S = 18 - for seeking the degree of candidate of science (it was abolished a few years ago, with the signing of the Bologna agreement, and this degree was obtained by people who graduated from the postgraduate course of study for 3 years after the university and successfully defended their thesis).

For the construction of econometric models of wage formation in Kazakhstan, we used the official data of the household survey conducted annually by the Statistics Committee of the Ministry of National Economy of the Republic of Kazakhstan for 2015. A sample survey of the standard of living of households is conducted in all regions of the country, and it is based on the principles of voluntary participation of selected households. This technique meets international standards for selecting a sample and ensures high quality of statistical data. The survey covered 17,326 people. Interviews were conducted in all 14 regions of the country and separately in two cities - Almaty and Astana.

Approximation of data on the level of wages and the number of years of study resulted in the following results:

$$\ln Y = 10,54 + 0,089S, \quad R^2 = 0,091$$
(397) (41,7)

Where:

LnY - the natural logarithm of a person's wage for a fixed period of time (in our case for 2011);

S is the duration of the individual's learning.

The numbers in brackets of t-statistics for the corresponding coefficients.

The expected value of the logarithm of earnings in the absence of training is 10.54. Evaluation of the coefficient with variable training means an annual return on education of 8.9%. However, the share of the logarithm of income variation, caused by the variation of the learning variable, turned out to be small, since R2 was only 0.091.

A sufficiently high rate of return from education in Kazakhstan can be both a cause and a consequence of high labor productivity, and can affect the demand for educational services and the long-term accumulation of human capital.

The impact of work experience on wage formation

If we add to the model equation the effect of the impact of general forms of advanced training [6], in this case the earnings function is reduced to the form

$$\ln Y_i = \ln Y_0 + \beta_1 s_i + \beta_2 k_i X_i + u_i.$$

Where:

 β_1 - is the rate of return from classical training;

 β_2 - the rate of return from training at work (i.e. from general forms of professional development);

 k_i - share of the i-th time interval spent on general training;

 X_i - duration of the length of service of the i-th employee, reached by the i-th time interval, which is usually measured as the age after deduction s_i and minus another 6 years.

Unfortunately, the data for k_i is usually not available. Moreover, considering that earnings will not be permanent after graduation, but will take a parabolic form with a peak somewhere in the middle, this led to the transformation of the equation of the dependence of wages on education and length of service to the following:

$$\ln Y_{i} = \ln Y_{0} + \beta_{1}s_{i} + \beta_{2}X_{i} + \beta_{3}X_{i}^{2} + u_{i}.$$

If the function of earnings under the influence of indicators of working experience takes a concave shape, as it is suggested by the theory of human capital, then the estimates β_2 must be positive, and the estimates of β_3 - negative. In addition, in order to calculate the number of years of work experience for which h Y_i reaches its maximum, it is necessary to differentiate this equality by X_i , to equate the result to zero and to resolve relatively X^* . The value of the job seniority level, for which h Y_i is maximum, then can be determined by the ratio:

$$X^* = -\frac{\beta_2}{2\beta_3}$$

It does not depend on the level of education s_i .

After we added a quadratic dependence on the work experience to our regression equation, the quality of the model increased (from 0.091 to 0.109). The results of the data approximation are the following:

$$\ln Y = 10,28 + 0,093S + 0,026EXP - 0,0006EXP^2, \quad R^2 = 0,109$$
(325,3) (42,4) (18,3) (-17,4)

Where:

EXP is a proxy variable, calculated as "Potential Experience" = Age of the employee -S - 6. In Kazakhstan, children begin their training when they are six years old. Here, the assessment of the return on education increases to 9.3%. In addition, as the theory of human capital suggests, the function of earnings under the influence of the indicator of working experience takes a concave shape, since the coefficient before the variable EXP is positive, and before the variable EXP² is negative.

Differentiating the equality in EXP, and equating the result to zero, we calculated the number of years of experience for which lnY reaches its maximum. We have received, that the peak of wages of the individual without education comes in his/her 23 years.

Let us note, however, that the age at which the peak of earnings is set will change, as the individual will get education; because the variable age is composed of 6 years spent on education, and the length of service. In our case, the individual with a school education has a maximum wage level at the age of 40, with a higher education at 44, and with a scientific degree at 47.

One of the areas of application of the theory of human capital is that if the abilities correlate with the years of training and if individuals with better education receive more opportunities for training at work, then the income of the more trained after education will be higher than that of the less educated. One way to take into account this effect is to reflect in the interaction equation the factors of training and experience:

$$\ln Y_{i} = \ln Y_{0} + \beta_{1}s_{i} + \beta_{2}X_{i} + \beta_{3}X_{i}^{2} + \beta_{4}s_{i}X_{i} + u_{i}.$$

Where the influence of professional experience on the logarithm of earnings,

$$\frac{\partial \ln Y_i}{\partial X_i} = \beta_2 + 2\beta_3 X_i + \beta_4 s_i$$

depends on the level of professional experience X_i and on the level of education s_i . Sufficient condition for the curves "experience - income" for the more educated individuals were steeper:

$$\beta_4 > 0$$

The results of the regression analysis after the inclusion of the new variable «s*EXP» were the following: Экономика: стратегия и практика. 2018. № 4 (48)

$$\ln Y = 10,299 + 0,091S + 0,025EXP - 0,0005EXP^{2} + 0,00008s * EXP, \quad R^{2} = 0,109$$
 (177,1) (21,3) (7,9) (-16,5) (0,39)

The coefficient before the variable «s*EXP» has a positive value ($\beta_4 = 0,00008$), which indicates that more educated people accumulate

experience faster, and, thus, their wages grow faster than those of the less educated do.

To verify our assertion, we plotted the curves of the «salary log-experience» for each level of education (figure 1).



Figure 1 – Profiles «log of salary – experience» by level of education

Profiles, constructed according to all observations, are concave; they do not have points of intersection. Profiles corresponding to a higher level of education are located higher. This order of arrangement of profiles is usually called natural.

With visual analysis, we can assume that only profiles for those with a basic secondary and higher education can be considered parallel. The wage of workers with higher education is growing faster than wage of those, who are reflected in the greater steepness of the curve. The profile of the "logarithm of salary - work experience" for those who have postgraduate education cannot be considered parallel to any of the others. For those who fall into this category, wages are initially high, and as they gain experience, they grow insignificantly than in other groups, and throughout their working life.

Consequently, human capital grows with experience. On the other hand, over time, it

is prone to wear and tear - health weakens, knowledge becomes obsolete, abilities can degrade. Therefore, it is necessary to reproduce not only the formation, but also the reproduction of human capital. For the reproduction of human capital in the period of labor or economic activity, it is necessary to invest in the information support of the employee, the costs of upgrading skills or retraining with changes in the technique and content of work in the workplace, and mobility costs in the case of structural changes in employment.

By investing in their employees, firms strive to intensify their labor returns, increase labor productivity, reduce losses of working time and thereby strengthen their competitiveness.

Formation of wages: the gender aspect

Recent years, the topic of gender differentiation of earnings in the Kazakhstan labor market has become increasingly important. This is because in modern society, the bulk of the economically active population is wage earners, for whom the labor income along with the possibility of finding employment largely determine their quality and standard of living. According to official statistics [7] and scientific research [8], in most countries of the world there are differences in the average earnings levels between men and women, consisting in the fact that men earn more. Are the observed differences the result of discrimination against women in the labor market or it is the result of women choosing a certain niche in employment?

To assess the difference in earnings between men and women, we modified the earnings function proposed by D. Mintzer, by adding to it the quality variable - gender of the individual as an explanatory variable. We obtained a model of the following form:

$$\ln Y = \beta_0 + \beta_1 S + \beta_2 EXP + \beta_3 EXP^2 + \beta_4 G.$$

Where:

 $G = \begin{cases} 0, \text{if individual is male,} \\ 1, \text{if individual is female.} \end{cases}$

Approximation of the data made it possible to obtain the regression equation

$$\ln Y = 10,2637 + 0,1037S + 0,0284EXP - 0,0006EXP^2 - 0,2888G, \quad R^2 = 0,163$$
(335,13) (48,32) (20,87) (-19,67) (-33,56)

Analysis of the results showed that the logarithm of women's wages is less than in men by 0.2888. The percentage change in the characteristics of earnings of females is determined by the formula . Thus, the wages of the female individuals are lower than the wages of men by 33%.

To assess the impact of work experience on the logarithm of the wages of men and women, an additional fictitious interaction variable was included in the model $G \cdot EXP$, i.e. $GEXP_i = G_i \cdot EXP_i$, i=1,...,n:

$$\ln Y = \beta_0 + \beta_1 S + \beta_2 EXP + \beta_3 EXP^2 + \beta_4 G + \beta_5 GEXP.$$

In this case, the estimated regression model looks like:

 $\ln Y = 10,2574 + 0,1036S + 0,0289EXP - 0,0006EXP^{2} - 0,2744G - 0,0007GEXP, \quad R^{2} = 0,163$ (327,56) (48,22) (20,12) (-19,68) (-15,90) (-0,96)

The insignificance of the regression coefficient over the GEXP variable indicates that an additional year of work experience has the same effect on the logarithm of wages, both in men and women.

A similar situation is observed with the additional year of study:

 $\ln Y = 10,3098 + 0,0998S + 0,0284EXP - 0,0006EXP^{2} - 0,3799G + 0,0075GS, \quad R^{2} = 0,163$ $(357,88) \quad (32,69) \quad (20,87) \quad (-19,66) \quad (-7,38) \quad (1,79)$

That is, the additional year of study has the same effect on the logarithm of wages, both in men and women.

It is important to examine the fact that differences in earnings between men and women are due to skills acquired through education and experience. We assume that the coefficients of the slope of the learning variables, and especially the length of service, may differ for men and women. To test our assumption, for each category of respondents, we built income functions

- for males:

 $\ln Y = 10,2813 + 0,1003S + 0,0313EXP - 0,0007EXP^{2}, \quad R^{2} = 0,114$ (222,45) (30,54) (15,22) (-14,64)

- for females:

 $\ln Y = 9,9563 + 0,1071S + 0,0256EXP - 0,0005EXP^{2}, \quad R^{2} = 0,163$ (241,56) (38,37) (14,24) (-13,01)

An analysis of the estimates of the regression equations obtained showed that the returns on education for women and men are approximately the same, and are 10.71% and 10.03%, respectively. The number of years of experience at which the maximum of the logarithm of earnings for men and women is reached is equal to and equal to 24 years. Consequently, the "log-salarywork experience" profiles for men and women will be parallel (figure 2).



Figure 2 – Profiles «log of the salary - work experience» by sex

Regional analysis of the model of the formation of wages

Differentiation of wages at the regional level exists in any country. For each region, its level of pay. This is primarily due to the demand for workers of various skills in regional labor markets, as well as with the evaluation of the work of workers of the same occupational and skill groups. A similar situation is typical for the regional labor markets of the Republic of Kazakhstan.

We estimated the difference in earnings between individuals living in urban and rural areas. For this, a qualitative variable was added to the regression equation, characterizing the place of residence of the individual:

$T = \begin{cases} 0, if individual is a city citizen, \\ 1, if individual lives in a village. \end{cases}$

Then the earnings function has the following modification:

$$\ln Y = \beta_0 + \beta_1 S + \beta_2 EXP + \beta_3 EXP^2 + \beta_4 T$$

Using the data from the household survey, we obtained a model of the following form:

 $\ln Y = 10,6334 + 0,0749S + 0,0286EXP - 0,0006EXP^2 - 0,3454T, \quad R^2 = 0,184$ (337,47) (34,92) (21,28) (-20,40) (-39,95)

The logarithm of wages of individuals living in rural areas is 0.3454 less than that of urban residents. The change in the characteristics of wages depending on the place of residence is calculated by the formula . Thus, the earnings of rural residents are lower than the earnings of urban residents by 41%.

Regarding the regions of Kazakhstan, it can be said that the return on education and work experience differs depending on the level of poverty in them. We divided 16 regions into three clusters with low (0% -1.8%), medium (1.8% -3.6%) and high (3.6% -5.9%) poverty levels.

The first group included Pavlodar region, Astana and Almaty. The model of wage formation for the listed regions was the following:

$$\ln Y = 10,39 + 0,101S + 0,025EXP - 0,0006EXP^{2}$$
(193,20) (21,84) (8,78) (-8,82)
$$R^{2} = 0.137$$

According to the model, the return on education for regions with a low level of poverty turned out to be 10.1%.

The group with the average poverty level includes Aktyubinsk, Almaty, Karaganda, East Kazakhstan, Kostanay, Mangistau, Atyrau, Zhambyl, Kyzylorda regions.

Approximating the data for these regions, we received the following earnings function:

$$\ln Y = 10,06 + 0,094S + 0,028EXP - 0,0006EXP^{2}$$
(173,56) (23,79) (10,57) (-9,70)
$$R^{2} = 0.126$$

Thus, for the second cluster, the return on education decreased by 0.5% and amounted to 9.4%.

The third cluster unites regions with a high level of poverty, such as West Kazakhstan, Akmola, North Kazakhstan and South Kazakhstan regions.

The regression equation for these regions has the form:

$$\ln Y = 10,54 + 0,071S + 0,026EXP - 0,0006EXP^{2}$$
(243,54) (23,31) (13,63) (-13,04)
$$R^{2} = 0,072$$

In this case, we observe the lowest return on education, at the level of 7.1%.

The analysis of models has shown that with the increase in the poverty level in regions, the level of return on education decreases.

Industry analysis of the model of the formation of wages

The determining factor of the differentiation of the population in relation to wages is the Applied Specification. The root causes of inter-industry relations undoubtedly include differences in the cost of labor, especially skilled workers in such occupations, which prevail in the industry, in particular, the different levels of costs for general and especially vocational training, as well as the degree of complexity, severity and working conditions in those industries that are most characteristic for the industry, the place occupied by this or that branch in the economy of the country, the demand for the products of the industry.

We conducted an analysis of wage generation models for employees of state institutions, scientific and educational institutions, and non-governmental financial organizations. Modeling was carried out based on the results of a questionnaire survey, among 500 employees of organizations in these areas of activity in the Karaganda region.

For each of the three groups of organizations, the following regression equation was constructed:

$$Y = \beta_0 + \beta_1 G + \beta_2 AGE + \beta_3 EDU + \beta_4 D$$

Where:

Y - is the wages of an employee of the industry,

G - is the gender of the employee (G = 0, if the gender is male, G = 1, if female gender),

AGE - the age of the employee,

EDU - level of education (EDU = 1, if there is a higher education, EDU = 0, if there is no higher education),

D - the presence of a scientific degree (D = 1, if there is an scientific degree, D = 0, if there is no scientific degree).

The results showed that the return on education from the studied sectors of the economy takes place only in the sphere of education, which in Kazakhstan belongs to spheres with a relatively low level of income [9]. The level of income in state institutions is explained only by two factors: sex and age of the employee: the income of a male employee is on average 33,118 tenge higher than that of female employees; with an increase in the age of the employee for 1 year, his income on average increases by 1,083 tenge with other things being equal. The incomes of employees in financial institutions are mainly influenced by the positions they occupy and the functions they perform. The weak level of influence of factors such as the level of education and academic degree, probably indicate that in these institutions there are practically no employees who have a scientific degree, as well as workers with lower education.

Conclusions

Based on the foregoing, it can be concluded that the higher the level of education, the higher the initial salary of the employee. In addition, employees with higher education acquire also basic skills, because their human capital accumulates more rapidly, which is reflected in the greater steepness of the curve "log of salary - experience" than by workers with secondary education.

The gender wage gap continues to be significant. Work experience and duration of training have the same effect on the logarithm of wages in both men and women. The number of years of experience at which the maximum of the logarithm of earnings is reached is the same for both sexes and is equal to 24 years.

In general, there is a slight inequality in income distribution in various regions of the country. However, at the same time, wages of individuals living in rural areas are lower than city residents by 41%. In addition, the level of returns on education is greater in regions with a lower poverty level. In regions with a low level of poverty, the rate of return on education is 10.1%, with an average poverty rate of 9.4%, and a high level of 7.1%.

Thus, the achieved results confirm the wellknown opinion that the diversification of regional economies and providing incentives for creating high-paying jobs in these regions is the most important means of increasing labor remuneration in certain regions.

In conditions of the Kazakhstan economy, incentives for investment in education, at least at the level of decision-making of individual economic entities are poorly expressed. Apparently, given the steady increase in the number of people receiving higher education - the availability of a diploma of education serves only as a "pass to the workplace", while it is not provide a higher level of income, and further growth in the level of education is not rewarded at all in most spheres of economic activity with the exception of individual. This idea confirms the opinion of some researchers, according to which the post-Soviet education system follows the so-called filter theory. According to this theory, the task of the education system is not to transfer knowledge and skills, but to test the abilities of trainees who existed before and apart from training. Therefore, the availability of higher education confirms the high level of potential productivity and actually serves as a "pass" for the best jobs. The danger of such a selection mechanism is clear - rational behavior at the individual level can lead to

irrational consequences at the level of society. If higher education becomes almost universal, as a signal it loses its informational value. As a result, this leads to "diplomomaniya" - self-developing process leading to profound structural imbalances and devaluation of education.

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Түйін

Зерттеудің мақсаты – жалақы деңгейіне эсер ететін факторларды анықтауға көмектесетін эмпирикалық талдау принциптерін таңдамалы түрде қарастыру; гендерлік аспектіні және аумақтық жағдайды ескере отырып, жалақыны төлеуде айырмашылықтарды бағалау. Әдіснамасы – факторлық белгілер ретінде жалған айнымалы-лар қолданылатын жалақы моделін қалыптастырудың корреляция-регрессиялық талдауы. Жаңалығы -жалақы деңгейін тек ұлттық деңгейде ғана емес, сондай-ақ білім беру мен кәсіби тәжірибенің әсерін бағалау арқылы аймақтық және салалық деңгейлерге әсер ететін факторларды талдау жұмысы жүргізілді. Нәтижелері – Қазақстандағы білім берудің қайтарымдылығы 8,9% екені анықталды. Дегенмен, бұл көрсеткіш ерлер мен әйелдер тұлғалары үшін бірдей емес, сондай-ақ экономика салалары мен тұрғылықты аймақтарға қатысты өзгеріп отырады. Қорытынды – ұсынылған модельдер Қазақстан Республикасында жалақы қалыптастыру факторларының жалпы көрінісін алуға және отандық еңбек нарығына тән үрдістерді сипаттауға мумкіндік береді.

Түйін сөздер: жалақы, адам капиталы, білім берудегі қайтарымдылық, гендерлік айырмашылық, еңбек нарығы.

Аннотация

Цель работы - провести выборочный обзор принципов эмпирического анализа, который помогает выделить факторы, влияющие на уровень заработной платы; оценить различия в оплате труда, учитывая гендерный аспект территориальное положение. Методология И корреляционно-регрессионный анализ для построения моделей формирования заработной платы с использованием фиктивных переменных в качестве факторных признаков. Новизна-проведен анализ факторов, влияющих на заработную плату не только на республиканском, но и на региональном и отраслевом уровнях с оценкой отдачи от образования и профессионального опыта. Результаты – определено, что уровень отдачи от образования в Казахстане составляет 8,9%. Однако, этот показатель неодинаков для индивидов мужского и женского пола, а также варьируется относительно отраслей экономики и регионов проживания. Выводы – предложенные модели позволяют получить общую картину относительно факторов формирования заработной платы в Республике Казахстан и описывают тенденции характерные для отечественного рынка труда.

Ключевые слова: заработная плата, человеческий капитал, отдача от образования, профессиональный опыт, рынок труда.

Abstract

The purpose of the article is to conduct a selective review of the principles of empirical analysis, which helps to identify factors affecting the level of wages; to assess the differences in wages, taking into account the gender aspect and territorial position. Methodology - correlation-regression analysis for building models of wage formation using fictitious variables as factor attributes. Novelty - an analysis of factors affecting wages not only at the national level but also at the regional and sectorial levels, with an assessment of the impact of education and professional experience. Results - it is determined that the rate of return on education in Kazakhstan is 8.9%. However, this indicator is not the same for individuals of male and female sex, and varies with respect to the branches of the economy and the regions of residence. Conclusions - the proposed models allow obtaining an overall picture of the factors of salary formation in the Republic of Kazakhstan, and describing the trend characteristic for the domestic labor market.

Keywords: wages, human capital, return on education, professional experience, labor market.