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FAIR WAGE AND THE SIZE OF PENSION CONTRIBUTIONS IN THE THEORY OF HUMAN CAPITAL MEASUREMENT

The aim of the paper is to present the basic models of human capital measurement as well as derived wage models determining the minimum fair wage, which is, in the light of the presented theory, a proper percentage of employee's human capital. The application of these models in macroeconomic analyses enabled the development of suggestions concerning changes in the pension system.

Keywords: fair wage; human capital; pension system.

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СПРАВЕДЛИВА ЗАРОБІТНА ПЛАТА ТА РОЗМІР ПЕНСІЇ В МЕЖАХ ТЕОРІЇ ВИМІРЮВАННЯ ЛЮДСЬКОГО КАПІТАЛУ

У статті представлено основні моделі вимірювання людського капіталу, а також зарплатні моделі, що визначають мінімальну справедливую оплату, яка в контексті представлених теорій має відповідати певному відсотку від людського капіталу робітників. Застосування даних моделей при макроекономічному аналізі надало можливість авторам розробити низку пропозицій стосовно внесення змін до пенсійної системи.

Ключові слова: справедлива оплата праці; людський капітал; пенсійна система.

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СПРАВЕДЛИВЫЕ ЗАРАБОТНАЯ ПЛАТА И РАЗМЕР ПЕНСИИ В РАМКАХ ТЕОРИИ ИЗМЕРЕНИЯ ЧЕЛОВЕЧЕСКОГО КАПИТАЛА

В статье представлены основные модели измерения человеческого капитала, а также зарплатные модели, определяющие минимальную справедливую оплату, которая в свете представленных теорий должна соответствовать определённому проценту от человеческого капитала работников. Применение данных моделей при макроэкономическом анализе позволило авторам разработать ряд предложений по внесению изменений в пенсионную систему.

Ключевые слова: справедливая оплата труда; человеческий капитал; пенсионная система.

Introduction. The model of human capital measurement and the related wage theories belong to the concepts contributing to the recognition of crucial issues for economics with regard to providing fair wages to employees. This model shows the theory of human capital measurement as well as the principles of remunerating should be the same. It also provides better understanding of the relation between the value creation in economy and its division thereof. The article presents some basic models of human capital measurement as well as derived wage models determining the minimum fair wage, which is, in the light of the presented theory, a proper percentage of employee's human capital. The application of these models in macroeconomic analyses enables the development of suggestions concerning changes in the pension system.

Key research findings.

1. Human capital measurement models. Human capital refers to employees' attribute, and this value increases over the period from birth till retirement from serv-

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ice. The size of individual human capital is determined by the expenses incurred, such as: the cost of living and the cost of education, as well as expenses incurred during professional career (e.g., postgraduate studies). Furthermore, employee's capital increases as a result of increased professional experience. Identification of these expenses and determination of the function of capital increase as a result of the acquired experience lead to the repeatedly verified models of human capital presented in many earlier papers, such as (Dobija, 2009; Dobija et al., 2010; Cieslak and Dobija, 2007; Koziol, 2007; Kurek, 2011; Renkas, 2011, 2012a, 2012b). The basic conditions for these models are presented in Table 1.

Table 1. Models of measurement of employees' human capital, authors' compilation based on (Dobija, 2009; Dobija et al., 2010; Renkas, 2012b)

#	Author and name of the model	Formula	Description
1	M. Dobija Human capital measurement model (basic)	$H(T) = (K + E) \times (1 + Q(T))$ Additive form: $H(T) = K + E + D(T)$	$H(T)$ – value of human capital; K – capitalised cost of living; E – capitalised cost of education; $Q(T)$ – learning curve over T years of work; $D(T)$ – capital from professional experience over T years of work
2	D. Dobija Model supplemented with capital of creativity	$H(T) = K + E + D(T) + R$	R – capital of creativity
3	W. Koziol Model of human capital measurement with continued education expenses	$H(T) = K + E + D(T) + U_i \times (1 + Q(t_i))$	U_i – volume of capitalised costs of reaching the i -th level of qualification; t_i – number of years from the time of reaching the proper level of qualification to the time of measurement
4	J. Renkas Econometric model of minimum fair wage	$H(T) = (13.18 X_1 + 217.39 X_2 + 1,320.74) \times 1,250$	X_1 – age; X_2 – number of education years

Note that these models are the of many variables, among the following are always present: k – monthly cost of living, t – time variable and ρ – economic constant of potential growth. The model of human capital of a person without education or professional experience is shown in the formula:

$$H(k, t, \rho) = K, \tag{1}$$

where $H(k, t, \rho)$ – the value of human capital; K – capitalised cost of living with capitalisation rate of ρ .

The size of human capital calculated according to the above formula is the basis for determining the level of minimum wage in individual national economies because those who deserve the minimum wage are the employees that do not have professional education or work experience. If a young person chooses to achieve higher education, his/her human capital will increase in the course of learning by the size of the capital from education. After graduation, the model of human capital for such a person will be as follows:

$$H(k, t, p) = K + E, \quad (2)$$

where $H(k, t, p)$ – the value of human capital; K – capitalised cost of living; E – capitalised cost of education.

The model of human capital for an employed person contains an additional variable related to the professional experience gained in the course of employment. It can be presented in the following manner (Cieslak and Dobija, 2007: 5–24):

$$H(T) = (K + E) \times [1 + Q(T)], \quad (3)$$

where $H(T)$ – the value of human capital attributed to a person with T years of work experience; K – capitalised cost of living; E – capitalised cost of education; $Q(T)$ – learning curve over T years of work.

The above model can also be presented in the additive form (Dobija et al., 2010: 79–80):

$$H(T) = K + E + D(T), \quad (4)$$

where $D(T)$ denotes capital from professional experience over T years of work and $D(T) = H(0) \times Q(T)$, where $D(0) = 0$. This model is more suitable for analysis and for shaping wages. It is derived from the general model of capital presented by M. Dobija (2007). According to this model, human capital is subject to natural, spontaneous dispersion with the average annual rate of 8%.

The human capital model can also be supplemented with the ratio of the capital of creativity (R) or the variable U_i , which is applied in human capital measurement model for a person who continues education (Koziol, 2010). This determines the volume of capitalised costs of reaching the i -th level of qualification (where t_i denotes the number of years from the time of reaching the proper degree to the time of measurement).

The development of the above models of human capital enables the presentation of the theory according to which wage (W) is perceived as % of the value of individual employee's human capital ($H(T)$). As shown in the research, this percentage is on the level of economic constant of potential growth (ρ) and amounts to 8% per annum. Such a size of wage is a fair one and does not allow depreciation of employee's human capital. Appropriate wage models, built on the basis of the models of human capital measurement, are systemised in Table 2.

By means of the above presented models, the size of human capital for each employee can be determined, and the resultant amount will be the basis for evaluating the fair wage. Thus, the concept of fair wages enables determining wage amounts that are the natural equivalent to the size of individual human capital of each company's employees. The fair value of remuneration in each case is considered in terms of maintaining the value of human capital, and not the fair value as defined in the International

Financial Reporting Standard (IFRS) 13 "Fair Value Measurement" (Holda, 2013a, 2013b). As a consequence, the fair value of remuneration, understood in this light, ensures the maintenance of employee's human capital, i.e. it covers the essential costs of living, the pension fund, the health care fund and the bringing of human capital in one offspring up to the level of parent's human capital (Holda and Renkas, 2014).

Table 2. Wage models as the derivatives of the value of employee's human capital, authors' compilation based on (Renkas, 2014)

#	Wage models	Characteristics of the models
1	$W = H(T) \times 0.08$, where $H(T) = K$	Wage model for an employee without any education or professional experience (such an employee's human capital consists exclusively of capitalised cost of living)
2	$W = H(T) \times 0.08$, where $H(T) = K + E$ and $T = 0$	Wage model for an employee who has professional education (additional variable of capitalised education cost appears)
3	$W = H(T) \times 0.08$, where $H(T) = (K + E) \times (1 + Q(T))$	Wage model for an employee who additionally has professional experience (the learning curve ratio depends on the number of years of professional work, with the initial years of work having the greatest importance)
4	$W = H(T) \times 0.08$, where $H(T) = K + E + D(T) + R$	Wage model for an employee who additionally has the capital of creativity
5	$W = H(T) \times 0.08$, where $H(T) = K + E + D(T) + U \times (1 + Q(t_i))$	Example of a wage model for an academic employee who incurs costs related to achieving the i -th qualification level (where t_i – the number of years on achieving the appropriate degree to the time of measurement)
6	$W = 13.18 X_1 + 217.39 X_2 + 1,320.74$	Econometric wage model (where X_1 – age; X_2 – the number of education years)

2. **Formulas determining the fair wage.** The possibility of developing a formula for calculating the level of minimum wage for a particular employee will solve the problem of determining appropriate fair wages. We will demonstrate this on the example, asking whether appropriate monthly remuneration in Ukraine is on the level of 200 UAH or rather on the level of 40,000 UAH? Common sense hints that wage on the level of 200 UAH is very low but the level of 40,000 UAH seems to be too excessive. Such an approach follows from perceiving the wage (W) as a % of employee's human capital (H):

$$W = u \times H, \tag{5}$$

where u – appropriate percentage; H – human capital of an employee.

Calculations of this sort (Cieslak and Dobija, 2007) indicate that the appropriate percentage rate, i.e. one determining the size of minimum wage, is on the level of economic constant of potential growth, i.e. at the value of p equal to 8%.

In the models of human capital measurement presented above (Table 1), there are categories that represent proactive actions and potential ones. More detailed analyses can be found in (Dobija and Renkas, 2011: 182). The authors present the model of capital growth in the following manner:

$$C_t = C_0 e^{(p-s+m)t}, \quad p = E(s) = 0.08 \text{ per annum}, \quad (6)$$

where p – economic constant of potential growth; s – the rate of natural, spontaneous dispersion of capital; m – the rate of capital growth resulting from work activity.

The interpretation of the forces that act under the exponential growth law is as follows:

- e^{pt} – the factor that determines the natural capital growth potential; economic constant $p = 0.08$ per annum;
- e^{-st} – the factor that determines the spontaneous dispersion of capital, i.e. the action of the thermodynamic arrow of time (the second principle of thermodynamics), t – calendar time;
- e^{mt} indicates the actions that attenuate the impact of the thermodynamic arrow of time and increase the growth due to capital transfer through work and management.

It is worthwhile to note here that variables s and m represent active forces of nature (in the case of variable s) as well as proactive actions in the form of capital accumulation as a result of work (variable m) that may compensate its dispersion. In turn, constant p symbolises potential forces. The natural potential determined by it can ensure actual increase of the initial capital provided that the rate of dispersion is counterbalanced by the effect of m . If m counterbalances s , then human capital grows at the rate of $p = 8\%$. Obviously, m may be greater than s (specialist and professional care and education) so human capital will grow at higher rate than $p = 8\%$ (the reverse situation may also occur). However, for determining the size of minimum wage, average conditions are taken into account, i.e. m counterbalances the effect of s . Thus, the wage that compensates the dispersion of the employee's human capital is determined according to the formula:

$$L = p \times H, \quad (7)$$

where L – the basic wage determined on the basis of the size of employee's human capital; p – economic constant of potential growth ($p = 8\%$). From this it follows that the basic wage on the level of $0.08 \times H$ compensates the dispersion of employee's human capital.

3. Fair wage and the size of pension contributions. One of the first authors to carry out macroeconomic analyses that included the category of human capital was T. Schultz. This scientist considered human capital as a factor of economic development for any country. He defined it as a set of elements determining the quality of society. According to this author, the increase in the quality of society is accomplished through learning, access to information, obtaining professional and personal experience, as well as appropriate upbringing and healthcare (Dobija, 2003: 150–151). Human capital is reflected in the acquired and inherent abilities and skills. T. Schultz held the opinion that the concentration of genes responsible for innate abilities runs a similar pattern in all societies. Differences in qualities of societies in various countries are the results of differences in skills acquired through education and experience. T. Schultz pointed out that the development level of a country and its further dynamics depend on the quality of human capital of population. The opinion that know-

ledge, experience and proper physical condition of the people are the key factors for productivity is commonly accepted. The value of human capital depends on its current size as well as the possibilities for its restoration and development. Therefore, in each country appropriate conditions should be created for the development of the abovementioned constituents of human capital. One of mandatory conditions here is the guarantee of appropriate fair wage rates.

The above presented models of human capital concerning individual employee develop the theory of human capital in the spirit of T. Schultz's deliberations. Let us note, however, that capital growth is largely accomplished within households. A household can be defined as an economic micro-entity built as a rule on family ties and relationships that yields income, uses it for various purposes, manufactures goods, renders services and accumulates savings (Palaszewska-Reindl and Michna, 1986: 34).

A household is thus the place where human capital is shaped, the same constituting the elementary work resources that enable economic growth. Its value changes as a result of work and in the course of time. Therefore, it is the household's task to restore and develop human capital, and this is an extremely important economic issue. Restoration of human capital in short term involves the restoration of the forces depleted in the course of performing work (e.g., through relaxation, food). Restoration of human capital in a long term involves the development of further generations (children), preparing them for work and living in the society. Economic progress requires that the system decisions should provide for the possibility of preparing next generations for performing work on the same level (or better but by no means worse) with their forerunners. From the point of view of the dynamics of human capital, this implies the maintenance and increase of the human capital value in the context of generation shift.

Attitude to labour is one of the most important elements of cooperation between a household and its environment. Based on the theory of human capital, labour is defined as a transfer of human capital to the objects of labour. Family, in return for transferring human capital of its members, as a factor of production, receives, as known, the transfer ($W = p \times H(T)$), the size of which under the effective market determines the level of human capital ($H(T)$), while p (8% – economic constant of potential growth) determines the minimum level of labour remuneration. The remuneration received by a household is then used first of all to cover the costs of human capital restoration, both in the long and short term. It is for this reason that the size of remuneration flow is so important from the point of view of long-term dynamics of households' human capital. Maintenance of its size requires income in an amount that will allow compensation for the natural dispersion of capital. Accomplishment of this goal in turn requires that the state should pursue an active policy on to labour remuneration. This applies particularly to the system of minimum wages in broad sense, as well as proper taxation and social policies that motivate individuals engage in economic activity.

There is no way of maintaining the size of human capital, at least on the same level, without a flow of income in a volume that may compensate its natural dispersion. As known, human capital disperses spontaneously and randomly, and the estimated rate of dispersion is s , where $E(s) = 0.08$ per annum. Reduction of the level of

labour remuneration below 8% results in capital dispersion. In practice this may manifest itself in the form of problems experienced by the family with regard to providing children with appropriate level of professional competence (at least the same as their parents have) or having no children at all. A similar situation may arise if a household member loses their job, which implies an absolute loss of the source of income.

In the light of the above deliberations, the costs incurred by households are tantamount to investment expenditure. For instance, expenditure on professional education ensuring the possibility of pursuing a profession with adequate earnings is a human capital investment that will result in a higher rate of remuneration due to the competencies that the employee has. This is thus not only consumption. The point of view presented above is not new. G. Myrdal argued (Przybyla, 2001: 287–290) that the costs incurred by households on living and professional education are an investment in human capital even though many economists still perceive them as consumption costs.

The development of the human capital theory presented in this paper opened up opportunities for measuring this capital, and consequently performing analyses and suggesting a number of economic reforms that have the potential of positively impacting the socioeconomic life of countries. This inter alia suggested changes concerns employees' pension funds. Calculations made in the broad context of the theory of human capital indicate the directions for future reforms.

The calculations presented below illustrate the situation when a correctly arranged system of pension contributions makes it possible achieving a considerable size of the pension fund despite the modest amount of contribution. As a result, an employee may receive pension in the future on the level with at least the fair minimum wage. Such remuneration prevents human capital depreciation and makes it possible to maintain it on at least the same level.

By way of exemplification of the above solutions, an analysis will be conducted concerning the situation of a family consisting of 4 people (2 parents and 2 children), in which the parents only have the basic constituent of human capital, i.e. capital from the cost of living, so their human capital is $H(T) = K$. Thus, the analysis concerns the group of people whose remuneration is equal to minimum wage. The presented below calculations of the human capital size for each parent have been made using the social minimum, which in compliance with the Law of Ukraine "On the Budget of Ukraine for 2015" (28.12.2014, # 80-VIII) – 1,218 UAH as of 1st June, 2015. On this basis, and using the model of human capital, we determine the appropriate size of minimum wage for both parents, as shown in Table 3. As the family bear the costs related to health and pension insurance, we assume the following: health insurance contribution – 10% of the remuneration, pension insurance contribution – 10% of the of basic remuneration.

As it has been established, the family's income remaining after deducting the pension and health contributions amounts to 5,838.62 UAH, i.e. approx. 1,460 UAH per person. Such an amount (being greater than the amount of the social minimum in Ukraine) enables an average family maintain the human capital preventing its depreciation, and to prepare children to perform work on the same (not worse) level as their parents.

Table 3. Calculation of the size of minimum wage, authors' own calculations

Two parents	Person A	Person B	Total
Size of the parents' human capital, UAH ($H(T) = K$)	547,372.00	547,372.00	1,094,744.00
Amount of basic annual remuneration (labour costs), ($8\% \times H(T)$)	43,790.00	43,790.00	87,580.00
Monthly remuneration (+12)	3,649.15	3,649.15	7,298.30
Contribution to the pension fund, UAH (10%)	364.92	364.92	729.84
Contribution to health insurance, UAH (10%)	364.92	364.92	729.84
Income remaining in the family, UAH	$7,298.30 - (2 \times 729.84) = 5,838.62$		

Regular deductions in the form of the pension fund contributions over 47 years will make it possible to raise an appropriate amount that will in turn make it possible to receive, following retirement at 65, a monthly pension which will be equal to the size of the remuneration received during the working life. If we assume that all contributions deducted from employee's remuneration are transferred to a personal bank account, than the deposited amounts will be additionally increased by the appropriate amount of interest. With the assumption of the annual interest rate at the level of 3%, after 47 years of capitalisation we will receive the following size of the accumulated pension fund (the applied fund capitalisation formula is as presented in (Dobija and Smaga, 1993: 78–82)):

$$\begin{aligned}
 CPF &= e \times \left(12 + \frac{11}{2} \times r \right) \times \frac{(1+r)^t - 1}{r} = \\
 &= 364.92 \times \left(12 + \frac{11}{2} \times 0.03 \right) \times \frac{(1+0.03)^{47} - 1}{0.03} = 445\,685.35,
 \end{aligned}
 \tag{8}$$

where CPF – the amount of capitalised pension fund; e – pension insurance contribution; r – the interest rate on the pension account; t – the period of capitalisation.

According to the survival curve, the average life expectancy after retirement in Ukraine is 15 years. Based on the size of the pension fund capitalised over the lifetime, we can calculate the future size of pension payments (Table 4). It should also be noted that during these 15 years the annual interest amounts will be added to the remaining amounts of the capitalised pension fund. This is an additional source of increasing the size of monthly pension payments.

The size of the monthly pension payments will increase with each consecutive year due to the addition of the annual interest to the pension fund. Apart from this, the calculations shown in Table 4 demonstrate that the monthly pension size will be almost equal to the size of remuneration currently received by the employee. It can be therefore stated that the remuneration determined on the basis of the 8% economic constant, as well as the above determined pension contribution and the 3% interest rate enable maintaining human capital over the employee's statistical lifetime period. Under such circumstances, there appears to be the opportunity to arrange for a fair standard of living that enables maintaining the size of human capital also after retirement from employment.

Table 4. Calculation of the monthly pension size, authors' own calculations

Years	Capitalised pension fund, UAH	Number of remaining months	Monthly amount of pension, UAH	Annual amount of pension, UAH	Size of the pension fund as of the end of year, UAH	Size of the pension fund with interest added (3%), UAH
1	445,685.35	180	2,476.03 ¹⁾	29,712.36	415,972.99	428,452.18
2	428,452.18	168	2,550.31	30,603.73	397,848.46	409,783.91
3	409,783.91	156	2,626.82	31,521.84	378,262.07	389,609.93
4	389,609.93	144	2,705.62	32,467.49	357,142.44	367,856.71
5	367,856.71	132	2,786.79	33,441.52	334,415.19	344,447.65
6	344,447.65	120	2,870.40	34,444.76	310,002.88	319,302.97
7	319,302.97	108	2,956.51	35,478.11	283,824.86	292,339.61
8	292,339.61	96	3,045.20	36,542.45	255,797.16	263,471.07
9	263,471.07	84	3,136.56	37,638.72	225,832.35	232,607.32
10	232,607.32	72	3,230.66	38,767.89	193,839.43	199,654.61
11	199,654.61	60	3,327.58	39,930.92	159,723.69	164,515.40
12	164,515.40	48	3,427.40	41,128.85	123,386.55	127,088.15
13	127,088.15	36	3,530.23	42,362.72	84,725.43	87,267.19
14	87,267.19	24	3,636.13	43,633.60	43,633.60	44,942.61
15	44,942.61	12	3,745.22	44,942.61	0.00	0.00
<i>Arithmetic mean</i>			3,070.10	36,841.17	-	-

¹⁾ 445,685.35 / 180 = 2,476.03 UAH.

Summary. The basic models of human capital measurement presented in this article, as well as the wage models derived are applicable in macroeconomic analyses. The proposed changes into the system of pension benefits are based on the determinants indicated in the paper, which enable employees receive pension payments based on the remuneration they have received. The model described in the paper provides for not only maintaining the size of employee's human capital in the long term but also for the possibility of its growth because there are periods in the lifetime that can be singled out when the per capita income in the family will exceed the social minimum. The correct use of this amount will foster additional growth of family's human capital, e.g. in the form of parents' financial support for their adult children. This may also advance the appearance of intellectual capital in their children or grandchildren in the form of capital from education.

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