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THE STRUCTURE OF KNOWLEDGE IN SOCIETY AS A DETERMINANT FAIR LABOUR INCOME INEQUALITIES IN THE ECONOMY

Стаття піднімає питання про справедливу нерівність заробітної плати, що аналізується на прикладі Польщі. Передбачалося, що відмінності в заробітній платі повинні бути результатом відмінностей у вартості індивідуального (особистого) людського капіталу, що визначається як здатність виконувати роботу. Згідно з альтернативною моделлю людського капіталу, посилаючись на постулат дотримання вартості заробітної плати та вартості праці, ця здатність виконувати роботу збільшується, зокрема, від освіти та досвіду роботи. На основі статистичних даних була здійснена вибірка працівників, для яких розраховані значення величини заробітків, у залежності від вартості людського капіталу.

Це дозволило детально визначити природні нерівності трудових доходів, які означають нерівності в результаті декомпозиції індивідуального людського капіталу в суспільстві. Згодом, порівнявши природний рівень нерівності заробітної плати в Польщі з фактичним рівнем, зазначено причини і наслідки надмірного і всезростаючого відхилення. Всі ці міркування несуть відповідні пропозиції, що викладені в кінці статті.

Ключові слова: *людський капітал, нерівність трудових доходів, нерівність доходів, справедлива заробітна плата.*

Introduction

By almost any definition, economics is presented as a science of the growth and distribution of national income. It proves how important the issue is to achieve an appropriate relationship between earnings of employees. Numerous research in this area suggests that excessive levels of diversity in income leads to not only gap between the actual and potential growth of the domestic product, but may also contribute to the development and consolidation social pathologies. The aim of paper is identify the optimal level of labour income inequality.

The article assumes that the extent of employee participation in the national product should be adequate to its contribution to its production. The measure of individual labor input is the value of an individual employee's human capital. It also is defined as potential ability to perform the work. Such assumption allows the specification of the natural, fair labour income (wage) inequalities in the economy. This inequalities are a consequence of the structure of human capital in the community (country). The research methodology used in article is based on the concept of human capital measurement. This method assumes that the main determinant of human capital value is the extent of human professional education. Thus, the natural level of labour income inequalities determines the existing structure of education among workers.

It should be emphasized that the research methodology used allows calculation of adequate size of labour income inequalities. The modern economics has developed methods allowing to exchange labour income inequality to income inequality. However, from the point of view of economic cohesion, more important indicator seems to be the labor income inequalities. Wages are the main source of income for the vast majority of people or households, and thus are the primary source of financing for the reproduction of human capital in the family.

1. The importance of the income distribution in the economy and the main methods of measuring income inequality

Distribution of income among workers in the economy is a key issue in economic sciences. Contributing to the development of a variety social trends affects not only the dynamics of economic development, but also, as a result, the level of social welfare. Mainly for this reason, the analysis of income disparities is linked to the issue of social evaluation of these inequalities. The answer to the question whether the ambient income inequality is too high, too low or are at the right level requires a economic and social standard. This standard should define as precisely the right to receive a different amount of income tested by individual members of society.

Egalitarian distribution of income, even idealistic overtones, is not free from defects. Not motivates to upgrade their qualifications, and ultimately can lead to tensions and discontent. Employees who have invested a lot in their education, performing complex and responsible work – in a egalitarian income distribution model - will receive similar compensation, as workers performing simple tasks.

On the other hand, a significant difference in income causes polarization of society, which is divided into poles of wealth and poverty. Such distribution is the cause of many social pathologies, damping dynamics of development. These general considerations make it necessary to identify optimal, economically reasonable level of income inequalities in society.

This conclusion confirms research on the relationship between the level of income inequality and economic growth. These studies indicate the existence of a certain level of income distribution, at which economic growth achieves the highest dynamics. Devia-

tions from this level result in underutilisation of the available economic potential and poorer economic performance [P. Kumor, J.J. Sztaudynger, 2007, p.494].

The problem of measuring income inequality has a significant place in the economic literature. There are many measures of inequality, which allows to present a numerical method of income inequality. This problem has been systematized by the development of measures of inequality axioms that allow the selection of the most adequate measure for the given problem research. It should be emphasized that it does not in any case have to be met by a metric axioms [N.C. Kwakani, 1980, s. 65 – 69].

One of the most commonly used measures of the level of income inequality in society is the Gini index, derived from the Lorenz curve. It satisfies mentioned axioms. Gini coefficient can be presented as the ratio of the field area A, concluded between the Lorenz curve and the 45 degree line (line egalitarian, equal distribution of income) to the area of the triangle below the line of 45 degrees. This ratio has a value in the range [0; 1], value 0 is achieved for an egalitarian distribution, which is the case when the income is divided equally between employees, and 1 for the distribution of the extreme concentration of wages, when one person receives all the income. Another measure of income inequality, Theil index, is distinguished by a feature called additive decomposability. It allows to determine the impact of different social groups to the general index of the measurement of income inequality [A.F. Shorrocks, pp. 613-625]. The statistical studies commonly used measure of income inequality is to compare the income of the richest quintile or decile of the poorest quintile, respectively, or decile. In addition, usually of a journalistic nature, is also used to compare the richest percentile of the poorest. The disadvantage of these solutions, especially the latter is not taking into account the distribution of income in the rest of the population.

Income distribution in the world is characterized by a great diversity. Analyzing the trend of the twentieth century can be seen that the lowest level of inequality characterized the beginning of the age, in 1900 the Gini index was 0.40, while its value peaked in 1965 with a score of 0.58. From now observed a slight reduction of income inequalities. In 1997, the Gini index stood at 0.52, and three years later he went down to 0.48. The common opinion is an argument in favor of the positive effects of globalization on welfare in the world. However, in reality the state of the global economy is not so optimistic, as it would appear from the above data. Analysis of the Lorenz curves for both the 1965 and 2000 years shows an increase in income in the 2nd, 3rd and 4th due to a decrease income of the fifth quintile (the richest), while the income attributable to the first (poorest) quintile remained constant, indicating the enhancement of a poverty in the poorest societies [OECD statistics].

Analysis of income distribution in individual countries indicates a very high level of income diversity in African countries and South America. In 2012, South Africa was recorded value of the Gini index at the level of 0.65. Somewhat lower level was reported in Bolivia and Colombia (0.58), Brazil (0.53), Paraguay (0.53), Mexico and Chile (both 0.52). The lowest level of inequality were observed in Sweden (0.23), Hungary and Norway (both 0.25). The greatest differences in income levels in European countries has developed in Bulgaria (0.46), Russia (0.46) and Turkey (0.40).

In the US, the value of the Gini index is currently about 0.45, this is one of the higher value achieved by the national economy. Until the 70's worth of income inequality in the US has decreased, wages vulnerable groups grew faster than the national average wage. At this time, the trend was reversed and still increasing [T. Pikkety, E. Saer, 2003].

In Poland, since the economic transformation in 1989, income inequalities grew continuously from 0.22 in 1989, reaching the 2005 level of 0.36. In the next years, the value of Gini index fell slightly and remained at approx. 0.33 - 0.34. Pre-transition period till 1989, Polish economy was characterized by a low value of the Gini index. This was largely a consequence of the lack of educational bonus, typical of the centrally planned economy [M. Brzeziński, 2013]. Salaries were weakly correlated with the level of education of employees. The transformation to market economy has been a constant increase in income inequality. This increase was due to positive effects, such as, for example, the emergence of educational bonus. However, there are also factors on the labor market, which resulted in excessive growth of income inequality. Inhibition of growth of inequality and the slight decrease was due to a significant rise of minimum wage in 2006 and the accompanying growth in emigration after Polish accession to the European Union. During this period, emigrated about 2 million people, mostly young people who, due to low wages received at the beginning of their careers, cause an higher income inequality.

The extension of the analysis of income distribution in society is to examine income inequality depending on the source of income of households. The following table shows the results for the Poland. Studies confirm the increase in income inequality in each of the groups (in this case, measured by the Thiel index). Particularly strong growth was recorded among income from self-employment and pensions. Least in the group of workers achieving income both from labour and farming. While the highest income diversity was observed in the group of household achieving income from labor and farming and self-employment. The smallest inequality, in spite of the observed upward trend, in pensioner households.

Similar studies were performed for Italy. They describe the income distribution according to the source of received income in Italy. The analysis of the data shows a stable level of income inequality in each group. The highest level of income inequality was observed in the group reaching income from self-employment and income from the lease. Least in the area of social transfers [C. Quintano, R. Castellano i A.Regoli, 2005].

Tab. 1. Income inequality, depending on the source of household income in Poland (in Theil index)

	Workers	Workers-farm	Farm	Self employ-ment	Pensioners	General
1999	1,90	0,156	0,400	0,202	0,104	0,205
2004	0,226	0,159	0,444	0,280	0,166	0,238

Source: [P. Ulman, A. Walega, 2006].

Table 2. Income inequality according to source of income In Italy In the years 1998 – 2002.

Source of income	Year		
	1998	2000	2002
1. Wages	0,33	0,32	0,30
2. Self-employment	0,55	0,51	0,55
Pension, retirement, benefits	0,17	0,15	0,16
4. Lease	0,46	0,45	0,42
General	**0,35**	**0,33**	**0,32**

Source: C. Quintano, R. Castellano i A. Regoli, 2005.

Analysis of data in Tables 1 and 2 is a good starting point for to clarify the terms of income inequality and wage inequality, sometimes used interchangeably. Income inequalities are the result of the level of inequality in the few sources of income, and wage inequalities arising from the wage relationship in the country. Data included in Tables 1 and 2 show a strong relationship between wage inequality and income inequality. Income inequality is about 2 percentage points higher than the wage inequalities. The correctness of this study confirm [F. Clementi, M. Gallegati, 2005]. In addition, the results of these Italian scientists argue that income from financial assets increases Gini index by 1 - 3 percentage points, depending on the market situation. Summarizing, the concept of income distribution and the distribution of wages is an acceptable simplification, however, requires consideration of these comments.

Presented statistical evidence suggests that the analysis of income inequality due to its universality and broad methodological instruments, may be included in the group of the most common areas of macroeconomic analysis. However, a common problem is the evaluation of the results, both from the point of view of social justice and economic efficiency.

2. The structure of education as a fundamental determinant of wage differentials

To solve the problem of the article, which is to specify a method for estimating the natural level of wage inequality has been applied an alternative model of human capital. The model allows for valuation of individual human capital (human capital of each employee) in a manner consistent with the accounting principles. Another use of alternative model of human capital is to provide the principles of human capital fair compensation, which provides an opportunity to preserve the value of human capital in the long term. Approach involves payment of the work in accordance with the value of the work performed [Dobija M., 2011].

Human capital is based on capitalised resources necessary to build the economic potential aimed to perform work by humans. In the first place, it includes the costs of professional education increased by the costs of living. It is necessary to incur the costs of living to prepare the physical carrier of human capital – the human body. Costs are incurred in time (t), which is necessary to prepare people to perform a given profession – from the time of birth to the moment of starting a professional career. If the human body is well prepared and a young person completes his/her education as planned, it indicates that capital diffusion (s) is compensated for by parents' efforts (parameter m). A formula of capital can be developed for employee (H_t), where initial outlays are represented by (H_0), constant economic value (p) and capitalization time (t):

$$H_t = H_0\, e^{p t}$$

This human capital model can be further extended to represent capital as the sum of capitalized costs of living (K) and education expenditures (E). These outlays lead to the ability to perform work, and this ability increases in the course of gaining experience. The supplementary formulas represent the development of human capital based on the costs of living K and education costs E:

$$H(T) = (K + E) \cdot (1 + Q(T))$$

In the case of annual capitalization the particular human capital components can be presented in the following way:

$$K = k \cdot 12\frac{e^{pt}-1}{p}$$

$$E = e \cdot 12\frac{e^{pt}-1}{p}$$

where: k – monthly costs of living, e – monthly education costs and the remaining values as presented above.

The process of gaining work experience can be graphically presented as a learning curve. This concept assumes a slower pace of an increase in the work potential in the course of subsequent work cycles (repetitions). It can be assumed that an employee performs a given task in the following year with greater efficiency (%), but efficiency increases slower in the course of time. The adjustment of the learning curve to the needs of the human capital model facilitates estimation of increased human capital in the course of work (gaining experience). This additional value of human capital is subject to valuation and is integrated into the human capital structure as capital combined with experience. Experience factor (Q(T)) is expressed by the function of years:

$$Q(T) = 1 - T^{\frac{\ln(1-w)}{\ln 2}}$$

where: w = learning factor, T = years of work experience T>1

A chart which presents human capital increase for a person with a university degree is presented in Fig. 1. In the Polish education system students start their studies at the age of 19 and attend their programmes for 5 years. Consequently, the period of cost of living capitalization is 24 years, while education cost capitalization corresponds to a 5-year university programme. After graduation people are obliged to start work. Work leads to gaining additional skills which originate from experience-based capital Q(T).
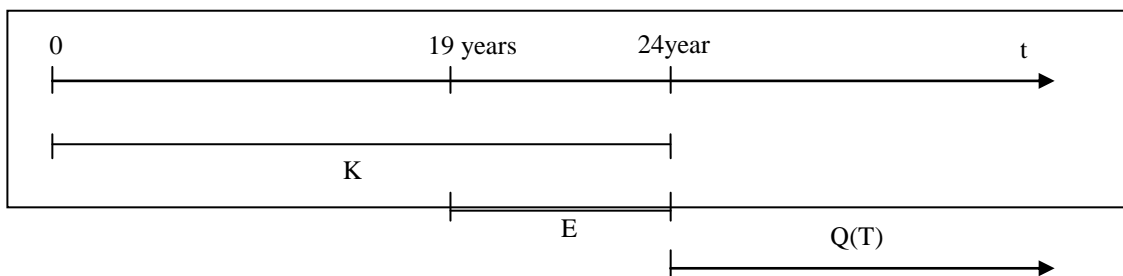

Fig. 1. A graphical representation of human capital creation

Fig. 2. Human capital increase for a person with MA degree

Fig. 2 presents human capital increase for a person with an MA degree. Annual costs of living (K) are estimated at PLN 7,500, and they are capitalised for 24 years. Annual education costs (E) are at the level of PLN 4,000, and they are capitalised for 5 years. This person completes higher education at the age of 24, starts work and gains experience which enhances work abilities resulting from capital combined with experience (D(T)).

The ability of assets to perform work is a prerequisite for their existence. Retaining the value of capital embedded in assets requires taking action counteracting destructive forces (s). This statement refers particularly to human capital – a component of human resources. Human capital is subject to natural dispersion and this fact is the basis of fair compensation theory. Research indicates that fair compensation must balance human capital dispersion, which implies that it should be at the level of 8% of human capital value. The level of 8% is confirmed by a number of research studies, especially in the area of rates of return in capital markets where it is reflected in risk premiums in the analysis of rates of return on human capital and agricultural products. Fair compensation theory is one of the factors which make the alternative human capital research programme different from the programme undertaken by T. Shultz and G. Becker.

A carrier of capital, including human capital, is affected by the capital dispersion process expressed in the general model as e^{-st}. Human capital retention is conditioned by an appropriate flow of income which compensates for human capital dispersion. In the case

of humans losses result from the nature of life (aging). Retaining the value of human capital (understood as the ability to perform work) requires incurring compensation costs resulting from preparing future generations to perform work of the same value. In other words, fair compensation should maintain the ability to perform short- and long-term work. The loss rate expressed by random variable s is at average level p = E(s) = 0.08/year. Simultaneously, it represents the constant economic value indicating the level of fair compensation (W):

$$W = H(T) \cdot p$$

Lower compensation levels decrease human capital value. In practice, it manifests itself in the parents' difficulties in ensuring the same level of education for their children. A compensation system based on human capital measurement requires individualised knowledge about employees' competences. Information on education and experience is essential in setting the level of fixed compensation components. It is useful to refer to several examples of base compensation.

As follows from applied model, mainly the value of expenditure on education and experience, affect the higher productivity, thus empowering to participate in the global product in appropriate extent. That participation occurs by periodically received remuneration. There can be point out two factors determining the appropriate wage relations: knowledge and experience gained. If all employees have the same qualifications and work experience, the level of income disparities would be negligible, so slightly exceed the Gini index of 0. From the point of view of society, human capital value of the experience depends on the age structure of employees, but does not have much impact on the process of wage differentials in society. As indicated by the analysis of theoretical models and empirical studies, gained experience has significant impact on wage increases only at the beginning of their careers, later lost its importance [P. Cahuc, A. Zylberberg, 2004, pp. 74]. Therefore, it is assumed that natural (fair) wage inequality should depend only on the structure of education in society.

Overview of the data in Table 3 indicates the existence of a relatively permanent structure of education in society. In developed countries the level of higher education is as about 25 - 28 percent of the active population. In Poland, it differs slightly from this level, but the dynamics of its growth indicates that it will be achieved within a few years.

Table 3. Structure of education among the economically active population in selected European countries

Education level (standard ISCED 97)		0	1	2	3	4	5A	5B	6	Sum
Germany	**1999**		665	6480	23278	4034	5016	432		39905
	%	0,0%	1,7%	16,2%	58,3%	10,1%	12,6%	1,1%	0,0%	100,0%
	2002		732	6065	21422	2209	5078	4056	496	40058
	%	0,0%	1,8%	15,1%	53,5%	5,5%	12,7%	10,1%	1,2%	100,0%
	2004		784	5874	20846	2495	5298	4090	659	40046
	%	0,0%	2,0%	14,7%	52,1%	6,2%	13,2%	10,2%	1,6%	100,0%
Sweden	**1999**		330	587	2128	661	539	30	33	4308
	%		7,7%	13,6%	49,4%	15,3%	12,5%	0,7%	0,8%	100,0%
	2002		244	526	2209	275	728	372	39	4393
	%		5,6%	12,0%	50,3%	6,3%	16,6%	8,5%	0,9%	100,0%
	2004		198	522	2201	286	798	379	45	4429
	%		4,5%	11,8%	49,7%	6,5%	18,0%	8,6%	1,0%	100,0%
England	**1999**	3505		1715	13360	2645	4565		2569	28359
	%	12,4%	0,0%	6,0%	47,1%	9,3%	16,1%	0,0%	9,1%	100,0%
	2002	3221		1695	13880	2626	5299		2398	29119
	%	11,1%	0,0%	5,8%	47,7%	9,0%	18,2%	0,0%	8,2%	100,0%
	2004	2934		2610	12295	2725	5612		2182	28358
	%	10,3%	0,0%	9,2%	43,4%	9,6%	19,8%	0,0%	7,7%	100,0%
Poland	**1999**		2714	5945	1271	5233	2051			17214
	%		15,8%	34,5%	7,4%	30,4%	11,9%	0,0%	0,0%	100,0%
	2002		2456	5232	1349	5161	2563			16761
	%		14,7%	31,2%	8,0%	30,8%	15,3%	0,0%	0,0%	100,0%
	2004		2099	5672	1400	4866	3102			17139
	%		12,2%	33,1%	8,2%	28,4%	18,1%	0,0%	0,0%	100,0%

Source: Yearbook Labour Statistics ILO, Yearbook CSO (Rocznik statystyczny GUS).

2. Calculation of the natural (fair) level of wage inequality. The study was based on GUS (Central Statistical Office of Poland - CSO) data on the structure of employment in the years 1996 - 2004. These data are divided into six groups of employees, based on this classification there was created sample of 100 Polish workers, for which was calculated the normative value of human capital and a subsequent fair compensation. Data taken to calculate the value of human capital are included in Table 4. The required calculations were made using shortly presented before alternative model of human capital.

Table 4. The values used to calculate fair wages in Poland

Type of education	Share In employment structure [%]	Years of experience	Experience factor	Years of capitalization cost of living	Fair (normative) wage	Cost of living + cost of education
Knowlegde workers[1]	4	21	0,1	24	5.263	500 + 200
Higher education	14	21	0,1	24	3.789	500 + 200
secondary and post-secondary education	29	24	0,05	21	2.196	450
High school	8	26	0,02	19	1.627	450
Vocational	33	27	0,03	18	1.530	450
Primary and lower secondary	12	29	0,01	16	1.144	450

Source: own calculation based on Yearbook CSO (Rocznik statystyczny GUS).

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1 knowledge workers are included professional groups, most active intellectually, as doctors, researchers, managers. According to CSO is a relatively stable group of about 600 - 700 thousand people.

Table 5. Comparison of income inequality recorded in the years 1996 to 2004 (measured by the Gini coefficient) of the natural (fair) level of income inequality, resulting from the application of the method based on alternative human capital model

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
natural (fair) level of income inequality	20,7	20,7	21,4	21	20,7	21,9	22,4	22,4	23,2
real level of income inequality	30	30,5	29,5	30,5	31	31,5	32,5	33,5	34,2
Gap	9,3	9,8	8,1	9,5	10,3	9,6	10,1	11,1	11

Source: own calculation based on Yearbook CSO (Rocznik statystyczny GUS).

Gini index of wage inequalities resulting from the structure of education and wages adequate to the value of human capital in each group is in the range of 20.7 to 23.2 (see. Table. 5), while the value of the Gini index given by the Central Statistical Office, resulting from the level of real income is 30 - 34. the natural level of wage inequality in the years 1996 to 2004 increased by 2.5 percentage points. This is due to the transformation of the structure of education in Poland towards the model characteristic of Western Europe. During these nine years the share of economically active population with higher education has doubled. Presented in the article method for calculating the natural level of wage inequality can also be used to provide a fair (natural) level of wage inequality in the EU, for example, in England. In 2004, the natural level of wage inequality in England has amounted to 24%. This value was calculated using data on the structure of education in England (see. Table. 3) and the cost of living and education (Eurostat). Comparison of this value with the result obtained for the Polish (23% - see. Tab. 4) leads to the conclusion that a fair amount of diversity in salary in Poland in the coming years may slightly increase and stabilize at this level.

According to the analysis mentioned in the first subparagraph, wage inequalities should be adjusted for the 2 - 5 percentage points due to diversification of income in respect of non-wage sources of income. Thus, the average difference between a natural level of inequality and the actual rate of about 10 percentage points is partly reasonable on a 5 pp. Other 5 - 6 p.p. and the gap between the natural wage inequality is proof of the existence in Poland excessive and growing income inequality, which can be considered as a serious dysfunction of the economic system. These inequalities are the result of the so-called over-pay. In addition, the very high level of wage inequality significantly reduces the rate of economic growth. Econometric studies [P. Kumor, J.J. Sztaudynger, 2007] indicate that the highest level of economic growth is possible, if the Gini index reaches a level of about 27 - 28 percent. This result coincides with the results of the research of this article. Correction of calculations for 2004 (23.2%) of 2 - 5 pp resulting from the additional income differences caused by non-wage income (i.e. self-employment, income from leasing and financial assets), leading to a result in the range of 25 - 28%. It is a fair the range of income inequality, which takes place when the range participation in national income depends on the individual capital expenditures: human and physical capital.

Summary. One of the demands of social justice says about the compatibility of pay with the value of the work performed. Value of work results from

employee's qualifications, which according to the model of human capital, are subject to measurement. Valuation of human capital, understood as a potential ability to perform the work, allows to calculate a fair level of wages. Used an alternative model of human capital is a good tool for determining the proper wages relation in the economy, which indicate a fair level of wage inequality measured with the Gini index. Analysis of human capital components, which determine level of competencies of employee, indicates that it is knowledge and work experience. From point of view of society (macro) level, experience factor is constant, therefore, a key variable differentiating wages in the economy is the structure of education. Its review of Poland and several Western European countries shows that this structure in these countries is very similar and stable. According to the researchers, the structure of education is the result of market forces, such as the rate of return on investment in education - both direct and opportunity costs - realized in the form of increased wages.

On the basis of statistical data on the structure of education in Poland was calculated a fair wage inequality level of about 23 percent, as measured by the Gini index. Comparison of this result with statistical data on the distribution of income in Poland shows that nearly 10 percent exceeded a fair level of inequality and alarming upward trend continue its growth.

As a result of the research there are two conclusions for economic science. They concern the practice of measuring income inequality. Currently practiced measurement of global income inequalities can only get to know size and dynamics of income inequality. Unfortunately, the problem is to evaluate the results. Usually dominates the belief, usually based on the intuition of researchers that the smaller the better inequality. This situation make impossible to use of this indicator in effective economic policy.

The first of the conclusions provides for the introduction new index: labor income inequality index. In this case, the subject of measurement is the distribution of labor income as remuneration of human capital. Regardless of the legal form of the work. Described in this paper naturally (fair) level of lobour income inequality can play role of macroeconomic standard for assessing the obtained real labour inequalities. The appropriate level of labor income inequality proves the adequate human capital payment. Consequences of its absence are described in detail in the work of M. Dobija [M. Dobija, 2011].

The second conclusion concerns the methodological aspects. Due to the diversity regional cost of living in the country, it is recommended to measure income inequality labor for different regions of the country. This will enable the one hand, to obtain more reliable results, on the other hand, will identify areas more vulnerable the wrong level of income inequality.

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