

PUBLIC SECTOR WAGE PREMIUM IN POLAND: A HUMAN CAPITAL APPROACH

Wojciech Koziol✉

Kraków University of Economics, Poland

ABSTRACT

Aim: The aim of the article is to estimate the value of the public sector wage premium. It is an important issue both in the area of wage management in an organization and labor market performance. **Methods:** The research method is based on measuring the rates of return on human capital in the public and private sectors. It assumes that human capital is a function of the cost of living, education, and work experience. The average value of human capital was calculated in a model sample of employees in the public, private, and total sectors in each of the analyzed periods. In order to calculate the rate of return, its value was compared with the average wage in each of the sectors. **Results:** The results indicate the existence of a small average negative public sector wage premium in Poland. However, in some periods, the observed wage gap widens significantly, reducing the wage competitiveness of the public sector. The results of measuring the return on human capital of employees of both sectors is about 8% per year. **Conclusions:** The paper's findings can be used to optimize the wage policy and analyze wage competitiveness in public sector entities. The paper contributes to the sector wage differentials literature by developing an original methodology based on a human capital rate of return and also contributes to the research paradigm on normative return on capital. Findings in the second field are consistent with the concept of an 8% economic constant of potential growth.

Keywords: sectoral wage premium, public sector, wage differentials, private sector, human capital, rate of return on human capital, economic constant of potential growth

JEL codes: J24, J31, E24

INTRODUCTION

The ability to divide the public and private sectors is what distinguishes modern economies. The characteristics of the goods and services provided by these industries, as well as how they are funded, serve as the axis around which these economic sectors are divided. These variations have a significant effect on how the hiring process is structured in both industries. The impact of the public sector is different from that of the

private sector. According to Dobrzański [1992], in the case of private companies, it is the impact on material objects. On the other hand, a public sector entity affects people and society, which is usually associated with higher complexity of the implemented organizational processes. This means that public sector employees face higher requirements in terms of qualifications, responsibility, and often a sense of professional mission. As a result of such significant differences in the specificity of functioning of both sectors, the question

Wojciech Koziol <https://orcid.org/0000-0001-7920-760X>

✉ koziolw@uek.krakow.pl

arises about the level of wage competitiveness (i.e., the level of remuneration in the public and private sectors). According to the neoclassical economic theory, the labor market performs an allocative function, balancing demand and supply in all labor market segments. However, as pointed out by Pigou [1933], the automatism of market processes requires certain conditions: 1) labor market participants act in accordance with the principle of rationality, striving to maximize their own benefits; 2) there is a large number of entities on the labor market that do not have the power to interfere in the market mechanisms; 3) the labor market is perfectly transparent and its participants have entire and always up-to-date market information; 4) homogeneity of the labor market (i.e., homogeneity of jobs and employees' qualifications); 5) the labor force is characterized by perfect occupational and spatial mobility, and wages have perfect flexibility from the point of view of sensitivity to changes in the relation between demand and supply in the labor market. These conditions are often collectively described as labor market mobility because the last of the postulates is largely dependent on the fulfillment of the previous ones. A perfectly mobile labor market does not assume the existence of a wage premium (positive or negative) in any sector.

The issue of the wage gap between the public and private sectors at the national and even international levels is a frequently discussed topic in economic research. The results of some studies indicate the presence of a positive wage premium for employment in the public sector (e.g., in the Netherlands [Hartog and Oosterbeek 1993], Germany [Melly 2005], Canada [Mueller 1998], Scotland [Heitmueller 2006], Ireland [Foley and O'Callaghan 2010, Flannery and Turner 2019], Italy [Dell'Aringa et al. 2007], Greece [Papapetrou 2006], Spain [Antón and Muñoz de Bustillo 2015], and Turkey [San and Polat 2012]). The common feature of these countries is that they belong to the group of developed countries. Different results were found when analyzing the wage premium in less developed countries or in economic transition. Studies conducted for the Czech Republic [Flanagan 1995], Russia [Brainerd 2002], Hungary [Lausev 2012], and Estonia [Leping 2005] indicate the existence of a negative public sector wage premium.

In many countries with a low level of economic development, the informal sector is a significant and sometimes dominant employer. In this case, it is reasonable to separate the area of wage analysis in the private sector into the formal and informal sectors. The results indicate that – in countries such as Brazil, Mexico, South Africa [Bargain and Kwenda 2014], India [Glinskaya and Lokshin 2007], and Egypt [Shahen et al. 2020] – the highest level of wages is in the public sector and the lowest in the informal sector.

The Polish economy was also the subject of research on the public sector wage premium. Research indicates that in 1996, wages were significantly higher in the private sector. This effect was particularly visible in the case of employees with higher education, where the pay gap reached 20% [Adamchik and Bedi 2000]. Socha and Weisberg [2002] came to similar conclusions when estimating the negative 10% public sector wage premium in 1995. Later research led to a certain decline in the negative wage premium to 4.7% in 2010 [Grotkowska and Wincenciak 2014, Grotkowska 2016].

The authors of all the cited studies noted significant differences in the qualifications of employees in the private and public sectors, making it impossible to compare average salaries in sectors. To eliminate this problem, methods based on data decomposition are used. The literature on wage gap offers various decomposition methods, ranging from parametric (e.g., Oaxaca - Blinder [Blinder 1973, Oaxaca 1973]) and semi-parametric [DiNardo et al. 1996], to non-parametric methods (e.g., propensity score matching method [Rosenbaum and Rubin 1983]). This methodology not only allows for estimating a possible wage premium in a given sector, but also enables an in-depth comparative analysis of remuneration for individual groups of employees. Most of the cited studies indicate that in developed countries, low-skilled workers receive lower wages in the private sector than in the public sector. Conversely, highly skilled workers earn more in the private sector.

This paper presents a different method of examining cross-sector differences in wage levels. This method assumes measuring the rates of return on the human capital of employees of the surveyed sectors.

The rate of return is defined as the relationship between the remuneration received by an employee and the value of their human capital. Employee qualifications can be valued in monetary units by using a suitable human capital measuring model. In this way, such a research approach makes it possible to solve the issue of differences in the level of education between employees of the analyzed sectors.

The aim of the article is to calculate the level of the public sector wage premium in Poland over the last several years. Research on the pay gap between the public and private sectors falls under the area of research on labor resource mobility. Identifying significant differences may lead to the conclusion that there are either significant barriers to labor resource mobility or non-wage benefits from employment that compensate for the observed wage gap. Additionally, calculating the rate of return on human capital for a wide range of data contributes to the scientific discussion on norms and the nature of rates of return on capital and human capital. The part describing the method of measuring human capital has a short outline of research in that field.

The article consists of four parts and a conclusion. The first part is an introduction, which outlines the issue of wage differences between sectors of the economy – in particular, between the public and private sectors. The second part presents the specificity of work and employment in the public sector in Poland. Specifically, the scope of this sector, working conditions, competency requirements for employees, and the level of remuneration are briefly discussed. The third part is methodical. The presentation of the method for measuring the rates

of return on human capital in individual sectors required, first and foremost, the specification of the method of human capital valuation and the provision of the necessary data for a reliable measurement. The fourth part presents the research results, while the last part contains conclusions, including a discussion of the empirical research results and conclusions regarding the research method used, as well as suggestions for its improvement and further application in analyses.

CHARACTERISTICS OF EMPLOYMENT IN THE PUBLIC SECTOR IN POLAND

According to the Polish statistical classification used by Statistics Poland (formerly the Central Statistical Office), the public sector is defined as all entities of the national economy that group together state property, specifically the state treasury and state legal persons, ownership of local government units or local government legal persons, and mixed ownership – with a predominance of capital of public sector entities. Over 20% of people are employed in the public sector in Poland. Since the economic transformation that began in the early 1990s, the public sector’s employment share has been declining. The first stage of the transition saw the biggest decline in the number of workers in this industry, and since 2011, it has stabilized at a level of about 3.4 million people. After 2011, the proportion of workers in the public sector decreased as a result of an increase in the overall workforce, combined with a relatively stable number of workers in this sector (Table 1).

According to the data in Table 1, the employment structure in Poland in the analyzed period tended

Table 1. People working in Poland by ownership sector in the years 1995–2020

Year	total employment		public sector employment		private sector employment	
	thous. pers.	thous. pers.	share in%	thous. pers.	share in %	
2020	16 021.4	3 399.4	21.22	12 622.0	78.78	
2019	16 120.6	3 423.4	21.24	12 697.1	78.76	
2018	15 949.7	3 403.7	21.34	12 546.0	78.66	
2017	15 710.8	3 371.3	21.46	12 339.5	78.54	

Table 1. (cont.)

Year	total employment		public sector employment		private sector employment	
	thous. pers.	thous. pers.	share in %	thous. pers.	share in %	
2016	15 293.3	3 356.3	21.95	11 937.0	78.05	
2015	14 829.8	3 343.6	22.55	11 486.2	77.45	
2014	14 563.4	3 377.1	23.19	11 186.3	76.81	
2013	14 244.3	3 375.0	23.69	10 869.3	76.31	
2012	14 172.0	3 427.0	24.18	10 745.0	75.82	
2011	14 232.6	3 496.5	24.57	10 736.1	75.43	
2010	14 106.9	3 570.7	25.31	10 536.2	74.69	
2009	13 782.3	3 606.5	26.17	10 175.8	73.83	
2008	14 037.2	3 621.2	25.80	10 416.0	74.20	
2007	13 771.1	3 619.8	26.29	10 151.3	73.71	
2006	13 220.0	3 635.3	27.50	9 584.7	72.50	
2005	12 890.7	3 660.4	28.40	9 230.3	71.60	
2004	12 720.2	3 695.6	29.05	9 024.6	70.95	
2003	12 640.7	3 780.2	29.90	8 860.5	70.10	
2002	12 803.3	3 905.1	30.50	8 898.2	69.50	
2001	14 995.6	4 027.7	26.86	10 967.9	73.14	
2000	15 488.8	4 318.1	27.88	11 170.7	72.12	
1999	16 008.9	4 656.0	29.08	11 352.9	70.92	
1998	16 267.1	5 017.3	30.84	11 249.8	69.16	
1997	16 294.5	5 426.5	33.30	10 868.0	66.70	
1996	15 841.9	5 767.0	36.40	10 074.9	63.60	
1995	15 485.7	5 979.7	38.61	9 506.0	61.39	

Source: own elaboration based on Statistics Poland data [GUS 2011 GUS 2021a].

to be similar to the proportions found in developed countries and the OECD. According to statistical data, the main employer in this group of countries is the private sector, employing – on average – 79% of the working population, while the rest is employed in the public sector [ILO News 2018]. The public sector greatly impacts the labor market, economic growth, and the shape of public finances.

The quantity and composition of wages paid to Poland's 3.4 million public sector employees have a significant impact on both the private and public sectors of the labor market. In particular, it is affected by wage-setting mechanisms in the public sector. In turn, the quality of public services provided shapes the insti-

tutional environment in the country and, thus, affects both the living conditions of the society and the efficiency and productivity of the economy. Numerous theories in the area of wage motivation and behavioral aspects of remuneration indicate that one of the conditions for ensuring the expected quality of products and services is the appropriate level of employee involvement. These mechanisms are also applicable in the public sector.

Wages and salaries in the public sector are largely financed from the central budget and the budgets of local government units. Therefore, their amount affects the shape of public finances. The key factor in maximizing the relationship between the quality of the public product and the costs of functioning of the

Table 2. Educational percentage structure of employees in the private and public sectors [%]

	2006			2012			2022		
	total	public	private	total	public	private	total	public	private
Higher education (tertiary)	22.3	40.2	16.5	30.1	50.6	24.7	36.8	59.3	29.7
Vocational secondary	29.9	31.6	30.8	27.8	25.8	28.3	27.3	21.9	29.6
General secondary	8.1	7.2	9.4	8.5	6.3	10.3	9.4	6.6	10.8
Basic vocational	30.4	16.9	35.6	26.9	14.3	30.4	22.0	10.2	24.9
Primary	9.4	4.1	7.6	6.7	2.9	6.3	4.5	2.1	5.1

Source: own elaboration based on Statistics Poland data [GUS 2011, 2021a].

public sector (and, thus, the level of taxation) is to find a balance between the four functions of wages: cost, income, motivation, and social.

The higher level of complexity of work in the public sector is an additional factor of high expectations on employees in terms of education and other skills, such as knowledge of foreign languages. In this sector, there is also the majority of statutorily regulated professions, where the necessary qualifications are defined by law [Czajka 2009]. The data in Table 2 confirms this observation. The share of employees with tertiary education is higher in the public than in the private sector. In 2006, this share was 2.5 times higher, while in 2012, this ratio decreased to two times and remained at this level in 2022.

Wage-setting mechanisms in the public sector often differ from those in the private sector, mainly due to the specific mission of entities in this sector. These units are usually not focused on maximizing the increase in equity or profit but, most often, their goal is to provide public goods and services and achieve social or political goals. According to the data of Statistics Poland, the majority of employees in the public sector are employees of public administration and national defense, social security, education, as well as health care and social assistance. Some progress in privatization is also noticeable in such sections as education or health care. Between 2011 and 2020, the share of the public sector in these sections decreased by about 10 p.p. [GUS 2011, GUS 2021a]. The domination of the public sector in these sections means

that non-market mechanisms, mainly political ones, determine the amount of remuneration. The public sector also includes commercial companies with a total or predominant share of public ownership. These businesses typically deal with the provision of public goods and services, such as energy, water, and municipal transportation. As such, they carry out operations targeted at maximizing the ratio of product quality to price – making a profit is only secondary.

Remuneration in the public sector depends on how wage funds are shaped in units. In the state budgetary units, these funds come directly from the state budget, while entities outside this sphere have a certain degree of freedom in this area as they must organize funds for salaries on their own. However, this flexibility appears to be restricted because these units mostly carry out duties for the public and have little influence on the total amount of money received for the services rendered. Public sector organizations have similar limitations. Despite being in the market, these units' missions make it challenging to maximize profits and expenses. For example, a communal transport company should provide all necessary local connections, regardless of their profitability and, at the same time, is limited by the ticket price list adopted by the commune council.

Remuneration in the public sector is characterized by less volatility and little pressure to make it dependent on market realities such as market wages, market conditions, or productivity of a given unit. This is impacted not just by the previously noted uniqueness of the goods and services provided, but also by elements

like increased unionization and laxer ownership oversight, as well as social wage control [Czajka, 2009].

The principles of formulating remuneration in the public sector are described in numerous legal acts, which makes them formal and complex. First of all, the remuneration system in the public sector is multi-component. In addition to the basic pay and the mandatory components provided for by labor law, employees may receive numerous fixed components of pay such as seniority pay, an annual bonus (the so-called “thirteenth salary”), a jubilee bonus, and – in the case of defense services such as the police or fire department – a rank allowance. Employment in the public sector is associated with a higher level of social security. In the public sector, almost 100% of people are employed based on an employment contract, while in the private sector, this percentage does not exceed 60%. The remaining part of private sector employees perform work as part of individual business activity or on the basis of civil law contracts [GUS 2021b].

This fact means that salaries in the public sector are, to a greater extent, burdened with tax and insurance contributions. As a result, net standard salaries seem lower compared to the private sector. The data analysis presented in Table 3 clearly indicates a higher level of gross wages in the public sector.

The sufficiency and competitiveness of pay in the public sector are called into question by a quick examination of the unique nature of work and compensation in this sector. The public sector has an edge, as demonstrated by a straightforward comparison of average salaries in the public and private sectors. It is necessary to consider the disparities in the educational attainment of workers in both industries in order to obtain more reliable conclusions. The further part of the article presents a human capital measurement model that allows the quantification of employee qualifications in monetary units. The next step is to calculate the relationship between the remuneration and the value of employees’ human capital in both sectors.

Table 3. Average gross monthly salary (in PLN) in public and private sectors in Poland in 2006–2020

Year	Average gross monthly salary [PLN]			Public/private [%]
	public	private	total	
2020	5 893.61	4 969.88	5 167.47	118.59
2019	5 511.11	4 695.06	4 918.17	117.38
2018	5 105.29	4 390.91	4 585.03	116.27
2017	4 796.06	4 081.07	4 271.51	117.52
2016	4 615.61	3 823.66	4 047.21	120.71
2015	4 482.55	3 664.68	3 899.78	122.32
2014	4 366.30	3 517.30	3 783.46	124.14
2013	4 249.19	3 389.76	3 650.06	125.35
2012	4 120.72	3 245.55	3 521.67	126.97
2011	3 978.80	3 129.86	3 399.52	127.12
2010	3 770.19	2 952.35	3 224.98	127.70
2009	3 607.05	2 846.72	3 102.96	126.71
2008	3 407.23	2 709.57	2 943.88	125.75
2007	3 044.96	2 470.65	2 672.58	123.25
2006	2 823.49	2 272.09	2 475.88	124.27

Source: own elaboration based on Statistics Poland data [GUS 2021b].

RESEARCH DESIGN

The analysis of the public sector wage premium in Poland, due to the small share of the informal sector, may be limited to a comparison with the formal private sector. According to Statistics Poland [GUS 2018], unregistered work (informal sector) is performed by 5.4% of employees. 53% of this group declare unregistered work as additional employment. Unregistered work is marginal in terms of the amount of work performed; only 6.8% of those working in the informal sector declare working more than 90 days a year, while 28% work up to 5 days a year.

HUMAN CAPITAL MODEL

The aim of the article is to calculate the level of human capital remuneration, which is defined as the relationship between the salaries received by employees and the level of employees' human capital. The general capital model, which distinguishes between homogeneous and heterogeneous capital, is the foundation for the human capital model employed in this article. It is founded on key accounting principles, the most significant of which is asset-capital dualism. Assets are a carrier of capital, and the value of assets determines capital value. The value of capital is a dynamic category that changes over time. A general model of capital developed by Dobija can be presented with the following formula [Dobija 2007]:

$$C_1 = C_0 e^{(p-s+m)t} \quad (1)$$

Where: C_1 – the value of capital on t -moment, C_0 – the initial value of capital, p – economic constant of potential growth, s – natural diffusion of capital, m – managerial actions variable, t – time variable.

This model assumes the separation of three forces affecting the value of capital:

- natural diffusion of capital (s). Natural destructive forces affect objects containing capital, causing a random decrease in its value;
- managerial activity (m), such as factors preserving from natural diffusion of capital value;
- the impact of natural growth potential (p).

An economic constant of potential growth (p) is the most important factor that positively affects the value of capital. Studies on capital market rates of return [Kurek 2009], agricultural product pricing assessments [Kucharczyk and Cieslak 2005], rates of return on human capital [Koziół 2011], and wage expectations surveys [Kurek and Górowski 2020] have all been undertaken. The findings show that the natural rate of return on capital is valued at roughly 8% annually. The similarity of the obtained results allowed determining this factor as the economic constant of potential growth. As a result of these three factors, the initial value of capital (C_0) may increase or decrease. In extreme cases, the value of capital can be completely dispersed. Another implication of the presented model is the fact that the value of capital has its source in the initial capital and periodic increases due to managerial activity and impact of the economic constant (p).

Human capital is understood as capital embodied in human resources. Capital determines an employee's ability to perform productive and creative work. As an object performing work, a human must have skills and a body which are a physical carrier of these skills. The human capital value is the derivative of the socially justified level of the costs of obtaining these skills, like the costs of education, but also takes into consideration the cost of living – which is necessary for the proper development of the human body. The costs of living are incurred from birth until humans gain sufficient readiness to perform a given profession. In Formulas (2) and (3), the costs of education and living constitute initial capital (HCO). The cost is usually covered by parents. When a person grows up, all three factors affect the value of human capital. The management factor (m) is primarily the activity of parents. It aims to reduce or compensate for destructive forces (s). For example, due to the parents' decision or random events, the real living costs significantly exceeded the normative costs. In this case, the additional amount of cost of living is not socially and economically justified; the market will not recognize these costs as an extra value.

Therefore, these additional costs do not enhance the value of human capital. The same principle holds true for the expenses associated with professional

education. If a young individual's physical development aligns with current standards and they have achieved their desired level of education, it signifies that the challenges of natural capital diffusion (random losses s) have been successfully addressed (balanced) by the efforts and choices made by their parents (m). Thus, the ultimate value of human capital (HC_1) after $t = x$ years can be presented in the following formula [Dobija 2015, Kozioł and Mikos 2020]:

$$HC_1 = HC_0 e^{p \cdot t} \quad (2)$$

Finally, human capital can be described as a function of initial outlays and an 8% economic constant of potential growth. The human capital model requires operationalization. According to this model, the value of human capital consists of three components: capitalized costs of living (K), capitalized costs of education (E), and human capital from gained professional experience (D). Supplementary formulas present the process of constitution of human capital from the cost of living (K) and education (E) [Dobija 2015, Kozioł and Mikos 2020]:

$$HC = K + E + D \quad (3)$$

With annual capitalization of costs, the individual components of human capital can be represented by the following formula:

$$K = k \cdot 12 \frac{ep - 1}{p} \quad (3a)$$

$$E = e \cdot 12 \frac{ep - 1}{p} \quad (3b)$$

k – monthly costs of living, e – monthly education costs, p – 8% economic constant of potential growth, t – capitalization time.

Gaining experience in the work process can be illustrated based on the concept of the learning curve. It assumes a diminishing increase in the ability to perform work with the following professional cycle. When a person performs activities familiar to them, repetition increases their efficiency in performing them. However, during subsequent repetitions, the increases are smaller and smaller. This relationship can be expressed on a logarithmic scale, which leads to the simple function presented by Blackburn in 1936 [Anderson 1985]:

$$Y_i = ai^{-b} \quad (4)$$

Where: Y_i – efficiency of task performance, i – number of repetitions, a, b – learning parameters.

In the management area, the above formula represents the average labor cost of (i) units of product. In the case of the production of the first unit, the equality $Y_1 = a$ occurs. Taking into account this observation and replacing the number of products with the number of years of work, as well as the fact that the labor cost of performing a given task indicates an increase in the employee's ability to perform work, an experience factor formula was developed representing the increase in human capital as a result of performing work [Dobija 2005]:

$$Q(T) = 1 - T^{\frac{\ln(1-w)}{\ln 2}} \quad (5)$$

where: $Q(T)$ – experience factor, w = learning factor, T = years of professional experience, $T > 1$

Therefore, it can be assumed that the employee will perform the same work in the following year by (w) percentage more easily, but this increase will be smaller every year. This additional value of human capital from gained experience (D) is a function of the initial value of human capital (i.e., human capital at the beginning of a professional career (no experience)):

$$D = (K + E)Q(T) \quad (6)$$

$$HC = K + E + D = (K + E)(1 + Q(T)) \quad (7)$$

DATA AND RESEARCH METHOD

Calculating the average rate of return on human capital employed in the analyzed sectors of the economy requires comparing the average salary recorded in a given year in the surveyed region (i.e., country) with the average value of human capital of employed persons (estimated for that year). Data on the average wage broken down by the private and public sectors is published annually by Statistics Poland (Table 3). Calculations require the average value of human capital employed in both sectors. In the previous part of the paper, the model of individual human capital was characterized as a derivative of the cost of living, education, and time of professional experience. It is the value of individual human capital, so each employee is the subject of the

model calculation. Calculation of the average value of human capital will require an analysis of the distribution of arguments affecting the value of human capital. As presented in the previous section, human capital consists of three components: capitalized cost of living (K), capitalized cost of education (E), and capital from work experience (D).

The cost of living is capitalized in the period from the birth of the employee until they are ready to work (i.e., until they complete the planned educational path). Table 4 shows the period of capitalization of living costs depending on the educational path planned by the employee. This period results from the education standards in Poland. The cost of living standard used in the calculation is the social minimum, reported regularly by the Institute of Labor and Social Affairs [IPiSS] on a regional and national basis. The value of the social minimum per person in a four-person household is used for the calculations. In Poland, education is free, but in the case of higher education, there are additional costs resulting from living in another city or purchasing teaching materials. During interviews with students of selected faculties, these costs were estimated to be half the cost of living. The time of capitalization of these costs is equal to the duration of studies (i.e., according to the standard adopted in Poland) is 5 years (Table 4).

The capital from work experience is a function of the period of professional work and the learning factor. This coefficient depends on the complexity of the work performed. This is indicated by the research of Hirschmann [1964], which concludes that the more complex task leads to the greater rate of learning and “the rate of learning can be sufficiently regular to be predictive”. Many empirical studies confirm this observation.

Investigating the learning effects of employees engaged in the order picking process in online stores has indicated an average individual annual learning rate of 0.07 [Grosse and Glock 2013]. Similar results are obtained in research on the learning rate of manual workers on an assembly line. The estimated learning rate was 0.085 [Pasquale et al. 2016]. In contrast, in Israeli kibbutz farms, the absence of complex tasks led to a learning rate of below one percent [Barkai and Levhari 1973]. Some indirect data for estimating the learning rate provides research on the relation between the salaries of IT professionals and tenure profiles [Slaughter et al. 2007]. Based on this data, one can estimate the learning rate range to be about 0.05–0.15, depending on the specificity of performed IT job. On the basis of research in this area, including my own research [Kozioł 2016], ranges of the learning coefficient were defined for each level of professional education (Table 4). It was assumed that more complex work is usually performed by people with a higher level of education.

Table 4. Parameters used to calculate the model distribution of human capital among the economically active persons in Poland

Parameter	Higher education	Vocational secondary	General secondary	Basic vocational	Primary
k – monthly costs of living	They are provided by the Institute of Labor and Social Affairs				
$t(k)$ – capitalization time of living cost	24 years	20 years	19 years	18 years	16 years
e – monthly education costs	Assumed to be half the cost of living.				
$t(e)$ – capitalization time of education cost	5 years	0	0	0	0
w – learning factor	0.08–0.12	0.05–0.07	0.04–0.06	0.03–0.05	0.01–0.02

Source: own study.

Table 5 presents an exemplary distribution of public sector employees in 2012. The decomposition procedure is a three-stage process. In the first, employees were divided according to the level of education, then divided equally according to the adopted values of the learning factor (w). For example, the learning factor range for employees with higher education was 0.08–0.12. There are five classes of values, so the percentage of employees with tertiary education was divided into five equal parts (subclasses). Each was assigned to each of the five values of the learning factor. In the third and final stage, the employees were divided into sub-subclasses representing the number of years of professional experience. It was assumed that the period of professional experience was evenly distributed, which means that the size of these classes is equal. In Poland, the retirement age is 65 for men and 60 for women. Because men slightly outnumber women in the labor market, the maximum employee age was set at 63 years. Under the assumption that individuals with higher education typically commence work at the age of 24, employees from this educational background, distributed across the five ranges of the learning factor, are evenly assigned to 39 groups based on professional experience (calculated as 63–24 years).

In the case of the analysis of capital from professional experience, further simplifications of the model can be applied because a significant increase in human capital from experience occurs in the first years

of a professional career and decreases in later years. As an illustration, consider an individual with higher education, for whom the job’s complexity justifies the application of a learning factor of 0.1. Over the initial five years of employment, the overall increase in human capital, attributed to the development of the experience component, amounts to 21.7%. Over the next five years, human capital grows by only 6.4%. Table 5 presents data on the structure of education and experience of public sector employees in 2012. Among 1,000 employees in the public sector in Poland, 506 people had higher education, 258 had vocational secondary education, 63 had general secondary education, 146 had basic vocational education and 29 had primary education. The information from Table 4 is used to determine the worth of each employee in each of these five employee classifications. The first step is to compute the human capital for an individual without professional experience. This is capital that may be divided into two categories: education (E) and the capitalized cost of living (K). The computation results for each of the examined periods, divided down by educational groups, are shown in Table 6. Then, using Formulas (6) and (7), the third component of human capital, experience capital (D), may be computed for each sub-subclass having the same level of education, learning factor, and job experience.

The experience factor ($Q(T)$) presented in the previous part of the article is a function of professional experience expressed in years of work (T) and learn-

Table 5. The number of individual groups of employees by education and work experience per 1,000 employees in the public sector in 2012 and their breakdown by the value of learning factor

Education level	Higher education (tertiary)					Vocational secondary			General secondary			Basic vocational			Primary	
Size of classes	506					258			63			146			29	
Value of learning factor	0.08	0.09	0.10	0.11	0.12	0.05	0.06	0.07	0.04	0.05	0.06	0.03	0.04	0.05	0.1	0.2
Size of subclasses	101.20	101.20	101.20	101.20	101.20	86.00	86.00	86.00	21.00	21.00	21.00	48.67	48.67	48.67	14.5	14.5
Size of sub-subclasses	$2.59 = \frac{101.20}{39}$					$2.00 = \frac{86}{43}$			$0.48 = \frac{21}{44}$			$1.08 = \frac{48.67}{45}$			$0.31 = \frac{14.5}{47}$	

Source: own study.

ing factor (w). It can be stated that in the presented sample of 1,000 public sector employees in Poland in 2012, one of the sub-subclasses is 2.59 persons with higher education, as well as the same learning factor value (from range 0.08–0.12 – e.g., 0.1) and years of professional experience (from range 0–39, – e.g., 15).

In this way, the sample's average value of human capital is calculated using data on educational percentage structure, partially presented in Table 2, for consecutive years (Table 6). In the next step, the average value of human capital is compared with the average wage in this sector. Data on average salaries is reported annually by Statistics Poland. The relation between the average salary and the average value of human capital is the rate of return on human capital (Table 7). It should also be taken into account that Polish law requires the employer to pay

part of the cost of the employee's compulsory social insurance in addition to the gross salary. This part of the insurance costs 21% of the gross salary. Social insurance is an element of direct material benefit obtained by the employee, so it is understood as part of their remuneration. As a result, when calculating the rate of return on human capital, the average salary rate should be increased by 21%. When conducting research in other countries, national solutions in the pay structure should be identified at this stage.

To fulfill the objectives of the study, it is recommended to prepare forty-five samples, each consisting of 1,000 individuals, in a systematic manner. This is necessary due to the analysis period spanning 15 years (from 2006 to 2020) and encompassing both the public and private sectors, as well as the entire economy (denoted as 'total' in tables).

Table 6. The value of human capital of an employee with no professional experience (starting a career) in particular years, depending on education (in PLN)

Year	Social minimum per person in a 4-person household	Value of human capital per employee without work experience					Average value of human capital		
		higher education (tertiary)	vocat. second.	general second.	basic vocat.	primary	total	private	public
2006	626.55	570 049	371 439	335 659	302 630	243 994	445 474	401 347	534 512
2007	646.78	588 455	383 432	346 497	312 401	251 872	465 298	424 542	549 228
2008	685.39	623 583	406 321	367 181	331 050	266 907	493 593	449 634	587 565
2009	709.81	645 801	420 798	380 264	342 845	276 417	521 470	474 018	622 023
2010	754.64	686 588	447 375	404 280	364 499	293 875	574 561	524 060	678 354
2011	805.37	732 743	477 449	431 458	389 002	313 630	619 335	568 781	729 447
2012	844.75	768 572	500 795	452 555	408 023	328 966	648 917	604 172	775 037
2013	862.49	784 712	511 312	462 058	416 591	335 874	675 145	623 029	804 410
2014	852.27	775 414	505 253	456 583	411 655	331 894	677 384	624 342	804 552
2015	855.39	778 253	507 103	458 255	413 162	333 109	680 587	633 466	809 535
2016	872.32	793 656	517 139	467 325	421 339	339 702	699 589	654 712	827 391
2017	908.23	826 328	538 428	486 562	438 684	353 687	732 259	688 236	873 761
2018	932.46	848 373	552 792	499 543	450 388	363 122	755 671	709 978	906 220
2019	972.55	884 847	576 559	521 020	469 751	378 734	795 232	747 503	948 120
2020	1 013.6	922 196	600 895	543 012	489 579	394 720	826 340	782 675	997 380

Source: own study Social minimum (cost of living) value is provided by the Institute of Labor and Social Affairs.

MAIN FINDINGS

The analysis of the rate of return on human capital in the economic sectors indicated that in each of the analyzed periods, there was a negative public sector wage premium. The value of the wage premium ranges from -0.9% (2011) to -9.8% (2018), reaching an average value of -4.8% in the analyzed period (Table 7). A certain cyclical nature of the dynamics of this value is clearly visible (Fig.1). Until 2016, the wage premium had a notably low value, averaging at -3.5% from 2006 to 2016. However, since 2017, there has been a significant increase in the negative wage premium. Between 2017 and 2020, the average value of the wage premium plummeted to -8.1% .

The identified wage gap can be partly justified by non-wage benefits accompanying employment in the public sector. First of all, there is greater employment stability.

However, the consistent level of these benefits during the analyzed period leads to the conclusion that justifying the higher level of the negative wage premium observed in the last four years with non-wage benefits is challenging. The enduring existence of a wider wage gap could be attributed to certain obstacles to inter-

-sectoral mobility. The documented rise in wage disparities may result in reduced wage competitiveness within the public sector, influencing the career choices of young professionals. If wage differences continue to increase, it could potentially facilitate the gradual removal of barriers to cross-sector mobility, allowing for the transition of specific employee groups to the private sector.

The calculated value of the rate of return on human capital is also a significant contribution to the study of return on capital norms. Its value has certain dynamics and sectoral differentiation, but its value is about 8% per year (Fig. 1). This observation is consistent with the research on the natural rate of return on capital cited in the third part. These studies also concern human capital, characterized by the fact that its carrier is not traditional assets, but employees. Due to the convergence of the obtained results within this research paradigm, the calculated rate of return on capital is called the economic constant of potential growth. Research indicates that human capital remuneration at this 8% constant level is optimal for employees and a sustainable economy [Dobija 2015]. Wages that are too low may result in reproduction problems and the long-term development of human capital in society. However, its excessive value may cause inflation.

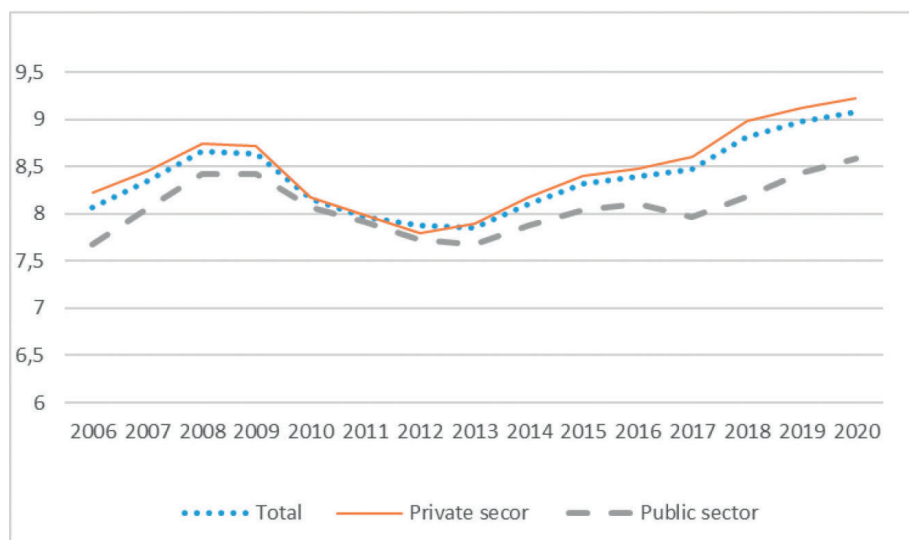


Figure 1. Dynamics of rate of return on human capital in Poland by economic sectors in 2006–2020

Source: own study.

CONCLUSIONS

The research indicates that in the analyzed period, the bonus for employment in the public sector is – 4.8%. Its value should be considered low; however, the analysis of dynamics shows an upward trend, which may suggest a decrease in the wage competitiveness of the public sector in Poland. The obtained results are largely consistent with the results of the previous studies. Research [in this field] for Poland was carried out using decomposition methods. Results showed that in the 1990s, there was an approximately 10% negative wage premium for employment in the public sector [Adamchik and Bedi 2000, Socha and Weisberg 2002]. Later research led to a certain decline in the negative wage premium to 4.7% in 2010 [Grotkowska and Wincenciak 2014, Grotkowska 2016]. It should also be noted that a different, original method of analyzing the wage difference was used in the study. Instead of wage decomposition, the rate of return on the human capital of employees of the surveyed sectors was measured. The obtained results also contribute to the research on identifying the natural, fair rate of return on capital. According to the research results, its value is 8% per year.

The research method developed, and the results obtained are a contribution to further research areas.

It may encompass the economies of other nations, although it is crucial to acknowledge that in the context of developing countries, the private sector should be delineated into formal and informal segments. Within this category of countries, the informal private sector typically constitutes the largest employer of the workforce, followed by the public sector, while the formal private sector employs the fewest individuals. In addition, an in-depth analysis of the structure of wage differences between individual employee groups in the public and private sectors or between industry sections of the economy can be carried out.

The main limitation of the presented method is the availability of reliable and regularly presented statistical data. The calculations are influenced by the precision of the estimation of the data used to calculate the value of human capital, particularly the value of the cost of living and education. In Poland, there is a re-

liable and regularly calculated social minimum, and such data is not always available in other countries. The cost of living often published on economic websites does not meet the accounting definition of cost, particularly the criteria of objectivity and necessity.

An attempt to evaluate the non-wage benefits of employment may be a particularly interesting research thread. If the negative bonus from employment in the public sector is an element of equilibrium in the labor market, the natural hypothesis is that non-wage benefits compensate for the wage gap.

The analysis of the dynamics of the rate of return on human capital indicates its increase in the years 2013–2020. At the end of the analyzed period, its value slightly exceeded 9%. This may mean an excessive level of remuneration in the scale of the economy. The long-term persistence of excess levels may be one of the reasons for inflation, which has been growing dynamically in Poland since 2020.

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PREMIA PŁACOWA Z TYTUŁU ZATRUDNIENIA W SEKTORZE PUBLICZNYM W POLSCE: PODEJŚCIE OPARTE NA POMIARZE KAPITAŁU LUDZKIEGO

STRESZCZENIE

Cel: Celem artykułu jest oszacowanie wartości premii płacowej tytułu zatrudnienia w sektorze publicznym. Jest to istotną kwestią zarówno w obszarze zarządzania płacami, jak i funkcjonowania rynku pracy. **Metody:** Metoda badawcza opiera się na pomiarze stóp zwrotu z kapitału ludzkiego w sektorze publicznym i prywatnym.

Zakłada, że kapitał ludzki jest funkcją kosztów utrzymania, wykształcenia i doświadczenia zawodowego. W każdym z analizowanych okresów obliczono średnią wartość kapitału ludzkiego w modelowej próbie pracowników sektora publicznego, prywatnego i pracowników ogółem. W celu obliczenia stopy zwrotu porównano jej wartość z przeciętnym wynagrodzeniem w sektorach. **Wyniki:** Wyniki wskazują na istnienie w Polsce niewielkiej ujemnej premii płacowej w sektorze publicznym. Jednak w niektórych okresach obserwowana luka płacowa znacznie się pogłębia, ograniczając konkurencyjność płacową sektora publicznego. Wyniki pomiaru stopy zwrotu z kapitału ludzkiego pracowników obu sektorów kształtują się na poziomie około 8% rocznie. **Wnioski:** Rezultaty te mogą zostać wykorzystane do optymalizacji polityki płacowej oraz analizy konkurencyjności płac w podmiotach sektora publicznego. Wykorzystanie oryginalnej metody opartej na pomiarze stóp zwrotu z kapitału ludzkiego sprawia, że artykuł poszerza literaturę dotyczącą sektorowych różnic płacowych, a także uzupełnia paradygmat badawczy dotyczący poszukiwania norm rentowności kapitału. Wyniki na drugim polu są zgodne z koncepcją 8% stałej ekonomicznej potencjalnego wzrostu.

Słowa kluczowe: sektorowa premia płacowa, sektor publiczny, zróżnicowanie płac, sektor prywatny, kapitał ludzki, stopa zwrotu z kapitału ludzkiego, stała ekonomiczna potencjalnego wzrostu