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INFLUENCE OF SELECTED HUMAN RESOURCES ATTRIBUTES ON THE CONDITION OF THE LABOUR MARKET IN POLAND

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Abstract. The aim of the article was to identify statistically significant determinants of human capital influencing the condition of the labour market in Poland. The resources of public statistics were used to collect empirical data. The collected data was developed using the technique of estimating the structural parameters of the regression function using the classical method of least squares (LSM). Due to the diversity of human capital factors, 4 thematic areas were identified, defined by 11 predictors describing the attributes of human capital. All the variables turned out to be statistically significant and had a positive effect on the improvement of the labour market condition in Poland, measured by the unemployment rate. The practical implication of the study is to obtain information about the significance level of the studied variables. This allows us to conclude which attributes of human capital have the greatest impact on the situation on the labour market. On this basis, it is possible to decide on taking actions aimed at creating human capital through the use of tools intended to reduce unemployment. The study should be considered preliminary due to limitations only 4 areas – Science, Information Society, Innovation and Technology in 2011–2020 were analyzed. Conclusions may contribute to further in-depth research.

Keywords: human resource management, determinants, labour market, statistical and econometric analysis, Polish economy.

JEL Classification: C51, E24, J24, M54.

Introduction

In the proposed considerations, it was decided to explore the issues of human resources development against the background of the labour market in Poland.

Numerous scientific works on human capital attempt to assess its impact on the economy. In the theory of economic, an increasingly important role is assigned to the human factor. The emergence of the concept of human capital and human investment was a breakthrough in the theory of the relationship between the quality of labour resources and economic growth.

The modern labour market functions in a turbulent environment, growing demands from employers and rough political, technological and social changes. Therefore, dynamic changes in the structure of education and qualifications of employees are observed.

Considering human capital as a factor determining the position of an individual in the labour market, the demand and supply sides should be taken into account. Qualifications, abilities and knowledge are determinants outlining the supply of labour resources. The higher the level of human capital, the more secure the position of the individual in the labour market. The labour market requires employees to be competent, flexible and willing to change. It is important to develop and promote the habit of lifelong learning, which increases one's own chances on the labour market.

Employees, through education and their own experience, acquire skills treated as a production factor, which means that human capital is a source of knowledge that leads to innovation, and these in turn contribute to the improvement of the situation on the labour market. Therefore, the aim of the article was to identify statistically significant determinants of human capital influencing the condition of the labour market in Poland.

The analysis covers the impact of selected measures in the field of human capital on the condition of the labour market in Poland, measured by the unemployment rate. Ultimately, eleven indicators grouped into 4 thematic

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areas were qualified for the study. The determinants of human capital were distinguished from the following groups: Science, Technology, and the Innovation and Information Society.

The work structure consists of two main parts. The first is a theoretical analysis, which is an introduction to the main topic of the research, and therefore an overview of the definitions as well as the goals and importance of human resource management are presented, followed by examples of contemporary and future changes in the labour market. The method of literature analysis was used in this section. The second component of the considerations is the econometric analysis of the phenomenon under study. First, the methodological assumptions are discussed, and then the construction of the model is presented. On the other hand, the results of the application of regression analysis were presented and the substantive assessment was carried out, followed by the culmination of research – condensed conclusions.

The research period was limited to ten years (2011–2020). 2021 was not included in the studies due to the lack of complete data at the time of preparing the proposed analysis.

In the work on the model, the GNU Regression Econometric and Time-Series Library – Gretl software was used, which provides advanced econometric methods. On the other hand, the model was estimated by using the classical method of least squares.

Out of concern for the care and accuracy of the research, it was decided to include all sixteen voivodeships in Poland. This should result in the transparency of the reception of the proposed research results.

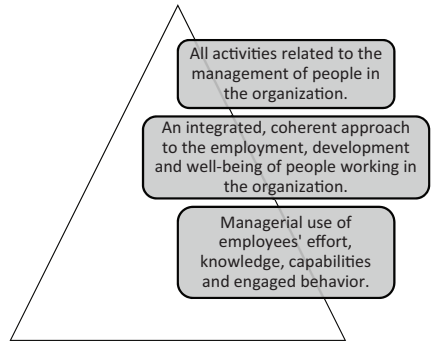

Figure 1. Exemplary definitions of HRM (source: own study based on Leleń, 2010, p. 10)

1. Human resources in the labour market – theoretical analysis

1.1. Definitions, goals and importance of HRM

The new philosophy of managing people in an organization was characterized by a dynamic approach to the mutual dependencies between tasks in the sphere of human resources of the enterprise and their connection with its strategy. Employees began to be perceived, not only as a component of operating costs, but primarily as a part of the company's assets.

In the subject literature, there are many definitions of human resource management, which is the result of the multidimensionality of this concept. Exemplary definitions are presented in Figure 1 and Table 1.

The immediate goal of HRM is to shape efficient personnel and stimulate them to the desired behaviours. As a result, this leads to the proper and quick implementation of the organization's tasks and meeting the needs of

Table 1. Review and analysis of selected HRM definitions (source: own study based on Pocztowski, 2007, p. 34; Armstrong, 1996, p. 9; Zając, 2007, pp. 13–14; Niedzielski & Walkowiak, 2000, p. 10; Górecka, 2010, pp. 52–53; Armstrong, 2007; Łukasiewicz, 2009; Guest, 1991, pp. 149–175; Pettigrew & Whipp, 1991)

Author	Human Resources management			
	General characteristics	Perception of human resources	Postulates	A reference to competitiveness
A. Pocztowski	It is a specific management concept in the area of personnel function of enterprises.	A business asset; building employee engagement as a tool for achieving goals.	Strategic integration of personnel matters with business matters, the active role of line management in solving personnel issues, the need to shape organizational culture, integration of personnel processes.	Human resources are seen as a source of competitiveness.
Cz. Zając	It means all activities related to the disposal of human resources by a given organization.	Achieving the set goals.	Strategic placement of skilled and committed employees, while using a variety of cultural, structural and personal techniques.	An employment management method that aims to gain a competitive advantage.
M. Armstrong	Strategic, coherent and comprehensive view of the issues related to the management and development of human resources within the structure of the company.	People are a valuable source of business success and should be viewed not as variable costs but rather as fixed assets.	People must be given the best possible leadership and opportunities to fully develop their abilities.	None.

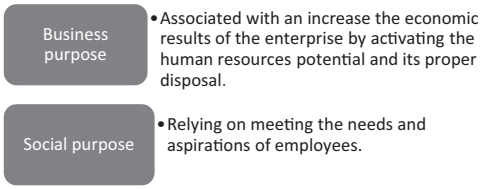

Figure 2. Equivalent HRM objectives (source: more widely in Romanowska, 2011, pp. 171–173)

the employed people. Figure 2 deals with the equivalent goals of HRM.

Human resources play a special role in creating an organization's competitiveness, with particular emphasis on their commitment and knowledge, stressing the common goals of stakeholders, and accenting the links and consistency in HRM practices.

Human resource management makes it possible to indicate the directions and ways of using human resources to achieve the goals of the organization. As a consequence, this will translate into an increase in the value of the entity. This, in turn, may lead to gain an advantage over the competition (with the help of a committed crew and technological, organizational, and human resources improvements).

1.2. Changes in the labour market

Labour markets in many countries, including Poland, are constantly transforming and require a new approach to human resource management (Kasprzyk, 2018, p. 249). Table 2 lists three categories of changes.

Table 2. Selected changes on the labour market (source: Aniołowie Konsultingu, 2022)

NOW	NEW	NEXT
Rapid technology development	Augmented and Virtual Reality	Artificial intelligence and machine learning
Mobile Internet	The idea of sustainable development	Welfare state
Flexible working conditions	Aging society	The economy of cooperation
Digitization of work	Growing social inequalities	Teal companies
Work automation	Extending life time	Overpopulation
Generational changes in the work environment	Work & life balance	Zero waste economy
Big Data and the progress of computing power	Lifelong learning	Climate changes

The Now category should be understood as the factors of change that are already felt and noticeable by employees and employers. New should be interpreted as noticeable and felt more and more, while Next as factors that do not yet have such a strong reflection on the society and are treated as something new.

2. Human capital and the condition of the labour market in Poland – econometric analysis

2.1. Methodological assumptions

In the empirical part of the work, the influence of selected factors on the condition of the labour market in Poland was analysed. The study covered 16 voivodships. The research period covers the years 2011–2020. The last period of the analysis covers the latest complete data available at the time of editing the final version of the considerations.

The Regression Econometric and Time-Series Library – GRETL software was used in the econometric modelling. This package is released under the GNU license, i.e. the General Public License allowing free access for all users. It includes advanced econometric modelling tools.

The general purpose of the research of econometric modelling is to identify statistically significant determinants of human capital influencing the condition of the labour market in Poland. In pursuit of this goal, two research questions were formulated:

- Did all the researched explanatory variables have a statistically significant influence on the dependent variable?
- Which of the examined variables had the strongest influence on the shaping of the dependent variable?

In developing this part of the work, two research methods were used. The first of them – statistical analysis, included the following elements:

- Characteristics of a test of selected features, and
- Regression models examining the significance of the analyzed features (Pietrewicz, 2016, pp. 124–125).

The second method, econometric analysis, in terms of examining the condition of the Polish labour market on the basis of the model, required taking several steps, such as the following:

- The specification of variables,
- Model form selection,
- Parameter estimation,
- Model verification, and
- Analysis of the obtained dependencies (Ganczarek-Gamrot, 2017, p. 95).

Work related to econometric modelling begins with the development of a set of statistical data. The research used panel data, that is spatiotemporal data, i.e. data observed in many areas for many periods of time (Franc-Dąbrowska, 2018). In the next step, you should focus on organizing panel data. The empirical research used statistical data from the Eurostat database (Eurostat, 2022).

The most important stages of the econometric procedure include the following: defining the phenomenon under study; adopting the appropriate analytical form of the model; specifying independent variables; estimating model parameters; model verification, which is jointly

defined by econometric modelling; and, finally the analysis of the dependencies obtained on the basis of the model (Marciniak, 2002, p. 81).

The tool examining the mechanism of relationships between variables is the regression function, which is an analytical expression of assigning the mean values of the explained variable to specific values of the explanatory variables. The technique of estimating the structural parameters of the regression function using the least squares method (LSM) was applied.

2.2. Model construction

The econometric analysis was carried out using panel data, i.e. data that are observed in at least two dimensions (Górecki, 2013, p. 17). This data type is a two-dimensional variable, conditioned in time and space.

It was decided to examine selected determinants of human capital in the context of the situation on the labour market in Poland in 2011–2020.

None of the many known methods of selecting variables for the model were used in the study. Therefore, it should be assumed that the choice of variables was made in an arbitrary manner, bearing in mind the research objective – it allowed to determine whether the relationship between the selected variables concerning human capital and the unemployment rate is significant. Originally, twenty variables were selected, but, in the end, eleven of them were selected for the study. The choice was made through the use of intuition and economic knowledge as well as information and results from other econometric studies.

The determinants of human capital were selected and classified into four areas, three variables were assigned to the area of Science, then two variables were qualified for the area of Innovation, and one for the area of Technology. The information society measures were definitely the most numerous group, because as many as 5 were selected. A detailed distribution is presented in Table 3.

Table 3. Assignment of human capital measures to appropriate areas (source: own study)

The condition of the labour market	Determinants of human capital		
	Group of measures	Indicators	The type of the variable
Unemployment rate Y_{it}	Science	X_{1it}	destimulant
		X_{2it}	destimulant
		X_{4it}	destimulant
	Information society	X_{5it}	destimulant
		X_{6it}	destimulant
		X_{7it}	destimulant
		X_{8it}	destimulant
		X_{9it}	destimulant
	Innovations	X_{3it}	destimulant
		X_{10it}	destimulant
	Technique	X_{11it}	destimulant

Assuming that the index, i = 1, 2, ..., 16, subsequent areas were marked (voivodships), and the index, t = 1, 2, ..., 10 time units (see Table 4), then the constructed model will be a single-equation linear economic model in the following form (more widely in Kolupa & Śleszyński, 2010, pp. 105–122).

$$Y_{it} = \alpha_0 + \alpha_1 X_{1it} + \alpha_2 X_{2it} + \alpha_3 X_{3it} + \alpha_4 X_{4it} + \alpha_5 X_{5it} + \alpha_6 X_{6it} + \alpha_7 X_{7it} + \alpha_8 X_{8it} + \alpha_9 X_{9it} + \alpha_{10} X_{10it} + \alpha_{11} X_{11it} + \nu_{it}, \quad (1)$$

where explained variable:
Y_{it} – unemployment rate (in %) in the i-th voivodship in period t;
explanatory variables:
X_{1it} – People with higher education in the age group of 25–64 (in % of the total population); X_{2it} – Employment in high-tech sectors (% of total population); X_{3it} – Patent applications to the European Patent Office (EPO) (per 1 million inhabitants); X_{4it} – Researchers (% of total employment) (numerator in full-time equivalent FTE); X_{5it} – Enterprises using computers (in % of total enterprises); X_{6it} – Enterprises with Internet access (in % of total enterprises); X_{7it} – Enterprises having their own website (in % of total enterprises); X_{8it} – Enterprises receiving orders via computer networks (website, EDI systems) (in % of total enterprises); X_{9it} – Enterprises of the non-financial sector with broadband Internet access (in % of total enterprises); X_{10it} – Industrial enterprises cooperating as part of a cluster initiative or other formalized cooperation (in % of innovatively active enterprises); X_{11it} – share of net revenues from the sale of products of entities included in the high and medium-high technology in the net revenues from the sale of products of entities included in the Industrial processing section (in %); ν_{it} – cumulative random error (consisting of the purely random part ε_{it} and the individual effect u_i, therefore $\nu_{it} = \varepsilon_{it} + u_i$) (Kufel, 2013, p. 173).

Table 4. Assignment of indexes to individual voivodships and relevant periods (source: own study)

No.	i	No.	t
1	Lower Silesia	1	2011
2	Kuyavia-Pomerania	2	2012
3	Lublin	3	2013
4	Lubusz	4	2014
5	Lodzkie	5	2015
6	Lesser Poland	6	2016
7	Masovia	7	2017
8	Opole	8	2018
9	Subcarpathia	9	2019
10	Podlaskie	10	2020
11	Pomerania		
12	Silesia		
13	Swietokrzyskie		
14	Warmia-Masuria		
15	Greater Poland		
16	West Pomerania		

The analysis covers all 16 voivodships and 10 time periods. Thus, each of the voivodships was analyzed in the same period, i.e. in 2011–2020.

2.3. Results of the application of regression analysis

Considerations will concern the combined regression model, fixed effects, and random effects.

The estimation using the classical least squares method (LSM) is considered admissible when the individual effect does not occur and the panel is treated as a set of cross-sectional data. This is precisely the situation in the model under study (Cf. Meyer & Meyer, 2017, pp. 429–441).

Using the GRETL program, the model parameters were estimated as presented in Table 5. It contains the values characterizing and describing the results of the least squares estimation.

Table 5. Model 1: LSM panel estimation, using 121 observations, 16 cross-sectional data units were included, time series of length: minimum 4, maximum 9, dependent variable (*Y*): Y_{it} (source: own calculations using the GRETL program)

	factor	standard error	t-Student	p value	
const	31.7710	11.4052	2.786	0.0063	***
X_{1it}	−0.176211	0.0998435	−1.765	0.0804	*
X_{2it}	−0.152764	0.0816826	−1.870	0.0641	*
X_{3it}	−0.217435	0.0642839	−3.382	0.0010	***
X_{4it}	−3.95156	1.48677	−2.658	0.0090	***
X_{5it}	−1.04902	0.351743	−2.982	0.0035	***
X_{6it}	−0.872010	0.332735	−2.621	0.0100	**
X_{7it}	−0.248987	0.0573841	−4.339	$3.21*10^{-5}$	***
X_{8it}	−0.257525	0.0989153	−2.603	0.0105	**
X_{9it}	−0.145414	0.0401615	−3.621	0.0004	***
X_{10it}	−0.052967	0.0274299	−1.931	0.0561	*
X_{11it}	−0.077503	0.0170526	−4.545	1.43×10^{-5}	***
Arithmetic mean of the dependent variable		10.13471	Standard deviation of the dependent variable		4.008256
Sum of squares of residuals		433.2357	Standard error of residuals		1.993650
R-squared determination coefficient		0.775285	Corrected R-square		0.752607
F(11, 109)		34.18717	The p-value for the F-test		$2.33*10^{-30}$
Likelihood logarithm		−248.8588	Akaike information criterion		521.7176
Schwarz Bayesian criterion		555.2671	Hannan-Quinn criterion		535.3433

Notes: *** statistically significant variable at the significance level of 0.01; ** statistically significant variable at the significance level of 0.05; * statistically significant variable at the significance level of 0.1.

All variables were collected in Table 6 and grouped by significance level.

Table 6. Significance level of variables (source: own study)

Variable		Significance level
X_{3it}	Patent applications to the European Patent Office	1%
X_{4it}	Researchers	
X_{5it}	Enterprises that use computers	
X_{7it}	Enterprises with their own website	
X_{9it}	Enterprises from the non-financial sector with broadband Internet access	
X_{11it}	Share of net revenues from the sale of products of entities classified as high and medium-high technology in net revenues	
X_{6it}	Enterprises with Internet access	5%
X_{8it}	Enterprises receiving orders via computer networks	
X_{1it}	People with higher education in the age group of 25–64	10%
X_{2it}	Employment in high-tech sectors	
X_{10it}	Industrial companies cooperating in the framework of a cluster initiative or other formalized cooperation	

Based on Tables 5 and 6, it can be concluded that all the variables are good stimulators for the improvement of the situation on the labour market in Poland. Nevertheless, the variables X_{3it}, X_{4it}, X_{5it}, X_{7it}, X_{9it}, and X_{11it}, have the greatest influence on the explained variable, as evidenced by the level of their significance.

According to Table 5, the model equation has the following form:

$$Y = \underset{(11.41)}{31.77} - \underset{(0.10)}{0.18}X_1 - \underset{(0.08)}{0.15}X_2 - \underset{(0.06)}{0.22}X_3 - \underset{(1.49)}{3.95}X_4 - \underset{(0.35)}{1.05}X_5 - \underset{(0.33)}{0.87}X_6 - \underset{(0.06)}{0.25}X_7 - \underset{(0.10)}{0.26}X_8 - \underset{(0.04)}{0.15}X_9 - \underset{(0.03)}{0.05}X_{10} - \underset{(0.02)}{0.08}X_{11}. \quad (2)$$

In the further part of the research, a test for the normality of the distribution of residuals was carried out – Figure 3.

"The test is aimed at checking the compliance of the distribution of the random component of the model with the normal distribution, i.e. one of the assumptions of classic method of least squares. If the random element has a normal distribution, then the estimator obtained by means of classic method of least squares has properties useful in constructing statistical tests in order to check various features of the econometric model" (more widely in Gruszczyński & Podgórska, 2004).

Null hypothesis: the random term is normally distributed.

Test statistic: Chi-square (2) = 0.16975, with p-value = 0.918627.

There is no reason to reject the null hypothesis and it is concluded that the distribution of the random

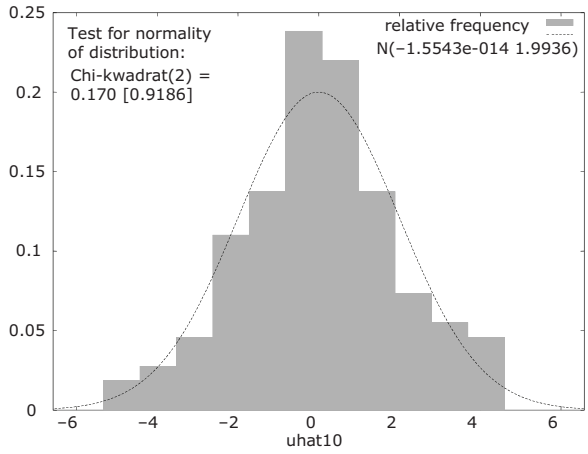

Figure 3. Histogram of the distribution of the residuals of the model with the chi-square test (source: own study using the GRETL program)

component has the characteristics of a normal distribution.

The next stage of the research was devoted to the estimation of the model with fixed effects – Table 7.

Table 7. Model 2: Estimation of fixed effects (non-random effects), using 121 observations, 16 units of cross-sectional data were included, time series length: minimum 4, maximum 9, dependent variable (Y): Y_{it} (source: own calculations using the GRETL program)

	factor	Standard error	t-Student	P value	
const	55.2781	9.5186	5.807	8.58×10^{-8}	***
X_{1it}	−0.5365	0.1262	−4.252	5.00×10^{-5}	***
X_{2it}	−0.3195	0.5051	−0.6325	0.5286	
X_{3it}	−0.0960	0.0594	−1.615	0.1097	
X_{4it}	−4.0861	2.1981	−1.859	0.0662	*
X_{5it}	−0.2725	0.2789	−0.9770	0.3311	
X_{6it}	−0.4340	0.2596	−1.672	0.0978	*
X_{7it}	−0.0607	0.0602	−1.008	0.3162	
X_{8it}	−0.0618	0.0848	−0.7281	0.4683	
X_{9it}	−0.1432	0.0357	−4.009	0.0001	***
X_{10it}	−0.0702	0.0227	−3.094	0.0026	***
X_{11it}	0.03289	0.0751	0.4376	0.6627	
Arithmetic mean of the dependent variable		10.1347	Standard deviation of the dependent variable		4.00826
Sum of squares of residuals		164.921	Standard error of residuals		1.32457
LSDV R-square		0.91446	Within R-kwadrat		0.86411
LSDV F(26, 94)		38.6487	The p-value for the F-test		2.55×10^{-39}
Likelihood logarithm		−190.43	Akaike information criterion		434.854
Schwarz-Bayesian criteria		510.340	Hannan-Quinn criteria		465.512

Joint test on named regressors:

Test Statistics: F(11, 94) = 54.3404, with the value of p = P(F(11, 94) > 54.3404) = 7.88174×10^{-36}.

A low p value means the rejection of the hypothesis H0 that the LSM panel model is correct, against the hypothesis H1 that the model with fixed effects is more appropriate.

After estimating the model with fixed effects, a model with random effects was constructed, the results are summarized in Table 8.

Table 8. Model 3: Random Effects Estimation (GLS), using 121 observations, 16 cross-sectional data units included, length time series: minimum 4, maximum 9, dependent variable (*Y*): Y_{it} (source: own calculations using the GRETL program)

	factor	Standard error	With	p-value	
const	55.3790	9.0045	6.085	1.16×10^{-9}	***
X_{1it}	−0.4973	0.1166	−4.264	2.01×10^{-5}	***
X_{2it}	−0.05351	0.2642	−0.203	0.8395	
X_{3it}	−0.08604	0.05476	−1.571	0.1161	
X_{4it}	−3.79413	1.91630	−1.980	0.0477	**
X_{5it}	−0.35852	0.26154	−1.371	0.1704	
X_{6it}	−0.50020	0.24390	−2.051	0.0403	**
X_{7it}	−0.06869	0.05585	−1.230	0.2187	
X_{8it}	−0.07642	0.08026	−0.952	0.3410	
X_{9it}	−0.14391	0.03339	−4.309	$1.64*10^{-5}$	***
X_{10it}	−0.06767	0.02092	−3.235	0.0012	***
X_{11it}	−0.03636	0.04875	−0.746	0.4557	
Arithmetic mean of the dependent variable		10.1347	Standard deviation of the dependent variable		4.0083
Sum of squares of residuals		610.828	Standard error of residuals		2.3565
Likelihood logarithm		−269.64	Akaike information criterion		563.29
Schwarz-Bayesian criteria		596.835	Hannan-Quinn criteria		576.91

Breusch-Pagan test (more widely on Maddala, 2008, p. 650; Welfe, 2018, pp. 124–125):

Null hypothesis: error variance in unit = 0;
LM = 69.4157, with p value = prob (chi-square (1) > 69.4157) = 7.9752×10^{-17}.

A low p value means the rejection of the hypothesis H0 that the LSM panel model is correct, against the hypothesis H1 that the model with random effects is more appropriate.

Hausman test statistics:

H = 14.1086, with the value p = prob (chi-square (11) > 14.1086) = 0.227044.

A low p-value means that the null hypothesis of the random-effects model is rejected versus the alternative hypothesis of the fixed-effects model.

2.4. Substantive assessment

As a result of the analysis, 4 areas of human capital, specific in terms of the labour market, were distinguished. The identified areas are defined by 11 predictors. Appropriately:

- Area 1 – Science (described by 3 variables);
- Area 2 – Information society (5 variables);
- Area 3 – Innovations (2 variables);
- Area 4 – Technique (1 variable).

It was established that there is a significant statistical relationship between all the variables used as measures of human capital and the unemployment rate. However, 6 variables in the following configuration had the strongest influence on the dependent variable:

- Science: X_{4it} – Researchers (in % of total employment).
- IT society: X_{5it} – Enterprises using computers (in % of total enterprises), X_{7it} – Enterprises with their own website (in % of total enterprises), X_{9it} – Enterprises of the non-financial sector with broadband access to the Internet (in % of total enterprises);
- Innovations: X_{3it} – Patent applications to the EPO (per 1 million inhabitants);
- Technique: X_{11it} – share of net revenues from sale of products of entities classified as high and medium-high technology in net revenues from sale of products of entities included in the Industrial processing section (in %).

The significantly limited scope of the conducted empirical research, in particular on determinants in the field of: adult learners, people employed in science and technology, specialists in the ICT sector, people employed in R&D or research workers and engineers, does not allow for the formulation of final demands. However, there are several economic recommendations that could be formulated on the basis of the obtained results of the econometric analysis.

It seems logical to support efforts aimed at professional activation of the society. Increasing the percentage of people with higher education or researchers will have a stimulating effect on the improvement of the situation on the labour market. Moreover, increasing employment in high-tech sectors will also bring about positive economic effects.

In their business strategies, entrepreneurs should attach more and more importance to technologically advanced means of collecting, searching and processing information and communicating (information society). Allocating increased efforts and funds for equipping entities with computers, broadband Internet access or having a website and EDI-type systems will bring positive results, both from the micro- and macroeconomic perspective.

Innovative activity has a positive effect on the labour market. As an example, the following relationship can be cited: along with an increase/decrease in the number of patent applications to the EPO, there is a decrease/increase in the unemployment rate (ceteris paribus). Thus, it seems rational that state action should be even more focused on promoting and enabling patent activity.

The development of high and medium-high technology entities has a positive effect on the labour market. The increase in revenues from the sale of these entities reduces unemployment and vice versa, ceteris paribus.

The positive impact of human capital development on the condition of the labour market indicates that it would be advisable to increase support for activities contributing to the improvement of human capital. As a consequence, inter alia, it will improve quality of life and social well-being.

Conclusions

The development of an organization depends on many factors, and the most common are the following: innovation, market competitiveness, and human resources. Undoubtedly, achieving a high position on the market by an entity depends on qualified staff who will try to achieve the assumptions made with eagerness and enthusiasm.

The research goal was achieved through econometric modelling of the relationships between the factors determining human capital and the condition of the labour market, measured by the change in the unemployment rate in Poland. The assessment was performed using the technique of estimating the structural parameters of the regression function using the classical method of least squares (LSCM). 3 proprietary panel models (total regression, fixed effects, and random effects) were built. The obtained results of the combined regression indicate that all examined factors are statistically significant and have an impact on the situation on the labour market in terms of the unemployment level.

- As a result of econometric modelling, several models were obtained to describe the volatility of the situation on the labour market in Poland.
- The factors that are the determinants of unemployment include, first of all, statistically significant variables at the significance level of 0.01, that is: X_{3it}, X_{4it}, X_{5it}, X_{7it}, X_{9it} and X_{11it}.
- The statistically significant variables at the significance level of 0.05 turned out to be the variables X_{6it} i X_{8it}.
- Variables X_{1it}, X_{2it}, X_{10it} had a statistically significant effect on the change in the unemployment rate, and these variables had the weakest impact on the shaping of the explained variable.
- The increase in the level of the researched explanatory variables (all of them are destimulants) has a negative impact on the change in the unemployment rate in Poland, which should be interpreted as a positive phenomenon, i.e. the increase in the analysed measures leads to a decrease in unemployment and vice versa (ceteris paribus).

The imperfection of the constructed models results from limitations, which include, first of all:

- insufficient length of time series containing human capital attributes,

– no up-to-date and complete statistical data is available, resulting in a significantly reduced number of analyzed areas and explanatory variables.

The practical implication is to show which of the examined attributes of human capital have the greatest impact on the labour market condition. This gives a large field to fight unemployment through the use of targeted state policy aimed at reducing the level of it.

Identification of the significance level of the variables may, at least partially, contribute to targeting those activities that improve the situation of the Polish labour market to the greatest extent.

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