INNOVATIVE HUMAN CAPITAL AND THE CONDITION OF THE POLISH LABOR MARKET

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Abstract

The aim of the considerations was to analyse and assess the impact of the attributes of innovative human capital on the condition of the labor market in the Polish economy. Public statistics resources were used as the source of data collection. In general, the research period covered the years 2016-2021. The collected data was compiled using basic descriptive statistics. The calculated values embraced the following statistical measures: arithmetic mean, median, minimum and maximum value, first and third quartile as well as the dynamics of changes. Several predictors were identified and defined in an arbitrary way, allowing for conducting research and formulating conclusions. The structure of the considerations is mostly empirical, although it also includes a library query to a small extent. The methods used in the work cover topical critical analysis and statistical analysis. The results of the analyses were presented in tabular and descriptive form. The practical implication of the study may be the fact of indicating the strength of the relationship between innovative human capital and the situation on the Polish labor market. This indirectly gives some scope for the application of a targeted policy aimed, on the one hand, at improving the situation on the labor market, and, on the other hand, at improving the socio-economic well-being in Poland.

Key words: human capital, innovation, labor market, Polish economy

JEL Code: J24, O32

Introduction

The dynamics of modern economic realities makes innovative capital take on special importance. Its positive impact on the growth of innovation and competitiveness is widely recognized (more on the topic, see: Kogut, Brożek, 2017), because knowledge and cooperation in the economic environment are becoming more and more important. Innovative capital is often presented in scientific periodicals as a kind of subcategory of intellectual capital (Machnik-Słomka, 2014). Due to the increased importance of knowledge, innovative capital has become a driving force for intellectual capital (more on the topic, see: Banaszkiewicz, Makowska, 2018). An analysis of the literature on the subject indicates that

the concept of innovative capital is developed in particular in relation to enterprises, which is why research focuses mainly on processes occurring at the organizational level (Zeng, 2002; Zeng, Gu, 2003). Thus, constantly growing importance of innovation in the modern world indicates the need for a thorough analysis of innovation capital on various levels. The proposed considerations (due to the required length of the article) are mainly limited to the treatment of innovative capital on the basis of empirical considerations, and so the analysis and assessment of the impact of the attributes of innovative human capital on the condition of the labor market in Poland was adopted as the aim of the considerations. In order to achieve this goal, a statistical analysis was conducted involving the examination of five arbitrarily selected predictors. Four of them are measures in the area of innovative capital, and one describes the labor market.

1 Innovative capital in Poland - analysis of statistical data

Innovative capital is not an unambiguous concept, because in the professional literature there are numerous definitions defining this specific type of capital. This is why one can find the defiontions proposed (among others) by Castro, Verde, Saez and Lopez (2010), Tseng and Goo (2005), Chen et al. (2004), or McElroy (2002). According to many authors (Zeng, 2002; Zeng, Gu, 2003; Edvinsson, Malone, 2001), innovative capital focuses on the intangible assets of the organization (i.e. intellectual capital) and affects the ability of enterprises to introduce innovations and generate resources in the long term (Machnik-Straw, 2014).

1.1 Research and development personnel

Starting the empirical analysis, in the first place, using Table 1, statistical data and calculations of basic descriptive statistics on R&D personnel were presented.

Tab. 1: Internal R&D personnel in Poland and NUTS 2 regions in 2016-2021

Internal R&D personnel per 1,000 professionally active people							Changes compared to 2016
Name	2016	2017	2018	2019	2020	2021	
Poland	6.6	7.1	7.8	8.1	8.6	9.0	36.36
Lower Silesian	6.9	8.0	9.4	95	10.4	11.4	65.22
Kuyavy-and-Pomerania	3.6	3.9	4.6	4.6	4.9	5.7	58.33
Lublin	4.6	4.7	5.0	6.0	6.2	6.2	34.78
Lubusz	2.0	2.5	2.5	2.4	2.3	2.4	20.00
Łódź	5.3	5.0	5.5	6.4	7.0	6.7	26.42
Lesser Poland	10.7	11.9	11.9	12.6	14.0	14.6	36.45
Mazovian	13.8	15.6	16.7	16.9	17.3	18.5	34.06
Opole	2.7	3.3	3.5	4.0	3.6	3.8	40.74

Sub-Carpathian	6.7	6.2	6.9	5.9	6.5	6.4	-4.48
Podlasie	3.5	3.9	4.3	4.6	4.7	4.7	34.29
Pomeranian	6.9	7.1	8.2	8.4	9.2	9.6	39.13
Silesian	4.7	5.0	5.4	6.0	6.5	6.7	42.55
St. Cross	2.3	1.7	2.4	2.6	2.5	2.4	4.35
Warmia-and-Masuria	2.8	2.9	3.5	3.9	4.0	4.6	64.29
Greater Poland	4.7	4.8	5.1	5.4	5.5	5.7	21.28
West-Pomeranian	2.9	3.3	3.4	4.0	3.7	3.9	34.48
Name	$\bar{x}$	Me	Q_1	Q_3	Min	Max	S
Poland	7.9	7.9	7.26	8.48	6.6	9.0	0.90
Lower Silesian	9.3	9.5	8.36	10.18	6.9	11.4	1.62
Kuyavy-and-Pomerania	4.5	4.6	4.07	4.83	3.6	5.7	0.74
Lublin	5.4	5.5	477	6.15	46	6.2	0.77
Lubusz	2.4	2.4	2.33	2.48	2.0	2.5	0.19
Łódź	6.0	6.0	5.36	6.63	5.0	7.0	0.82
Lesser Poland	12.6	12.3	11.91	13.65	10.7	14.6	1.45
Mazovian	16.5	16.8	15.88	17.20	13.8	18.5	1.61
Opole	3.5	3.6	3.35	3.75	2.7	4.0	0.45
Sub-Carpathian	6.4	6.5	6.25	6.65	5.9	6.9	0.35
Podlasie	4.3	4.4	3.99	4.68	3.5	4.7	0.49
Pomeranian	8.2	8.3	7.37	9.00	6.9	9.6	1.09
Silesian	5.7	5.7	5.11	6.38	4.7	6.7	0.81
St. Cross	2.3	2.4	2.32	2.48	1.7	2.6	0.32
Warmia-and-Masuria	3.6	3.7	3.05	3.98	2.8	4.6	0.69
Greater Poland	5.2	5.2	4.87	5.48	4.7	5.7	0.40
West-Pomeranian	3.5	3.6	3.33	3.85	2.9	4.0	0.41

Source: Local Data Bank, https://bdl.stat.gov.pl/bdl/metadane/cechy/3740?back=True, (accessed 04.04.2023).

In 2021, internal R&D personnel accounted for 9 people per thousand professionally active in Poland. This percentage used to be steadily increasing up till 2016. An upward trend was recorded in all provinces, which should certainly be interpreted as a positive aspect, supporting the growth of R&D facilities. The exception to the rule was the Sub-Varpathian Province, where a decrease of 4% was observed compared to the base year.

1.2 Number of researchers

Another predictor in the area of innovative capital turned out to be the number of researchers. Statistical data and calculations are included in **Table 2**.

Tab. 2: Researchers[1] in Poland and NUTS 2 regions in 2016-2021

Researchers per 1,000 professionally active people							Changes compared to 2016
Name	2016	2017	2018	2019	2020	2021	
Poland	5.2	5.7	5.8	5.9	6.2	6.5	25.00
Lower Silesian	5.5	6.3	7.2	7.1	7.5	7.9	43.64
Kuyavy-and-Pomerania	2.9	3.1	3.2	3.6	3.9	4.2	44.83
Lublin	3.7	3.8	3.9	4.1	4.1	4.2	13.51
Lubusz	1.8	2.2	1.9	1.6	1.5	1.5	-16.67
Łódź	4.2	4.0	4.0	4.8	4.7	4.4	4.76
Lesser Poland	8.9	10.0	9.8	10.3	11.4	12.0	34.83
Mazovian	10.6	11.9	12.0	11.5	11.9	13.0	22.64
Opole	2.2	2.7	2.7	3.0	2.6	2.8	27.27
Sub-Carpathian	4.7	4.8	5.0	4.2	4.5	4.4	-6.38
Podlasie	2.8	3.1	3.2	3.2	3.2	3.1	10.71
Pomeranian	5.7	6.2	6.9	6.8	7.5	8.0	40.35
Silesian	3.8	4.1	4.2	4.6	5.0	5.1	34.21
St. Cross	2.0	1.5	1.8	1.9	1.9	1.8	-10.00
Warmia-and-Masuria	2.4	2.5	2.2	2.7	2.8	3.3	37.50
Greater Poland	3.3	3.5	3.5	3.6	3.6	3.8	15.15
West-Pomeranian	2.4	2.8	2.8	3.0	2.9	3.0	25.00
Name	$\bar{x}$	Me	Q_1	Q_3	Min	Max	S
Poland	5.9	5.9	5.73	6.13	5.2	6.5	0.44
Lower Silesian	6.9	7.2	6.50	7.43	5.5	7.9	0.87
Kuyavy-and-Pomerania	3.5	3.4	3.13	3.83	2.9	4.2	0.50
Lublin	4.0	4.0	3.83	4.10	3.7	4.2	0.20
Lubusz	1.8	1.7	1.53	1.88	1.5	2.2	0.27
Łódź	4.4	4.3	4.05	4.63	4.0	4.8	0.34
Lesser Poland	10.4	10.2	9.85	11.13	8.9	12.0	1.13
Mazovian	11.8	11.9	11.60	11.98	10.6	13.0	0.78
Opole	2.7	2.7	2.63	2.78	2.2	3.0	0.27
Sub-Carpathian	4.6	4.6	4.43	4.78	4.2	5.0	0.29
Podlasie	3.1	3.2	3.10	3.20	2.8	3.2	0.15
Pomeranian	6.9	6.9	6.35	7.35	5.7	8.0	0.84
Silesian	4.5	4.4	4.13	4.90	3.8	5.1	0.52
St. Cross	1.8	1.9	1.80	1.90	1.5	2.0	0.17
Warmia-and-Masuria	2.7	2.6	2.43	2.78	2.2	3.3	0.38

[1] Research and development includes creative work undertaken in a methodical way to increase the body of knowledge - including knowledge about humankind, culture and society - and to create new applications for existing knowledge.

Greater Poland	3.6	3.6	3.50	3.60	3.3	3.8	0.16
West-Pomeranian	2.8	2.9	2.80	2.98	2.4	3.0	0.22

Source: Local Data Bank, https://bdl.stat.gov.pl/bdl/metadane/cechy/3740?back=True, (accessed 04.04.2023).

For logical reasons, the analysis of the data in Table 2 is a derivative of the data presented in Table 1. Similarly to the case of R&D personnel in Poland, the number of researchers was also characterized by an upward trend. The average ($\overline{x}$) number of people in research positions in 2016-2021 was approximately 6 per thousand economically active people. Comparing 2021 with 2016, it can be concluded that the number of researchers has decreased in three provinces: Lubusz (nearly 17%), St. Cross (10%) and Sub-Carpathian (6%).

1.3 Expenditures on innovative activity

In the next stage, it was decided to examine the expenditure on innovative activity, because this measure, even indirectly, is the aftermath of capital innovation. The data that refer to this area are presented in Table 3.

Tab. 3: Expenditures on innovative activities[2] in enterprises in Poland and NUTS 2 regions in 2016-2021

Expenditure on innovative activity in enterprises per 1 professionally active person							Changes compared to 2016
Name	2016	2017	2018	2019	2020	2021	
Poland	2 298	2 417	2 153	2 291	2 313	2 401	4.48
Lower Silesian	2 714	2 208	1 334	2 303	2 094	2 888	6.41
Kuyavy-and-Pomerania	1 041	1 111	943	909	1 340	1 310	25.84
Lublin	689	706	n/a	765	905	924	34.11
Lubusz	1 370	1 582	1 023	n/a	746	899	-34.38
Łódź	n/a	4 125	3 394	2 609	2 091	1 444	-64.99*
Lesser Poland	2 749	2 580	2 663	3 174	3 234	3 290	19.68
Mazovian	4 016	5 458	4 496	4 592	5 292	5 633	40.26
Opole	n/a	975	1 305	911	653	667	-31.59*
Sub-Carpathian	2 031	1 841	n/a	2 617	2 690	2 663	31.12
Podlasie	851	670	552	1 729	1 020	941	10.58
Pomeranian	2 212	2 377	2 168	2 294	1 953	2 613	18.13
Silesian	1 959	1 912	2 002	2 325	2 021	1 976	0.87
St. Cross	552	911	n/a	n/a	489	496	-10.14
Warmia-and-Masuria	391	511	574	702	652	879	124.81

[2] Innovative activity concerns all scientific, technical, organizational, financial and commercial activities that actually lead or are intended to lead to the implementation of innovations. Some of these activities are innovative in themselves, while others are not new, but are necessary for the implementation of innovation (Oslo Manual, 2018).

Greater Poland	1 758	1 924	1 563	1 602	1 910	1 541	-12.34
West-Pomeranian	1 024	1 085	826	675	618	751	-26.66
Name	$\bar{x}$	Me	Q_1	Q_3	Min	Max	S
Poland	2 312	2 306	2292.75	2379	2 153	2 417	94.73
Lower Silesian	2 257	2 256	2122.5	2611.25	1 334	2 888	545.90
Kuyavy-and-Pomerania	1 109	1 076	967.5	1260.25	909	1 340	182.18
Lublin	798	765	706	905	689	924	110.41
Lubusz	1 124	1 023	899	1370	746	1 582	344.23
Łódź	2 733	2 609	2091	3394	1 444	4 125	1056.37
Lesser Poland	2 948	2 962	2684,5	3219	2 580	3 290	318.15
Mazovian	4 915	4 942	4520	5416.5	4 016	5 633	638.84
Opole	902	911	667	975	653	1 305	266.95
Sub-Carpathian	2 368	2 617	2031	2663	1 841	2 690	401.25
Podlasie	961	896	715,25	1000.25	552	1 729	414.19
Pomeranian	2 270	2 253	2179	2356.25	1 953	2 613	220.88
Silesian	2 033	1 989	1963.25	2016.25	1 912	2 325	148.14
St. Cross	612	524	494.25	641.75	489	911	201.32
Warmia-and-Masuria	618	613	526.75	689.5	391	879	168.08
Greater Poland	1 716	1 680	1572.75	1872	1 541	1 924	173.03
West-Pomeranian	830	789	694	974.5	618	1 085	188.62

Legend: n/a – not available. * Due to the lack of data for 2016, changes compared to 2017 were calculated.

Source: Local Data Bank, https://bdl.stat.gov.pl/bdl/metadane/cechy/3740?back=True, (accessed 04.04.2023).

The median for Poland in terms of expenditure on innovative activity in enterprises was PLN 2,306 per 1 professionally active person. The highest value was allocated for this purpose in 2017 and it was respectively PLN 111 more than the median value. Considering the potential of the Mazovian Province, it must be admitted that it was in this province that enterprises allocated the most funds for innovative activity. For example, in 2021 it was more than twice as much as the average value for Poland. A diametrically different situation was described in the St. Cross Province, where the expenditure on innovative activity in 2021 per 1 professionally active person was less than 5 times less than the average for Poland.

1.4 Number of patents granted

The last predictor describing the innovativeness of human capital is the number of patents granted by the Patent Office of the Republic of Poland (PPO) - **Table 4**.

Tab. 4: Patents[3] granted in Poland and NUTS 2 regions in 2016-2021

Patents granted by the Polish Patent Office for 100,000 residents							Changes compared to 2016
Name	2016	2017	2018	2019	2020	2021	
Poland	8.8	7.3	7.6	7.7	5.9	8.5	-3.41
Lower Silesian	11.9	8.9	8.7	8.7	6.8	11.4	-4.20
Kuyavy-and-Pomerania	5.0	4.3	4.5	4.7	3.3	5.0	0.00
Lublin	8.9	7.5	7.9	10.2	8.2	13,4	50.56
Lubusz	2.4	2.1	3.4	2.7	1.7	3.5	45.83
Łódź	8.8	8.0	7.5	8.1	7.0	9.4	6.82
Lesser Poland	10.4	9.7	10.2	9.3	8.4	10.6	1.92
Mazovian	15.1	11.6	9.9	10.3	7.0	10.2	-32.45
Opole	7.5	6.2	6.7	4.7	4.5	8.0	6.67
Sub-Carpathian	4.3	4.4	6.3	5.7	5.3	8.3	93.02
Podlasie	4.4	2.3	3.7	5.5	3.2	5.7	29.55
Pomeranian	7.4	5.6	5.8	6.8	4.7	5.0	-32.43
Silesian	10.5	7.7	8.3	7.6	7.0	9.4	-10.48
St. Cross	3.9	3.4	3.4	5.1	3.9	4.9	25.64
Warmia-and-Masuria	3.8	2.9	3.8	3.4	1.8	2.7	-28.95
Greater Poland	7.2	6.7	8.5	7.2	4.8	7.6	5.56
West-Pomeranian	6.0	8.0	8.3	10.9	6.4	8.4	40.00
Name	$\bar{x}$	Me	Q_1	Q_3	Min	Max	S
Poland	7.6	7.7	7.38	8.30	5.9	8.8	1.02
Lower Silesian	9.4	8.8	8.70	10.78	6.8	11.9	1.91
Kuyavy-and-Pomerania	4.5	4.6	4.35	4.93	3.3	5.0	0.63
Lublin	9.4	8.6	7.98	9.88	7.5	13.4	2.20
Lubusz	2.6	2.6	2.18	3.23	1.7	3.5	0.71
Łódź	8.1	8.1	7.63	8.63	7.0	9.4	0.87
Lesser Poland	9.8	10.0	9.40	10.35	8.4	10.6	0.82
Mazovian	10.7	10.3	9.98	11.28	7.0	15.1	2.64
Opole	6.3	6.5	5.08	7.30	4.5	8.0	1.43
Sub-Carpathian	5.7	5.5	4.63	6.15	4.3	8.3	1.48
Podlasie	4.1	4.1	3.33	5.23	2.3	5.7	1.33
Pomeranian	5.9	5.7	5.15	6.55	4.7	7.4	1.04
Silesian	8.4	8.0	7.63	9.13	7.0	10.5	1.30
St. Cross	4.1	3.9	3.53	4.65	3.4	5.1	0.73
Warmia-and-Masuria	3.1	3.2	2.75	3.70	1.8	3.8	0.77

[3] A patent has been defined as a right to exclusive use of an invention for a specified period of time, for profit reasons (industrial, commercial) in the territory of a given country or countries, granted by a competent state, regional or international authority (Patent Office of the Republic of Poland, 2023).

Greater Poland	7.0	7.2	6.83	7.50	4.8	8.5	1.23
West-Pomeranian	8.0	8.2	6.80	8.38	6.0	10.9	1.74

Source: Local Data Bank, https://bdl.stat.gov.pl/bdl/metadane/cechy/3740?back=True, (accessed 04.04.2023).

The most favorable year in terms of the number of patents granted by the PPO turned out to be the first of the analyzed periods, i.e. 2016. The maximum value (max) was approximately 9 granted patents per 100,000. residents. In general, the trend for Poland was volatile, with alternating upward and downward trends. Low values of the standard deviation indicate a small dispersion (differentiation) of the values describing NUTS 2 around the average for Poland.

2 State of the labor market in Poland - analysis of the unemployment rate

The analysis of innovative human potential was decided to refer to the situation on the labor market in Poland. Therefore, on the side of the labor market, one predictor was selected, showing its condition, specifically the registered unemployment rate - **Table 5**.

Tab. 5. Unemployment rate[4] in Poland and NUTS 2 regions in 2016-2021

Total unemployment rate in %							Changes compared to 2016
Name	2016	2017	2018	2019	2020	2021	
Poland	8.2	6.6	5.8	5.2	6.3	5.8	-29.27
Lower Silesian	7.2	5.7	5.2	4.6	5.6	4.9	-31.94
Kuyavy-and-Pomerania	12.0	9.9	8.8	7.9	9.0	8.1	-32.50
Lublin	10.3	8.8	8.0	7.5	8.2	8.7	-15.53
Lubusz	8.6	6.5	5.8	4.9	6.3	5.1	-40.70
Łódź	8.5	6.7	6.1	5.4	6.2	6.1	-28.24
Lesser Poland	6.6	5.3	4.7	4.1	5.3	5.0	-24.24
Mazovian	7.0	5.6	4.9	4.4	5.2	4.7	-32.86
Opole	9.0	7.3	6.3	5.8	6.9	6.4	-28.89
Sub-Carpathian	11.5	9.6	8.7	7.9	9.1	9.9	-13.91
Podlasie	10.3	8.5	7.7	6.9	7.8	7.8	-24.27
Pomeranian	7.1	5.4	4.9	4.5	5.9	5.2	-26.76
Silesian	6.6	5.1	4.3	3.6	4.9	4.3	-34.85
St. Cross	10.8	8.8	8.3	8.0	8.5	8.7	-19.44
Warmia-and-Masuria	14.2	11.7	10.4	9.1	10.2	9.1	-35.92
Greater Poland	4.9	3.7	3.2	2.8	3.7	3.2	-34.69
West-Pomeranian	10.9	8.5	7.4	6.8	8.4	7.3	-33.03

[4] The registered unemployment rate was calculated as the ratio of the number of registered unemployed to the number of economically active civilian population (in total and a given group), i.e. excluding persons on active military service and employees of budgetary units conducting activities in the field of national defense and public security (GUS).

Name	$\bar{x}$	Me	Q_1	Q_3	Min	Max	S
Poland	6.3	6.1	5.80	6.53	5.2	8.2	1.04
Lower Silesian	5.5	5.4	4.98	5.68	4.6	7.2	0.92
Kuyavy-and-Pomerania	9.3	8.9	8.28	9.68	7.9	12.0	1.51
Lublin	8.6	8.5	8.05	8.78	7.5	10.3	0.97
Lubusz	6.2	6.1	5.28	6.45	4.9	8.6	1.34
Łódź	6.5	6.2	6.10	6.58	5.4	8.5	1.06
Lesser Poland	5.2	5.2	4.78	5.30	4.1	6.6	0.83
Mazovian	5.3	5.1	4.75	5.50	4.4	7.0	0.93
Opole	7.0	6.7	6.33	7.20	5.8	9.0	1.13
Sub-Carpathian	9.5	9.4	8.80	9.83	7.9	11.5	1.23
Podlasie	8.2	7.8	7.73	8.33	6.9	10.3	1.16
Pomeranian	5.5	5.3	4.98	5.78	4.5	7.1	0.91
Silesian	4.8	4.6	4.30	5.05	3.6	6.6	1.03
St. Cross	8.9	8.6	8.35	8.78	8.0	10.8	1.00
Warmia-and-Masuria	10.8	10.3	9.38	11.38	9.1	14.2	1.93
Greater Poland	3.6	3.5	3.20	3.70	2.8	4.9	0.73
West-Pomeranian	8.2	7.9	7.33	8.48	6.8	10.9	1.47

Source: Local Data Bank, https://bdl.stat.gov.pl/bdl/metadane/cechy/2392?back=True, (accession: 04.04.2023).

When interpreting the data in Table 5, one can see that the unemployment rate in all provinces showed a negative tendency which, in the case of a destimulant, should be treated as a positive phenomenon. In the analyzed period, 25% of the observations were lower than or equal to 5.8% (Q1), and 75% of the observations recorded a value equal to or greater than the first quartile. On the other hand, the results of the third quartile (Q3) show that 75% of observations received results lower than or equal to the value of the third quartile, i.e. 6.53%, and 25% of observations received results equal or greater than this value.

3 Innovative capital and the condition of the labor market - correlation analysis

As the culmination of the empirical part, it was decided to conduct a correlation analysis, examining the potential relationship between the measures of innovative capital and the situation on the labor market, measured by the unemployment rate. The results of Pearson's correlation analysis are presented in **Table 6**.

Tab. 6: Pearson correlation results

Dependence	Correlation coefficient
Internal R&D personnel per 1,000 professionally active people and the unemployment rate	~ -0.5
Researchers per 1,000 professionally active people and the unemployment rate	~ -0.5
Expenditure on innovative activity in enterprises per 1 professionally active person and the unemployment rate	~ -0.5
Patents granted by the Polish Patent Office for 100,000 inhabitants and the unemployment rate	~ -0.4

Source: Own calculations

The obtained dependencies can be perceived as strong, moderate or weak; it, however, looks that such an interpretation is arbitrary. Thus, it was assumed that the correlation strength should be interpreted as follows: $|r| < 0.2$ – no linear relationship; $0.2 \leq |r| < 0.4$ – weak relationship; $0.4 \leq |r| < 0.7$ – moderate relationship; $0.7 \leq |r| < 0.9$ – quite strong relationship; $|r| \geq 0.9$ – very strong relationship. Considering the above, it can be concluded that all the examined relationships showed a linear relationship, but they were characterized by a moderate degree of relationship strength. The conducted analysis confirmed that all dependencies show a negative correlation. In other words, both characteristics we have dealt with above increased or decreased in different directions.

Conclusion

After conducting an empirical analysis for the years 2016-2021 in Poland and in NUTS 2 regions, the following conclusions were drawn:

- it was shown that the unemployment rate decreases with the increase in the number of internal R&D personnel per 1,000 professionally active people, and vice versa;
- it was proven that as the number of researchers per 1,000 professionally active people increases, the unemployment rate decreases and vice versa;
- it was proven that the unemployment rate decreases and vice versa, together with the increase in the number of expenditures on innovative activity in enterprises per 1 professionally active person;
- it was confirmed that the unemployment rate decreases and vice versa together with the increase in the number of patents granted by the PPO per 100,000 inhabitants.

The research goal was achieved and thus it was determined that the selected attributes of innovative capital are moderately correlated with the situation of the labor market in Poland. It has also been shown that the research and development facilities in Poland are expanding in size, while the unemployment rate shows a negative trend. The arguments cited are good

prognoses for the future, on the one hand due to the innovativeness of the economy and on the other hand due to the condition of the labor market.

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