

**REGIONAL ECONOMY COMPETITIVENESS
AS A DETERMINANT OF THE HUMAN CAPITAL
LEVEL OF EXEMPLIFIED
BY THE WARMIŃSKO-MAZURSKIE VOIVODESHIP**

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A b s t r a c t

The Warmińsko-Mazurskie Voivodeship belongs to the group of voivodeships with a low level of economic growth in Poland. When considering the importance of human capital in the process of economic growth stimulation, it should be emphasised that the low level of human capital is one of the obstacles preventing the acceleration of economic growth and improvement in the region.

The purpose of the presented analyses was to find the reasons for the low level of human capital in the Warmińsko-Mazurskie Voivodeship. The results, prove that the level of human capital in the regions of Warmia, Mazury and Powiśle results from low competitiveness as regards to higher education, and the low competitiveness potential of the regional economy. In a consequence, the labor market is in an unfavorable situation which leads to the outflow of the most skilled and best-educated parts of the labor force.

**KONKURENCYJNOŚĆ GOSPODARKI REGIONALNEJ JAKO DETERMINANTA
POZIOMU KAPITAŁU LUDZKIEGO NA PRZYKŁADZIE
WOJEWÓDZTWA WARMIŃSKO-MAZURSKIEGO**

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Słowa kluczowe: kapitał ludzki, wzrost gospodarczy, konkurencyjność.

Abstrakt

Województwo warmińsko-mazurskie należy do województw o najniższym poziomie wzrostu gospodarczego w Polsce. Biorąc pod uwagę znaczenie kapitału ludzkiego w stymulowaniu wzrostu gospodarczego, można założyć, że jego niski poziom stanowi jedną z barier ograniczających możliwość zdynamizowania procesów wzrostu i rozwoju gospodarczego w omawianym regionie.

Celem analiz, których wyniki zaprezentowano w pracy, jest wskazanie wybranych determinant niskiego poziomu kapitału ludzkiego w województwie warmińsko-mazurskim. Uzyskane wyniki pozwalają na stwierdzenie, że wśród najważniejszych uwarunkowań tego stanu należy wskazać relatywnie niski poziom konkurencyjności województwa w zakresie kształtowania kapitału ludzkiego oraz niski poziom konkurencyjności gospodarki województwa, którego bezpośrednim skutkiem jest względnie niekorzystna sytuacja na regionalnym rynku pracy, co prowadzi do odpływu najbardziej wykwalifikowanej i najlepiej wykształconej części zasobów siły roboczej.

Introduction

An analysis of the available literature pertaining to the correlations between the level of human capital and the level and dynamics of economic growth shows that the differences observed at the level of economic growth in particular regions may be, at least partially, determined by disparities of human capital resources and their quality. The regions with the highest level of human capital are usually characterised by higher economic level and growth rate (cf. HERBST 2007, FLEISCHER et al. 2012, ŚWITAŁA 2007, HERBST 2012, GOLEJEWSKA 2013, SHI 2014). Additionally, stimulation of production processes by human capital seems to intensify with time and with the achievement of the higher level of growth (MUJAHID et al. 2014, p. 183). The above theses have strong theoretical grounds and are well documented in results of empirical research (BRONZINI, PISELI 2009, p. 187); therefore, they can be considered as stylised facts in economics.

Human capital plays a significant role, especially in poorly developed regions and areas. It contributes to collective actions, accelerates knowledge and innovation generation and diffusion processes, and stimulates development of network connections among economic entities. Human capital development is also accompanied by increased trust among local and regional economic entities, self-government units and social organisations (KUKLIŃSKI 2003, p. 9). Therefore, it is also vital for the development of social capital, which contributes to the acceleration of economic development processes by increasing the level of economic activity and streamlining the operation of public institutions (SORENSEN 2012, p. 875).

The starting point for the presented analyses were the results of a study conducted by Merło, Bogdański and Michalak. The authors stated that the level of human capital in the Warmińsko-Mazurskie Voivodeship was the

lowest in the country in between 2009 and 2013 in comparison to other voivodeships. Furthermore, in the analysed period, the researchers observed that the rates reflecting the above-mentioned level were continuously plummeting (MERŁO et al. 2015). The Warmińsko-Mazurskie Voivodeship is also a voivodeship with the lowest level of economic growth in Poland. When considering the importance of human capital in the process of economic growth stimulation, it should be emphasised that the low level of human capital is one of the obstacles preventing the acceleration of economic growth and improvement in the region.

Therefore, a question emerges which factors and processes underlay the adverse changes in the formation of human capital in the voivodeship. Efficiency of regional policy aimed at reduction of the development gap between the Warmińsko-Mazurskie Voivodeship and other voivodeships in the country calls for specification of determinants of the existing disparities. Therefore, the purpose of the analyses, the results of which are presented in the study, is to show the causes of the low level of human capital in the analysed voivodeship.

Research Methodology

The study comprises two research hypotheses. Both refer to factors influencing the human capital level in the Warmińsko-Mazurskie Voivodeship. The first hypotheses stipulates that the relatively low level of human capital results from the low competitiveness of the voivodeship as far as the fostering of human capital is concerned. The second hypotheses assumes that the deteriorating level of human capital in the region is caused by the human resources' drain due to the low level of competitiveness, and hence the relatively difficult situation in the labour market.

To verify these hypotheses it was necessary to divide the research process into several stages. At the first stage, the researchers defined the potential of the Warmińsko-Mazurskie Voivodeship in terms of fostering human capital. To this end, a component of the Regional Competitiveness Index (RCI) was distinguished and calculated in the area of higher education and continuing education. The RCI is a composite indicator created by Annoni, Dijkstre and Kozovska for the purpose of international comparisons of the competitiveness of regional economies. Its assumptions and methodology of calculation are based on the Global Competitiveness Index (GCI) elaborated by the World Economic Forum. It describes regional competitiveness via three specific sub-indexes (basic requirements, efficiency enhancers and innovation and sophistication factors) using 80 explanatory variables. The RCI calculation

methodology is described in detail in the following publications: ANNONI, DIJKSTRA (2013) and ANNONI, KOZOVSKA (2010).

To describe regional competitiveness in terms of fostering human capital, the following explanatory variables were used:

- population aged 25–64 with higher education – as a percentage of the total population in this age group;
- professional development – participation of people aged 25–64 in professional development and training courses as a percentage of people aged 25–64;
- access to higher education institutions – number of people living within a maximum distance of 60 minutes from a higher education institution as a percentage in total population.

To gain an insight into the educational potential of the analysed voivodeship, information on a number of students at the University of Warmia and Mazury in Olsztyn (as the largest university in the region) and their structures on account of territorial origin were taken into account. At this stage of the research, the Online Candidate Enrolment System used at the University in Olsztyn was the source of information. Additionally, at this stage the researchers also used data obtained from a diagnostic survey using the direct survey technique. The study was conducted during the academic year 2013/2014 and covered 1,340 students from the Faculty of Economics at the University of Warmia and Mazury in Olsztyn, representing the supply side in the labour market in the analysed region.

Verification of the second research hypothesis required calculation of the RCI value as a composite measure of the competitiveness level. Additionally, the values of particular RCI components, i.e. values of indices in the basic requirement group, the efficiency enhancers' group and group of innovation and sophistication factors were also calculated. Owing to this, it was possible to indicate which dimension of regional competitiveness contributed to the total competitiveness level of the analysed region in the greatest extent.

Due to the limited access to source data, the time range of the study pertains to the year 2013. However, when considering the specific nature of factors fostering the level of competitiveness of regional economies, both in global terms and as regards to competitiveness in higher education, it may be assumed that it remained on a relatively stable level over a period of several years.

The source data were derived from an online statistical database – EURO-STAT.

Human Capital Versus Competitiveness of the Warmińsko-Mazurskie Voivodeship in of the Area of Higher Education

In general terms, human capital may be defined as all predispositions, knowledge, skills and capabilities, as well as health that may be used in the production process (ZIEJEWSKI 2011, p. 138). The assessment of human capital in regional terms may be horizontal, by way of comparing selected categories characterising its quality, or by using some aggregated ratios (WIERZBICKA 2017, p. 332). One of the measures used for that purpose is the Human Capital Resources Index (WAŚNIEWSKA 2007, p. 252, MOSSAKOWSKA 2008, p. 11). It involves the measurement of four variables:

- professional activity rate – the share of professionally active people in the total population aged at least 15;
- employment rate – the share of the working population in the total population aged at least 15; the rate is used to evaluate the mobilisation of the labour force;
- entrepreneurial activity rate – the number of entities registered in the REGON database compared to the number of inhabitants over 17 years of age who are engaged in professional activity in the region; it is assumed that a higher level of entrepreneurial activity results in a larger number of entities registered in the region;
- educational level – the percentage of working population with tertiary education level; it is assumed that the quality of human capital improves with the increase of the educational level of a given person.

As indicated by the results of a research conducted by Merło, Bogdański and Michalak between 2009 and 2014, the level of human capital measured by the Human Capital Resources Index varied in Poland. In the case of the analysed voivodeship, its values were the lowest in the country, and, what is more, constant deterioration thereof could be observed in the analysed period (Tab. 1).

The low values of the Human Capital Resources Index resulted from the fact that in the analysed period the region was characterised by the lowest employment rate and professional activity rate in the country, as well as second lowest level of education (MERŁO et al. 2015). Assuming that the observed trends continue over time, they will cause further social and economic marginalisation of the region.

In an attempt to determine the causes of the described process, the researchers defined the potential of the Warmińsko-Mazurskie Voivodeship in terms of fostering human capital. An approximate measurement of such potential is regional competitiveness in terms of higher education and continuing education, which constitute the RCI components.

Table 1

Values of Human Capital Resources Index in years 2009–2013

Voivodeship	2009	2010	2011	2012	2013
Mazowieckie	0.89	0.91	0.89	0.89	0.91
Wielkopolskie	0.47	0.65	0.56	0.53	0.58
Pomorskie	0.39	0.56	0.52	0.53	0.51
Małopolskie	0.38	0.43	0.45	0.42	0.42
Dolnośląskie	0.33	0.38	0.37	0.37	0.40
Łódzkie	0.33	0.44	0.42	0.33	0.37
Zachodniopomorskie	0.34	0.33	0.33	0.36	0.36
Lubelskie	0.32	0.37	0.37	0.34	0.35
Podlaskie	0.34	0.30	0.37	0.37	0.35
Lubuskie	0.23	0.36	0.35	0.26	0.29
Kujawsko-Pomorskie	0.25	0.26	0.27	0.31	0.29
Śląskie	0.28	0.27	0.33	0.30	0.28
Świętokrzyskie	0.34	0.39	0.34	0.32	0.27
Opolskie	0.21	0.26	0.27	0.29	0.26
Podkarpackie	0.36	0.39	0.30	0.26	0.24
Warmińsko-Mazurskie	0.19	0.22	0.17	0.08	0.08

Source: MERŁO et al. (2015, p. 29).

The competitiveness of the Warmińsko-Mazurskie Voivodeship in this respect is at a very low level (Fig. 1). Similarly, as in the case of the Human Capital Resources Index, the RCI value in terms of higher education and continuing education in the analysed region was the lowest in the country. The lowest accessibility to higher education institutions and a relatively low percentage of people enrolling in continuing education programs contributed to the low value.

Apart from several smaller colleges, only one university operates in the region – i.e. the University of Warmia and Mazury in Olsztyn – where over 83%¹ of all students in the region pursue their educational programs. Thence, the small number of higher education institutions is one of the main factors limiting the possibility of improving the educational level of the region's population. Furthermore, while considering low economic growth and the overall low affluence of the population connected therewith, it should be remembered that the youth from small towns and less prosperous families may not always be able to afford to move to larger cities to study and any potential

¹ According to the data from the Local Data Bank of the Polish Central Statistical Office (GUS), 32.5k people studied in the Warmińsko-Mazurskie Voivodeship in 2013. In the same period, the number of students at the University of Warmia and Mazury was nearly 27k.

distance between the place of residence and a university (or, more precisely, the travel time, which is related not only to the distance, but also to the infrastructure) is too great for daily commuting.

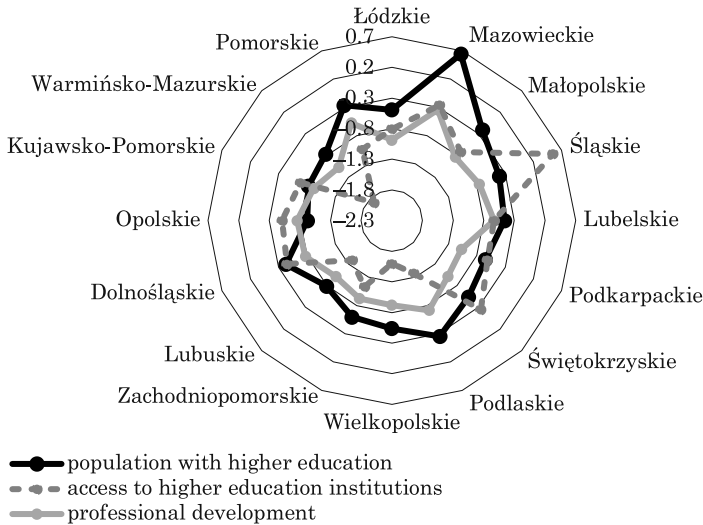


Fig. 1. Components of RCI index in terms of higher and continuing education
Source: MERŁO, MICHAŁAK (2015).

Furthermore, the analysis of data from the Online Candidate Enrolment System allows for a conclusion that the educational, academic and cultural offer of the University of Warmia and Mazury, as the largest higher education institution in the region is sufficiently appealing to attract approx. 10k new students each year. When analysing the structure of student data in terms of their places of origin, it can be observed that nearly 37% of students come from other voivodeships, e.g. from the Northern poviats in Mazowieckie and western parts of Podlaskie Voivodeship i.e. areas with large and recognised academic centres – i.e. Warsaw and Białystok. This testifies to high competitiveness of the University of Warmia and Mazury in Olsztyn, as well as the city itself as regards the level of human capital in the region.

However, the high efficiency of the University of Warmia and Mazury in attracting students from the region of Warmia, Mazury and Powiśle, as well as the neighbouring voivodeships does not translate to the high quality of human capital. Therefore, it seems that one of the reasons for such a low level of human capital in the region of Warmia, Mazury and Powiśle may be the drain of the most qualified and most educated labour force to other voivodeships.

Regional Economy Competitiveness As a Determinant of the Human Capital Level

When analysing the impact of activities undertaken to improve the human capital level in the region, it is important to determine the percentage of graduates (primarily university graduates) who stay in the region after the completion of their studies. It should also be remembered that the economic growth rate and the situation in the labour market are the main determinants influencing the decisions of university graduates and the labour force in general whether to stay in the region or not. If the region is relatively well developed and it is relatively easy to find employment there, the percentage of graduates starting their professional careers in the region is higher (ROSKOWSKA 2009).

The results of the surveys conducted among students of the Faculty of Economics at the University of Warmia and Mazury allow for the ascertainment that the drain of university graduates is an important factor compromising the level of human capital in the Warmińsko-Mazurskie Voivodeship. Only 35.3% of the respondents were determined to stay in this Voivodeship after their graduation (18.7% of students planned to stay in Olsztyn, whereas 16.6% of them planned to move to other towns in the voivodeship). Simultaneously, 30% of the students expressed their intention to emigrate (27.4%) or move to another city outside the voivodeship (2.6%). Therefore, it is justified to assume that the main reason for graduates' leaving the Warmińsko-Mazurskie Voivodeship is the unfavourable situation in the regional labour market.

The analysis of the results of the Olsztyn study conducted by Herbst in 2009 led to similar conclusions. The percentage of graduates who decided to stay in the capital city of Warmia is 30.1%, which is low when compared to other academic centres in Poland. Similarly, the percentage of graduates who came to Olsztyn from different regions and decided to stay after their graduation is also relatively low (16.3%). This means that the impact of the university in Olsztyn on the development of human capital in the city – even though noticeable – is lower than in the case of other academic centres and notwithstanding the fact that the overall situation in the labour market in Olsztyn is definitely the best within the entire Warmińsko-Mazurskie Voivodeship and very good in relation to the national average. The main directions of migration of the students from the University of Warmia and Mazury are metropolises, mainly capital cities in Mazowieckie, Pomorskie and Wielkopolskie Voivodeships, and thus areas characterised by a relatively favourable situation in the labour market (HERBST 2009).

The above statements show that Warmia, Mazury and Powiśle are characterised by a strong “depletion” tendency of human resources, which is also

referred to as the brain drain. To reverse this trend, it is necessary to create favourable conditions for the conduct and development of business activity within the area of the voivodeship, which could ultimately increase investments and gradually improve the situation in the labour market. However, the main obstacle is the low level of competitiveness of the regional economy.

The RCI values, as indices for measuring the competitiveness of regional economies in Poland, were diversified. Above all, Mazowieckie, Śląskie, Małopolskie and Dolnośląskie Voivodeships recorded the highest scores. In the Warmińsko-Mazurskie Voivodeship, the RCI value was the lowest in the country in 2013 (Tab. 2).

Table 2
Ranking of Polish voivodeships by the RCI value

Voivodeship	RCI value	Place in the RCI ranking	% of EU regions with lower RCI values
Mazowieckie	-0.18	147	44.0
Śląskie	-0.41	175	33.3
Małopolskie	-0.47	184	29.8
Dolnośląskie	-0.54	190	27.5
Pomorskie	-0.58	194	26.0
Opolskie	-0.58	196	25.2
Łódzkie	-0.58	197	24.9
Lubelskie	-0.67	204	22.2
Lubuskie	-0.70	206	21.4
Zachodniopomorskie	-0.71	207	21.0
Wielkopolskie	-0.73	209	20.3
Podlaskie	-0.73	211	19.5
Świętokrzyskie	-0.73	212	19.1
Podkarpackie	-0.74	214	18.3
Kujawsko-Pomorskie	-0.74	215	18.0
Warmińsko-Mazurskie	-0.87	230	12.2

Source: own calculations on the basis of ANNONI, DEKSTRA (2013).

In the case of the analysed voivodeship, the low value of the RCI resulted from the adverse shape of variables describing three dimensions of regional competitiveness (Fig. 2).

Despite the fact that the greatest disparities between the analysed voivodeship and other Polish regions occur within the “efficiency area” and “innovation area”, in the case of poorly developed regions, such as the Warmińsko-Mazurskie Voivodeship, the basis for competitiveness of such

areas are basic factors. Therefore, any activities aimed at improving the competitiveness level of the voivodeship and, in the longer perspective, its economic growth rate should be concentrated on factors enhancing this exact area of regional competitiveness.

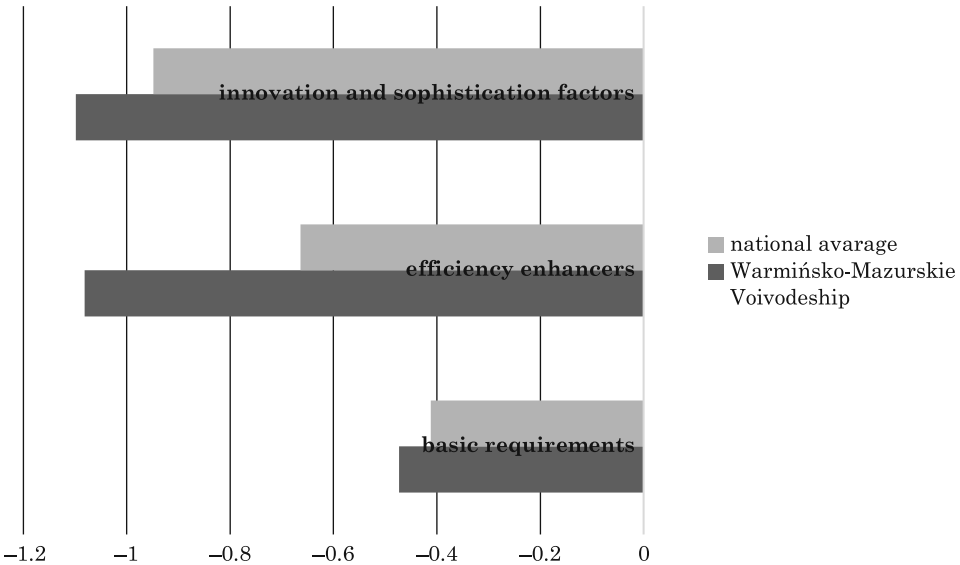


Fig. 2. Areas of competitiveness by RCI values in the Warmińsko-Mazurskie Voivodeship
Source: own calculation on the basis of ANNONI, DLJKSTRA (2013).

Within its framework, areas that require particular attention are pillars related to the level of health of the regional community, as well as the level of development and infrastructure quality (Fig. 3).

The level of road, rail and air infrastructure in the Warmińsko-Mazurskie Voivodeship is the worst in the whole country, and definitely requires more financing to increase the voivodeship's chances for faster development and enhanced competitiveness when compared to other Polish regions. Thanks to this, it would be possible to keep more qualified workers in the voivodeship, increase human capital, and, in the longer perspective, enhance the development potential of the analysed region.

Summary and Conclusions

Human capital is considered one of the key factors of economic growth. Its importance results from the fact that the level of human capital is determined by the rate of accumulation as well as creation of knowledge and technology

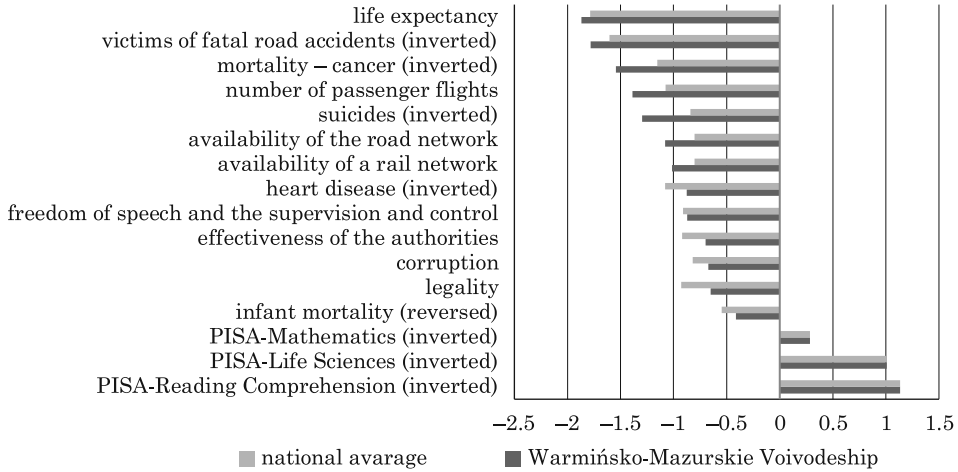


Fig. 3. Ranking of factors determining the RCI in the area of basic requirements in the Warmińsko-Mazurskie Voivodeship (regional level), (smallest to the largest)
Source: own calculations on the basis of ANNONI, DŁKSTRA (2013).

which, in turn, affects the efficiency of use of other production factors and the economic growth rate. Therefore, the low level of human capital offers slight chances for quick and stable economic growth and, in consequence, may be the cause of the divergence process.

The purpose of the presented analyses was to find the reasons for the low level of human capital in the Warmińsko-Mazurskie Voivodeship, which is also the least developed voivodeship in the country. The results prove that the level of human capital in the regions of Warmia, Mazury and Powiśle results from low competitiveness as regards higher education, and the low competitiveness potential of the regional economy.

The in-depth analysis of partial RCIs and data on the economic growth rate in the Warmińsko-Mazurskie Voivodeship allows for a conclusion that this is a region at the first and lowest stage of development. Competitiveness in the regions of this type relies on basic factors. Above all, the level of economic, technical and transport infrastructure, as well as quality of the institutions, health care and primary and secondary education determine the competitiveness of such units. Investments in such areas should be a priority in terms of public intervention, so that they can increase, in the longer perspective, the competitiveness of the regional economy and, in effect, the economic growth rate.

Apart from the above-mentioned research objective, analyses aimed at realising two tasks were also conducted. The first task is of a cognitive nature and is related to the indication of factors that hinder the development of

human capital in peripheral areas, including the Warmińsko-Mazurskie Voivodeship. Taking into account the fact that human capital is one of the vital factors determining economic growth, the achievement of the above goal also allowed for identification of basic development limitations in Warmia, Mazury and Powiśle.

The second task involves application. The results of the aforementioned analyses may constitute grounds for initiating a discussion on the goals and tools of economic policy implemented at a regional level, as well as their legitimacy and efficiency. The first competitions for co-financing of selected projects from the EU funds under the 2014–2020 financial perspective will be decided this year. Previous experiences in the implementation of past perspectives show that not all of the realised projects included the specific needs of the Warmińsko-Mazurskie Voivodeship as far as stimulation of its development is concerned. Taking into account the fact that this is probably the last financial perspective as part of which our country and region will be a beneficiary of substantial aid funds, it is essential to exert all efforts to use them in the most efficient way possible and to solve actual problems and development obstacles in the region.

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References

- ANNONI P., DIJKSTRA L. 2013. *EU Regional Competitiveness Index RCI 2013*. Joint Research Centre EC.
- BRONZINI R., PISELI P. 2009. *Determinants of long-run regional productivity with geographical spillovers: The role of R&D, human capital and public infrastructure*. *Regional Science and Urban Economics*, 39: 187–199.
- FLEISCHER B., LI H., ZHAO M.Q. 2010. *Human capital, economic growth, and regional inequality in China*. *Journal of Development Economics*, 92: 218–231.
- GOLEJEWSKA A. 2013. *Human Capital and Regional Growth Perspective*. *Barometr Regionalny*, 11: 7–17.
- HERBST M. 2007. *Wpływ kapitału ludzkiego i społecznego na (krótkookresowy) wzrost gospodarczy w polskich regionach*. In: *Kapitał ludzki i kapitał społeczny a rozwój regionalny*. Ed. M. Herbst. Wydawnictwo Naukowe SCHOLAR, Warszawa.
- HERBST M. 2009. *Tworzenie i absorpcja kapitału ludzkiego przez miasta akademickie w Polsce*. *Studia Regionalne i Lokalne*, 4(38): 21–38.
- HERBST M. 2012. *Edukacja jako czynnik i wynik rozwoju regionalnego: doświadczenia Polski w perspektywie międzynarodowej*. Wydawnictwo Naukowe SCHOLAR, Warszawa.
- KUKLIŃSKI A. 2003. *O nowym modelu polityki regionalnej – artykuł dyskusyjny*. *Studia Regionalne i Lokalne*, 4(14): 5–15.
- MERŁO P., BOGDAŃSKI M., MICHALAK J. 2015. *Kapitał ludzki a rynek pracy w województwie warmińsko-mazurskim*. In: *Efekty inwestowania w kształcenie kadry menadżerskiej dla potrzeb regionalnego rynku pracy. Studium przypadku na przykładzie WNE UWM*. Eds. J. Michalak, P. Merło. Wydział Nauk Ekonomicznych, Uniwersytet Warmińsko-Mazurski w Olsztynie, Olsztyn.

- MERLO P., MICHALAK J. 2015. *Konkurencyjność regionów. Badania i rekomendacje efektywnego inwestowania środków publicznych na poziomie NUTS2 w Polsce*. Maszynopis dostępny w Katedrze Makroekonomii UWM.
- MOSSAKOWSKA E. 2008. *Poziom i wykorzystanie kapitału ludzkiego w województwie mazowieckim*. Zeszyty Naukowe SGGW, 72: 5–16.
- MUJAHID N., AMJAD A., SANAM W.K. 2012. *Human Capital Investment and Physical Capital Nexus (A Path to Economic Growth of the Country): A Case Study of Pakistan 1980-2010*. Humanities and Social Sciences, 21: 181–187.
- ROSZKOWSKA S. 2009. *Ekonomiczne uwarunkowani migracji międzywojewódzkich w Polsce*. Gospodarka Narodowa, 4: 55–74.
- SHI M. 2014. *Empirical analysis on the relationship between human capital investment and economic growth in rural areas: Based on the data of Henan*. Journal of Chemical and Pharmaceutical Research, 6(3): 378–382.
- SORENSEN J.F.L. 2012. *Testing the Hypothesis of Higher Social Capital in Rural Areas: The Case of Denmark*. Regional Studies, 46: 873–891.
- ŚWITAŁA J. 2007. *Wpływ kapitału ludzkiego na rozwój regionalny w Polsce w kontekście gospodarki wiedzy*. In: *Innowacyjność w budowaniu gospodarki wiedzy w Polsce*. Eds. E. Okoń-Horodyńska, S. Pangsy-Kania. Instytut Wiedzy i Innowacji, Warszawa.
- WIERZBICKA W. 2017. *Kapitał ludzki jako filar gospodarki opartej na wiedzy – analiza stanu regionalnego zróżnicowania w Polsce*. Studia Prawno-Ekonomiczne, CIV: 329-343, DOI: 10.26485/SPE/2017/104/19.
- WAŚNIEWSKA A. 2007. *Zasoby kapitału ludzkiego na obszarze Warmii i Mazur*. In: *Przemiany rynku pracy w kontekście procesów społecznych i gospodarczych*. Katedra Mikroekonomii Uniwersytetu Szczecińskiego. Szczecin.
- ZIEJEWSKI T. 2011. *Kapitał ludzki – inwestowanie w człowieka (niematerialne czynniki rozwoju)*. Journal of Agribusiness and Rural Development, 1(19): 135–141.