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INVESTMENT IN HIGHER EDUCATION VERSUS ECONOMIC GROWTH – A PROPOSAL FOR THE DECOMPOSITION OF THE MRW MODEL FOR POLAND

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ABSTRACT

Higher education has become an increasingly knowledge-based sector of the present-day economy. The state faces the issues of financing higher education and assessing the effects of investment in the sector of higher education. The aim of this article is to determine the impact of investment expenditure on higher education (including the resources from the EU funds) on Poland's economic growth as measured by the GDP growth rate. The research hypothesis of the article is that the economic growth that is caused by investment in higher education with the contribution of the EU funds results in a higher GDP growth than in the case when there is no access to such resources. The results of the research indicate that increased investment in higher education, which was the result of the availability of the EU structural funds, influenced the increase in human capital in Poland and raised its impact on the GDP growth rate.

Key words: investment, higher education, economic growth, EU funds, MRW model

INTRODUCTION

Higher education generates knowledge which is a unique resource that contributes to economic growth. Numerous economists emphasize the role of education in the development of human capital and its significance in economic processes [Schultz 1961, Barro-Castro et al. 2001]. Contemporary research on economic growth and its factors also indicate that there is a correlation between the level of human capital that is generated by higher education and the rate of economic growth of a country [Gyimah-Brempong et al. 2006].

The higher education sector functions in the economy as a source of knowledge that is necessary to manage technologically advanced production processes. In the course of training at university level, highly specialized abilities and scientific theories are transferred that can subsequently be applied to generate innovations in production processes. This process can be understood in at least two ways: either as the introduction of new products (product innovation) or the introduction of new methods of manufacturing, or – possibly – the implementation of goods that so far did not exist in the economy [Gomułka 1990]. However, although they are indispensable, neither students nor entities that run schools of higher education can afford such investments in development. Thus, it seems interesting to take into consideration the impact of investment in higher education through EU funds. The European Union funds for higher education typically constitute investment in financial, tangible and

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intangible, as well as untouchable[1], assets of schools of higher education. In models of economic growth, investments that are defined in this way constitute a component of an economic growth factor, which facilitates the investigation of their impact on the GDP growth. The objective of the article is to investigate the implementation of EU funds in the Polish higher education sector by determining the impact of investment expenditure (including the EU funds) on economic growth measured by the GDP growth rate. The research hypothesis is that the economic growth that is caused by investment in higher education with the contribution of the EU funds results in a higher GDP growth than in the case when there is no access to such resources.

MATERIAL AND METHODS

In order to verify the hypothesis, the article provides a proposal for a decomposition of a model of economic growth with regard to the investment expenditure on higher education with the contribution of the EU funds. The decomposition of GDP growth was conducted for the period of 1995–2013, which was determined by the availability of quantitative data that were necessary to conduct appropriate computations.

In investigations that aim at the analysis of the impact of particular factors on GDP the Solow model, or derivative models [Romer 2000, Bukowski and Zawistkowska 2006, Kokocińska 2006] are applied most frequently.

In the traditional approach, the Solow model has the form of a three-factor production function. These factors are: capital (K), labour force (L) and technological progress (A). The Authors propose a development of the classical Solow production function to a four-factor function, where – apart from technological progress (A), real capital (K) and labour force (L) – the impact of human capital (H) on GDP growth is taken into consideration. When analyzing the impact of higher education with the consideration of its financing structure (including the EU funds) on economic growth, a modified MRW model, which includes the human capital component, was applied. The analysis assumed the application of a production function derived from the Solow model and an attempt at decomposition was made; for further considerations, the canonical form of the production function was taken (the Cobb–Douglas function), which presents the dependence of output on capital, work force and human capital [D'Auria et al. 2010]. Thus, the production function is given by:

$$Y = A \cdot K^{\alpha} \cdot L^{\beta} \cdot H^{1-\alpha-\beta} \tag{1}$$

where: Y – GDP;
K – physical capital (gross expenditure on real capital);
H – human capital, perceived as expenditure on higher education in relation to the state's budget expenditure on higher education per one student and the share of university graduates in the workforce; this ratio is calculated as the value of investment expenditure in schools of higher education divided by the state's budget expenditure on schools of higher education per one student; then the result obtained is multiplied by the number of university graduates in the workforce, i.e. people who are in employment directly in the economy;
L – work load (workforce, i.e. the number of people in employment in the economy);
A – the model's residual component, perceived as technological progress (*TFP*);
α, β, $(1 - \alpha - \beta)$ – flexibilities of K, L and H.

[1] Untouchable assets are generated in the course of the development of non-infrastructure projects (soft projects) and are not accounted for on the entity's balance sheet, as Polish balance sheet law does not provide for such an asset category. Untouchable assets are the result of a project team's creative work, e.g. regarding the development of a new programme curriculum or a unique curriculum of a field of study or the research and publication of its results. Such project products are not accounted for in the balance sheet as intangible assets and the financial effects of the creation of such assets are shown in the profit and loss account through the revenue cost settlement of the grant.

In such an approach, H – as a factor of economic growth – includes investment expenditure on higher education (including the EU funds), which makes it possible to present the contribution of the investment to the GDP growth. The Authors' proposal of the presentation of H is given by formula

$$H = \frac{\frac{N}{W_{bp}}}{S} \cdot A \tag{2}$$

where: N – investment expenditure of schools of higher education;
W_{bp} – state's budget expenditure on higher education;
S – number of students;
A – number of graduates in employment.

In order to investigate the influence of factors A, K, H, L on the value of the production function Y, the time factor (t)[2] should be taken into account. Consequently, the function is given by:

$$Y(t) = A(t) \cdot K(t)^{\alpha} \cdot L(t)^{\beta} \cdot H(t)^{1-\alpha-\beta} \tag{3}$$

Having differentiated the production function by time, one obtains:

$$\frac{\partial Y}{\partial t} = \frac{\partial Y}{\partial A} \cdot \frac{\partial A}{\partial t} + \frac{\partial Y}{\partial K} \cdot \frac{\partial K}{\partial t} + \frac{\partial Y}{\partial L} \cdot \frac{\partial L}{\partial t} + \frac{\partial Y}{\partial H} \cdot \frac{\partial H}{\partial t} \tag{4}$$

After dividing both sides of the equation by Y (GDP), the following form of the production function is obtained:

$$\frac{\frac{\partial Y}{\partial t}}{Y} = \frac{\frac{\partial A}{\partial t}}{A} + \alpha \cdot \frac{\frac{\partial K}{\partial t}}{K} + \beta \cdot \frac{\frac{\partial L}{\partial t}}{L} + (1 - \alpha - \beta) \cdot \frac{\frac{\partial H}{\partial t}}{H} \tag{5}$$

It can be assumed for a discrete time variable that the time derivative of every variable equals approximately its growth and consequently:

$$\frac{\Delta Y}{Y} = \frac{\Delta Y}{A} + \alpha \cdot \frac{\Delta K}{K} + \beta \cdot \frac{\Delta L}{L} + (1 - \alpha - \beta) \cdot \frac{\Delta H}{H} \tag{6}$$

Such notation implies that it is possible to investigate the direct impact of the growth factors (including H) on variable Y.

The Authors also made an attempt to estimate on their own the production function flexibility parameters. The procedure began with the estimation of the parameter [Snowdon et al. 1994]:

$$\alpha = r \cdot \frac{K}{Y} \tag{7}$$

where: r – average annual percentage rate assumed for the economy in the period under investigation;
K – average level of real capital;
Y – GDP.

[2] In further steps for the purpose of simplification, the productin function is given by formula (1)

For the estimation of parameter β, the following equation was taken:

$$\beta = w \cdot \frac{L}{Y} \tag{8}$$

where: w – average salary in the national economy in a given period;
L – volume of workforce in the economy;
Y – GDP.

In line with the assumption of the production function, the value of the exponential parameter H equals the difference: $1 - \alpha - \beta$.

In the growth model presented, higher education is accounted for in factor H and it is identified with expenditure on higher education, including the European funds as a component of public expenditure on the sector.

RESEARCH RESULTS

The research concerned the impact on economic growth of the European funds invested in higher education. The first stage of the research consisted in the analysis of the GDP in Poland in 1995–2013, which – with regard to the decomposition when applying the MRW model of economic growth – required an analysis of the nominal and real GDP flows in the period under investigation. Figure 1 presents nominal and real GDP flows in 1995–2013; this constitutes the first stage of the GDP decomposition. The next stage was to calculate the values of particular economic growth factors (K, L, H, A) and to estimate their growth rate.

Apart from the determination of factors K and L, the GDP growth rate decomposition requires the estimation of the human capital factor (H). It is indispensable to study the relation between the expenditure on higher education and the number of graduates and the share of employees with higher education in the total volume of workforce in the economy. A further stage of the decomposition was to estimate factor H for Poland on the basis of formula 8.

The average value of H for Poland (without the EU funds) amounted to 0.0133, while the average value of H with the EU funds was 0.0665.

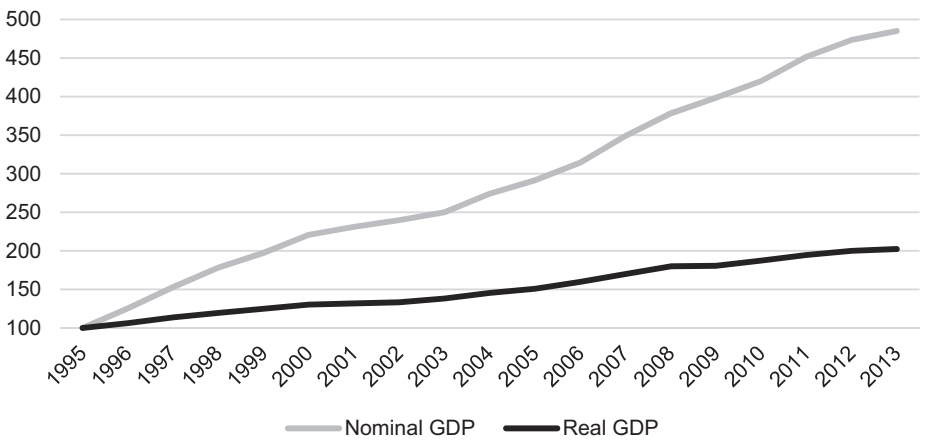

Fig. 1. Gross domestic product dynamics in Poland in 1995–2013 (1995 = 100) (%)

Source: Authors' research based on the GUS (Central Statistical Office of Poland) Yearbooks for 1995–2013.

Figure 2 presents the development of factor *H* in a graphical form, which facilitates the interpretation that was conducted in two periods: for 1995–2003 the graph shows factor *H* before the accession of Poland to the EU and after that accession, i.e. the period when EU money was invested in higher education. The square markers on Figure 2 represents the hypothetical course of variable *H* in the case of the lack of the EU funding in 2004–2013.

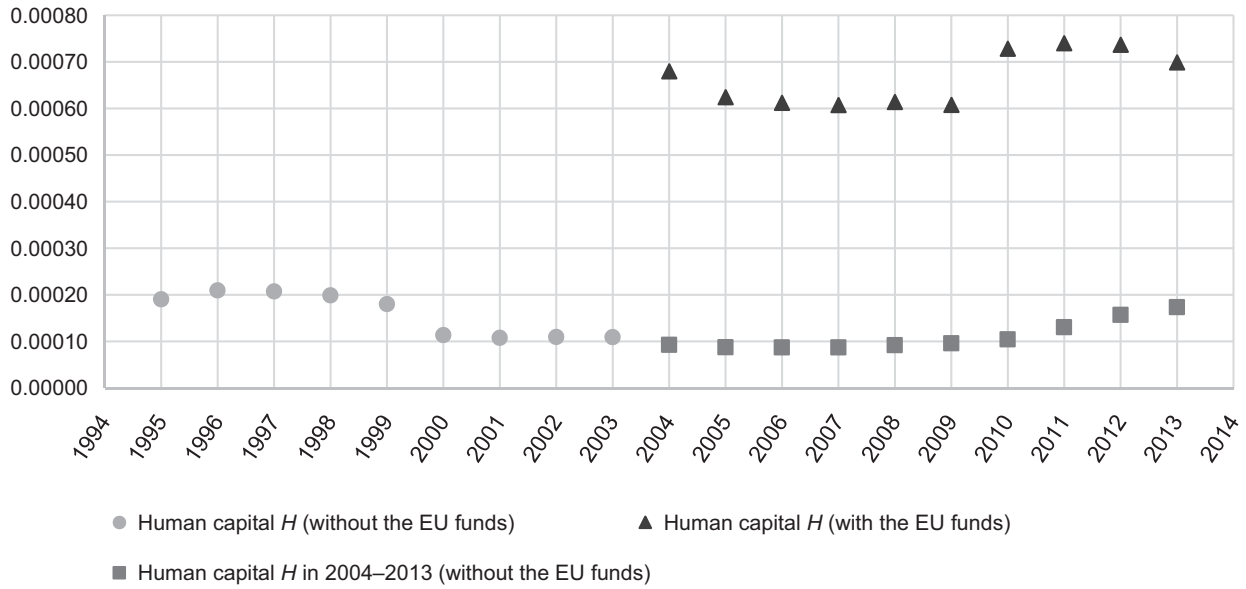

Fig. 2. Factor *H* in Poland in 1995–2013

Source: Authors' research.

The verification of the impact of the investment of schools of higher education on the GDP growth required an investigation of a two-variant financial flow. Its estimation was possible with the application of the data from Table 1. On the basis of the economic growth measurement in Poland an empirical simulation of the economic growth with and without the contribution of the EU funds in higher education investment is presented synthetically in Tables 2 and 3 where the GDP growth rates are given together with the changes in the investment in factors (*A*, *K*, *L*, *H*). The tables also present the share of particular factors in economic growth, which facilitated the assessment of their impact on GDP in the period under investigation. Table 4 presents the results of the decomposition and their synthesis.

The division of the research period into two sub-periods was due to Poland's accession to the EU in 2004 which was a qualitative factor. It resulted in the reorientation of the Polish economy because of the total elimination of tax duties and the introduction of the free flow of capital and workforce.

The results of the research and analysis made it possible to decompose the annual GDP growth rates in Poland by such factors as capital – *K*, workforce (i.e. the number of people in employment) – *L*, human capital – *H*, and *TFP* – *A*. Moreover, apart from the estimation of the change in investment in particular economic growth factors, their share in GDP was also estimated.

Table 1. Nominal and real investment expenditure on higher education in Poland, state expenditure on schools of higher education, EU funds for higher education, number of people with higher education in employment, students and graduates of schools of higher education in Poland in 1995–2013

Year	Nominal investment expenditure in higher education	Real investment expenditure in higher education N	Nominal state budget expenditure on higher education	Real state budget expenditure on higher education W_{bp}	Averaged investment expenditure in higher education N	Nominal EU funds	Real EU funds	Number of people with higher education in employment	Students	Graduates
				mln PLN					thousands	
1995	293.60	293.60	2 177.50	2 177.50	293.60	×	×	1 643.00	682.20	70.30
1996	503.40	426.81	3 011.30	2 553.16	426.81	×	×	1 746.00	774.60	89.03
1997	738.80	550.13	3 763.60	2 802.47	550.13	×	×	1 837.00	927.50	115.87
1998	958.90	643.46	4 283.00	2 874.06	643.46	×	×	1 989.00	1 091.80	146.32
1999	1 228.10	777.33	5 084.70	3 218.38	777.33	×	×	1 952.00	1 275.00	174.77
2000	1 575.80	930.05	5 347.10	3 155.89	538.27	×	×	2 055.00	1 431.90	215.42
2001	1 680.60	957.86	6 403.30	3 649.56	665.56	×	×	2 196.00	1 584.80	303.97
2002	1 541.40	856.26	6 868.20	3 815.34	771.76	×	×	2 386.40	1 718.70	342.14
2003	1 478.90	817.48	7 077.40	3 912.11	832.99	×	×	2 618.00	1 800.50	366.14
2004	1 785.80	947.80	8 854.20	4 699.31	867.79	10 150.54	5 387.34	2 889.00	1 858.70	384.03
2005	1 958.70	1 013.63	9 753.30	5 047.32	901.89	13 534.06	7 003.86	3 138.00	1 894.80	391.47
2006	2 036.00	1 034.36	10 010.70	5 085.81	918.60	10 150.54	5 156.86	3 321.00	1 953.80	393.97
2007	2 246.90	1 094.17	10 844.90	5 281.11	933.91	1 911.43	930.80	3 541.00	1 941.30	410.11
2008	2 394.80	1 138.51	11 191.00	5 320.31	981.49	2 796.98	1 329.71	3 811.00	1 937.00	420.94
2009	2 624.30	1 188.78	11 851.50	5 368.62	1 045.69	19 838.09	8 986.47	4 146.00	1 927.00	439.75
2010	4 950.80	2 207.31	11 792.60	5 257.73	1 093.89	10 542.87	4 700.54	4 557.00	1 900.00	478.92
2011	4 963.20	2 138.82	12 082.00	5 206.56	1 332.63	18 668.13	8 044.75	4 170.20	1 841.00	497.53
2012	4 411.20	1 863.10	12 476.20	5 269.41	1 553.52	16 949.84	7 158.89	4 201.80	1 764.00	485.25
2013	3 465.70	1 445.16	13 285.80	5 540.04	1 707.31	13 338.80	5 562.14	4 971.00	1676.00	455.21

Source: Authors' own research.

Table 2. Economic growth measurement in Poland in 1996–2013, rates of change in economic growth factors and their contribution in the growth in line with the MRW assumptions (without the contribution of EU funds in the investment expenditure of schools of higher education (%)

Specification	1996	1997	1998	1999	2000	2001	2002	2003	Average 1996–2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average 2004–2013
GDP change rate $\left(\frac{\Delta Y}{Y}\right)$	6.21	7.14	5.08	4.49	4.27	1.13	1.09	3.76	4.15	5.28	3.70	5.83	6.41	5.81	0.36	3.79	3.93	2.72	1.16	4.01
TFP $\left(\frac{\Delta A}{A}\right)$	1.50	–0.03	–0.43	2.68	5.33	5.76	5.04	4.02	2.98	3.03	0.32	–0.18	–1.62	–2.08	2.61	5.23	1.31	2.93	2.53	2.11
K expenditure change $\left(\alpha \frac{\Delta K}{K}\right)$	4.31	6.28	4.55	2.24	0.57	–4.25	–2.80	0.59	1.44	1.80	2.43	4.76	6.16	6.01	–2.84	–1.16	3.09	–0.38	–1.18	1.68
L expenditure change $\left(\beta \frac{\Delta L}{L}\right)$	0.11	0.73	0.82	–0.51	–1.72	–0.49	–1.27	–0.98	–0.41	0.32	0.83	1.14	1.78	1.83	0.53	–0.36	–0.53	0.09	–0.26	0.12
H expenditure change $\left[(1 - \alpha - \beta)\frac{\Delta H}{H}\right]$	0.29	0.16	0.13	0.08	0.09	0.11	0.12	0.13	0.14	0.13	0.12	0.11	0.08	0.06	0.06	0.07	0.07	0.07	0.08	0.11
Contribution of *TFP* in GDP growth	24.10	–0.48	–8.45	59.54	124.85	508.98	461.18	106.87	159.58	57.27	8.67	–3.13	–25.21	–35.76	726.95	138.05	33.19	107.87	217.01	138.97
Contribution of *K* in GDP growth	69.45	87.98	89.66	49.86	13.42	–375.14	–256.18	15.59	–38.17	34.08	65.51	81.69	96.22	103.28	–789.92	–30.54	78.57	–14.11	–101.23	–43.43
Contribution of *L* in GDP growth	1.69	10.27	16.21	–11.26	–40.33	–43.28	–116.32	–26.00	–26.13	6.13	22.47	19.56	27.72	31.51	147.53	–9.40	–13.46	3.50	–22.51	0.22
Contribution of *H* in GDP growth	4.75	2.24	2.58	1.85	2.05	9.44	11.31	3.54	4.72	2.52	3.35	1.89	1.27	0.98	15.45	1.89	1.70	2.74	6.73	4.24

Source: Authors' own research.

Table 3. Economic growth measurement in Poland in 1996–2013, rates of change in economic growth factors and their contribution in the growth in line with the MRW assumptions, with the contribution of the EU funds in the investment expenditure of schools of higher education (%)

Specification	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
GDP change rate $\left(\frac{\Delta Y}{Y}\right)$	3.70	5.83	6.41	5.81	0.36	3.79	3.93	2.72	1.16	3.75
TFP $\left(\frac{\Delta A}{A}\right)$	1.93	1.93	1.27	0.77	0.96	4.46	2.85	2.55	1.69	2.05
K expenditure change $\left(\alpha \frac{\Delta K}{K}\right)$	1.32	2.52	3.14	3.01	–1.34	–0.53	1.39	–0.17	–0.51	0.98
L expenditure change $\left(\alpha \frac{\Delta L}{L}\right)$	0.00	1.14	1.78	1.83	0.53	–0.36	–0.53	0.09	–0.26	0.47
H expenditure change $\left[(1 - \alpha - \beta)\frac{\Delta H}{H}\right]$	0.45	0.24	0.22	0.20	0.21	0.22	0.23	0.24	0.24	0.25
Contribution of *TFP* in GDP growth	52.17	33.17	19.84	13.21	266.91	117.65	72.44	94.04	145.47	90.54
Contribution of *K* in GDP growth	35.65	43.21	49.02	51.82	–371.69	–14.09	35.26	–6.23	–43.56	–24.51
Contribution of *L* in GDP growth	0.02	19.56	27.72	31.51	147.53	–9.40	–13.46	3.50	–22.51	20.50
Contribution of *H* in GDP growth	12.16	4.05	3.42	3.46	57.26	5.84	5.77	8.69	20.60	13.47

Source: Authors' own research.

Table 4. Synthesis of economic growth measurement in Poland in 1996–2013 in line with MRW (%)

GDP growth factors under investigation	GDP growth resulting from increase/decrease of the factor	Contribution of the factor to GDP growth (when GDP growth = 100)	GDP growth resulting from increase/decrease of the factor	Contribution of the factor to GDP growth (when GDP growth = 100)	GDP growth resulting from increase/decrease of the factor	Contribution of the factor to GDP growth (when GDP growth = 100)
	1996–2013	1996–2013	1996–2003	1996–2003	2005–2013	2005–2013
GDP growth rate $\left(\frac{\Delta Y}{Y}\right)$	4.01	100.00	4.15	100.00	3.75	100.00
Residual factor, *TFP* $\left(\frac{\Delta A}{A}\right)$	2.52	117.72	2.98	159.58	2.05	90.54
Investment expenditure on fixed assets in the economy (without the expenditure on higher education) $\left(\alpha \frac{\Delta K}{K}\right)$	1.23	–25.25	1.44	–38.17	0.98	–24.51
Number of people in employment in the national economy $\left(\beta \frac{\Delta L}{L}\right)$	0.07	–1.44	–0.41	–26.13	0.47	20.50
Human capital factor with the EU funds $\left[(1 - \alpha - \beta)\frac{\Delta H}{H}\right]$	0.19	8.97	0.14	4.72	0.25	13.47
Human capital factor without the EU funds $\left[(1 - \alpha - \beta)\frac{\Delta H}{H}\right]$	0.11[a]	4.24[a]	0.14[a]	4.72[a]	0.09[a]	3.85[a]

[a] Hypothetical value without the implementation of the EU funds – in this case the GDP growth resulting from the *TFP* increase was 2.60% in 1995–2013; in 2005–2013 the GDP growth resulting from *H*-hypothetical was 0.09% – in this case factor *A* would be 2.21% and its contribution to the growth equaled 90.54%.

Source: Authors' own research.

The analysis of Poland's economic growth in 1996–2013 resulted in the following conclusions:

1. In the full period investigated the growth rate of real GDP was positive and its average value for the period was 4.01%; in 1996–2003 and after 2004 (i.e. in the sub-period after the accession to the EU) the average values were 4.15 and 3.75%, respectively.
2. On the average, human capital (*H*) in the period under investigation caused the increase of the GDP growth by 0.19%; Tables 2, 3 and 4 include an economic experiment that consisted in estimating a hypothetical factor *H*, i.e. without the contribution of the EU funds for 2004–2013. The GDP growth rate was only 0.11% due to the value of the *H* growth rate, i.e. it was lower by 0.08 p.p. than the average value for 1996–2013 with the consideration of the EU funds flow. The *H*-hypothetical for 2005–2015 resulted in GDP growth by only 0.09% and the contribution of this factor to the GDP would be 3.85%. Human capital (*H*) that was estimated for 2005–2013 with the consideration of the EU grants to the investments of schools of higher education caused an average increase of the GDP growth by 0.25% and its contribution to the GDP growth was 13.47%. Thus, the contribution of *H*-hypothetical to growth is lower than the contribution of realized *H* by almost 11 pp, which implies that the EU grants contributed significantly to the increased contribution of actual *H* to the GDP growth rate.
3. The role of traditionally conceived capital (*K*) is becoming increasingly less significant in present-day economies as regards its function as a GDP growth rate factor. The contribution of *K* to the GDP growth rate in the period under investigation (*H* without the EU funding) was negative while there was a growing contribution of workforce, human capital and *TFP*. The average contribution of *K* in the period in question (*H* without the EU funding) was negative and amounted to –43%, and when analyzing the GDP measurement with the application of factor *H* that considered the EU fund flow, the contribution of *K* to growth increased to –24% (2005–2013). The impact of the number of people in employment on GDP growth fluctuated; in the whole period under investigation the impact of workforce on the GDP growth was 0.07% and the contribution of this factor to the GDP growth was negative and amounted to –1.44%, in 1996–2006 the impact was –0.44% and the contribution –26.13%, while in 2005–2013 it was 0.47 and 20.50%, respectively.

As regards a detailed analysis of the research results, it should be pointed out that the contribution of human capital to economic growth, both with and without the consideration of EU funds, fluctuates relatively insignificantly (in comparison to other factors). The average contribution of *H* to growth (*H* measured without the EU fund flow) was on the level of 4.24%.

When the EU funds were considered in the investment expenditure of the schools of higher education (*H* with the implementation of the EU funds), the contribution of *H* in the GDP growth was 8.97% (in 1996–2013); however, in this case two periods should be distinguished:

- 1996–2003, that is, the pre-accession period when the average contribution of *H* in the growth was 4.72%;
- 2004–2013, that is, the period when the investment expenditure on higher education was increased by the value of the EU funds; the average contribution of *H* in the growth was then 13.47%.

CONCLUSIONS

The research on the impact of particular factors on the economic growth indicated that the contribution of the EU funds to the investment expenditure in the schools of higher education caused a bigger impact of the factor on the GDP growth than in the cases when there was no the EU funding (the difference was 4.73 p.p.). Thus, in the view of the coming limitation of the EU funds, the following recommendations concerning the development of higher education can be presented:

1. Budget transfers to higher education should be treated as investments; the return on these investments should be reflected by: an increase in the investment expenditure change in line with the GDP growth rate or an

increase (or at least the maintenance) of the contribution of human capital to the economic growth on the present level.

2. The investment effectiveness of budget transfers to schools of higher education should be assessed by the employment rate among people with higher education which is understood as the ratio of people with higher education in employment to the whole population with higher education. This is important, as such a relation gives the answer to the question about the contribution of graduates to the production of goods and services, i.e. to GDP growth.
3. In the view of the coming limitation of the EU funding as a significant source of investment in schools of higher education it is important to ensure a constant relation of budget transfers for higher education to GDP at the minimum level of 1%; that will facilitate the maintenance of the investment level and will influence the level of human capital as a significant economic growth factor, especially considering a further transformation of the Polish and European economies. This process, i.a. constant GDP growth is to be maintained, requires the supply of a highly qualified workforce. Poland's experience, particularly in 2004–2013, indicates that both the structure of professional activity of people with higher education and their share in the total level of employment met the requirements of the economy and supported the increase of the significance of human capital in the economic growth (the average *H* for the period is 13.74%).

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INWESTYCJE W SZKOLNICTWO WYŻSZE A WZROST GOSPODARCZY – PROPOZYCJA DEKOMPOZYCJI MODELU MRW DLA POLSKI

STRESZCZENIE

Szkolnictwo wyższe stało się jednym z sektorów współczesnej gospodarki, która w coraz większym stopniu jest oparta na wiedzy. Jednym z dylematów państwa staje się finansowanie szkolnictwa wyższego oraz próba oceny skutków inwestycji czynionych w sektorze szkolnictwa wyższego. Celem artykułu jest określenie wpływu nakładów inwestycyjnych w szkolnictwie wyższym (w tym pochodzących z funduszy unijnych) na wzrost gospodarczy Polski mierzony tempem PKB. Hipoteza badawcza pracy zakłada, że wzrost gospodarczy wskutek poniesienia nakładów inwestycyjnych przez szkolnictwo wyższe, z udziałem funduszy unijnych, powoduje większy wzrost PKB niż w sytuacji braku dostępu do tych funduszy.

Wyniki otrzymanych badań dowodzą, iż zwiększone nakłady inwestycyjne szkół wyższych, spowodowane dostępnością funduszy strukturalnych Unii Europejskiej wpłynęły na wzrost poziomu kapitału ludzkiego w Polsce i zwiększyło jego oddziaływanie na tempo PKB.

Słowa kluczowe: inwestycje, szkolnictwo wyższe, wzrost gospodarczy, fundusze UE, model MRW