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AN ATTEMPT AT MEASURING THE EFFECTIVENESS OF HIGHER EDUCATION IN POLAND¹

Summary: In 2006, the European Commission presented the Modernization Agenda for Universities founded on three reforms: curricular, governance and funding. According to the agenda, funding should be based on output-oriented budgeting. What is more, investment in higher education should bring benefits to all stakeholders. The most commonly used tool for measuring the private rate of return to education is Mincer's econometric model. The paper presents the results of research on the private rate of return to education, which was estimated by the classical Mincerian function where wages are modelled as a function of level of education and experience. Empirical research was conducted using individual data from the Social Diagnosis – research of selected Polish households. The study was conducted in two stages. First, the parameters of the Mincer's model for respondents included in the diagnosis in 2011 were estimated. Secondly, the parameters of the model for respondents, who declared in 2011 having higher education degree and who took part in the diagnosis in previous years (since 2003) and then declared a lower (other than higher) level of education, were estimated. To determine the significance of differences in monthly net incomes before and after reaching the higher education degree, the Wilcoxon Matched-Pairs Signed-Rank Test was used.

Keywords: private rate of return to education, Mincerian earnings function, effectiveness, Wilcoxon Matched-Pairs Signed-Rank Test, modernization of higher education.

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1. Introduction

The modernization of the higher education system is one of the most important aims of the European Union. Good and qualitative education may play a crucial role in economic growth, influences social development, and what is more may also create jobs and bring prosperity to all stakeholders [Dziechciarz 2011].

The presented research is concentrated on the private concept of the rate of return to education, where the most popular method applied in the studies is Mincer's econometric model. The aim of the research is to measure the rate of return

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to education and the rate of return to experience (measured in years of working) for respondents included in the Social Diagnosis in 2011 by estimating the parameters of the Mincer model. Moreover, the parameters of the model for respondents, who declared in 2011 having a higher education degree and who took part in the diagnosis in previous years (since 2003) and then declared a lower (other than higher) level of education, were estimated. To determine the significance of the differences in monthly net incomes before and after reaching the higher education degree the Wilcoxon Matched-Pairs Signed-Rank Test was used.

2. European Union policy

There are several initiatives that concentrate on the modernization of higher education:

- The Bologna Declaration
- The Lisbon Strategy
- The Europe 2020 Strategy

The point of the Bologna Declaration was to reform the higher education system in the European Union member states. The principal goals agreed were: the creation of the European area for higher education, the adoption of a system of degrees which are easily readable and comparable, the establishment of a system of credits (ECTS European Credit Transfer System), the promotion of mobility, the assessment of quality assurance and increasing the international competitiveness of European tertiary education [Confederation of The EU Rectors Conferences and Association of European Universities 2000]. The main aim of the Lisbon Strategy was to create the most dynamic, competitive and knowledge-based economy in the world within a period of 10 years, where the key to achieving the appointed goal was to invest in human capital [European Commission 2010a]. The Europe 2020 Strategy determines the trend of higher education's development in the forthcoming years, and, similarly to the Lisbon Strategy, emphasizes the significance of educational policy both in economic development and in the fight against unemployment [European Commission 2010b]. According to the strategy the European Commission presented in 2006, the project of the Modernization Agenda for Universities (Delivering on the modernization agenda for universities: education, research and innovation), and in the 2011 Modernization Agenda (Supporting growth and jobs: an agenda for the modernization of Europe's higher education systems) which is a part of The European Strategy for Growth and Jobs [European Commission 2013].

Both agendas are founded on three reforms [European Commission 2012]:

- Curricular
- Governance
- Funding

Modernization of curricula is understood as a set of reforms of degree structures at national level. A new structure of degree should be two (Bachelor – Master) or

three (Bachelor – Master – Doctor) cycle and the first degree should be completed after a minimum of three years. The aim of the curriculum modernization is also improving the flexibility of learning paths (by diversifying the teaching model, adapting courses and specializations to the needs of the labour market but also by accessing various modes of education). Moreover, the curricula should be redefined in terms of competencies. Competence-based learning is possible by providing series of training courses and workshops for academic staff. Another point is to be in line with both national and European qualifications' frameworks. Important changes also apply to the mobility of students and academic staff. According to the reform, internationalisation should be the strategic goal of the system. Lastly, this modernization of curricula aims to provide recognition to universities. This is possible thanks to the diploma supplement and the ECTS credit points system [Center for Higher Education Policy Studies 2006].

Modernization in the area of governance is concentrated on increasing the autonomy and independence of universities, particularly in the area of developing own strategy, structures, management and personnel recruitment. Moreover, universities should also have autonomy in undertaking research and recruitment of students as well as in setting their own budget. The European Commission has also recommended the implementation, improvement and monitoring of internal and external quality assurance systems. Another goal is to establish or revamp of existing collaborations with institutions outside the academic environment and/or with industry [Center for Higher Education Policy Studies 2008a].

Funding reform consists of several goals. Firstly, modernization in this field is focused on diversifying revenue sources, both public and private. It is recommended that private sources should come from companies as well as from students, who are paying tuition fees. Students could get funds for tuition and maintenance from various loans and grants, which would be available after the accreditation agency's positive opinion on the institution. Students will be able to pay their loans back after finishing university. Secondly, it is recommended that higher education institutions receive funds from public sources determined by a funding formula, a negotiation based on a budget estimate or by the performance contracts. In each funding mechanism, the amount of funds should be based on the output of the university's activities. Lastly, investment in higher education should bring benefits to all stakeholders [Center for Higher Education Policy Studies 2008b].

All the above initiatives were created to emphasize the role of human capital in economic and social development.

3. Data

In the presented research the individual data from the Social Diagnosis² were used [Rada Monitoringu Społecznego 2003-2011]. Social Diagnosis is the panel research

² In the presented study, weights attached in the dataset were not taken into account. This may influence the representativeness of the sample and the accuracy of the results.

on selected Polish households and its members, and it reflects the conditions and quality of their life. The questions included in the questionnaire concern in particular economic conditions such as income³, investments, contracted credits, but also non-economic factors mainly in the areas of education, lifestyle and health. The data have been gathered since 2000. The measurements take place biennially in March (since 2007). The presented research focuses on the years from 2003 to 2011 [Diagnoza Społeczna 2013].

The study was conducted in two stages. Firstly, the parameters of the Mincers model for respondents included in the diagnosis in 2011 were estimated. The data sample size which was taken into account was 5965. Unfortunately, in 2011 there was no information about respondents' experience. Because of that, the presented research included only those respondents who had taken a part in the diagnosis in 2009 and had declared that they were employed, and those who also took part in the next diagnosis (in 2011) and were still working (experience in 2011 is equal to experience in 2009 plus two years). Secondly, the parameters of the model for respondents who declared in 2011 having a higher education degree and who took part in the diagnosis in previous years (since 2003) and then declared a lower (other than higher) level of education, were estimated. In a situation where over the years some respondents changed their qualifications and level of education several times, the research included only the most recent change. Monthly incomes were also corrected by inflation (where the base year was 2003). From the analysis, cases where income was below minimum wages in all the years were removed. Only those respondents who worked during the diagnosis (by a variable the number of years of service with their current employer, in the absence of this variable by – unemployment) were taken into account. As a result there were 152 cases. Table 1 provides the basic statistics about wages in 2011, before and after reaching a higher education degree.

Table 1. Basic statistics about wages

Variable	N	Mean [PLN]	Standard deviation [PLN]	Median [PLN]
2011	5 965	2 325	1 647	2 000
'before'	152	2 453	1 158	1 188
'after'	152	3 226	1 668	2 651

Source: own elaboration based on data from The Social Diagnosis [Rada Monitoringu Społecznego 2002-2011, *Diagnoza Społeczna: zintegrowana baza danych, 2003-2011*, www.diagnoza.com (04.08.2012)].

To determine the significance of the differences in monthly net incomes before and after reaching the higher education degree, a test for dependent samples was

³ Alternatively, Net Salary could be also used as money which could be spent on respondents' needs.

conducted. This test is used when the samples are paired (each observation of the first sample has a unique connection with the observation in the second sample). Because of the non-normal distribution of incomes in both groups: the 'before' and 'after' Wilcoxon Matched-Pairs Signed-Rank Test was used. A tested null hypothesis, stating the equality of median difference in paired observations is given by the following formula [Jackson 2011]:

$$H_0: M_d = 0.$$

For a big sample size, the test statistics is expressed by the formula [Howell 2009]:

$$Z = \frac{W - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24}}}$$

where: W is a sum of positive ranks and n is sample size. The p -value for the executed test was equal to 0,000. This allows to reject the null hypothesis so median incomes after reaching tertiary education level is higher than before.

4. The Mincerian earnings function and its implementation

The human capital theory was the basis of work on the rate of return to education. One of the main thesis in the human capital theory is that education and the improvement of workers' skills brings a rise in both productivity and wages [Becker 1994]. This means that returns to education are the reward for investing in education. Returns to education can be classified into five main categories [Psacharopoulos 2009]:

- Private.
- Social.
- Public.
- Fiscal.
- Pseudo-returns.

The private rate of returns is usually used to explain the students behaviour regarding demand for higher education. Another thing is assessing the effects of public education expenditure and the benefits of such expenditure. Private rate of returns is based on benefits and cost of education undertaken by the individual students [Psacharopoulos 1995]. The private benefits of education are [Dziechciarz 2011]: employability, earnings, mobility, labour market flexibility but also: better consumer efficiency and better health. The social rate of return summarizes the costs and benefits of the investment into education from the state or society as a whole. They refer to the full resource cost of education, and they are used to assess the efficiency of public spending on education [Psacharopoulos 1995]. The two next returns: the public and fiscal are similar to social, but in the case of public they take into account

extra taxes which are generated by the graduate and in the case of fiscal are related to the country's public finances. The last concept is pseudo-return, which measures the wage effect but does not take into account the cost incurred for achieving that advantage [Psacharopoulos 2009].

The presented research is concentrated on the most widely discussed concept of returns, which is private return to education. The framework to measure effectiveness of education, returns to schooling, returns to labour market experience and additionally returns to schooling quality [Heckman et al. 2003] is an econometric model developed by J. Mincer (1958, 1974) called the Mincerian earnings function. The Mincerian approach based on individual-level data. The basic earnings function is based on semi-log ordinary least squares regression using logarithm of incomes as the dependent variable, and the level of years of schooling and years of seniority as independent variables⁴ [Psacharopoulos 1994]. This model can be expressed by the formula [Mincer 1974]:

$$\ln Y = \alpha + \rho s + \beta_0 x + \beta_1 x^2 + \xi$$

where: Y is earnings, s is schooling level or years of study, x is work experience. In equation (3) ρ can be interpreted as the average private rate of return to schooling (with the assumption that all schooling costs are opportunity costs) [Polachek 2007], β is related to both the amount and the financial return to on-the-job training, and α is related to initial earnings capacity. Mincer's model can also be modified by other dummy factors, which have an influence on incomes and referring to the completion of education cycles. For example: gender, age, place and class of residence, major of the studies, occupation and sector of employment. The results for the first (taking into account all respondents in 2011) model are presented in Table 2.

Table 2. Parameter estimates of Mincer's model (2011)

Variable	Coefficients	p-value
Constant	6,729	0,000
Years of study (s)	0,053	0,000
Experience (x)	0,015	0,000
Quadratic experience (x)	0,000	0,000

Source: own elaboration based on data from The Social Diagnosis [Rada Monitoringu Społecznego 2002-2011, *Diagnoza Społeczna: zintegrowana baza danych, 2003-2011*, www.diagnoza.com (04.08.2012)].

Each of the parameters is significant at the 0.05 level of significance. The coefficient of determination is 13%. The rate of return to education is 5,3%, and the rate

⁴ Both variables are understood as expenditure on education.

of return to experience is about 1,5%. The parameters for models for two samples: 'before' and 'after' are given in the following tables.

Table 3. Parameter estimates of Mincer's model 'before'

Variable	Coefficients	<i>p</i> -value
Constant	7,474	0,000
Years of study (s)	-0,001	0,943
Experience (x)	0,034	0,000
Quadratic experience (x)	-0,001	0,006

Source: own elaboration based on data from The Social Diagnosis [Rada Monitoringu Społecznego 2002-2011, *Diagnoza Społeczna: zintegrowana baza danych, 2003-2011*, www.diagnoza.com (04.08.2012)].

In the 'before' model, variable: the years of study, is not significant (at the 0.05 level of significance). This could mean that in this case the most important is experience⁵. After rejecting the non-significant variable, the parameters of the Mincer model ('before'), were estimated once again (Table 4).

Table 4. Parameter estimates of Mincer's model 'before'

Variable	Coefficients	<i>p</i> -value
Constant	7,458	0,000
Experience (x)	0,034	0,000
Quadratic experience (x)	-0,001	0,006

Source: own elaboration based on data from The Social Diagnosis [Rada Monitoringu Społecznego 2002-2011, *Diagnoza Społeczna: zintegrowana baza danych, 2003-2011*, www.diagnoza.com (04.08.2012)].

For the presented model, after rejecting the non-significant variable, the coefficient of determination is 17%, and the rate of return to experience, after 10 years of working, is nearly 1,4%.

Table 5 provides the results for the model 'after'.

⁵ The value of the classic coefficient of variation for variable: years of study 'before', is near 14%. This means that the variable has the possibility of diversification.

Table 5. Parameter estimates of Mincer's 'after'

Variable	Coefficients	<i>p</i> -value
Constant	6,584	0,000
Years of study (s)	0,066	0,002
Experience (x)	0,031	0,001
Quadratic experience (x)	-0,001	0,017

Source: own elaboration based on data from The Social Diagnosis [Rada Monitoringu Społecznego 2002-2011, *Diagnoza Społeczna: zintegrowana baza danych, 2003-2011*, www.diagnoza.com (04.08.2012)].

In the model 'after', each of the parameters is important at the 0.05 level of significance, the coefficient of determination is 20% and the rate of return to education is 6,6%. Rate of return to experience at 10 years of working is 1,1%.

5. Conclusion

The aim of the conducted analysis was to assess the rate of return to education in 2011 and the influences of the level of education on wages of people before and after obtaining higher education degree. Based on the conducted research, some general conclusion can be drawn:

- the level of education significantly influenced monthly net incomes,
- wages of people after obtaining higher education degree are considerably higher than their wages before obtaining higher education degree, and are higher by 773 PLN,
- experience has the biggest influence on monthly net incomes of people before obtaining higher education degree,
- the global rate of return to education in 2011 is above 5%, and the rate of return to education in 2011, for people with a higher education degree it is nearly one percentage point higher,
- not well -fitting data points to a statistical model which could be a result of the existence of, other than years of education and experience variables which have an influence on wages: gender, age, region of living, major or occupation,
- the Mincerian earning function may be modified by added a new variables.

The presented research is the basis for measuring the effectiveness of higher education in Poland and for the improvement of the existing methods of measuring the private rate of return to education.

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PRÓBA POMIARU EFEKTYWNOŚCI SZKOLNICTWA WYŻSZEGO W POLSCE

Streszczenie: Modernizacja szkolnictwa wyższego jako czynnika rozwoju gospodarczego jest obecnie jednym z ważniejszych priorytetów Unii Europejskiej. W 2007 r. Komisja Europejska przedstawiła Agendę modernizacyjną szkół wyższych, w której zapowiedziała reformę trzech kluczowych dla rozwoju gospodarki obszarów: programów nauczania, zarządzania i finansowania. Zgodnie z agendą finansowanie szkolnictwa ma się opierać na efektach. Co więcej, inwestycje w szkolnictwo wyższe powinny przynosić korzyści wszystkim zainteresowanym stronom. Najczęściej stosowanym narzędziem pomiaru korzyści indywidualnych, a więc efektywności kształcenia, jest model Mincera. W pracy zaprezentowano wyniki badań nad prywatną stopą zwrotu w edukację, oszacowaną za pomocą klasycznej (wyrażonej za pomocą liczby lat nauki i stażu pracy) funkcji zarobków Mincera. Do analizy wykorzystano dane indywidualne Diagnozy Społecznej – badania mierzącego warunki i jakość życia Polaków. Badania przeprowadzono dwuetapowo. W pierwszym kroku zbudowano model dla wszystkich respondentów ujętych w Diagnozie Społecznej w 2011 r. Następnie zbudowano osobne modele dla respondentów, którzy w badaniu przeprowadzonym w 2011 r. zadeklarowali wykształcenie wyższe oraz brali udział w diagnozie w poprzednich latach (od roku 2003) i deklarowali wtedy niższy (inny niż wykształcenie wyższe) poziom wykształcenia. Aby stwierdzić istotność różnic w dochodach przed osiągnięciem i po osiągnięciu wykształcenia wyższego przeprowadzono uprzednio test Wilcoxona dla par obserwacji.

Słowa kluczowe: stopa zwrotu z edukacji, funkcja zarobków Mincera, efektywność, test Wilcoxona dla par obserwacji, modernizacja szkolnictwa.