

The wage premium from parents' investments in the education of their children in Poland

The aim of this paper is to determine whether parents' investments in the education of children in Poland have an impact on the wages of the latter in adulthood. To answer this question, an extended Mincer wage equation was estimated using OLS on the basis of data from the nationwide tracer survey of Polish graduates conducted in 2007. The results of the analysis show that parents' investments in the education of their children have a strong, positive impact on the first earnings after the end of formal education. This relationship is observed when the investment is depicted with the education level of each parent, as well as when represented by the child's participation in various extra-curricular activities. Furthermore, if any of the above measures of parents' investment is included in the equation, the wage premium from formal education decreases. In particular, when both these measures of parents' investments are included in the model, the tertiary education premium declines by about one quarter, while the secondary vocational education and secondary general education are no longer significant determinants of the graduates' wages (as compared to basic vocational education).

Key words: investment in human capital, formal education, extra-curricular activities, wage premium, wage equation

JEL codes: I26, J24

1. Introduction

Wage premium from education has been estimated in hundreds of studies for more than forty years since the human capital paradigm was developed (Schultz, 1961; Becker 1964; Mincer 1974).¹ Education, whether expressed in terms of years of schooling, or measured by the education level, has been found to have a positive impact on earnings. Therefore, the rate of return on education computed on this basis substantiates decisions to invest in education. The academic boom observed in Poland since the early 1990s, manifested by a rapid increase of the net enrolment ratio in higher education from 9.8% in 1990 up to 40.9% in 2009,² demonstrates, that education is perceived as a key determinant of professional success.

Over years, numerous reservations have been raised against using the Mincer equation as a tool for estimating the wage premium from education. According to the signalling theory (Spence 1973) – an extreme example of such a reservation – the wage premium results solely from the diversity of individuals according to their ability and as such, it will appear even if formal education does not provide any skills that might be useful on the job. In a situation like this, formal education is only a tool for classifying the population according to abilities (Arrow 1973; Stiglitz 1975).

Furthermore, the role of inherent abilities and parents' investment in the education of their children in determining the level of future earnings is emphasised (Leibowitz 1974, Becker & Tomes 1976). Studies published in recent years stress that as a result of parents' investment choices, children develop not only cognitive, but also non-cognitive skills³ (Carneiro & Heckman 2003; Heckman & Masterov 2004; Cunha et al., 2006). Contributing to this literature, Cunha and Heckman (2007) developed a model of skill formation over the life cycle, which proves that parents, when investing their time and money in the education of their children, increase their earning potential via two channels. Firstly, in a direct way, through equipping their children with skills – both cognitive and non-cognitive – in their early childhood, so as to enable them to acquire further knowledge and skills in the formal education process. The more skills a child has when entering school, the more effective schooling will be, since according to Cunha and Heckman (2007) skills are self-productive. Secondly, parents have an indirect impact on their children's future earnings, through providing them with skills that are useful in the labour market, but cannot be acquired at school or university. Hence, if the wage equation does not include the stock of skills at the start of schooling and parental investments made in the schooling period, then, if there is selection of those most talented for non-compulsory schooling, the wage premium from education may be overestimated.

This thesis is supported by research. Firstly, studies show that cognitive and non-cognitive skills of children aged 5-7 have a positive impact on their earnings in adulthood and, if included in the wage equation, translate into a lower wage premium from education (Naylor, Smith and Telhaj 2015; Carneiro, Crawford and Goodman 2007; Blanden, Gregg and Macmillan 2007). Secondly, studies document that parents' investments in the education of

¹ Overviews of such studies can be found e.g. in: Psacharopoulos (1994), Card (1999), Harmon, Oosterbeek and Walker (2003), Psacharopoulos and Patrinos (2004), Heckman, Lochner and Todd (2006).

² See: GUS (2010) and GUS (2015).

³ The concept of "non-cognitive skills", although criticised by some psychologists (e.g. Gutman and Schoon, 2013) has been commonly accepted in the literature for denoting all skills that are not measured using IQ and achievement tests. It is used interchangeably with such terms as "socio-emotional skills", "personality traits", "personal characteristics", "soft skills", although they all differ to a certain degree in fact. (Kautz et al., 2014).

their children – represented in the wage equation by such variables as: parents' education level, their income, occupation or interest in the child's educational progress – have a positive impact on children's earnings in adulthood, this influence being both direct (Crawford, Vignoles 2014; Carneiro, Crawford and Goodman 2007) and indirect, that is via the effect on the wage premium from education (Naylor, Smith and Telhaj, 2015). Furthermore, research indicates a positive direct impact of investments represented by the child's participation in extracurricular activities (Lleras 2008).

There have been numerous studies on the wage premium from education in Poland⁴, but so far only in one of them (Flabbi, Paternostro and Tiongson 2008) parental investments in education of their children were included in the wage equation.⁵ Earnings in adulthood were found to be positively related to parental investments, both directly and indirectly. It should be noted however, that this analysis covers the initial period of the economic transformation in Poland only (1991-1993) and it is based on a relatively modest research sample.⁶ The wage premium from parents' investments in extracurricular activities of their children in the period of formal education has not been analysed in Poland so far.

The aim of this paper is to determine whether the parents' investments in the education of children in Poland have an impact on the wages of the latter in adulthood and whether this influence is direct or indirect. To answer these questions, an extended Mincer wage equation was estimated using OLS on the basis of data from the nationwide tracer survey of Polish graduates conducted in 2007.⁷ Unlike other Polish nationwide sampling studies of economic activity in the labour market (PLFS – Polish Labour Force Survey, HCB – Human Capital Balance, HBS – Household Budgets Survey), this one provides detailed information about various forms of investments in human capital in the period of formal education.

The results of the analysis show that parents' investments in the education of their children have a strong, positive impact on the first earnings after the end of formal education. This influence is identified when investments are measured by the parents' education level, as well as when represented by the child's participation in various extracurricular activities. Furthermore, parental investments have also an indirect impact on their children's earnings in adulthood, as indicated by the decline in the wage premium from education, when any of the above investment measures is included in the wage equation.

The paper is structured into three sections. In the first one, we discuss the process of human capital formation. The second chapter offers an overview of recent empirical research on the wage premium from parents' investments in the education of their children. The third section presents our own empirical analysis of Polish data. The paper ends with the key conclusions from our study.

⁴ The following authors analysed the subject of wage premium in Poland after 1990: Rutkowski (1996); Bedi (1998); Newell and Reiley (1999); Weisberg and Socha (2002); Keane and Prasad (2006); Strawiński (2006); Newell and Socha (2007); Strawiński (2007); Flabbi, Paternostro and Tiongson (2008); Morawski, Myck and Nicińska (2009); Gajderowicz, Grotkowska and Wincenciak (2012); Szreder et al. (2012); Majchrowska and Roszkowska (2013); Majchrowska and Roszkowska (2014).

⁵ It was father's education represented by the years of schooling.

⁶ The data source was the International Social Survey Program (ISSP); the research sample of ca. 500 economically active individuals for each year.

⁷ The „Badanie aktywności zawodowej absolwentów w kontekście realizacji programu Pierwsza praca” survey (Labour market activity of graduates in the context of the „First Job” Program) was carried out by the Central Statistical Office of Poland (GUS) in the years 2006-2007. The survey covered more than 20 thousand respondents who completed their formal education in the years 1998-2005. The data gathered reflect graduates' professional path over the first three years after graduation, with a special focus on their first job.

2. The process of human capital formation

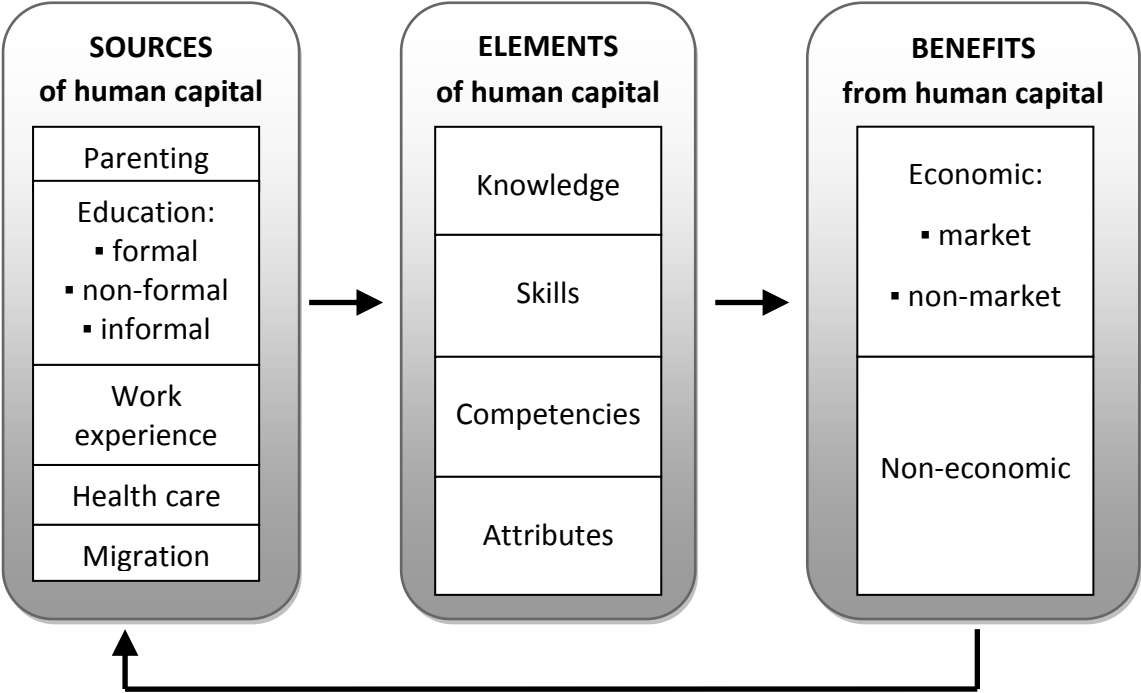
The literature defines human capital in many ways.⁸ Typically, according to the approach proposed by Schultz (1961), human capital is referred to as “the skills, the knowledge and all the attributes that can improve the individual’s productivity”. Becker (1964) expanded on this definition and argued that human capital can be a result of “the individual’s natural endowment, as well as investments in education, training and experience”. OECD, which has been measuring human capital in international sample surveys of the youth and adults for years, emphasises that in addition to knowledge and skills, the attitudes determining how these resources are used in one’s professional practice are also important, these attitudes being referred to as “competencies”. (OECD 2013).

Researchers agree that human capital is built through an investment process, a general diagram of which is presented in Figure 1 (Boarini, Mira d'Ercole and Liu 2012). Investments can take a variety of forms, such as parenting, education (formal, non-formal, informal), health care or economic migration. Furthermore, investing may occur through work, since human capital, unlike physical capital, grows when used and shrinks if not used.

Investments in human capital may translate into both economic and non-economic benefits, the former having market and non-market aspects. The market-related benefits stem from the individual’s competitive advantage in the labour market and are demonstrated by the enhanced employability, higher earnings or better career prospects. The non-market benefits involve a greater productivity of one’s unpaid activities, such as household work for example. The non-economic benefits include a better health condition and a greater life satisfaction. What is important, both economic and non-economic benefits translate into a further growth of human capital, since they enhance the motivation to invest in human capital and provide more funds that can be assigned to this purpose. Figure 1 shows this process as a feedback effect. Hence, a high stock of human capital stimulates its further growth.

⁸ An extensive overview of the human capital definitions is given by Zalewska-Turzyńska (2014).

Figure 1. Human capital: its formation, composition and benefits generated



Source: adapted from Boarini, Mira d'Ercole i Liu (2012).

Cunha and Heckman (2007) propose a model which illustrates the process of skill formation in the initial phase of life– from the prenatal stage until adulthood (see Figure 2). The model assumes that both cognitive and non-cognitive skills are developed as a result of a multistage process, its inputs including the skills acquired at the former stages of life, parental investments and contributions from the child’s environment and educational institutions (school, university). Every human being is endowed with some skills at birth – this is a result of both innate abilities and prenatal investments made by the child’s parents.⁹ The increment of skills in the pre-school period is directly proportional to the stock of skills at birth and parental and environmental investments. Similarly, the increment of skills over the period of formal education depends on the stock of skills at the moment of entering school, the parental and environmental investments, and the contribution from school.

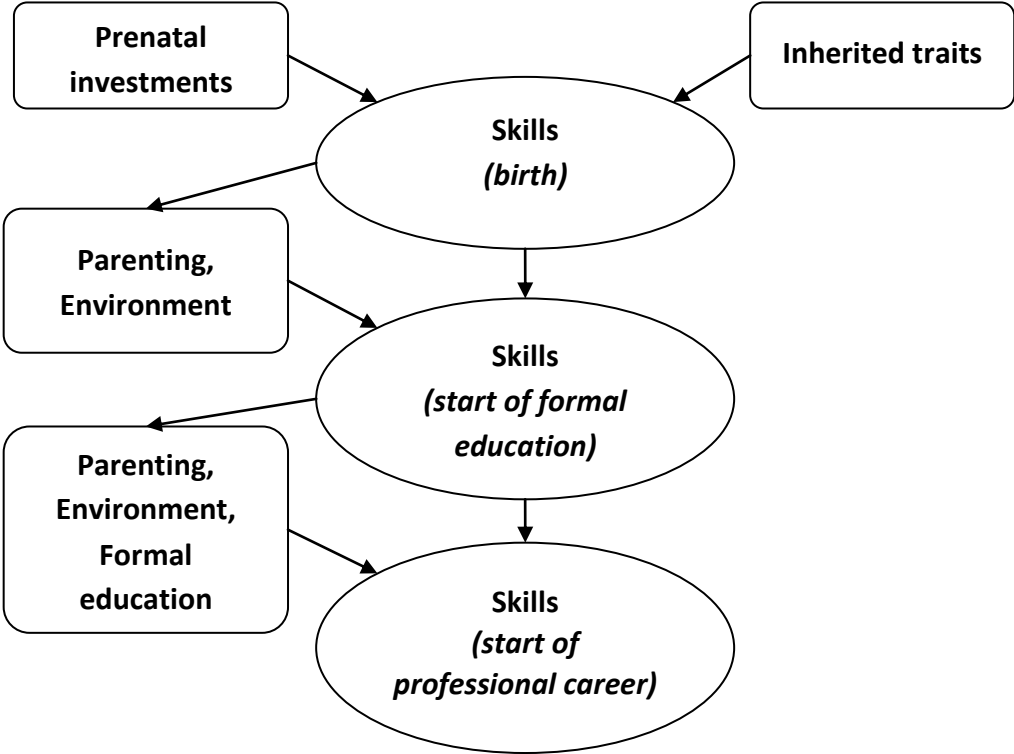
According to the model, skills are characterised by two key features: self-productivity and complementarity. Self-productivity means that skills embodied in one period persist into future periods. For example, a child who acquires the skill of concentrating on a task will be able to learn more at school. This property is summed up by Cunha and Heckman (2007) in a brief statement that “skills beget skills”. Secondly, the model assumes that skills are statically and dynamically complementary. Static complementarity means that the increment of skills resulting from investments is directly proportional to the initial stock of skills. For example, the longer a child is able to stay focused, the more he or she will be able to learn in a class.¹⁰ Dynamic complementarity, on the other hand, implies that skills produced as a result of investments at one stage raise the productivity of investments to be made at subsequent

⁹ Research findings show that both these factors affect educational choices and earnings as well (Björklund, Jantti and Solon 2007).

¹⁰ This is supported by research findings, see: Raver, Garner and Smith-Donald (2007).

stages. Hence, skill investments at different stages are synergistic. For example, investing in a speed reading course will add to benefits from buying books in the future. Each of these features produces a multiplier effect – the greater the initial stock of skills, the greater the increment is. This leads to a conclusion that the sooner investments are made, the bigger their impact on the stock of skills is.¹¹

Figure 2. Process of skill formation at early stages of the life cycle



Source: adapted from Kautz et al. (2014).

According to the model presented above, skills, and consequently graduates’ future earnings, can be strongly dependent upon parental investments.¹² Firstly, this effect can be a direct one – when the child acquires skills which are useful in the labour market but which could not be acquired in any other way (at school or as a result of environmental influences). Secondly, it can be indirect, since the stock of skills acquired in the pre-school period, i.e. when parents are the main investor, determines the volume and the productivity of school investments. Children entering school with greater skills experience higher increment of skills with a given level of school investments – which follows from static complementarity of skills – but at the same time school investments will be higher (e.g. in the form of free extracurricular activities or free tertiary education) – as dynamic complementarity of skills implies – adding to the growth in skills level.¹³ Hence, skills developed as a result of parental

¹¹ Evidence can be found in the work of O’Connor et al. (2000), Barnett (2004).

¹² The essential role of parents in the formation of cognitive and non-cognitive skills is supported by numerous empirical studies (e.g. Carneiro and Heckman 2003; Cunha, Heckman, Lochner and Masterov 2006; Heckman and Masterov 2004). These findings indicate that parental abilities and commitment to the upbringing and education of their children have a positive effect on the cognitive and non-cognitive skills of the latter in adulthood.

¹³ This implies that formal education should add to skill differences among students. Evidence can be found in empirical studies, see: Hansen, Heckman and Mullen (2004); Heckman, Larenas and Urzua (2005).

investments and those provided by schools should be positively correlated, and both should have a positive impact on earnings.

3. Literature review

The main focus of studies on private effects of human capital investments is on estimating the wage premium or the rate of return from formal education. Most frequently, the Mincer wage equation is used for this purpose, with years of schooling or education level as a measure of investment in formal education. The equation is based on an assumption that formal education and years of work (representing professional experience and on-the-job training) are the only determinants of human capital acquired by an individual. Yet, if the stock of human capital and, consequently, future earnings are determined also by some other factors, which are correlated with formal education, then omitting them in the model may result in a biased estimator of the wage premium from formal education. In the light of the model of skill formation in the initial period of life (Cunha and Heckman 2007), the Mincer wage equation neglects innate abilities, as well as investments by parents and the environment. Therefore, attempts have been made to expand the wage equation and include variables representing these factors.

Hanushek and Woessmann (2008) proposed a model, in which individual earnings (Y) are a function of the human capital stock represented by: abilities (A), family investments (F), formal education (S) and other factors (X), including professional experience and health status. Hence, the wage equation takes the following form:

$$(1) \quad Y = \alpha A + \beta F + \gamma S + \delta X + \varepsilon$$

where stochastic term (ε) represents idiosyncratic earnings differences.

In the equation presented above, the stock of human capital is represented – similarly as in the Mincer wage equation – by key inputs to the process of human capital formation. What variables will be used as measures of specific input categories, depends on the availability of data. Abilities are usually measured using the intelligence quotient (Herrnstein and Murray 1994; Jensen 1998), but this variable is relatively seldom available in databases. Therefore, an alternative approach is adopted, where pre-school or pre-college cognitive and non-cognitive skills (H_c and H_n respectively) are included in the wage equation (Heckman, Stixrud i Urzúa 2006). Then, the wage equation would be as follows:

$$(2) \quad Y = \theta H_c + \sigma H_n + \beta F + \gamma S + \delta X + \vartheta$$

Furthermore, cognitive skills are measured by: reading comprehension and numerical reasoning test scores (Naylor Smith and Telhaj 2015), university admission test achievements (Crawford and Vignoles 2014; Chia and Miller 2007), secondary school graduation test scores (Naylor Smith i Telhaj 2015). Non-cognitive skills are most often represented by various indirect measures based on behaviour patterns observed. Information about respondents' behaviour in their childhood is obtained from their teachers, parents or respondents themselves.¹⁴ Most frequently children are observed in their pre-school or school environment. Observation includes such behaviours, as: peer relations, interaction with adults (willingness to interact, hostility), conduct in classes (active, passive, disruptive), work habits and conscientiousness (doing homework, punctuality, attendance). The behaviours observed are used as separate measures of non-cognitive skills

¹⁴ According to some authors, teachers and pedagogues, being objective, are the best sources of information.

(Lleras 2008; Blanden, Gregg and Macmillan 2007) or as a basis for compound measures (Carneiro, Crawford and Goodman 2007; Segal 2013; Naylor, Smith and Telhaj 2015).

Parental investments are usually represented in wage equations by those of the parents' features that have a potential of being correlated with their willingness to invest in the education of their children. These include: parents' education, their income, occupation, employment status, or interest in the child's educational progress (Naylor, Smith and Telhaj 2015; Freier, Schumann and Siedler 2015; Crawford and Vignoles 2014; Carneiro, Crawford and Goodman 2007). Direct measures, such as child's participation in educational activities requiring parents to bear a cost, are less common. An example of such a measure is participation in extracurricular activities (Rosenbaum 2001; Lleras 2008).

Research has shown that skills, both cognitive and non-cognitive, of children aged 5-7 are strong determinants of their earnings in adulthood (Carneiro, Crawford and Goodman 2007; Blanden, Gregg and Macmillan 2007). Furthermore, wages are found to be affected by parents' investments in the education of their children, whether the latter are represented in the wage equation by such parental characteristics as: education, income, occupation and interest in child's educational progress (Naylor, Smith and Telhaj 2015; Crawford and Vignoles 2014; Carneiro, Crawford and Goodman 2007), or measured by the child's participation in extracurricular activities (Lleras 2008). Last but not least, Naylor, Smith and Telhaj (2015) found out that the inclusion of variables reflecting pre-school skills and parents' investments in the wage equation resulted in a lower wage premium from education.¹⁵

There have been numerous studies on the wage premium from education in Poland.¹⁶ They were based on data from various sources.¹⁷ It is a common feature of these analyses that they apply the Mincer wage equation estimated using OLS, with or without the Heckman correction. While many different specifications have been used, there has been only one analysis so far (Flabbi, Paternostro and Tiongson 2008) in which a variable depicting parental investments was included in the wage equation (it was father's years of schooling). This variable was found to have a significant positive impact on wages. Besides, when it was included in the linear regression model estimated using OLS, the wage premium from the tertiary education decreased by ca. 2 percentage points. It should be noted however, that this analysis covers the initial period of the economic transformation in Poland only (1991-1993) and is based on a relatively modest research sample (ca. 500 respondents each year) which comes from ISSP (International Social Survey Program).

¹⁵ To be specific, the study refers to a premium for the class of degree achieved in the UK.

¹⁶ See: Rutkowski (1996); Bedi (1998); Newell and Reiley (1999); Weisberg and Socha (2002); Keane and Prasad (2006); Strawiński (2006); Newell and Socha (2007); Strawiński (2007); Flabbi, Paternostro and Tiongson (2008); Morawski, Myck and Nicińska (2009); Gajderowicz, Grotkowska and Wincenciak (2012); Szreder et al. (2012); Majchrowska and Roszkowska (2013); Majchrowska and Roszkowska (2014).

¹⁷ In most cases, individual data were sourced from: BAEL – Population's Economic Activity Survey, BBGD – Home Budgets Survey, the October survey of wages conducted by the Central Statistical Office in Poland, see: GUS (2016).

4. Empirical analysis

The aim of this paper is to determine whether parents' investments in the education of children in Poland have an impact on the wages of the latter in adulthood and whether this effect is direct or indirect.

4.1. Data

The analysis is based on data from the nationwide tracer survey of Polish graduates conducted by the Central Statistical Office of Poland (GUS) in the years 2006-2007. The focus of the survey was on the economic activity of graduates of various school types over the period of the first three years after the completion of formal education, with special attention to the first job after the graduation. The nationwide survey was conducted on a sample of 20 251 persons who completed their formal education between 1 January 1998 and 31 December 2005 (at basic vocational schools, technical secondary schools, general secondary schools, post-secondary schools, universities). The population was limited to individuals who did not exceed 27 years of age at the time of graduation and the break between the next-to-last and the last stage of education was not longer than 12 months.¹⁸

The reason behind choosing namely this database is that, unlike other Polish nationwide sampling studies of economic activity in the labour market (PLFS – Polish Labour Force Survey, HCB – Human Capital Balance, HBS – Household Budgets Survey), this one provides detailed information about various forms of investments in human capital in the period of formal schooling. In particular, it contains information about the participation in various types of extracurricular activities at school and outside it (e.g. foreign language classes, IT classes, sports and tourism, artistic and technical activities, scouting).

As a dependent variable, we used an hourly wage rate¹⁹ computed on the basis of the net wage and the number of working hours in the first job after graduation, provided that the respondent undertook employment within a year after the graduation. Consequently, the following respondent categories have been eliminated from the database: 1) individuals who did not work within the first year after ending formal education, 2) self-employed and family members supporting them, since none of these groups was asked about earnings, 3) hired workers who did not disclose their income. Eventually, the sample used for the analysis comprised 6403 observations.

4.2. Method of analysis

Based on the overview of theoretical and empirical literature, as well as some preliminary analyses, we formulated the wage equation as follows:²⁰

$$(3) \quad w_i = S_i\beta_1 + F_i\beta_2 + X_i\beta_3 + \varepsilon_i$$

¹⁸ A detailed description of the methodology can be found in ASM (2008).

¹⁹ To be more precise, a natural logarithm of hourly rate.

²⁰ Initially, due to the suspected self-selection of the sample, the wage model was estimated using Heckman's two-step approach (Heckman 1979). Besides variables present in the wage equation, three additional variables were used in the selection equation: marital status, number of children, family model (both / one of the parents working). Yet, since the results did not show any self-selection bias, we finally decided to estimate the linear regression model using OLS.

where dependent variable (w_i) represents the natural logarithm of the first net hourly rate earned by graduates in the first job after completing formal education, provided that they undertook employment within the first year after graduation.²¹ Independent variables include: (S_i) – education level, (F_i) – vector of variables depicting parents’ investment in the education of their child, (X_i) – vector of variables which covers other individual traits of graduates and characteristics of the local labour market. All independent variables are listed in Table A1 in the Appendix. The linear regression model above was estimated using OLS, by computing heteroscedasticity-resistant variance estimations.

The problem encountered in the context of this analysis is that the database used in the analysis does not contain any variable that might be a direct measure of cognitive and non-cognitive skills at the start of formal education. Among the variables available in the database, the grade point average from the diploma of the last school attended seems to be the closest approximation of these skills. Indeed, grade point average is often accepted as a measure of cognitive and non-cognitive skills (Chia and Miller 2007; Feng-Liang, Xiaohao and Morgan 2009; Naylor, Smith and McKnight 2002; Naylor, Smith and Telhaj 2015; Freier, Schumann and Siedler 2015), although using it seems more justifiable when comparing graduates from the same educational stage than those ending education at different stages. In addition, it seems doubtful if the measure of skills at the moment of graduation may be a good approximation of skills at the start of schooling. Therefore, we chose not to include the grade point average in the model. Under the circumstances, the variables depicting the parents’ and school investments may be biased. If the amounts of both these investments are directly proportional to child’s abilities – as assumed by Cunha and Heckman (2007) – the bias will be positive, i.e. the wage premium from parents’ and school investments will be overestimated.²²

4.3. Results

To analyse the effect of each variable representing parents’ investments in the education of their children on graduates’ first earnings, as well as on the wage premium from formal education, we estimated a dozen model specifications. The first specification, besides control variables (gender, age, place of residence, region, year of graduation), encompasses the level of formal education only, more variables to be added gradually further on (Table 1).

The results show that the wage premium increases along with the level of formal education, but its value depends on the model specification. When formal education level is the only variable representing the stock of human capital, the wage premium accounts for 8% and 11% for graduates of general secondary schools and secondary vocational schools²³ respectively (against graduates of basic vocational schools, who are base category), while premiums obtained by graduates of bachelor’s/engineer’s and master’s degree programs are much higher and reach as much as 42% and 55% respectively (specification 1).²⁴

²¹ For the sake of comparability of the initial earnings of graduates who started their first job in different years (1998-2005), initial hourly rates were adjusted by the Consumer Price Index, with 2005 as the base year.

²² According to Becker and Tomes (1976), parents seeking to maximize the utility of investing in children, provide able children with human capital, while those less able with other capital types (financial, physical).

²³ The latter category comprises graduates of technical secondary schools, profiled secondary schools and post-secondary schools.

²⁴ Percentage increments were computed using the coefficients presented in Table 1, according to the following formula: $\Delta\% = \exp(\beta) - 1$.

Table 1. Estimates of the graduates' first wage equation

<i>Model specification</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Education: secondary general	0.104***	0.061**	0.070***	0.054**	0.083***	0.098***	0.097***	0.099***	0.104***	0.103***	0.073***	0.033
Education: secondary vocational	0.074***	0.046**	0.048**	0.041**	0.063***	0.069***	0.068***	0.072***	0.072***	0.073***	0.056***	0.029
Education: tertiary, bachelor's engineer's	0.348***	0.298***	0.299***	0.287***	0.329***	0.343***	0.343***	0.346***	0.346***	0.347***	0.324***	0.274***
Education: tertiary, master's degree	0.440***	0.369***	0.376***	0.357***	0.408***	0.434***	0.431***	0.437***	0.441***	0.440***	0.402***	0.333***
Father's education: unknown		0.094*		0.094*								0.091*
Father's education: basic vocational		0.073***		0.068***								0.067***
Father's education: secondary		0.158***		0.140***								0.136***
Father's education: tertiary		0.270***		0.241***								0.230***
Mother's education: unknown			0.026	-0.025								-0.026
Mother's education: basic vocational			0.035	0.004								0.003
Mother's education: secondary			0.100***	0.031								0.026
Mother's education: tertiary			0.184***	0.051								0.033
Extracurricular activities: language classes					0.130***						0.113***	0.095***
Extracurricular activities: IT classes						0.097***					0.050*	0.041
Extracurricular activities: sports and							0.060***				0.036*	0.028
Extracurricular activities: artistic activities								0.088***			0.053	0.050
Extracurricular activities: technical									0.122**		0.094	0.097*
Extracurricular activities: scouting										0.129**	0.096*	0.071
Number of observations	6,403	6,403	6,403	6,403	6,403	6,403	6,403	6,403	6,403	6,403	6,403	6,403
R2	0.115	0.128	0.122	0.129	0.121	0.117	0.117	0.116	0.116	0.116	0.123	0.135
p-value of F-statistics	0	0	0	0	0	0	0	0	0	0	0	0

Note: Each specification includes additionally: gender, age when first employed, place of residence, region (province), year of graduation; ***/**/* stand for 1%, 5% and 10% significance level respectively.

Source: Authors' own analyses based on unit data from the nationwide tracer survey of Polish graduates conducted in 2007.

Parental investments in education are depicted by two groups of variables in the model: parental education level and participation in extracurricular activities at the last stage of formal education. They were chosen due to the availability of data, as well as for theoretical and empirical reasons.

According to Leibowitz (1974), the level of parental education is related to:

- 1) the quantity and quality of parents' time spent on educating their children,
- 2) the quantity and quality of educational goods and services purchased by parents for their children.²⁵

The results of empirical research indicate that this relation is positive in both cases. Firstly, parents with a university degree spend more time on active childcare, which includes conversation, listening, reading, playing games and teaching (Craig 2006; Kitterod 2002; Yeung et al. 2001). At the same time, activities of this type are found to contribute the most to the child's human capital (Brooks-Gunn, Han and Waldfogel 2002). Secondly, data from surveys conducted in Poland prove that parental education level has a positive impact on private expenditures on the education of children (Rokicka and Sztanderska 2013; Kłobuszewska 2014).

The database used for the empirical analysis provides information about each parent's level of education.²⁶ When mother's and father's education level is included in separate specifications, each of them has a positive effect on the child's future earnings, the impact of father's education being stronger however (specification 2 and 3). On the other hand, when both these variables are included in one and the same specification, it is only father's education that adds significantly and positively to graduate's earnings (specification 4).²⁷ The likely reason is that men's contribution to the household income is greater and consequently, there is a stronger correlation between father's than mother's education and the household income. When expanded by parental education level, the model shows a significant decline in the child's educational wage premium— from 55% to 43% for graduates of master's studies. Based on the model of skill formation (Cunha and Heckman, 2007), this outcome can be interpreted as evidence that parents provide their children with skills that are useful in the process of formal education and afterwards also in their professional life.²⁸

Child's extracurricular activities when attending the last school (or university) is an alternative measure of parental investments.²⁹ In this case, the investment comprises not only the direct cost of participation (e.g. attendance fees, cost of materials and travelling), but also, or maybe even mostly, the cost of equipping the child with the basic skills that predetermine or inspire extracurricular participation. It seems that extracurricular participation can be encouraged both by cognitive skills and a variety of non-cognitive skills, such as: intellectual curiosity, sociability, pro-activeness, assertiveness, conscientiousness,

²⁵ Looking more broadly and leaving the human capital paradigm, one can see that parental education represents cultural and social capital too and these two values can also be passed to children and have an effect on their future earnings (Farkas 2003).

²⁶ "Education unknown" is an additional class within this variable, which should be identified as the lack of a parent most probably.

²⁷ A similar outcome is reported by Carneiro, Crawford and Goodman (2007).

²⁸ Since the positive effect of father's education was suspected to be, to some extent, a result of father's help in finding the first job, a variable reflecting relatives' or acquaintance's help in getting the first job was included in the wage equation. This variable turned out to be statistically insignificant, even when crossed with father's education.

²⁹ The database used does not allow the identification of extracurricular participation at the earlier stages of education.

self-discipline, perseverance, determination – the skills that should potentially be conducive to efficient learning and work. Therefore, extracurricular participation seems to be a good measure of the parental investments in skills that are useful at school and work.

The database contains information about child's participation in six types of extracurricular activities: foreign language classes, IT classes, sports and tourism, artistic activities, technical activities and scouting. When included in the model individually (in separate specifications), each of them has a positive effect on graduates' earnings (specifications 5-10). If all are included in one and the same specification, only four of them have an independent effect on earnings – foreign language classes, IT classes, sports and tourism, scouting (specification 11). Then, when parental education level is added to the model, only two extracurricular activity types matter – language classes and technical activities. They translate into a 10% increase in earnings.

The findings reported above seem to support our initial thesis that extracurricular participation requires some basic skills, both cognitive and non-cognitive. Since these skills are not fully controlled for in the model, we may suspect a biased estimator of the wage premium from extracurricular activities. The more variables depicting basic skills are included in the model (graduate's education, parental education, participation in other extracurricular activities), the smaller the bias should be. In our model, most probably, the bias has not been entirely eliminated. Therefore, the positive relation between language classes or technical activities and earnings may still be partly a result of the incomplete identification of basic skills (e.g. the lack of a measure of innate abilities), but most probably it mainly reflects some specific skills that encourage participation in such activities (e.g. linguistic predispositions, technical predispositions) and the increment of skills resulting from participation in these activities.

It should be stressed that the inclusion of parents' education and extracurricular participation in the wage equation translates into a lower wage premium from education, but the effect of adding each of these two groups of variables is to some extent independent of the other one. This brings us to a conclusion that skills developed as a result of parental investments represented by these variables not only improve employability, but are also useful in acquiring formal education. Therefore, variables representing these investments, if used in the model, reduce the bias of the wage premium from education. What is important - the reduction is substantial. The wage premium from master's degree and from bachelor's/engineer's degree decreases by nearly one-fourth (from 55% down to 40% and from 42% to 32% respectively), while secondary vocational and general secondary education entirely lose their positive impact on graduates' earnings (when compared with the basic vocational education).

These findings are largely consistent with the outcomes of former research on the effect of parents' investments on their children's earnings in adulthood. They corroborate the positive impact of father's education on his child's wage, reported earlier by Flabbi, Paternostro and Tiongson (2008) for Poland and Carneiro, Crawford and Goodman (2007) for the UK. Furthermore, they indicate a positive wage effect of parents' investments in the form of child's participation in extracurricular activities (language classes and technical activities). Lleras (2008) is the only author reporting a similar finding for the United States (related to sports and non-sports academic activities), while Rosenbaum (2001), whose analysis covered the U.S. too, did not find out such a relationship.

5. Conclusions

The findings of the study provide a basis for a number of essential conclusions. Firstly, parents' investments in the education of their children have a strong, positive, direct impact on graduates' first earnings in Poland. This relationship is observed both when investments are depicted with the level of parents' education and the child's participation in extracurricular activities at the last stage of formal education. This effect seems to be rather strong, since father's university degree translates into child's wage higher by 26% than that earned by children of fathers with a primary education, while extracurricular technical activities and language classes yield a 10% wage premium. By comparison, wage premium from bachelor's/engineer's and master's degree amounts to 32% and 40% respectively.

Secondly, by investing in education, parents provide their children with skills that are useful in their professional life, as well as with those useful in the process of formal education. Hence, these investments influence graduates' earnings not only directly, but also indirectly. The significance of the latter effect is nontrivial, since nearly one-fourth of the tertiary education premium and the whole premium for secondary vocational and general secondary education is explained by parent's investments in the education of their children.

Thirdly, the above implies that parents' investments should be included in the wage equation, otherwise the wage premium from education will be overestimated. This, in turn, may result in overestimation of the rate of return from education and consequently, in making wrong decisions as regards private and public investments in formal education.

Certainly, the analysis presented here is subject to a number of limitations that may have affected the results. Firstly, it covers only the first wages paid to graduates who took up employment within the first year after graduation over the period 1998-2005. It cannot be ruled out that the wage premium from formal education and from parents' investments change over time.³⁰ An employer who faces a candidate with no employment record, may refer to the applicant's education, class of degree and skills presented during the interview. In time, as the actual productivity is revealed, the education premium may change.

Secondly, according to the model of skill formation (Cunha and Heckman 2007), to identify the premium from parental and school investments, it would be necessary to control for innate abilities or pre-school cognitive and non-cognitive skills in the wage equation.³¹ Regrettably, the database does not contain any such information, therefore the premium from parental investments may have been overestimated if parents' and school investments are complementary to child's abilities, or underestimated, if they are substitutive.

Thirdly, the level of parents' education has been used as one of the measures of parents' investments in the education of children. According Carneiro, Crawford and Goodman (2007), such factors as the family social class, represented by father's occupation, as well as parents' concern about the child's educational progress, have a stronger effect on their children's cognitive and non-cognitive skills. Naylor, Smith and Telhaj (2015), on the other hand, add parents' income to the wage equation. Regrettably, such data are not available in the database used for this study. This may impair the identification of parents' investments. The inclusion of extracurricular participation in the model was intended to address this problem to some extent.

³⁰ Based on data from BBGD, Strawiński (2006) reports that education premium in Poland grows with age until ca. 40 years and this growth is faster for university graduates than for secondary school graduates.

³¹ An approach like this was adopted by Carneiro, Crawford and Goodman (2007) and by Naylor, Smith and Telhaj (2015), for example.

References

- Arrow K.J. (1973), Higher Education as a Filter, *Journal of Public Economics*, 2 (3), pp. 193-216.
- ASM (2008), Badanie aktywności zawodowej absolwentów w kontekście realizacji programu „Pierwsza praca”. Analiza wyników badania, Ministerstwo Pracy i Polityki Społecznej. Departament Rynku Pracy, Warszawa.
- Barnett W.S. (2004), Benefit-Cost Analysis of Preschool Education, <http://nieer.org/resources/files/BarnettBenefits.ppt>.
- Becker G.S. (1964), Human capital: A theoretical and empirical analysis, with special reference to education, National Bureau of Economic Research, New York.
- Becker G. S., Tomes N. (1976), Child endowments and the quantity and quality of children. *The Journal of Political Economy*, 84(4), pp. 143–162.
- Bedi A.S. (1998), Sector Choice, Multiple Job Holding and Wage Differentials: Evidence from Poland, *Journal of Development Studies*, No 1.
- Bjorklund A., Jantti M., Solon G. (2007), Nature and Nurture in the Intergenerational Transmission of Socioeconomic Status: Evidence from Swedish Children and Their Biological and Rearing Parents, NBER Working Paper No. 12985.
- Blanden, J., Gregg P., Macmillan L. (2007), Accounting for intergenerational income persistence: non-cognitive skills, ability and education, *Economic Journal*, 117, pp. C43-60.
- Boarini R., Mira d'Ercole M., Liu G. (2012), Approaches to Measuring the Stock of Human Capital: A Review of Country Practices, OECD Statistics Working Papers, 2012/04, OECD Publishing.
- Bowles S., Gintis H., Osborne M. (2001), The Determinants of Earnings: A Behavioral Approach, *Journal of Economic Literature*, 39 (4), pp. 1137-1176.
- Brooks-Gunn J., Han W.-J., Waldfogel J. (2002), Maternal Employment and Child Cognitive Outcomes in the First Three Years of Life: The NICHD Study of Early Child Care, *Child Development* 73(4), pp. 1052–72.
- Card D. (1999), The Causal Effect of Education on Earnings, in: Ashenfelter O. i Card D. (ed.), *Handbook of Labor Economics Vol. 3A*, Elsevier Science, Amsterdam.
- Carneiro P., Crawford C., Goodman A. (2007) The Impact of Early Cognitive and Noncognitive Skills on Later Outcomes, CEE DP 92, Centre for the Economics of Education, London School of Economics, London.
- Carneiro P., Heckman J.J. (2003), Human Capital Policy; in: Heckman J.J., Krueger A.B. i Friedman B.M. (ed.), *Inequality in America: What Role for Human Capital Policies?*, MIT Press, Cambridge (MA).

Chia G., Miller P.W. (2007), Tertiary performance, field of study and graduate starting salary, University of Western Australia.

Craig L. (2006) Parental education, time in paid work and time with children: an Australian time-diary analysis, *The British Journal of Sociology* 57 (4), pp. 553-575.

Crawford C., Vignoles A. (2014), Heterogeneity in graduate earnings by socio-economic background, IFS Working Paper W14/30.

Cunha F., Heckman J.J. (2007), The technology of skill formation, *American Economic Review*, 97 (2), pp. 31–47.

Cunha F., Heckman J.J., Lochner L.J., Masterov D.V. (2006), Interpreting the Evidence on Life Cycle Skill Formation, in: Hanushek E. A. and Welch F. (ed.), *Handbook of the Economics of Education*, North-Holland, Amsterdam.

Farkas G. (2003) Cognitive skills and noncognitive traits and behaviors in stratification processes, *Annual Review of Sociology*, 29, pp. 541–562.

Feng-Liang L., Xiaohao D., Morgan W.J. (2009), Higher Education and the starting wages of graduates in China, *International Journal of Educational Development*, 29, pp. 374–38.

Flabbi L., Paternostro S., Tiongson E.R. (2008) Returns to education in the economic transition: A systematic assessment using comparable data, *Economics of Education Review*, 27, pp. 724–740.

Freier R., Schumann M., Siedler T. (2015), The Earnings Returns to Graduating with Honors: Evidence from Law Graduates, IZA Discussion paper Nr 8825.

Gajderowicz T., Grotkowska G, Wincenciak L. (2012), Premia płacowa z wykształcenia wyższego według grup zawodów, *Ekonomista*, 5, pp. 577-604.

GUS (2010), Szkoły wyższe i ich finanse w 2009r., *Informacje i opracowania statystyczne*, Warszawa.

GUS (2015), Szkoły wyższe i ich finanse w 2014r., *Informacje i opracowania statystyczne*, Warszawa.

GUS (2016), Struktura wynagrodzeń według zawodów w październiku 2014r., *Informacje i opracowania statystyczne*, Warszawa.

Gutman L.M., Schoon I. (2013), *The Impact of Non-cognitive Skills on Outcomes for Young People: Literature Review*, Education Endowment Foundation, London.

Hansen K.T., Heckman J.J., Mullen K.J. (2004), The effect of schooling and ability on achievement test scores, *Journal of Econometrics*, 121 (1–2), pp. 39–98.

Hanushek E.A., Woessmann L. (2008), The role of cognitive skills in economic development, *Journal of Economic Literature*, 46 (3), pp. 607-668.

Harmon C., Oosterbeek H., Walker I. (2003), The Returns to Education: Microeconomics, *Journal of Economic Surveys*, 17(2), pp. 115–56.

Hauser R., Huang M. (1997) Verbal Ability and Socioeconomic Success: A Trend Analysis, *Social Science Research*, 26, pp. 331–376.

Heckman J. (1979), Sample Selection Bias as a Specification Error, *Econometrica*, No 1.

Heckman J.J., Larenas M.I., Urzua S. (2005), Accounting for the Effect of Schooling and Abilities in the Analysis of Racial and Ethnic Disparities in Achievement Test Scores, University of Chicago, http://jenni.uchicago.edu/econ_neurosci/ability_all_2006-04-19_jsb.pdf.

Heckman J., Lochner L., Todd P. (2006) Earnings functions, rates of return and treatment effects: The Mincer equation and beyond; in: Hanushek E. and Welch F. (ed.) *Handbook of the Economics of Education*, Vol. 1, North Holland, Amsterdam, pp. 307-458.

Heckman J.J., Masterov D.V. (2004), The Productivity Argument for Investing in Young Children. Technical Report Working Paper No. 5, Committee on Economic Development.

Heckman J.J., Stixrud J., Urzua S. (2006), The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior, *Journal of Labor Economics*, 24(3), s. 411–82.

Herrnstein R.J., Murray C.A. (1994), *The Bell Curve: Intelligence and Class Structure in American Life*, Free Press, New York.

Jensen A. R. (1998), *The g Factor: The Science of Mental Ability*, Praeger, Westport, CT.

Kautz T., Heckman J.J., Diris J., Weel B.T., Borghans L. (2014), *Fostering and Measuring Skills: Improving Cognitive and Non-cognitive Skills to Promote Lifetime Success*, OECD Education Working Papers, No. 110, OECD Publishing, Paris.

Keane M.P., Prasad E.S. (2006), Changes in the structure of earnings during the Polish transition, *Journal of Development Economics*, 80, pp. 389– 427.

Kitterod R.H. (2002), Mothers' Housework and Childcare: Growing Similarities Or Stable Inequalities, *Acta Sociologica* 45(2), pp. 127–49.

Leibowitz A. (1974), Home investments in children, *Journal of Political Economy*, 82(2), pp. 111–131.

Lleras C. (2008), Do skills and behaviors in high school matter? The contribution of noncognitive factors in explaining differences in educational attainment and earnings, *Social Science Research*, 37, pp. 888–902.

Mincer J. (1974), *Schooling, Experience and Earnings*, New York: Columbia University Press for the National Bureau of Economic Research.

Morawski L., Myck M., Nicińska A. (2009), Count Your Hours: Returns to Education in Poland, IZA Discussion Paper, No 1332.

Naylor R., Smith J., McKnight A. (2002), Sheer Class? The Extent and Sources of Variation in the UK Graduate Earnings Premium, CASE paper Nr 54, London School of Economics.

Naylor R., Smith J., Telhaj S. (2015), Graduate Returns, Degree Class Premia and Higher Education Expansion in the UK, Centre for Economic Performance, Discussion Paper No 1392.

Newell A., Reilly B. (1999), Rates of Return to Educational Qualifications in the Transitional Economies, Education Economics, No 1.

Newell A.T., Socha M.W. (2007), The Polish Wage Inequality Explosion, IZA Discussion Paper, No 2644.

O'Connor T. G., Rutter M., Beckett C., Keaveney L., Kreppner J.M. (2000), The Effects of Global Severe Privation on Cognitive Competence: Extension and Longitudinal Follow-Up, Child Development, 71(2), pp. 376–90.

OECD (2013), The Survey of Adult Skills: Reader's Companion, OECD Publishing, <http://dx.doi.org/10.1787/9789264204027-en>

Psacharopoulos G. (1994), Returns to Education: A Global Update, World Development 22(9), s. 1325–43.

Psacharopoulos G., Patrinos H. (2004), Returns to Investment in Education: A Further Update, Education Economics, 12(2), pp. 111–34.

Raver C.C., Garner P.W., Smith-Donald R. (2007), The Roles of Emotion Regulation and Emotion Knowledge for Children's Academic Readiness: Are the Links Causal?, in: Pianta R.C., Cox J., Snow K.L. (ed.), School Readiness and the Transition to Kindergarten in the Era of Accountability, Brookes Publishing, Baltimore.

Rosenbaum J. (2001), Beyond College for All: Career Paths for the Forgotten Half, Russell Sage Foundation, New York.

Roszkowska S., Majchrowska M. (2013), Czy wykształcenie i doświadczenie zawodowe mają znaczenie? Wyniki równania Mincer dla Polski, Roczniki Kolegium Analiz Ekonomicznych, No 30/2013, pp. 235-253.

Roszkowska S., Majchrowska M. (2014), Premia z wykształcenia i doświadczenia zawodowego według płci w Polsce, Narodowy Bank Polski, Materiały i Studia No 302.

Rutkowski J. (1996), High Skills Pay-off : The Changing Wage Structure during Economic Transition in Poland, Economics of Transition, No 1.

Schultz T.W. (1961), Investment in Human Capital, American Economic Review, Vol. 51, No. 1, pp. 1-17.

- Segal C. (2013) Misbehavior, Education, and Labor Market Outcomes, *Journal of the European Economic Association*, 11 (4), pp. 743–79.
- Spence A.M. (1973), Job Market Signaling, *Quarterly Journal of Economics*, 87 (3), s. 355-374.
- Stiglitz J.E. (1975), The Theory of „Screening”, Education and the Distribution of Income, *The American Economic Review*, Vol. 65, No. 3, pp. 283-300.
- Strawiński P. (2006), Zwrot z inwestowania w wyższe wykształcenie, *Ekonomista*, vol. 6, pp. 805–821.
- Strawiński P. (2007), Czy w Polsce opłaca się studiować? Wyniki modelu inwestycji w wyższe wykształcenie, WNE UW, <http://coin.wne.uw.edu.pl/pstrawinski/publ/oplaca.pdf>
- Szreder M., Kalisiak K., Białowąg K., Szapiro T. (2012), Premia płacowa z wykształcenia wyższego według kierunku studiów, *Ekonomista*, vol. 5, pp. 555-576.
- Taber C.R. (2001), The Rising College Premium in the Eighties: Return to College or Return to Ability?, *Review of Economic Studies*, 68, pp. 665–691.
- Weisberg J., Socha M.W. (2002), Earnings in Poland: The private versus the public sector, *Journal of Entrepreneurial Finance*, 7 (3), pp. 17-38.
- Yeung J., Sandberg J.F., Davis-Kean P., Hofferth S. (2001), Children’s Time With Fathers in Intact Families, *Journal of Marriage and the Family* 63(1), pp. 136–54.
- Zalewska-Turzyńska M. (2014), O zastosowaniu podejścia prakseologicznego do koncepcji kapitału ludzkiego T.H. Davenporta, *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, No 349.

Appendix

Table A1. Independent variables included in the wage equation

<i>Independent variable</i>	<i>Value classes</i>
Gender	1* – woman
	2 – man
Age when first employed	continuous variable
Education	1* – basic vocational
	2 – general secondary
	3 – secondary vocational (secondary technical, profiled secondary, post-secondary)
	4 – tertiary, bachelor's or engineer's degree
	5 – tertiary, master's degree
Father's education	1* – primary or less
	2 – basic vocational
	3 – secondary (general, vocational, post-secondary)
	4 – tertiary
	5 – unknown
Mother's education	1* – primary or less
	2 – basic vocational
	3 – secondary (general, vocational, post-secondary)
	4 – tertiary
	5 – unknown
Extracurricular activities: language classes	1 – participation in extracurricular organised foreign language classes at the last stage of schooling
	2* – no participation
Extracurricular activities: IT classes	1 – participation in extracurricular organised IT classes at the last stage of schooling
	2* – no participation
Extracurricular activities: sports and tourism	1 – participation in extracurricular organised sports or tourist activities at the last stage of schooling
	2* – no participation
Extracurricular activities: artistic activities	1 – participation in extracurricular organised artistic activities at the last stage of schooling

	2* – no participation
Extracurricular activities: technical activities	1 – participation in extracurricular organised technical classes at the last stage of schooling
	2* – no participation
Extracurricular activities: scouting	1 – participation in scout meetings at the last stage of schooling
	2* – no participation
Place of residence class	1* – rural
	2 – town ≤ 100,000 residents
	3 – town >100,000 residents
Region (province)	1* – Dolnośląskie
	2 – Kujawsko-Pomorskie
	3 – Lubelskie
	4 – Lubuskie
	5 – Łódzkie
	6 – Małopolskie
	7 – Mazowieckie
	8 – Opolskie
	9 – Podkarpackie
	10 – Podlaskie
	11 – Pomorskie
	12 – Śląskie
	13 – Świętokrzyskie
	14 – Warmińsko-mazurskie
	15 – Wielkopolskie
	16 – Zachodniopomorskie