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Does it pay to invest in the education of children?

Jacek Liwiński*, Emilia Bedyk**

Abstract

The work described here sought to determine whether parents' investment in the education of children in Poland has 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. Analysis shows that parental investment in the education of children has a strong, positive impact on first earnings after the end of formal education. This relationship is to be observed when the investment is depicted with educational level of each parent, as well as when represented by the child's participation in various extracurricular activities. Furthermore, if any of the above measures of parental investment is included in the equation, the wage premium from each level of formal education decreases. In particular, when both these measures of parental investments are included in the model, the tertiary education premium declines by about one quarter, while secondary vocational or general education are no longer significant determinants of the graduates' wages (as compared with basic vocational education).

Keywords: investment in human capital, formal education, extracurricular activities, wage premium, wage equation
JEL Codes: I26, J24
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* Faculty of Economic Sciences, University of Warsaw, jliwinski@wne.uw.edu.pl.
** Faculty of Economic Sciences, University of Warsaw.

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1. Introduction

The wage premium from education has been estimated in hundreds of studies over the more than forty years since the human capital paradigm was developed (Schultz 1961; Becker 1964; Mincer 1974).[1] Whether expressed in terms of years of schooling, or level, education has been found to exert a positive impact on earnings. The rate of return on education computed on this basis thus substantiates decisions to invest in education. The academic boom observed in Poland since the early 1990s, manifested in a rapid increase in 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.

However, over time, numerous reservations have been raised against the use of the Mincer equation as a tool estimating the wage premium from education.[3] According to the extreme example of these reservations, i.e. signalling theory (Spence 1973), the wage premium results solely from the diversity of individuals in terms of ability, so it will appear even if formal education fails to provide any skills potentially useful on the job. In such a situation, formal education is only a tool by which employers classify individuals according to their abilities (Arrow 1973; Stiglitz 1975).

Also stressed is the role of inherent abilities and parents' investment in the education of their children when it comes to determining the level of future earnings (Leibowitz 1974; Becker and Tomes 1976). Studies published in recent years stress that, thanks to parents' investment choices, children develop not only cognitive, but also non-cognitive skills[4] (Carneiro and Heckman 2003; Heckman and 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 demonstrates that parents, by investing their time and money in the education of their children, increase their earning potential via two channels. First, in a direct way. By equipping their children with skills – both cognitive and non-cognitive – in their early childhood, parents enable the acquisition of further knowledge and

[1] The wage premium from education can be understood as the incremental increase in earnings due to extension of the period of formal education by one year, or the achievement of a certain educational level, as compared with the reference level. The wage premium thus offers information as to the amount a person earns more thanks to investment in his/her education, regardless of the cost of education. Overviews of studies on this 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 Mincer equation assumes that the wage level is a function of schooling and work experience.

[4] The concept of "non-cognitive skills", though criticised by some psychologists (e.g. Gutman and Schoon 2013) has gained wide acceptance 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 each of these in fact differs to a certain degree (Kautz *et al*. 2014).

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. Second, parents have an indirect impact on their children's future earnings, by equipping them with skills useful on the labour market, but not capable of being acquired at school or university.

The aim of the work described here has been to determine whether parental investment in the education of children in Poland has 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.[5] Unlike other nationwide Polish sampling studies of economic activity on the labour market (like the PLFS – Polish Labour Force Survey, HCB – Human Capital Balance and HBS – Household Budgets Survey), this one offers detailed information on various forms of investment in human capital in the period of formal education.

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

This paper is structured into four sections. In the first, we discuss the process of human capital formation at early stages in the lifecycle. The second section presents methods of measuring the wage premium from human capital, while the third offers an overview of recent empirical research on the wage premium from parental investment in the education of their children. The fourth section then addresses our own empirical analysis of Polish data, before the paper ends with a presentation of key conclusions from our study.

[5] The survey entitled "Badanie aktywności zawodowej absolwentów w kontekście realizacji programu *Pierwsza praca*" (Labour market activity of graduates in the context of the "First Job" Programme) was carried out by the Central Statistical Office of Poland (GUS) in the years 2006−2007. The survey extended to more than 20,000 respondents who completed their formal education in the years 1998−2005. The data gathered reflect graduates' professional paths over the first three years after graduation, with a special focus on their first job.

2. The process of human capital formation at early stages in the lifecycle

The literature defines human capital in many ways.[6] Typically, and in line with 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". The OECD, which has been measuring human capital in international sample surveys of young people and adults for years, emphasises that, in addition to knowledge and skills, attitudes determining how these resources are used in 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 or informal), healthcare 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 on the labour market, and are demonstrated via enhanced employability, higher earnings or better career prospects. The non-market benefits involve a greater productivity of unpaid activities, such as household work. The non-economic benefits include a better state of health and greater life satisfaction. Importantly, both economic and non-economic benefits translate into 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. It is in this way that a high stock of human capital stimulates further growth thereof.

[6] An extensive overview of definitions of human capital is provided by Zalewska-Turzyńska (2014).

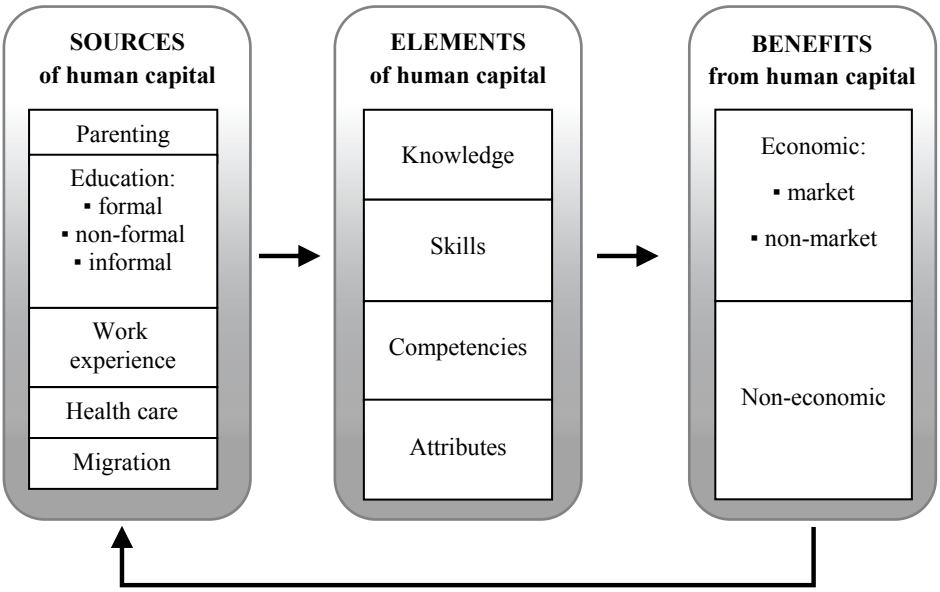

Figure 1. Human capital: its formation, composition and benefits generated
Source: adapted from Boarini, Mira d'Ercole and Liu (2012).

Cunha and Heckman (2007) propose a model which illustrates the process of skill formation in the initial phase of life – from the prenatal stage through to adulthood (see Figure 2). This model assumes that both cognitive and non-cognitive skills are developed as a result of a multistage process, its inputs including the skills acquired in former stages of life, parental investments and contributions from the child's environment and educational institutions (school and university). Every human being is endowed with certain skills at birth – this is a result of both innate abilities and prenatal investments made by the child's parents.[7] The increment characterising skills in the pre-school period is directly proportional to the stock of skills at birth, as well as parental and environmental investments. Similarly, the incremental development of skills over the period of formal education depends on the stock of skills at the moment school is entered, the aforesaid parental and environmental investments, and the contribution made by school.

In line with the model, skills are characterised by the two key features of 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 complementary in static and dynamic terms.

[7] Research findings show that both factors affect both educational choices and earnings (Björklund, Jantti and Solon 2007).

Static complementarity means that the incremental development 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.[8] 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 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. This leads to a conclusion that the sooner investments are made, the greater their impact on the stock of skills.[9]

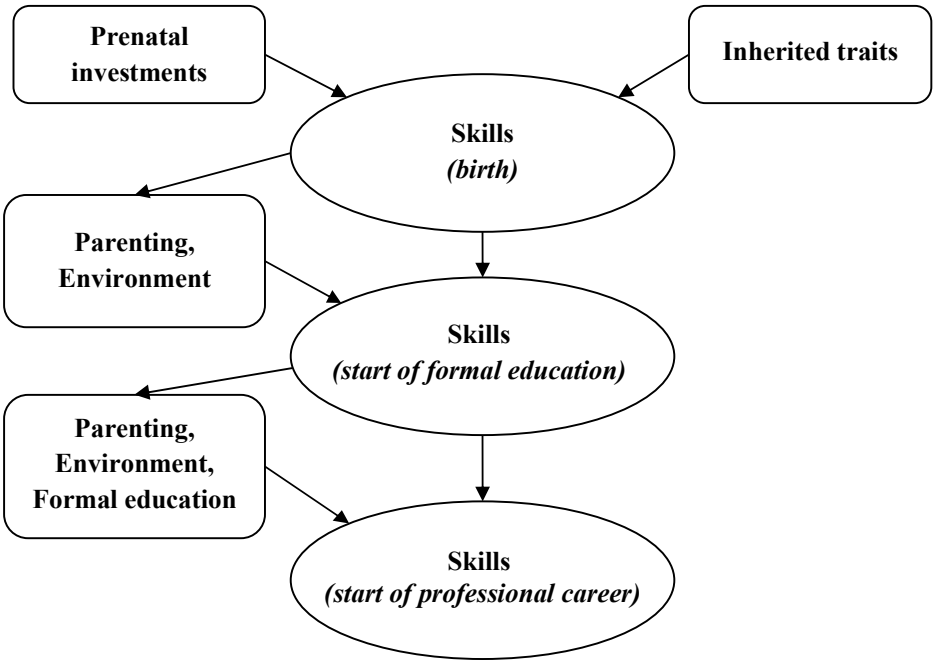

Figure 2. Process of skill formation at early stages in the lifecycle
Source: adapted from Kautz *et al.* (2014).

Within the framework of the model presented above, skills, and consequently graduates' future earnings, can be very much dependent upon parental investments.[10] Firstly, this effect can be a direct one – when a child acquires skills useful in the

[8] This is supported by research findings, see: Raver, Garner and Smith-Donald (2007).
[9] Evidence can be found in the work of O'Connor *et al.* (2000), Barnett (2004).
[10] An essential role for 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.

labour market and not capable of being 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 productivity of school investments. Children entering school with greater levels of skill experience more marked incremental growth in these with a given level of school investment – which follows on from the static complementarity of skills – but at the same time school investments will be greater (e.g. in the form of free extracurricular activities or free tertiary education) – as dynamic complementarity of skills implies, adding to the augmentation in skill levels.[11] Hence, skills developed as a result of parental investments and those provided by schools should be correlated positively, and both should have a positive impact on earnings.

3. Methods of measuring the wage premium from human capital

The main focus of studies on private effects of human capital investments is on estimating the wage premium or rate of return from formal education. Most frequently used for this purpose is the Mincer wage equation, with years of schooling or education level deployed 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 the human capital acquired by an individual. Yet, if the stock of human capital and, consequently, future earnings are determined also by certain other factors (which are correlated with formal education), then their omission from 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. Attempts have therefore been made to expand the wage equation and include variables representing these factors.

Hanushek and Woessmann (2008) proposed a model in which individual individual earnings (Y_i) are a function of the human capital stock represented by: abilities (A_i), family investments (F_i), formal education (S_i) and other factors (X_i), including professional experience and health status. Hence, the wage equation takes the form:

$$Y_i = \alpha A_i + \beta F_i + \gamma S_i + \delta X_i + \varepsilon_i \tag{1}$$

where stochastic term ε_i represents idiosyncratic earnings differences.

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

The equation presented above resembles the Mincer wage equation in that the stock of human capital is represented by key inputs to the process of human capital formation. The identity of the variables used in measuring 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. An alternative approach is therefore adopted, whereby pre-school or pre-college cognitive and non-cognitive skills (HC_i and HN_i respectively) are included in the wage equation (Heckman, Stixrud and Urzúa 2006). The wage equation would then be:

$$Y_i = \theta HC_i + \sigma HN_i + \beta F_i + \gamma S_i + \delta X_i + \vartheta_i \quad (2)$$

Furthermore, cognitive skills are measured by reference to reading comprehension and numerical reasoning test scores (Naylor, Smith and Telhaj 2015), university admission test achievements (Crawford and Vignoles 2014; Chia and Miller 2008), and secondary school graduation test scores (Naylor, Smith and 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 or from parents, or from the respondents themselves. 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 class (active, passive, disruptive), work habits and conscientiousness (doing homework, punctuality, attendance). The behaviours observed are used as separate measures of non-cognitive skills (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 the potential to be correlated with willingness to invest in the education of their children. These include parents' education, income, occupation and employment status, or else 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 a child's participation in educational activities that incur parental cost, are less common. An example of such a measure is participation in extracurricular activities (Rosenbaum 2001; Lleras 2008).

4. Review of the empirical literature

Empirical studies document that parents' investment in the education of their children – represented in the wage equation by such variables as parents' educational level, 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 and 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).

Moreover, some studies reveal a significant role of initial, pre-education skills. They show that skills, both cognitive and non-cognitive, among children aged 5−7 are strong determinants of their earnings in adulthood. Besides, if a measure of these skills is included in the wage equation, the wage premium from education declines (Naylor, Smith and Telhaj 2015; Carneiro, Crawford and Goodman 2007; Blanden, Gregg and Macmillan 2007).

In Poland, there have been numerous studies on the wage premium from education,[12] as based on data from various sources.[13] It is a common feature of these analyses that the Mincer wage equation estimated using OLS is made use of, 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 investment was included in the wage equation (this was the 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 tertiary education decreased by ca. 2 pp. Hence, parental investments have both a direct and an indirect impact on child's wages in adulthood. However, it should be noted 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 the ISSP (International Social Survey Programme).

So far, the wage premium from parents' investment in extracurricular activities of their children in the period of formal education has not been analysed in Poland.

[12] 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).

[13] In most cases, individual data were sourced from: PLFS – the Polish Labour Force Survey, HBS – the Household Budgets Survey, the October survey of wages conducted by the Central Statistical Office in Poland, see: GUS (2016).

5. Empirical analysis

The aim of the work detailed in this paper has been 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.

5.1. 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 (ASM 2008). The focus of the survey was 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 paid to the first job after graduation. The nationwide survey was conducted on a sample of 20,251 people 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 and universities). The population was limited to individuals not over 27 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.

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

As our dependent variable, we chose an hourly wage rate computed on the basis of the net wage and number of working hours in the first job after graduation, provided that the respondent took up employment within a year of graduating. Consequently eliminated from the database are: 1) individuals not working within the first year of completing formal education, 2) the self-employed and family members supporting them, since none of these groups was asked about earnings, and 3) hired workers not disclosing their income. Ultimately, the sample used for analysis comprised 6403 observations.

Information about wages is declarative, meaning that figures are not necessarily consistent with the actual situation, for such reasons as: reluctance to disclose real earnings, the inability to recollect how much was really earned, and the tendency to round figures up or down. It is not possible to say how these measurement errors affect the final result. However, the distribution of wages is – as expected – unimodal and skewed to the right.

5.2. Method of analysis

On the basis of the overview of theoretical and empirical literature, as well as some preliminary analyses, we formulated the wage equation: [14]

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

where the the dependent variable (W_i) represents the first net hourly rate earned by graduates in the first job after completing formal education, provided that they undertook employment within a year of graduating. [15] Independent variables include ($\boldsymbol{S}_i$) – education level, ($\boldsymbol{F}_i$) – a vector of variables depicting parents' investment in the education of their child and ($\boldsymbol{X}_i$) – a vector of variables covering 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 lacks any variable that might measure cognitive and non-cognitive skills at the start of formal education directly. Among the variables available in the database, the grade point average from the diploma of the last school attended seems to approximate these skills most closely. Indeed, grade point average is often accepted as a measure of cognitive and non-cognitive skills (Chia and Miller 2008; 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 at the same educational stage, as opposed to 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 sizes of these two investments are directly proportional to a 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. [16]

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[14] Initially, due to 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 ones were used in the selection equation, i.e. marital status, number of children and family model (both parents or one parent working). However, since the results did not show any self-selection bias, we ultimately decided to estimate the linear regression model using OLS.

[15] For the sake of comparability of the initial earnings of graduates starting their first job in different years (1998−2005), initial hourly rates were adjusted by the Consumer Price Index, with 2005 as the base year.

[16] According to Becker and Tomes (1976), parents seeking to maximize the utility of investing in children, provide able children with human capital, and the less able with other capital types (e.g. financial or physical).

5.3. Results

To analyse the effect of each variable representing parental investments in the education of 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 and year of graduation), encompasses the level of formal education only, with more variables to be added gradually further on (Table 1).

The results show that while the wage premium increases along with the level of formal education, 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 schools[17] respectively (against graduates of basic vocational schools, who are the base category), while premiums obtained by graduates of Bachelor's/Engineer's and Master's degree programs are much higher, reaching as much as 42% and 55% respectively (specification 1).[18]

Parental investments in education are represented by two groups of variables in the model: parental education level and participation in extracurricular activities at the last stage of formal education. These 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 the quantity and quality of:

1) parents' time spent on educating their children,

2) educational goods and services purchased by parents for their children.[19]

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 expenditure on the education of children (Rokicka and Sztanderska 2013; Kłobuszewska 2014).

[17] The latter category comprises graduates of technical secondary schools, profiled secondary schools and post-secondary schools.

[18] Percentage increments were computed using the coefficients presented in Table 1, in line with the formula: $\Delta\% = \exp(\beta) - 1$.

[19] Looking more broadly and leaving the human capital paradigm behind, one can see that parental education represents cultural and social capital too, with these two values capable of being passed down to children and exerting an effect on their future earnings (Farkas 2003).

Table 1. Estimates of graduates' first wage equation

Model specification	(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: Bachelor's Engineer's degree	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: 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 tourism							0.060***				0.036*	0.028
Extracurricular activities: artistic activities								0.088***			0.053	0.050
Extracurricular activities: technical activities									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 also includes gender, age when first employed, place of residence, region (province), year of graduation; ***/**/* stand for the 1%, 5% and 10% significance levels respectively.

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

The database used for the empirical analysis provides information on each parent's level of education.[20] When the educational levels of mother and father are included in separate specifications, each of them has a positive effect on a child's future earnings, albeit with the impact of the father's education being stronger (specification 2 and 3). On the other hand, when both variables are included in one and the same specification, it is only the father's education that adds significantly and positively to a graduate's earnings (specification 4), as reported by Carneiro, Crawford and Goodman (2007). The likely reason is that men's contribution to the household income is greater, with a stronger correlation between a father's (as opposed to a mother's) education and household income. When expanded to include 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. On the basis of the model of skill formation (Cunha and Heckman 2007), this outcome can be interpreted as evidence that parents provide their children with skills of use in the process of formal education, and afterwards also in professional life.[21]

A child's extracurricular activities when attending the last school (or university) is an alternative measure of parental investment.[22] 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 the latter can be encouraged by both cognitive and a variety of non-cognitive skills, such as: intellectual curiosity, sociability, pro-activeness, assertiveness, conscientiousness, self-discipline, perseverance and determination – 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 a child's participation in six types of extracurricular activity, i.e. 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 these has a positive effect on graduates' earnings (specifications 5−10). If all are included in one and the same specification, the only four having an independent effect on earnings are foreign-language classes, IT classes, sports and tourism and scouting (specification 11). Then, when parental education level is added to the model, only two extracurricu-

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

[21] In line with the suspicion that the positive effect of a father's education was to some extent the result of a father offering help in finding a first job, a variable reflecting the help of some relative or acquaintance in getting the first job was also included in the wage equation. However, this emerged as non-significant statistically, even when crossed with paternal education.

[22] The database used does not allow extracurricular participation at the earlier stages of education to be identified.

lar activity types matter – language classes and technical activities. These 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 arising from them. The more variables depicting basic skills that are included in the model (graduate's education, parental education, participation in other extracurricular activities), the smaller the bias should be. It is most probable that the bias has not been entirely eliminated from our model, so the positive relationship between language classes or technical activities and earnings may still partly result from incomplete identification of basic skills (e.g. the lack of a measure of innate abilities), but most probably in the main it reflects certain specific skills that encourage participation in such activities (e.g. linguistic or technical predispositions), as well as an increment in levels of skill resulting from participation in these activities.

It should be stressed that the inclusion of parental 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 the parental investment represented by these variables not only improve employability, but also prove useful as a formal education is acquired. Therefore, variables representing these investments, if used in the model, reduce the bias of the wage premium from education. What is important here is that the reduction is found to be substantial. The wage premium from a Master's degree and from a Bachelor's/Engineer's degree decreases by nearly one-fourth (from 55% down to 40% and from 42% to 32% respectively) in these circumstances, 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 earlier research on the effect of parents' investments on their children's earnings in adulthood. They corroborate the positive impact of a father's education on his child's wage, reported earlier by Flabbi, Paternostro and Tiongson (2008) for Poland, and by Carneiro, Crawford and Goodman (2007) for the UK. Furthermore, they indicate a positive wage effect of parental investment in the form of a 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 also covered the U.S., failed to obtain such a relationship.

6. Conclusions

The findings presented here provide a number of key conclusions. First, the investment of parents in Poland in the education of their children has a strong, positive and direct impact on the first earnings of the country's graduates. This relationship is to be observed when investments are represented by either the level of education of the parents or the child's participation in extracurricular activities at the last stage of formal education. This effect seems rather strong, since a father's university degree translates into a child's wage higher by 26% than that earned by the children of fathers with primary education only, while extracurricular technical activities and language classes yield a 10% wage premium. By comparison, the wage premium arising from a Bachelor's/Engineer's or 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 non-trivial, since nearly one-fourth of the tertiary education premium and the whole premium for secondary vocational and general secondary education is explained by parental investment in the education of their children.

Thirdly, the above implies that parental investment should be included in the wage equation, since the wage premium from education will be overestimated otherwise. This may in turn result in overestimation of the rate of return from education, and consequently in the making of wrong decisions where private and public investment in formal education is concerned.

The analysis presented here is certainly 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 of graduation, over the period 1998−2005. There is no way to preclude the wage premium from formal education and from parental investment being subject to change over time.[23] 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. However, as time passes and actual productivity is revealed, the educational premium may change.

Second, in line with the model of skill formation (Cunha and Heckman 2007), identification of the premium from parental and school investments would entail controlling in the wage equation for innate abilities or pre-school cognitive and non-cognitive skills.[24] Regrettably, the database contains no such information, so

[23] Based on data from HBS, 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.

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

the premium from parental investment may have been overestimated, if investment on the part of parents and school is complementary to a child's abilities, or underestimated, if they are substitutive.

Third, the level of parental education has been used as a measure of parental investment in the education of children. According to Carneiro, Crawford and Goodman (2007), such factors as family social class represented by a 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. On the other hand, Naylor, Smith and Telhaj (2015) add parents' income to the wage equation. Regrettably, such data are not available in the database used for this study, and this may impair identification of parental investment. The inclusion of extracurricular participation in the model was intended to address this problem to some extent.

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Appendix

Table A1. Independent variables included in the wage equation

Independent variable	Value classes
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 inhabitants
	3 – town >100,000 inhabitants
Region (voivodship)	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

Source: authors' own elaboration.