



Munich Personal RePEc Archive

Changes in return to higher education in Poland 1998-2005.

Strawinski, Pawel

Warsaw University, Poland

2 June 2008

Online at <https://mpra.ub.uni-muenchen.de/9533/>
MPRA Paper No. 9533, posted 12 Jul 2008 14:13 UTC

Changes in return to higher education in Poland 1998-2005.

Paweł Strawiński*

Department of Economics, University of Warsaw, Poland.

In the article private rate of return to higher education in the 1998-2005 period is considered. The model is based on a comparative advantage theory. Extended Mincerian wage equation is used to account for a non-random decision to undertake studies at university level. The estimate of private rate of return in Poland is roughly 9%, and it is among the highest in Europe. In addition, the unexpected rise in rate of return is observed. Moreover, positive relationship between graduation and the obtained wages was found. This change has been linked to labour market transformation and Skill Biased Technical Change. Also the influence of financing tertiary education is considered.

Keywords: return to education, private returns, skill biased technical change, sample selection.

Introduction

The recent survey of Polish Central Statistical Office (Kilińska, Radcowski 2005) investigating educational determinants and educational career choices showed that young people perceive education as an investment. People that have decided to undertake such an investment expect that it will pay off in the near future with satisfactory income level, better career perspectives, higher prestige, and last but not least, that it will lower the risk of unemployment spell.

Investment in human capital creates a great opportunity for people, families, firms and a society as a whole (Psacharopoulos 1994). This is the simplest way to achieve higher level of social welfare. Human capital accumulation accelerates technological and economic growth (De la Fuente 2003). Nowadays, in the era of globalisation, common markets and expansion of knowledge based economy investment in human capital has become a necessity. The total gains from investments in education are higher than economic return alone. In this article,

* pstrawinski@wne.uw.edu.pl

however, only the latter is considered. This is due to the data that do not allow for deeper investigation.

The return to investment in education can be viewed as a discount rate. In such a case return is defined as a rate that equalises the present value of the stream of incomes and the stream of expenditures in a given point of time. For university level of education it is the difference between the present value of an increase in wage stream of a university diploma holder and present value of additional cost of obtaining the university degree and the opportunity cost.

The private rate of return captures financial incomes that can be attributed to higher qualifications. To estimate this value one has to take into account the cost incurred by an individual and an expected increase of their future income. Government taxes and social benefits influence the profitability of an educational investment. Public assistance of educational investment makes, even in countries with progressive tax system, a real negative tax on human capital (Harmon et al. 2002). Similarly, the private rate of return is lowered due to social security system. Nevertheless, in Europe investment in education seems to be more attractive than financial investment due to governmental support (De la Fuente 2003). Such investments are supported by covering a large share or total investment cost. The common policy instruments are subsidies or tax reductions.

The aim of the paper is to provide evidence on return to education in Poland. The estimate of private returns to education is about 9,5%, and similarly to the other transition countries is higher than in Western Europe (for more details, see for example Pastore and Verashchagina 2006). We ground this result in the context of transition and increased demand for formal skills.

The remainder of this article is divided into five main parts. The next section presents a short overview of related literature. Further, methods of calculating the rate of return to education models in European countries are presented. The second part raises methodological issues and present the model for empirical investigation. In the third part, datasets are presented. Section four shows the empirical results, whereas the final part summarizes findings and present conclusions.

1. The return to education

Several economic surveys find a positive relationship between an educational degree and the received salary. Labour market researches indicate that for the United States each additional year of education increases average wage by 7.5% (Acemoglu, Angrist 1999). In neighbouring Canada Bar-Or with co-authors (1995) estimates the rate of return to 4-year university diploma at 30%. In a recent survey Caponi and Plesca (2007) show that individuals with a university degree earn 30-40% more than secondary school graduates. In similar article Blundell et al (2005) show, using various econometric techniques that having a university diploma in the United Kingdom raises the average salary by 25%. In another survey for that country Card (1999) estimates the annual rate of return to education at 6-11% depending on a field of study.

Similar results have been obtained in studies concerning other European Union members that have “continental” system of higher education. Brunello, Coni and Lucifora (2001) examine the Italian labour market data, and show that the average yearly rate of return to university education is about 6.2% for males, and 7.5% for females. This result has been confirmed by Mendolicchio (2005). She shows that rate of return to education for women is between 7-12% and for men between 6.5%-11%. Comparable results for UE15 are obtained by Harmon, Oosterbeek and Walker (2002). They estimate the average annual rate of return at 6.5%. De la Fuente (2003) in the report prepared for European Commission estimates the yearly rate of return to education at 6.2%, while he stresses that in the long horizon there is an additional 3.1% premium from quicker technological development.

As it is pointed out in Psacharopoulos (1994), return to investment in higher education decreases with growth of the national income per person. That is the reason why we expect that in Central and Eastern European countries, so also in Poland, the rate of return to education should be higher than the average for old European Union members. However, the conducted empirical research indicates a picture very different from the one expected. Newell and Reilly (1999) analysed distribution of wages in several transition countries for mid-1990s and found that return to education is on a remarkably low level. Their estimate of the rate of return to education is 2% only for early 1990's and later reaches 4-5%. Similar conclusions could be drawn from Pastore and Verashchagina (2006) who investigated returns to education in Belarus'. When analysing returns to education in transition countries, it should be noted

that the transformation and decentralisation processes lead to an increase in rates of return to education. Accordingly existing evidence, this increase rises the rate of return to 4-5% depending on country specificity (Pastore and Verashchagina 2006). Compared with 7-12% rate found for developed countries (Psacharopoulos and Patrinos 2002), this observation clearly indicates that higher education in Central and Eastern Europe was undervalued. It was rather rewarded rather than in social of prestige, than in earnings.

It is worth noticing that in late nineties all transition economies faced local crisis. Among the causes one should stress the role of deficit of workers with sufficiently high qualification levels. Therefore, labour market has changed accordingly and employers' expectations for qualifications and skills have risen. There was noticeable fall in demand for low qualified workers, and an increase in the demand for specialists. Consequently, young people after secondary school have difficulties with finding a job. In Poland, in addition to the transition effect, there exists a demographic effect. In this period people form large cohorts entered labour market. These two effects combined have created an educational boom. The number of university students rose dramatically. At the beginning of transition process the share was 9.8% and after ten years in 1998/99 – 25.4%. Since that moment it has been rising by about 2% annually reaching the 36,8% in academic year 2004/05. At the moment it exceeds 38%.

The higher education system has been transformed since early nineties. The major change was an adjustment to the new market conditions and individual's expectations. The most important new element of higher education system is the emergence of privately owned universities. In non-governmental schools, not like in governmental ones, the student has to pay a tuition fee. Development of private schools exploded at the time of curricula diversification to two-stage education with graduate and post graduate courses. Creating an opportunity for private schools to run undergraduate courses. Another important factor is a reaction of public schools and an increasing number of places offered in part-time study scheme. The fraction of full-time students has decreased, while fraction of part-time has risen (Kilińska, Radcowski 2005). This change occurred despite the fact that the latter scheme is paid.

At the beginning of the transition process there was 7 non-state universities. Nowadays, there are nearly 350 (Strawinski 2008). The important date is year 1997, when private universities outnumbered the state ones. As a result of a long and rapid increase in educational services,

Poland has nowadays the most developed non-public university sector in Europe. The private sector students account for 40% of all student population. In the first phase of the transition period non-governmental universities offered only undergraduate courses. At the moment about 25% of them offer post-graduate master programs, and few PhD programs (OECD 2003).

The dynamic development of private university has been attributed to demand side of the economy. Interestingly, this finding stands in opposition to empirical research that points out rather low level of return to higher education in transition economies. It seems that the main reason for this undervaluation is the dual character of the economy. In the public sector non-market mechanism determined the wages. In addition, the state was the main employer

2. Methodology

There are several ways to estimate the rate of return to higher education. It might be that the dual character of transition economies poses some differences to methodological issues. Nevertheless we employ standard approach in the field and use the Mincer model (1974). The Mincerian wage equations are commonly used in several labour economy fields, such as return to education, wage inequalities, or pay-gender discrimination gap. In this method empirical data are fitted to logarithm of actual wage by a linear regression model. Characteristics such as level of education, age as a measure of work experience and socio-demographic characteristics are used as explanatory variables. This basic model is extended by inclusion of the mechanism that allows for controlling non-random selection in university education.

The model is based on comparative advantage theory. Individuals choose their preferred education level. In order to do that, they compare streams of future incomes with alternative education levels. At every moment they can withdraw from the education system. Continuation of studies is considered as an investment, because there is a necessity to choose between current costs and future incomes. Studies postpone the entrance to the labour market and lessen working activity time. Analogously to the standard cost benefit analysis of investment project, it is possible to calculate the internal rate of return. This return rate is defined as interest level that equals present value of cost stream with present value of future expected incomes stream.

To reduce the complexity of the analysis the rate of return to education is treated as the parameter characteristic of an individual. It is assumed, that undertaking investment at an individual level has no impact on general equilibrium of the economy. Consequently, the marginal return rate is not affected by the decision of other society members. The next assumption simplifying the analysis is that the study costs are uniformly distributed over a study period. In reality, they are usually higher at the beginning and then decline.

Let Y_{ij} be lifetime labour income of person i with education level j . Let X_i be a vector of observable abilities and socio- demographic characteristics and ε_i a vector of unobservable terms that have an influence on the labour income. The cost of achieving education level j is C_{ij} . It varies among individuals due to specific abilities and predispositions heterogeneity. Let V_{ij} be a value of education level j for person i . The mechanism of choosing the desired education level can be presented as:

$$Y_{ij} = f(X_i, \varepsilon_i) \quad (1)$$

$$V_{ij} = \max_j (Y_{ij} - C_{ij}) \quad (2)$$

One chooses such education an level j , that maximises the difference between stream of incomes attached to this level and the cost required to achieve it.

The analytic formula is a modification of Willis and Rosen (1979) model. In our model we restrict the analysis to the choice between the high school degree H and the university degree U . We assume that wages are increasing functions of the time. The rate of growth depends on workers education level and is g_h for person with high school education and g_u for university diploma holder. The amount of time necessary to achieve a diploma is marked T years. If one's chooses university education their stream of future incomes is given by:

$$y_{Ui}(t) = \begin{cases} 0 & 0 \leq t \leq T \\ y_{Uo} \exp(g_U(t-T)) & T < t < \infty \end{cases} \quad (3)$$

The variable t represents working time and $(t-T)$ is a measure of working experience. We can denote income equation for a high school person in a similar way:

$$y_{Hi}(t) = \overline{y_{H0}} \exp(g_H t) \quad 0 \leq t < \infty \quad (4)$$

The income stream is determined by two parameters: the starting salary for each education level $y_{.0}$ and the growth rate g . The person, while making decision about going to the university compares discounted future values of income.

$$PV_{Ui} = \int_T^{\infty} y_{Ui}(t) \exp(-r_i t) dt = \frac{\overline{y_{U0}}}{(r_i - g_U)} \exp(-r_i T) \quad (5)$$

$$PV_{Hhi} = \int_0^{\infty} y_{Hi}(t) \exp(-r_i t) dt = \frac{\overline{y_{H0}}}{(r_i - g_H)} \quad (6)$$

The discounted value of education cost is equal to PV(C). The person i chooses university education if $PV(U)-PV(C)>PV(H)$, so the net benefit from achieving the university degree is greater than the benefits form secondary school education.

The discounted values of education level equation given by (5) and (6) are not earnings equations. They reflect an economic mechanism of choosing between two different education levels. The salary level is a function of education, experience measured by age and social and demographic characteristics. It is commonly assumed in the labour economy that the distribution of earnings is well approximated by the log normal distribution.

The education, level up to some point, is pre-determined by the social background of the person (Becker 1990). The sample selection problem will occur. In such a case, as is pointed out in the contemporary economic literature (Blundell et al. 2005; Harmon et al. 2002) to eliminate the sample selection bias it is necessary to include a selection equation in the model. The complete model can be written as

$$\begin{cases} w_0 = Z_i \delta + \xi_i \\ \ln(w) = X_i \beta + U_i \gamma + \varepsilon_i \end{cases} \quad (7)$$

where w_0 is a selection indicator, Z_i is a selection variable matrix, U_i is a university degree indicator variable. The model parameters could be consistently estimated by two-step procedure or the maximum likelihood method (Heckman 1979).

3. Sample characteristics

The main data source is Households Budget Survey (HBS). It is yearly, representative study that collects information about households with a special attention paid to income sources and expenditure structure. Each year over 30,000 households are surveyed. The households are periodically replaced to keep the sample representative. Therefore, it is not possible to construct a valid panel. We use cross-sectional data from 1998-2005 instead.

Another issue is related to the farming income, which is highly correlated with land productivity, and very weakly related to human capital productivity (Czekaj 2006). As a consequence, farmer's income is only partly determined by its education and abilities. To overcome the problem we omit the data from households in which farming was the only or main income source. This way of handling the problem is justified in economic theory.

The empirical sample is restricted to the individuals of working age (16-60 for females and 16-65 for males), who receive incomes from work or self-employment. In order to compensate for selection process information about non-working people is also included. In addition, information about part-time employees is discarded (about 120 observations each year). This step is necessary because data does not provide information about exact number of working hours, so it is not possible to calculate hypothetical full time earnings. We also excluded individuals who combine incomes from employment and social assistance. For this group of employees wage level is limited by a law. In analogy to part time workers this specific group has a labour supply that differs greatly from the standard one. In addition, the people who declare that work is not their main source of income also were left out. The latter group decided to work on non-economical basis, so their wage may not reflect the value of their working abilities.

<Table 1 about here>

After all data correction about 35,000 observations for each year are left in the sample. The data descriptive statistics are presented in Table 1 and comprise of information about people who completed education and received high school or university diploma. First column shows mean value, in the following there are minimum and maximum values for 1998-2005 period. Women have a larger share in the sample (57,03%). This is attributed to the fact that it is more usual for men than women to choose secondary vocational school and start to work. As it is shown in recent surveys (Kilińska, Radcowski 2005) in most cases educational decisions are driven by economic needs or are the results of voluntary choices. The average age in the analysed sample is higher than in labour active population. Due to high wage replacement rate in low income-education groups, these people decide to leave the labour market before reaching the retirement age. For the more educated employees early retirement is not so profitable, on average they work longer. The variable *university* is an indicator of university education level and has an auxiliary role. The labour active individuals with university education are on average 10 years older than high school graduates.

It is important to point out that employment structure changed dramatically during the seven years of transition. As it is shown by Newell and Socha (2007) between 1998-2002 private sector employment rose by 50% and exceeded public sector employment. The traditional production sectors (farming, mining, industry) lost their importance. On the other hand there was a great expansion of service sector. It is also worth noticing that self-employment share rose to 11% during that period. This group of workers is very much diversified. It comprises small business owners, managers, craftsmen and workers. The presence of this group may have an important impact on the result of the analysis, but on the other hand, plays also an important role in the economy.

4. Results

The analysis departs from average net wage level. In the following stage wage equation is estimated. The next step is to use empirical data to construct wage profiles for employed people and also for those who decided to study. In the final stage we compare economic cost and benefits from studying paying special attention to opportunity cost.

<Table 2 about here>

Monthly average net wage from employment presented in Table 2. rose during the analysed period. The growth rate of real wages was, of course, much slower. It is worth noticing that in 1999 the real wages declined. This decline could be easily linked to the effect of four major reforms¹ and economic perturbations. These unsettlements may have an influence on the estimated return rate.

We compare the actual wage levels with hypothetical wage profiles calculated from wage equation parameters. Assumed theoretical framework determines the model with sample selection. The selection equation is labour market participation probit. The wage equation functional form is a standard Mincer type equation that includes additional information about place of living (size of the town, region), type of job (public or private sector) and the legal status of job contract (regular or self employment). The role for additional variables is to separate factors that influence wages independently from the education level from those, which jointly determine education and wages.

The wage equation (7) is estimated for each year separately. As a result we receive seven sets of estimates. In table 3 we present the summary characteristics of coefficients. To conserve space we decided to present most important coefficients for wage equation only. Estimates of participation equation are very similar to other studies.

<Table 3 about here>

The sizes and magnitudes for coefficients included in the wage equation are in accord with labour market theory. Positive sign for *gender* variable show that employers tend to pay higher wages the men than women, even if both have similar qualifications and working experience. This might be an indication of gender related wage discrimination. Coefficient for experience and experience squared may be interpreted as diminishing marginal returns from working experience. The university education premium is positive. Not surprisingly, private sector employees are on average better paid. However, it is worth noticing that skilled workers' wages are higher in the private sector, while blue-collar workers earn less in that sector. The other, not reported, coefficients beside control variables such as size of the town

¹ On 1st January 1999 new health system, pension system, social security system and administrative system were introduced.

and regional dummies reflect a regional diversification of an average wage. The wage level rises in proportion to the size of the town, and the proximity to western border.

The wage growth rate for skilled jobs was much faster than for workers (Newell, Socha 2007). This finding indicates that having better skills is adequately rewarded on a labour market. Such behaviour is in accord with Skill Biased Technological Change theory (Card, DiNardo 2002). When the wage diversification rises as an effect of SBTC, then what we observe is a faster wage growth rate for qualified personnel in technologically advanced branches of industry. On the other hand, unskilled workers wages' fall.

Using results from wage equations for each year, the wage distribution in terms of education and age level is calculated. It is assumed that all remaining characteristics for both groups are on the same mean level. The wages in both sub-populations are behaving similarly. At the beginning of working career wages rise as a result of increasing working experience. University graduates enter the labour market 5 years later, however, they start from higher salary. In addition, the growth rate for the latter group is faster. The highest earnings are received by people in age of 44-48 years. For people over 50 the wages decline slightly. The effect can be explained by lower productivity of older workers'. This effect is compensated by experience; this compensation is higher for university graduates.

Economic costs of education can be easily decomposed into two main factors. The first factor is financial costs and the second element is opportunity costs. A student resigns from participation in a labour market, so the amount of unearned income may be treated as an economic cost of studying. The sum of opportunity costs account for the probability of finding a job by young people.

The tuition fee in the analysed time period was not constant. Up to 2002/2003 academic year the average studying fee was rising along with inflation. During the following years the situation changed. The growing number of private universities, and increased recruitment for fee-paying studies in state owned universities changed the market from supplier to customer-oriented. In response to falling relative interest in fee-paying university studies, the end of demographic peak and lower inflation rate many schools decided to offer incentives to study to the candidates. This process prevents tuition fees from increasing. Vast majority of schools used the inflation slowdown to keep fees at a constant level. This meant, that the study cost

decreased in real terms. The annual average studying fee in academic year 2000/2001 was 6.300 zloty (GUS). Opportunity cost calculation is based on hypothetical wage profiles for average individuals. It equalizes the amount of hypothetical unearned incomes during the study period. Unearned income real value is 1200-1300 zloty before tax. This amount seems to be reliable, because this is a market wage level for secondary school graduates in that period. Total studying costs are presented in Table 4.

<Table 4 about here>

In the seven years financial costs of studying increased by 40% in nominal value, which means that in real terms the costs decreased by about 9%. This real cost decrease is due to lower share of tuition-fee in total study financial cost.

Education is one of the factors which describe human capital. Therefore, in analogy to the physical capital, it is possible to estimate level of inputs required to increase the level of education. The starting point for the economic analysis is an assumption, that individuals are rational, and make their choices according to the theory of maximum expected utility. In the model, university studies are treated as investment.

Using the wage equations coefficients, hypothetical wage profiles are computed for people with different education level. The next stage is to transform the wage profiles into lifetime earnings. For university graduates, the financial costs, bank loan costs and the opportunity costs were all subtracted from earnings. This gave the net value of educational investment. The return rate was calculated as a proportion of additional net income to high school graduates lifetime earnings. Relevant estimates are presented in Table 5.

<Table 5 about here>

Return rate to university education estimation of 6-9% level confirm the expectations. Similar result was achieved by Strawiński in earlier work (Strawiński 2006). To prove result robustness several models were estimated. In all models the return rate estimates ranged form 5 to 10% depending on used wage equation. Changes in return to education rate have similar pattern to GDP growth rate in that period. During the economic slowdown (1999-2001) return to education also fell, and after 2002 boost the return rises.

Special attention was paid to the observed phenomenon of sharp increase in return rate between year 2001 and 2002. This effect has been observed in all but one empirical model. The odd model is one that does not use working position dummies. In this model the estimate of return rate is 6-7% for all years. To investigate this change we looked at wage dynamics and wage diversification. The nominal wages rose by 50% on average for low skilled workers, while for high skilled workers the figure is 100%. Similar observation was made for administrative workers.

The investment to university education is characterised by a relatively high return rate. The actual rate is about 6.5% in late 1990s and about 9.5% in recent years. These values are comparable to the other European countries, placing Poland among the countries with the highest return to education rates. This finding is in harmony with expectations (see Psacharopoulos, Patrinos 2002), because a country with a relatively low GDP level in comparison with the other European countries and a faster rate of economic growth is characterised by a high demand for skilled workers. Young people making study decision take into account current wage levels and expect that they will benefit from university graduation. Obviously, this reasoning has a weak point. The labour market is not stable over time. The fact that when the study decision is made the return to education rate is relatively high or relatively low, does not mean that true return rate will be high or low. Unfortunately, estimation of unknown return rate is not possible for obvious reasons.

The goal of this research is to consider private rate of return to education in Poland. At the beginning related literature and theoretical model are presented. The second part deal with empirical sample, estimation strategy and results. The main result is that the actual rate of return to education is about 6% for 1998-2001 period and around 9% for the latter period. We have tried to explain this change by linking increased return rate to overall performance of the economy in the transition process. The observed increasing gap between wages of high school graduates and university diploma holders' supports SBTC theory.

The question about profitability of university studies is still relevant. The estimated return rate to university education is positive and is among the highest in Europe. This observation helps to explain why we observe a great expansion of tertiary schooling in Poland. Graduation from a university course has a positive influence on the probability of finding job and the wage

received. Unfortunately, there is no general answer to the main question. Relying on our result, we can conclude, that the person who decided to study at beginning of 1990s made a very profitable investment decision. How profitable will a similar decision for current cohorts be we will know in next years. The results indicate that profitability is increasing.

REFERENCES

- Acemoglu D., Angrist J. (1999) "How Large Are the Social Returns to Education? Evidence From Compulsory Schooling Laws." *NBER Working Paper* Nr 7444.
- Ashenfelter O. (1978) "Estimating the Effect of Training Programs on Earning." *The Review of Economics and Statistics* vol. 60/1.
- Bar-Or Y., Burbidge J., Magee L., Robb A. (1995) "The Wage Premium to a University Education in Canada 1971-1991." *Journal of Labour Economics* vol. 13/4.
- Becker G. (1990) *Ekonomiczna teoria zachowań ludzkich*, PWN Warszawa.
- Brunello G., Coni S., Lucifora C. "The Returns to Education in Italy: A New Look at the Evidence." *IZA Working Paper* 2000 nr 130. Published in: Harmon, C./I. Walker/N. Westergard-Nielsen (eds.), *The Returns to Education in Europe*, Edward Elgar, 2001.
- Blundell R., Dearden L., Sianesi B. (2005) "Evaluating the impact of education on earnings in the UK: Models, methods and results from the NCDS." *Journal of the Royal Statistical Society. Series A.* vol. 168 no 3.
- Caponi V., Plesca M. (2007) "Post-Secondary Education in Canada: Can Ability Bias Explain the Earnings Gap Between College and University Graduates?." *IZA Discussion Paper* nr. 2784.
- Card D. (1999) "The Casual Effect of Education on Earnings" in O.Ashenfelter, D.Card *Handbook of Labour Economics*. North Holland. Amsterdam 1999.
- Card D. (2001) "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems." *Econometrica* vol. 69/5.
- Card D., Di Nardo J. (2002) "Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles." *Journal of Labour Economics* vol. 20/4.
- Czekaj T. (2006) „Dochodowość materialnych czynników produkcji w gospodarstwach indywidualnych w 2004 roku.” IERiGŻ Working Paper nr 32/06.
- De la Fuente A. (2003) *Human Capital in a Global and Knowledge-based Economy. Part 2: Assesment at the EU Country Level*. European Commission Raport.

- Harmon C., Oosterbeek H., Walker I. “*The Returns to Education: A Review of Evidence.*”
Centre for Economics of Education. London 2002.
- Heckman J. (1979) “Sample Selection Bias as a Specification Error.” *Econometrica* vol. 47/1.
- Kilińska D., Radcowski S. *Ścieżki edukacyjne Polaków*. GUS. 2005.
- Mendolicchio C. (2005) “Gender and private returns to education: a cross-country analysis”,
UCLouvain Working Paper 2005-56.
- Mincer. J. (1974) *Schooling. Experience and Earnings*. Columbia University Press. New York
- Newell A., Reilly B. (1999) “Rates of return to educational qualifications in the transitional economies”, *Education Economics*, vol. 7.
- Newell A., Socha M. (2007) “The Polish Wage Inequality Explosion.” *Economics of Transition* vol. 15/4.
- Pastore F., Verashchagina A. (2006) “Private Returns to human capital over transition: A case study of Belarus.” *Economics of Education Review* vol. 25.
- Psacharopoulos G. (1994) “Returns to Investment in Education: A Global Update.” *World Development* vol. 22. no. 9.
- Psacharopoulos G., Patrinos (2002) “Returns to Investment in Education: A Further Update.”
World Bank Policy Research Working Paper 2881,
- Strawiński P. (2006) „Zwrot z inwestowania w wyższe wykształcenie.” *Ekonomista* vol. 6.
- Strawiński P. (2008) „Finansowanie szkolnictwa wyższego.” *Wiadomości Statystyczne* vol. 4/2008.
- GUS *Szkoły wyższe i ich finanse*. GUS. Various issues from 1998-2005.
- Willis R.J., Rosen S. (1979) “Education and Self Selection.” *Journal of Political Economy* vol. 98/5.

Table 1. Sample characteristics.

Variable	Characteristics		
	mean	min	max
gender	0.4362	0.4264	0.4555
experience	39.2503	39.1224	39.5212
experience ²	1638.8340	1622.3160	1669.4420
experienceXuniversity	11.0090	10.0711	13.1629
(experience ²)Xuniversity	463.9512	431.8404	543.9871
public sector	0.4417	0.3670	0.5459
self-employment	0.1209	0.1101	0.1308
family	0.7814	0.7518	0.7978
log wage	7.1067	6.9066	7.2317

Source: Own computations based on HBS data.

Table 2. Average monthly wage.

year	nominal net wage	real wages in 2004 prices
1998	975.94 zł	1318.26 zł
1999	1001.04 zł	1237.18 zł
2000	1129.09 zł	1279.56 zł
2001	1207.96 zł	1286.23 zł
2002	1249.12 zł	1288.27 zł
2003	1289.47 zł	1314.57 zł
2004	1342.85 zł	1342.85 zł
2005	1397.80 zł	1373.98 zł

Source: Own computations based on CSO&HBS data.

Table 3. The wage equations coefficients.

Variable	Coefficient		
	mean	min	max
male	0,1870	0,1235	0,3301
experience	0,0561	0,0426	0,0692
experience^2	-0,0006	-0,0008	-0,0004
experienceXuniversity	0,0289	0,0082	0,0339
(experience^2)Xuniversity	-0,0003	-0,0004	-0,0001
public sector	-0,0498	-0,0919	-0,0201
self-employment	0,2066	0,1304	0,2493
family	0,1054	0,0759	0,1489

Source: Own computations based on HBS data.

Table 4. Yearly nominal cost of university education.

Year	Studying fee yearly	Opportunity cost	Total cost
1998	5300 zł	54 000 zł	80 500 zł
1999	5800 zł	60 100 zł	89 100 zł
2000	6300 zł	68 700 zł	100 200 zł
2001	6700 zł	73 600 zł	107 100 zł
2002	6900 zł	73 500 zł	108 000 zł
2003	7000 zł	75 200 zł	110 200 zł
2004	7000 zł	81 600 zł	116 600 zł
2005	7000 zł	77 600 zł	112 600 zł

Source: Own computations based on HBS data.

Table 5. Return rate from university education

year	Yearly return to university education	Return rate to university education
1998	7.27%	36.35%
1999	6.42%	32.12%
2000	6.60%	33.00%
2001	5.86%	29.28%
2002	8.72%	43.60%
2003	9.27%	46.35%
2004	8.79%	43.97%
2005	8.72%	43.61%

Source: Own computations based on HBS data.