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RETURNS TO VOCATIONAL EDUCATION EVIDENCE FROM POLAND

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Returns to vocational education. Evidence from Poland

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Abstract

Vocational education in upper-secondary school has been perceived for many years as being inferior to general education, in spite of the fact that vocational education graduates enjoy a faster transition from school to work and are more likely to have a permanent first job. As a consequence of the reform of the educational system that took place in Poland in 1999, the enrolment ratio in vocational schools has fallen dramatically. The empirical evidence in the literature on the returns to vocational education is limited. This study fills that gap and looks into wage premium for workers with vocational education in Poland before and after the reform of the educational system. The relative returns to different types and levels of education were estimated using a standard Mincerian wage equation framework. The empirical analysis concentrated on a comparison of the relative benefits of vocational and non-vocational education. The results showed that vocational education graduates have, on average, a higher probability of finding a permanent job, and secondary-vocational education graduates receive higher earnings than secondary general education graduates in Poland. However, wages of vocational education graduates are lower than those of secondary general education. In spite of this, the decreasing number of vocational education graduates post-reform has contributed to reducing this gap.

Keywords:

educational economics, wages, wage differentials, returns to education, vocational education, general education, tertiary education, Poland

JEL:

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Introduction and motivation

Currently, vocational education and training is high on the policy agenda, especially in the European Union. The main focus is on three areas: improving the quality of training, developing the quality of instructors and teachers, and tailoring courses and curricula to the needs of the labour market.

In developed countries, two main models of schooling structure exist. In many European countries, the dual system (often called the German system) provides both vocational-oriented and general-oriented education and training. On the other hand, in the United States of America and the United Kingdom, only the general track exists, as specific skills can be gained by on-the-job training and therefore are seen as unnecessary inclusions in school curricula. What is essential is to give the student the ability to adapt to the changing labour market. In Poland, the education reform shifted the structure of the system towards the Anglo-Saxon approach.

The Polish educational system is interesting to analyse. At the beginning of the economic transition, the participation rate in tertiary education was about 10%, and only 6.5% of the population had a university degree. One of the most important developments of the 25-year Polish transition is the educational boom. The most important aspect of this is the expansion of tertiary education. At the end of 2014, the tertiary education participation rate was just below 38%, and 25% of the population possessed, at minimum, a university master degree. This development was accompanied by an increase in the quality of education at the secondary level, as measured by the Programme for International Student Assessment (PISA). However, there is relatively little prior research into how these educational changes have translated into changes in the situation of young people in the labour-market.

Vocational education in upper-secondary schools has previously been perceived as inferior to general education, in spite of the fact that vocational education graduates enjoy a faster transition from school to work and are more likely to have a permanent first job.

The goals of Poland's educational reforms were to improve the overall level of education in Polish society, increase educational opportunities for citizens, and improve the quality and

equity of the educational system[1]. Until 1999, the configuration of the basic educational system in Poland relied on a traditional dual structure involving:

- A comprehensive primary school cycle lasting eight years;
- A secondary school cycle with two tracks:
    - a general track (called *liceum*) lasting four years;
    - a vocational track lasting either three years in the case of basic vocational school or five years in the case of secondary vocational school, also called *technikum*.

In other words, basic education for children meant 11 to 13 years of schooling depending on their track choice. The direction and duration of further education had to be decided at the end of primary school, at around the age of 14.

The 1999 reform introduced a new, intermediate stage of education. A new level of schooling was created: lower secondary school, called *gimnasium*. This type of school became a symbol of the reform. The previous structure was replaced by a system described as six plus three plus three. This meant that education in primary school was reduced to six years. Students would then continue their education in the three-year gymnasium programme. Only after completing three years in gymnasium would they move on to:

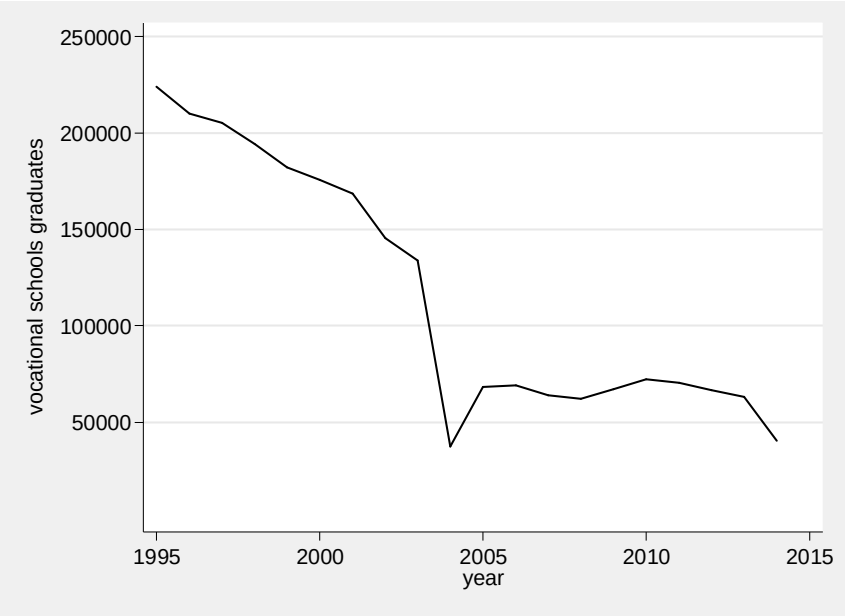
- a three-year secondary school programme (general *liceum* or specialised *liceum*),
- a two-year vocational school programme, or
- a four-year technical school programme (*technikum*).

It was assumed that the introduction of gymnasium would allow Poland to raise its population's level of education, particularly in rural areas where schools were small. The reform increased compulsory general education to nine years and postponed the choice between the secondary-level general or vocational programme for one year.

The unanticipated result of the reform was a rapid decline in enrolment at vocational schools. After implementation of the reform, the number of vocational and secondary-vocational school graduates fell rapidly, and this number remained low throughout the following years (see Figure 1). The lowest recorded number of graduates (less than 40,000 in 2004) can be seen as a direct consequence of extending the general education programme by one year

[1] The 1999 educational reform in Poland was comprehensively described by the OECD report of 2011.

Figure 1. Vocational school graduates in Poland from 1995 to 2013

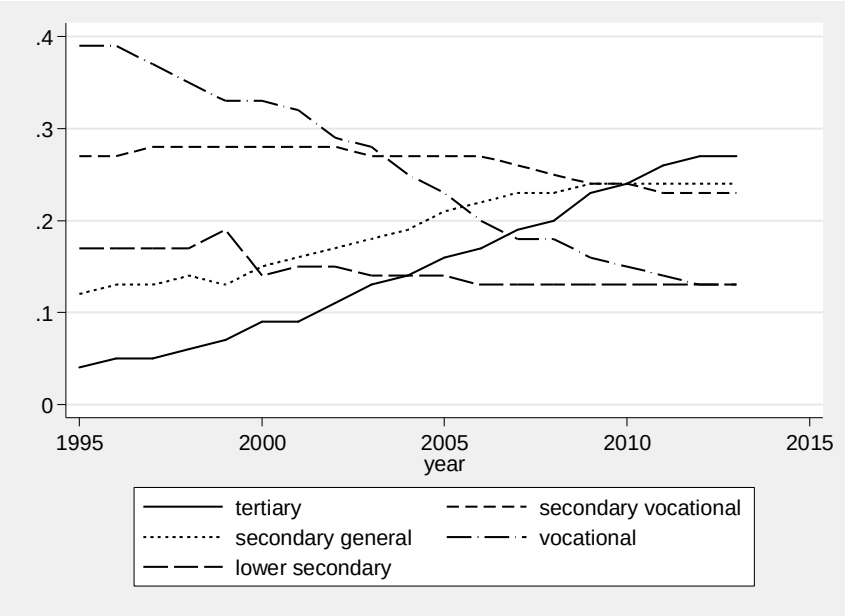


Source: Central Statistical Office

The educational structure of the youth population (19-30 years old) has changed significantly during the last 20 years (Figure 2). In 1995, the most common level of education among young people was vocational education (almost 40% of the youth population) and secondary-vocational education (almost 30% of young people). Only about 5% of the population aged 19-30 in 1995 had tertiary university or equivalent education.

The biggest changes of this period were noted among young people with vocational and tertiary education. From 1995 to 2015, the percentage of the youth population with tertiary education increased from around 5% to 27%. At the same time, the percentage of people aged 19 to 30 with vocational education decreased from almost 39% to only 13%. Relatively big changes were observed with respect to general secondary education: the percentage of the youth population having this type of education doubled. However, it is worth noting that most of them continued their education at the tertiary level. From 1995 to 2013, the percentage of people with secondary general education in the total population rose, albeit by only two percentage points.

Figure 2. Educational structure, 19-30 years old



Source: Authors' calculation based on LFS 1995-2013 data.

As stated above, the empirical evidence in the literature on the returns to vocational education is limited. In addition, a single, global model of education does not exist. Therefore, the present study is partly exploratory.

The principal aim of this study was to estimate wage premium to vocational education in Poland. To achieve this goal, the Mincerian wage equation framework was used. Furthermore, this study will also take a deeper look into the consequences of educational reform in Poland. Specifically, two questions will be examined:

- Has the rising number of tertiary education graduates lowered the wage premium to education?
- Has the decreasing number of vocational education graduates increased the wage premium to education?

The rest of this paper is constructed as follows. Section 2 contains a literature review, divided into two parts. The first part is devoted to international empirical evidence of returns to vocational education; the second part focuses specifically on returns to education in Poland. Section 3 presents the data and its limitations, and describes the labour market in Poland. In

section 4, the methodology of this study and its empirical results are presented. Finally, section 5 provides a summary of the study's findings and its conclusion.

2. Literature review

2.1 International empirical evidence

For many years, vocational education in upper-secondary schools has been perceived as inferior to general education. Adler (1983) and Goodlad (1984) described vocational education as anachronistic. Jacobs and Grubb (2003) stated that the 'institutional transformation of education over the 20th century has resulted in a general consensus that specific vocational preparation should not be a part of high school'. Many studies in this field, examining the effects of secondary-vocational education, found few or no economic benefits (e.g. Gustman and Steinmeier 1983; Hotchkiss 1993; Neuman and Ziderman 1999).

However, some researchers consider vocational education to be an educational alternative to general secondary schooling. Neuman and Ziderman (1999) described vocational education as a 'framework for improving life-outcomes of unemployed youth and other social groups with special needs'. However, based on Israeli data, they found only a small difference in earnings between the vocational and academic graduates. More encouraging data was found by Bishop and Mane (2004), who noted that the return to secondary vocational education in the United States has been growing since the 1980s. Additionally, Meer (2007) stated that those workers who had been on a *technical track* as students (which can be understood as vocational educational) were unlikely to earn more than if they had chosen differently.

Jakubowski et al. (2010) noted that cost-benefit studies on returns to schooling for vocational tracks showed lower returns and higher costs. Moreover, under the communist system, mental work was valued less than physical work, and as workers in manufacturing were paid more than workers in services, vocational education was very popular in the planned economies in Eastern Europe. This situation changed with the transition to a market economy, when general education increased in popularity (Brunello et al. 2010).

Hanushek et al. (2011) used micro data for 18 countries from the International Adult Literacy Survey in order to test their hypothesis that any relative labour-market advantage of

vocational education decreases with age. The authors employed a difference-in-differences approach that compared employment rates across different ages for people with general and vocational education. They found strong support for the existence of such a trade-off, most pronounced in countries that emphasize apprenticeship programs. The role of apprenticeships was also confirmed by Lopez-Mayan and Nicodemo (2012).

Hanushek et al. (2011) argument was that vocational education leads to a slower adoption of new technologies. Additionally, Krueger and Kumar (2004a, 2004b) argued that the propensity to use vocational rather than general education may be a cause of growth-rate differentials between the U.S. and Europe. In their research, Hanushek et al. (2011) showed that in the U.S. and other countries that do not have well-developed or noteworthy vocational education systems, the employment probability of individuals with different types of education does not vary with age at all. However, in many European countries, age-employment patterns differ between individuals with general and vocational education. This is mostly visible in Denmark, Germany, and Switzerland, which have broad vocational education systems that combine education with apprenticeships.

Lopez-Mayan and Nicodemo (2012) analysed the school-to-work transitions in Spain for individuals who have completed vocational education. The objective of their study was to explore the determinants of the transitions from vocational school to work and to analyse differences between the two vocational levels in Spain (vocational high school and vocational college). The authors found no relevant differences neither in the duration nor in the estimates of the determinants of transitions, across the different types of vocational education. However, taking into account other factors such as wage, occupation, and contract, more differences exist. The principal difference between the two types of vocational education is in the occupation types. Graduates from vocational high school work mainly in high blue-collar occupations[2] while those with vocational college are employed mainly, and with similar percentages, in low white-collar[3] and high blue-collar occupations. Additionally, some differences by gender were found, suggesting that there exists gender segregation in some sectors (particularly in the fields of construction, education, and health). In general, Lopez-Mayan and Nicodemo (2012) underlined the importance of apprenticeship, which increases the hazard rate to employment from both types of vocational education.

[2] Service and sale workers; Skilled agricultural; Craft and related trade workers; Plant and machine operators.
[3] Technicians and associate professionals; Clerical support workers.

Research on the behaviour of the returns to schooling during the economic transition shows that returns have increased in most economies, mainly during the early stages of the transition (see e.g. Orazem and Vodopivec 1997, Flabbi et al. 2008, Fleischer et al. 2005). In addition, the recent report prepared by the European Centre for the Development of Vocational Training (CEDEFOP) (2013) showed that relative to medium-level education (ISCED 3 and 4), graduates who attended vocational training 'enjoy a faster transition to work, are more likely to have a permanent first job, and are less likely to find a first job with a qualification mismatch'. It also stated that vocational education graduates are generally more likely to participate in the labour market.

Following that approach, many European countries provide extensive vocational education at the secondary level, mostly linked with apprenticeships, in order to improve the chances of workers' entry into the economy.

A study by Coupé and Vakhitova (2011) estimated the returns to education in transition countries. They found that transition countries had relatively low returns to education and that the economic boom did not lead to a clear change in these returns. They also noted that returns to education in Poland are among the highest in the transition countries.

In the same paper, Coupé and Vakhitova (2011) assessed the effects of returns to vocational education. However, they limited the sample to Ukraine. Their estimations showed that in 2003, each year of education at a vocational school increased one's monthly wage by 2.6%, compared to 4.4% for professional education and 5.8% for academic education. However, in 2007, only academic education had a significant return of 5.6% per additional year. The authors concluded that these changes were due to the growing share of workers who earn above minimum wage. Having restricted the sample to those earning above minimum wage, this study showed that both regressions showed no effects in terms of vocational education, but significant effects in terms of professional and academic education. The authors concluded that vocational education was 'helpful in 2003 in earning the minimum wage but not really helpful in earning more than that. As almost everybody began earning more than the minimum wage by 2007, these types of education no longer have an effect on income'.

Andersson et al. (2013) stated that in the transition economies, returns to vocational education are higher than returns to general education. However, Hujer et al. (2006), in a paper analysing the effect of vocational training on unemployment duration in Eastern Germany, noted that its impact was significantly negative. This was explained with the hypothesis that the programmes offered were not compatible with market demand.

Vocational training is often connected with those who are disadvantaged or less able to participate in general education. Following this approach, Bartlett (2009) stated that abandoning the provision of effective vocational education training may worsen labour-market outcomes for young people.

2.2 Wage premium for different levels of education – A review of Polish literature

Analyses of wage level and wage distribution amongst employees with different types of education have been conducted by several authors. Below, studies from the last ten years are briefly discussed.

Among older studies, Puhani (2000) and Newell and Socha (2005) are worthy of mention. Both articles underlined the increase in wage premiums for workers with higher education. However, as they only covered data from the early 1990s, the results cannot be compared with later studies.

Strawiński (2006 and 2008) analysed the returns to higher education based on data from the Polish Household Budget Survey and found that the annual rate of return to higher education was around 6.5% to 9.5%, from 1998 to 2005: one of the highest in Europe. In addition, people with higher education had an average of 30% higher earnings. The study also showed that investment in higher education in Poland yielded after 12 to 15 years, under the assumption of a low, real interest rate.

Rogut and Roszkowska (2007) analysed the relationship between qualifications and the level of wages in Poland from 2001 to 2004 using data from the Structure of Wages and Salaries Survey. Their analysis showed that between 2001 and 2004, wages of university graduates were approximately 30% to 50% higher than the average salary in Poland, and the wages of

workers with vocational education were 20% lower. The analysis showed that in these years, the relative wages of workers with vocational education further decreased.

Myck et al. (2009) estimated the rates of returns to higher education in Poland, combining information from two different Polish surveys from 2005 (the Polish Labour Force Survey and the Polish Household Budget Survey), and by using the Polish micro-simulation model (SIMPL). They showed the differences in net and gross rates of return to higher education, using monthly and hourly wages, and showed how important selection correction was in their conclusion. Annual rates of return to university education varied from 6.7% to 9.7% for men and 8.0% to 13.4% for women, when results using net monthly wages (without correcting for labour-market selection) were compared to results using gross hourly wages (a selection-corrected specification).

Gajderowicz et al. (2012) analysed the wage premia for higher education for different occupational groups in Poland. They used the Polish Labour Force Survey (PLFS) data and covered the period of 1995 to 2009. The authors estimated wage premia for higher education in ownership sectors (public and private) and for different occupational groups. They found that the average wage premium for higher education decreased significantly in the second half of the 2000s from 26% in 2005 to less than 15% in 2008 and 2009. Significant differences were observed between the private and public sector. In the latter half of the 1990's, the wage premium for workers with higher education in the private sector was much higher than for workers in the public sector. Since the late 1990s, the wage premium in the private sector has been declining. In the public sector, a significant drop was noted in the second half of the 2000s. Moreover, the authors estimated changes in wage premiums for the third, fourth, and fifth major occupational groups (which are usually associated with secondary education). Their results showed a significant decline in wage premia in all groups analysed (from 27% to 34% in 1995 to 14% to 15% in 2009), which can be associated with significant increases in the number of workers having tertiary education.

Szreder et al. (2012) analysed wage premia for workers with higher education by type of education in Poland. They used individual data from the cyclical, sociological survey called Social Diagnosis from the year 2009. Their results indicated that the highest returns to education were observed for workers with mathematical or technical degrees in higher education.

Majchrowska and Roszkowska (2013) analysed the differences in wage premia according to work experience among different occupational groups in Poland from 2004 to 2010, using the Structure of Wages and Salaries by Occupations Database. They found significant differences in wages among occupational groups. The highest wages were not surprisingly noted in groups with the highest required skills (i.e. the second and third major occupational groups: professionals and– technicians and associate professionals, respectively). Interestingly, the group with the third highest recorded wage premia after 20 years of work experience was the eighth group, plant and machine operators and assemblers, in which most workers have vocational education.

Roszkowska and Majchrowska (2014) analysed the differences in wages of men and women with different educational levels, and their changes from 2004 to 2010 using the Structure of Wages and Salaries by Occupations Database. The analyses indicated significant differentiation of both educational and job experience wage premiums among the occupational groups. The lowest wages were received by persons with either general secondary or basic skills education. The lack of requirement for an improvement in skills during their working life translated into a very small increase in the remuneration of employees with increasing seniority. Roszkowska and Majchrowska found that wage premium for vocational education was much higher among men than women. Moreover, the wage premium for this type of education significantly decreased between 2004 and 2008 (from 24% to 20% in the case of men and 17% to 10% among women, with regard to primary and incomplete primary education). From 2008 to 2010, the reverse trend was observed. Wage premium for vocational education increased from 20% to 22% among men and from 10% to 16% among women. Another interesting finding showed that wage premium for vocational education in the case of men was almost the same as the wage premium observed among workers with general secondary-education. In the case of workers with tertiary education, a similar trend was observed. There was a decline in wage premium from 2004 to 2008, and an increase from 2008 to 2010.

3. Descriptive analysis

3.1 The data

In this analysis, we used micro-level data from the Labour Force Survey (LFS) for the time span of 1995 to 2013. The LFS itself is a representative, individual-level survey; however, the population covered by the survey was targeted through households. The information was collected quarterly, with a focus on labour-market activity. Each quarter, the survey gathered information from about 50,000 individuals. Since 2010, this number has doubled.

There are some methodological problems with the dataset, such as redesigns of the survey. From a macroeconomic perspective, the major concern with the dataset is the survey discontinuity that occurred during the 2nd and 3rd quarter of 1999. To remove this gap in the dataset, we used estimates from 1999Q1 to replace missing data from 1999Q2. Additionally, to replace missing data from 1999Q3 we used data from 1999Q4.

As is common in studies covering several years, some data coherency steps were taken. The information collected by the LFS in previous years was limited. For instance, there was no information regarding individual field of study prior to 2004. The second issue in data harmonisation was changes made to the questionnaire items. These changes limited the analysis of the present study to categories that remained unchanged throughout the years in question.

The information regarding individual education from 1995 to 2000 was divided into seven distinct categories (*tertiary, post-secondary, secondary vocational, secondary general, vocational, primary,* and *incomplete primary*). In 2001, two additional categories were separated: *gymnasium* and *without school education*. However, in labour statistics, categories up to gymnasium are reported jointly. In 2004, in response to changes to the education system at the university level, the category *tertiary* was divided into *tertiary with PhD degree* and *tertiary with master or bachelor title*. However, those categories are reported jointly in the LFS summary tables. Tertiary level education categories were divided further in 2010. The category *tertiary with master or bachelor title* was divided into three separate subcategories: *master title, bachelor title,* and *college title*.

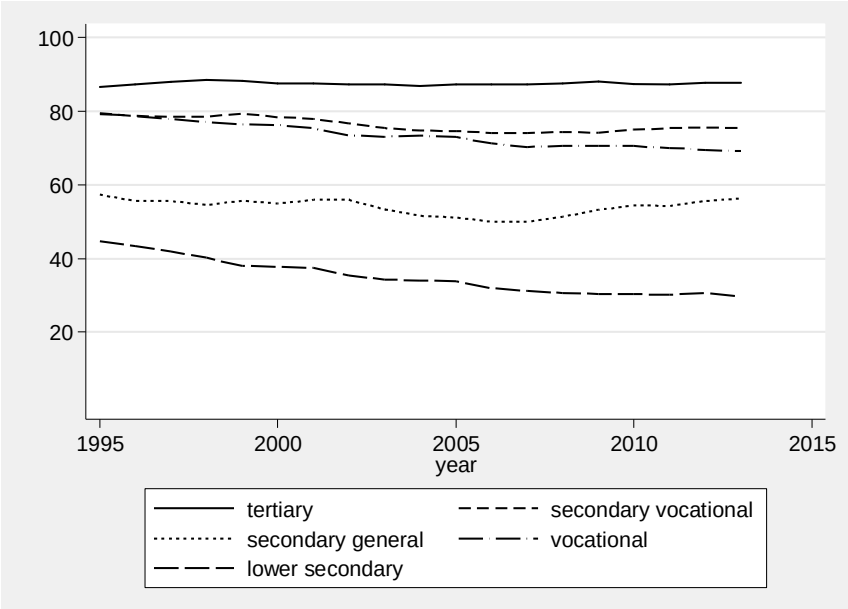
To achieve coherency in the presented results over the years, we limited the analysis to five educational categories – *tertiary, post-secondary, secondary vocational, secondary general, vocational* and *up to gymnasium*. Tertiary education includes all types of university-level

education regardless of diploma type. The category of post-secondary education was joined with secondary-vocational education due to fact that for only slightly more than 2% of the active Polish labour-market population, post-secondary education is the highest achieved level of education.

To calculate labour activity and educational measures, the data from all quarters of respective years was aggregated. This method is also used by Eurostat and national statistical offices to calculate yearly statistics. The statistics of employed, unemployed, and inactive individuals are directly accessible from the LFS. All remaining statistics are the authors' calculations based on the LSF micro data.

As shown in Figure 3, the labour-activity ratio depends on educational level. Not surprisingly, the highest ratio was observed among persons with tertiary education (over 85%). Slightly lower labour-market activity was observed among those with secondary vocational (77 %) or vocational education (75%). The labour-market activity in secondary and up to lower-secondary education groups was much lower. It is worth emphasising that those groups constitute less than 10% of the total active labour population among persons not enrolled in an educational programme.

Figure 3. Labour market activity by education level



Source: Polish Labour Force Survey 1995-2013.

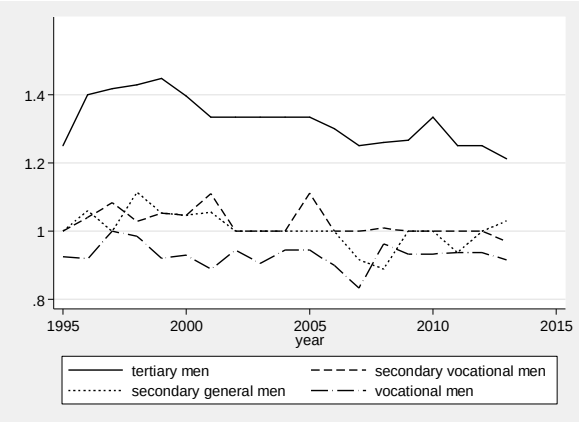
We will begin the analysis with our findings relative to wages received by workers with different educational levels. In contrast to the literature, the calculations based on median wages are presented. There are at least two arguments that suggest that this approach results in a better overview of the labour-market situation. Firstly, the distribution of wages is usually right-skewed. This means that the probability mass is concentrated at lower values. In this case, less than half of the population's wages reaches the mean, and therefore the median better reflects the central tendency. Secondly, there is the statistical argument that the numerical value of the mean is prone to outliers.

Below, the evolution of relative wages achieved on average by young workers aged 19 to 30 is presented. The most significant change in the period of 1995 to 2015 concerns wages of young workers with tertiary education. In late 1990's, the median wages of young men with tertiary education were more than 40% higher than the median wages in Poland (Figure 4a). Since then, they have been almost constantly declining. In 2013, young men with tertiary education earned only about 20% more than the median wage in the economy.

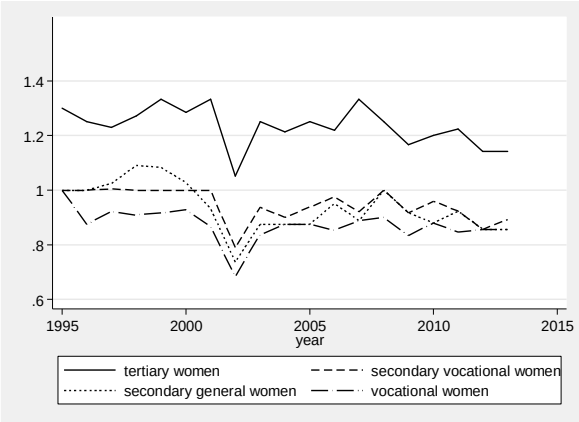
The evolution of wages of young women with tertiary education is very similar to that observed in the case of young men. At the beginning of the 2000s, wages of women with tertiary education aged 19 to 30 were about 30% higher than median wages of young women in general (Figure 4b). Since then, they have significantly declined to 15% higher than the median in 2013.

As far as wages of young men with other types of education are concerned, it can be observed that their relation to median wages was rather stable in the analysed period: only a slight decrease in the relative wages of workers with general secondary education was observed. In the case of young women with lower than tertiary types of education, one can notice a permanent decline in relative wages of around 10%.

Figure 4. Relative median wage by education



male young workers



female young workers

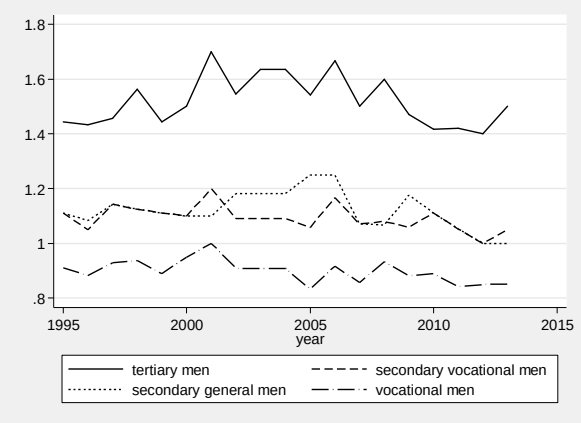
Source: Authors' calculations based on LFS 1995-2013 data.

The picture is quite different if one looks at the evolution of wages of prime-aged workers (aged 31 to 50) (Figure 5a and 5b). The relation of relative wages of both prime-aged men and women with tertiary education to median wages of young workers was significantly higher throughout the entire period.

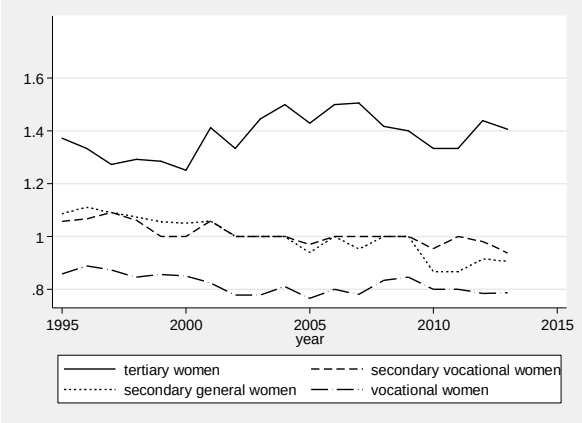
In 1995, prime-aged men with tertiary education earned slightly over 40% higher wages than the median wage of prime-aged workers. During the next few years, the ratio increased to 60%. Only since the latter half of the 2000s, the relative wages of prime-aged workers with tertiary education have been decreasing to the level observed at the beginning of the analysed period.

Relative wages of prime-aged men with general-secondary, vocational-secondary, and vocational education were rather stable during most of the analysed period. In the last few years, a small downward trend has been observed in these areas.

Figure 5. Relative median wage by education



male prime-aged workers



female prime-aged workers

Source: Authors' calculations based on LFS 1995-2013 data.

The behaviour of wages for prime-aged women differs slightly from those observed in the case of prime-aged men. For the tertiary educational level, wages increased from 125% to 150% of median wages from 2000 to 2008. Since then, another downward trend has been observed, but relative wages have not fallen to the level observed at the beginning of the analysed period. In 2013, prime-aged women earned, on average, 40% more than the median wage.

A downward tendency was observed in the case of wages of prime-aged women with lower than tertiary levels of education. Wages of prime-aged women with general-secondary or vocational-secondary education decreased from around 110% of the median wage in 1995 to around 90% in 2013. Wages of prime-aged women with vocational education fell from 90% in 1996 to less than 80% in 2013.

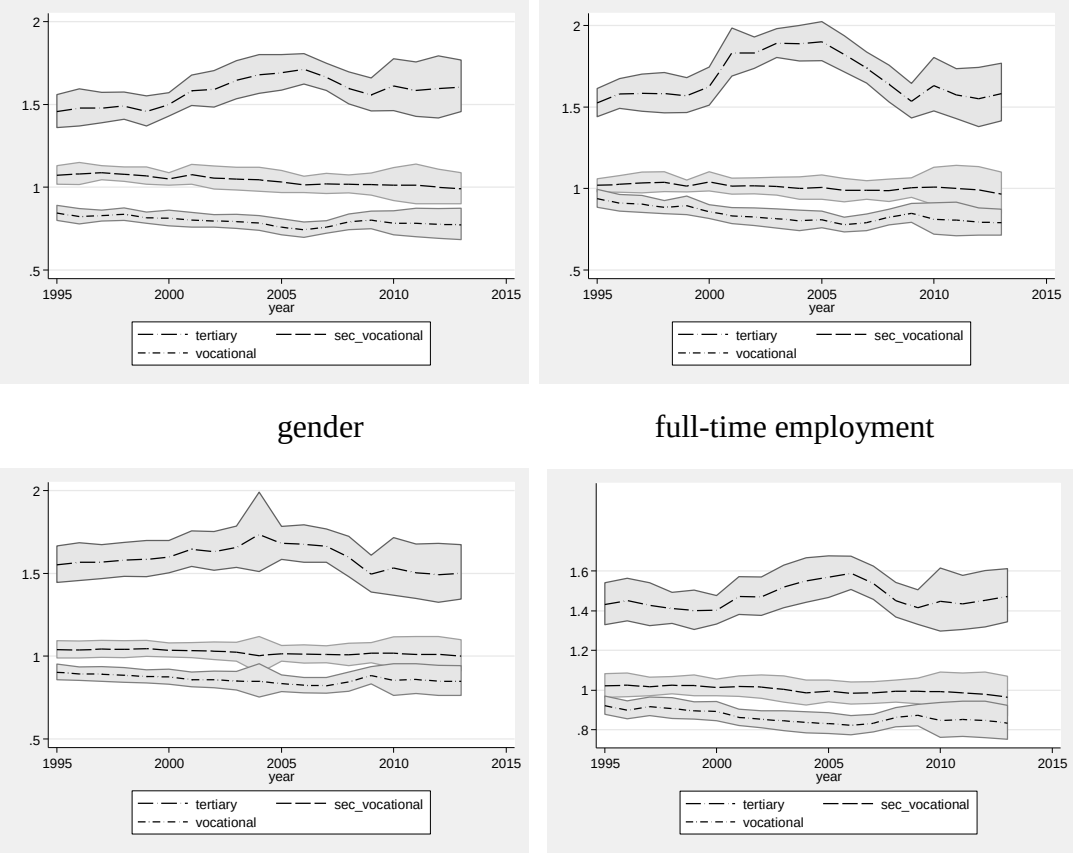
4. Empirical results

4.1 Modelling strategy (methodology)

We will begin with an analysis of the impact of individual characteristics on relative wages achieved by workers with different educational levels. In this paper, we concentrated only on those characteristics that have been proven to be significant by other studies. First, we analysed the impact of a single characteristic only. A separate, Mincer-type wage equation extended by one characteristic of the individual or workplace was estimated. As the analysis

considers median wages, a median regression was used (for details, see for instance Koencker and Basset, 1978).

Figure 6. Education-related wage gaps in Poland from 1995 to 2013 controlling (respectively) gender, form of employment, NACE section, and size of the firm

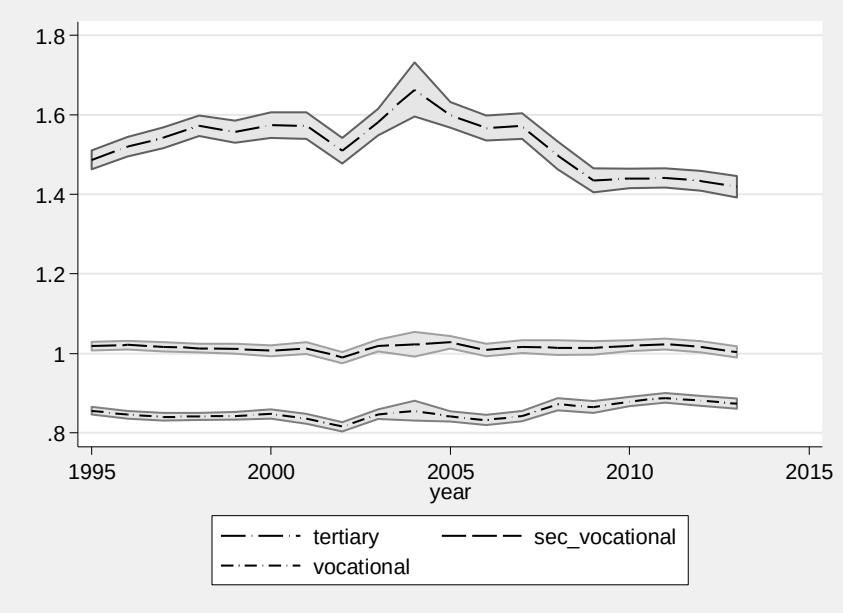


Source: Authors' calculation based on LFS 1995-2013 data.

Different characteristics of individuals and their workplaces were used to adjust the raw median wage-gap. The top left panel of Figure 6 presents the education-related median wage-gap according to gender. The top right panel presents the education-related median wage-gap according to full time vs. part time employment. In the bottom left panel, the education-related median wage-gap adjusted to the NACE (Statistical Classification of Economics Activities in European Community) section of the economy is presented, and in the bottom right panel, the wage-gap accounting to firm size is presented. Apart from the aforementioned individual and workplace characteristics, we also controlled for disability and town size.

The general pattern of the differences is very similar across graphs; only the sizes of the estimated gaps differ. People with tertiary education earn significantly higher than median wages, but the size of the gap seems to decline over time. Those with secondary or secondary-vocational education earn median wages. The median wages of the most interesting group – individuals with vocational education - for the purpose of the analysis in the late 1990's was well below the national median. Moreover, it appears to have declined further since 2003. This general picture remained almost unchanged when all factors were controlled simultaneously (see Figure 7).

Figure 7. Wage gap controlling all factors



Source: Authors' calculation based on LFS 1995-2013 data.

4.2 Selection model

To adjust estimates for the employment shares of different educational groups, we used the two-stage selection model, as this version is more robust to misspecification than the one-step selection model estimated by maximum likelihood. Moreover, in the wage equation, we used the median regression introduced by Koencker and Basset (1978), instead of the traditional mean regression. We controlled selection, adding the polynomial of selection equation with a fitted value, a method proposed by Buchinsky (2001).

In the selection equation, the dependent variable was a dummy variable, which indicated whether the person was employed or not. The set of explanatory variables included the following personal characteristics: education level, gender, marital status, and disability; and household localisation characteristics: the dummy variables of town size and NUTS2 regions. Marital status and disability were treated as variables having an impact on achieved education level and labour force participation, but having no direct effect on wages.

The wage equation had the standard Mincer-type form. The dependent variable was a natural logarithm of declared, monthly net-wage. The right hand side variables include educational level as well as experience and experience squared, part-time, NACE, firm size, town size, and NUTS2 regions. The measure of experience was implied years of education. The part-time dummy variable highlighted people who worked part-time. The NACE dummy variables were introduced to capture the differences between different sections of the national economy. Town size and regional dummy variables were included to capture the potential regional differences in wages.

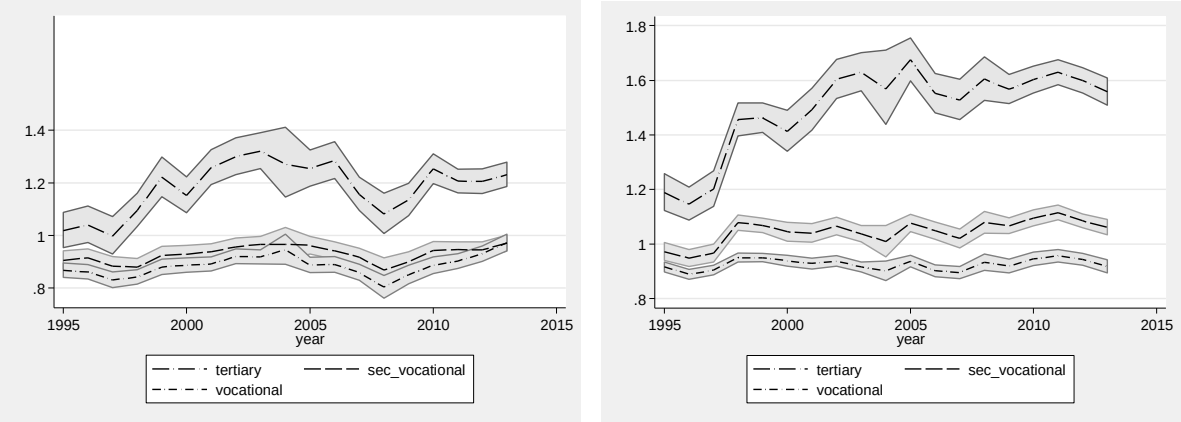
The model parameters were estimated separately for each year. We attempted to add a second tier of selection: selection into level of education. However, this effort made estimation cumbersome, and we experienced the parameter identification problem. These difficulties arose from limited family background information in the LFS data. Detailed information, for instance on parents' educational level, was only available for individuals living with their parents.

The results showed a very interesting picture of the Polish labour market. The evolution of the educational wage gap differed significantly between young and prime-aged workers. The relative wages of young workers with tertiary education were much lower than the wages of prime-aged workers with tertiary education during the entire period analysed. This difference seems to be justified by the lower human capital (especially in regard to work experience) of young workers. Interestingly, the analyses observed a significant decrease in the relative wages of young workers in the late 2000s. Since that decline, wages of young workers with tertiary education have remained at a relatively low level. They are currently only 20% higher than median wages. Wages of prime-aged workers with tertiary education are approximately 50% higher than median wages and this difference has been relatively stable since the early 2000s.

Another notable difference was observed for workers with vocational education. At the beginning of the analysed period, wages of young workers with this level of education were similar to those of prime-aged workers with vocational education. In the years of economic boom before the crisis, as well as in the last few years, it was observed that relative wages of young workers with vocational education have significantly increased. In 2013, wages for this group were only slightly lower than median wages, and wages of prime-aged workers in this group are much more stable: they remain around 90% of the median wages.

Another very interesting feature of the findings is the behaviour of wages of workers with secondary-vocational education. Figure 8 shows that wages of young workers with vocational and secondary-vocational education do not statistically differ. A different picture was observed among prime-aged workers. Relative wages of prime-aged workers with secondary-vocational education are around 10% higher than median wages, and are significantly higher than wages of prime-aged workers with only vocational education completed.

Figure 8. Selection-adjusted wage gap (differences between median wages of workers with given levels of education and median wages) in Poland from 1995 to 2013



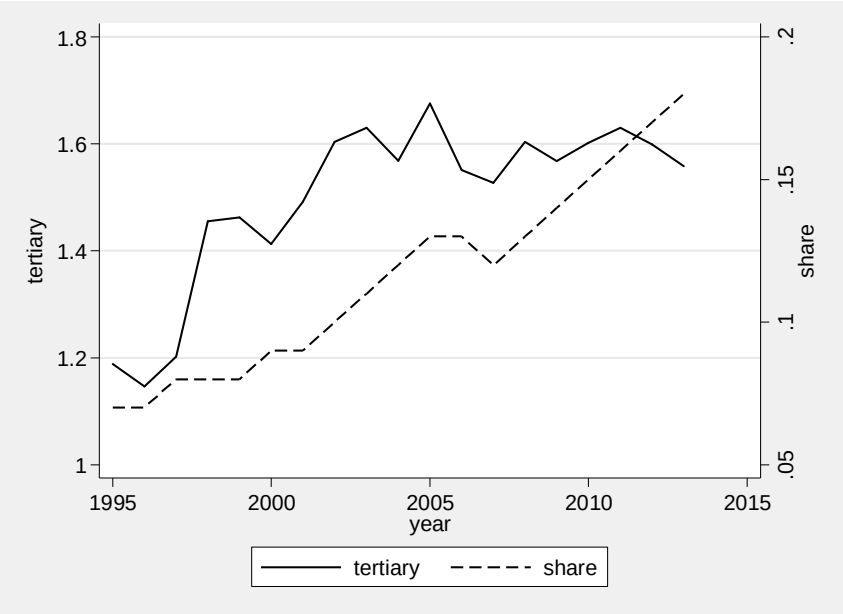
young workers prime-aged workers

Source: Authors' calculation based on LFS 1995-2013 data.

Our results indicated that significant changes in the structure of employment with regard to education, which were observed during recent years in Poland, have important implications for wage structure. In particular, the entry of many young workers with tertiary education into the labour market resulted in a significant decline in the average level of wages they receive. On the other hand, a noticeable decrease in the number of vocational education graduates and

deficits in the labour supply in some occupations translated into an increase in relative wages for this type of workers (see Figure 10).

Figure 10. Tertiary wage premium and tertiary education share among prime-aged workers



5. Summary and conclusions

The aim of this paper was to analyse the evolution of educational employment structure in Poland from 1995 to 2013, and to estimate wage premiums for different types of education. In this period, significant changes in employment structure according to educational level have occurred. To a large extent, these changes were due to the Polish educational reform of 1999. One of its consequences was a dramatic fall in enrolment at vocational schools. Moreover, due to the fact that a huge number of private schools offering tertiary education at the bachelor and master level appeared, tertiary education became much easier to complete and a lot of young people decided to follow this educational route. As a result, the share of the population with tertiary education in Poland increased from below 10% to 25%.

Our results indicate that the changes in the educational structure of Poland have had a significant impact on wage structure. A decline in the number of vocational school graduates has led to a shortage of skilled labour in some labour market segments. Consequently, an

increase in the relative wage premium of young employees with vocational skills has been observed.

On the other hand, the appearance of a significant number of young people with tertiary education in the Polish labour market in recent years has caused the so-called 'crowding effect', as the number of vacancies has not increased in parallel with the number of young workers. Looking at the occupational and educational employment structure of young workers, one can observe that part of the young labour force is overeducated. In consequence, the relative wage premium for workers with tertiary education has significantly decreased.

The results of our study are very significant for educational policy in Poland. There is a strong indication that vocational qualifications are important in the Polish labour market, and their importance will grow with time. This leads us to a recommendation for an improved quality of vocational-oriented training at both secondary and tertiary educational levels. To prevent a worsening of the over-education effect, various steps should be taken to create well-designed, vocational curricula and thus attract more students into these programmes.

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