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Wage Returns to Different Education Levels. Evidence from Poland¹

Introduction

The aim of this paper is to analyse changes in the wage premium for different educational levels in Poland in the period 1995–2013. The main focus is placed on vocational education. An OECD (2010) report states that vocational education and training (VET) can play a central role in preparing young people for work, developing the skills of adults, and responding to the labour-market needs of the economy. Despite this role, VET has been unaccountably neglected and marginalised in policy discussions, often being overshadowed by the increasing emphasis on general academic education and the role of schools in preparing students for university education. It has also often been seen as low status by students and the general public. The importance of vocational education has been also underlined by the European Commission, which makes great efforts to improve the quality of training, teachers, trainers and other professionals in the sector, as well as to make courses more relevant to the labour market's needs.²

In 1999, a wide-ranging educational reform was conducted in Poland. This reform had very ambitious goals: improvement of the quality of schools, and popularization of secondary and higher education, as well as providing equal educational opportunities, especially for rural children. The last of these goals was especially emphasised, with aim of reducing differences in educational opportunities between children in rural and urban areas.

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² http://ec.europa.eu/education/policy/vocational-policy/index_en.htm

One effect of the reform has been the changes that have occurred in the educational structure of the population. The most noticeable changes have been noted for people with vocational and tertiary education. The unanticipated result of the reform has been a rapid decline in enrolment at vocational schools. From 1995 to 2013, the percentage of people aged 19 to 30 with vocational education has significantly decreased. Concurrently, the share of the young population with general secondary education has doubled. Significant changes have also been observed with respect to tertiary education: the percentage of the young population having this type of education increased considerably.

The changes in the educational structure have had a significant impact on wage levels. In this paper, we analyse the changes in average wages of young and older workers with different levels of education. To analyse changes in the wage premiums, the Mincerian wage equation framework was used. We aimed particularly to answer the following two questions: Has the rising number of tertiary education graduates lowered the wage premium to higher education? Has the decreasing number of vocational education graduates increased the wage premium to vocational education?

The remainder of this paper is constructed as follows. Section 1 contains a brief description of the educational reform in Poland and its consequences for educational structure. Section 2 comprises 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 the study and its empirical results are presented. Finally, Section 5 provides a summary of the study's findings and its conclusion.

1. Educational reform in Poland in 1999 and its consequences

Before 1999, a two-tier educational system existed in Poland. The first level comprised eight years of obligatory primary school; the second consisted of secondary schooling, divided into two possible tracks (see Table 1):

- a general track, this being a four-year general secondary school programme (called 'lyceum'); or
- a vocational track, with either a three-year basic vocational school or a five-year secondary vocational school programme (technical school).

In other words, students' primary and secondary educational path lasted either 11 or 13 years, depending on their track choice. The direction and duration of secondary education had to be decided at the end of primary school, at the age of 15. Importantly, the vocational path was previously more prevalent than general secondary school education (Herbst and Wojciuk, 2014).

The 1999 reform introduced a new, intermediate stage of education: a lower-secondary school (called ‘gymnasium’). The previous two-tier educational structure was replaced by a three-tier system: primary school education was reduced to six years, and pupils could continue their education in the compulsory three-year gymnasium programme. Only after completing three years in the gymnasium could they move on to:

- a three-year secondary school (general or profiled lyceum), or
- a two-year basic vocational school, or
- a four-year secondary vocational school (technical school).

After the reform, the obligatory number of years in schooling increased from eight (in primary school) to nine (in primary school and gymnasium). In the case of basic vocational education, general secondary education and secondary vocational education, the number of years in schooling remained the same (see Table 1). The reform also postponed for one year the choice between the secondary-level general or vocational programme.

Table 1
The comparison of the educational system in Poland
before and after the reform in 1999

Before the reform of 1999

Age				Grade
6	Zero class (primary schools or kindergartens) Comprehensive primary schools			0
7				I
8				II
9				III
10				IV
11				V
12				VI
13				VII
14				VIII
	Entrance exam			
15	General secondary schools (lyceums)	Secondary vocational schools (technikums)	Basic vocational schools	I
16				II
17				III
18				IV
19	Matura			V
		Matura		

After the reform of 1999 to 2016

Age				Grade	
6	Zero class (primary schools or kindergartens)			0	
7	Comprehensive primary schools			I	
8				II	
9				III	
10				IV	
11				V	
12				VI	
	Final test				
13	Comprehensive lower secondary schools (gymnasiums) ISCED 2A			I	
14				II	
15				III	
	Final exam				
16	General secondary schools (ISCED 3A)	Profiled general secondary schools (ISCED 3A)	Secondary vocational schools (ISCED 3B)	Basic vocational schools (ISCED 3C)	I
17				II	
18				III	
19	Matura	Matura		IV	
			Matura		

Notes: Matura = ‘maturity’ final secondary school exam; ISCED = International Standard Classification of Education, created by UNESCO to facilitate comparisons of education statistics and indicators across countries on the basis of uniform and internationally agreed definitions (<http://www.uis.unesco.org/Education/Pages/international-standard-classification-of-education.aspx>).

Source: Jakubowski et al. (2016).

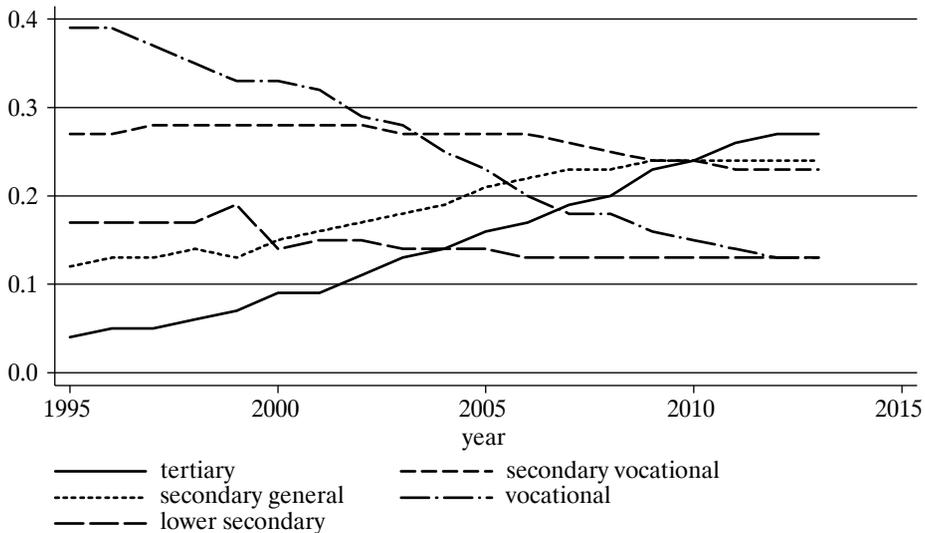
The goals of the educational reform were to improve the overall level of education among the Polish population, increase educational opportunities for the citizens, and provide equal educational opportunities, especially for rural children. The authors of the reform assumed that the introduction of gymnasiums would raise the overall level of education, particularly in rural areas. The last of these goals was emphasised, with the aim of reducing differences in educational opportunities between children in rural and urban areas. The lower-secondary schools introduced by the reform aimed to raise the level of education in rural areas and in small cities, in order to facilitate the commencement of secondary and higher education (Zahorska, 2009).

The results of the Programme for International Student Assessment (PISA)³ tests confirm the systematic increase in the quality of secondary education in Poland. The PISA score in mathematics rose by 5.3% between 2003 and 2012, in reading by 8.1% between 2000 and 2012, and in science by 5.6% between 2006 and 2012. Another effect of the reform was the changes that have occurred in the educational structure of the population. In 1995, almost 40% of the young population (19–30 years old) completed only basic vocational education, and almost 30% of young people completed only secondary vocational education. Only about 5% of the population aged 19–30 in 1995 had tertiary university or equivalent education (see Figure 1).

Looking at the changes in the structure of education among young people in 1995–2013 (see Figure 1), the largest are noticed among young people with vocational and tertiary education. In 1995–2013, the percentage of the young population with tertiary education has increased from around 5% to 27%. Concurrently, the percentage of people aged 19 to 30 with vocational education has decreased from almost 39% to only 13%. Relatively large changes have been observed with respect to general secondary education: the percentage of the young population having this type of education has doubled.

Figure 1

**Changes in the educational structure of the young population
(between 19 and 30 years old) in Poland in 1995–2013
(percentage of highest level of education completed by people aged 19–30)**



Note: Before 1999, ‘primary education’ was treated as ISCED 2A level (lower-secondary education), due to its length.

Source: authors’ calculations based on PLFS data.

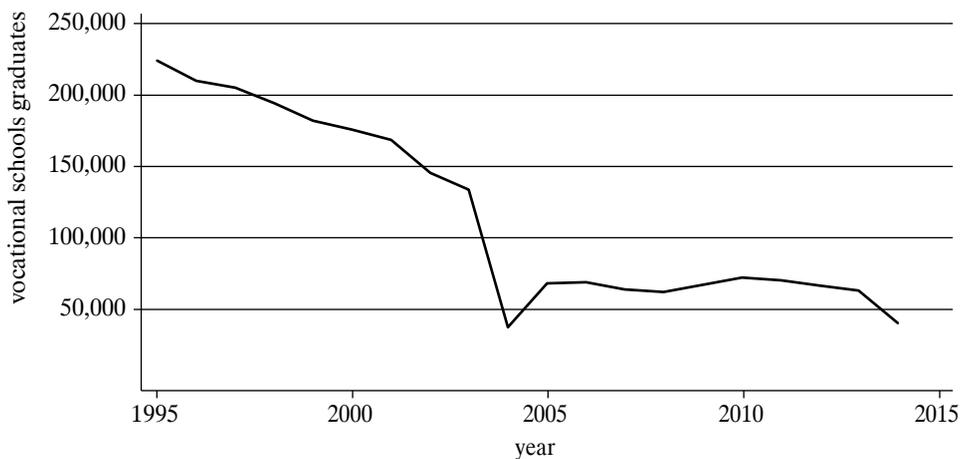
³ The PISA test is given to students from randomly selected schools who are aged between 15 years 3 months and 16 years 2 months at the time of the test. This constitutes an average age of 15.7, which was chosen because at this age people in most OECD countries are nearing the end of compulsory education (source: <https://www.oecd.org/pisa>).

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 with tertiary education. Looking at the occupational and educational employment structure of young workers, one can observe that part of the Polish labour force is overeducated. The share of employees with tertiary education in occupational groups where it is not needed (i.e. the third and lower major occupational groups according to ISCO classification) has increased significantly since 2000. For instance, the share of employees with tertiary education has risen among clerks from 4% to over 30%, and among technicians from 9% to over 40%.⁴

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 2). 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. Vocational education in upper-secondary schools has become 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.

Figure 2

Vocational school graduates in Poland from 1995 to 2013 (thousands of pupils)



Source: Central Statistical Office.

However, relatively little prior research has investigated how these educational changes have translated into changes in the situation of young people in the labour market (see the review of literature in the next part of the paper). In this paper, we aim to fill at least part of the gap by analysing the impact of changes in

⁴ These data refer to population aged 15–64.

the educational structure in Poland on changes in wage premiums of workers who have completed different types of education.

It is worth to note recent changes in educational system in Poland. At the time of writing this research paper the policy makers have changed the educational system to return to the pre-reform one. Since the beginning of school year 2017/18 gymnasia have been closed. All children finishing 6th grade in primary school remained for the 7th and 8th grade.

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’. Additionally, Krueger and Kumar (2004a, 2004b) argued that the European propensity to employ workers vocational rather than general education may be a cause of growth-rate differentials between the US and Europe.

Putting too much emphasis on vocational (rather than general) education may also lead to a slower adoption of new technologies. In their research, Hanushek et al. (2011) demonstrated that in the US 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. However, in many European countries, age-employment patterns differ between individuals with general and vocational education. This is particularly visible in Denmark, Germany and Switzerland, which have broad vocational education systems that combine education with apprenticeships.

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

Many studies in this field, in examining the effects of secondary-vocational education, found few or no economic benefits of undertaking vocational education instead of a general track (e.g. Gustman and Steinmeier, 1983; Hotchkiss, 1993; Neuman and Ziderman, 1999; Coupé and Vakhitova, 2011).

However, some researchers consider vocational education to be an effective 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’. Based on data obtained for Israel, they estimated wage returns of about 8% higher for

workers with vocational education, but only if the working field was related to the vocational course pursued. For unrelated occupations, the difference in earnings between the vocational and academic graduates was relatively small.

More encouraging data was found by Bishop and Mane (2004), who noted that the returns to secondary vocational education in the United States had 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 education) were unlikely to earn more than if they had chosen an academic path.

Another important question concerns whether the differences in earnings of workers with vocational education and general education show a relationship with such variables as age or working experience. 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 estimated a Mincer earnings function and found strong support for the existence of such a trade-off, this being most pronounced in countries that emphasise apprenticeship programmes. In their research, the authors stated that vocationally educated workers have an initial wage advantage of 15.5%. However, they also noted that generally educated ones catch up as they become older and more experienced, and therefore earn more as they age.

Similar research was conducted for the UK, Germany and the Netherlands by Cörvers et al. (2011). In the cases of the UK and Germany, the authors found higher initial earnings for vocational education. However, as demonstrated above, wages for generally educated individuals have a tendency to grow faster and therefore surpass those of vocationally educated ones.

Research on the behaviour of returns to schooling during economic transition shows that returns have increased in most economies, mainly during the early stages of the transition (e.g. Orazem and Vodopivec, 1997; Flabbi et al., 2008; Fleisher et al., 2005). In addition, the recent report prepared by the European Centre for the Development of Vocational Training (CEDEFOP) (2013) showed that in terms of 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’. The report also stated that vocational education graduates are generally more likely to participate in the labour market.

Following this approach, many European countries currently provide extensive vocational education at the secondary level, mostly linked with apprenticeships, in order to improve the opportunities for workers’ entry into the economy.

In the previously central planned economies in Eastern Europe, 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 (Jakubowski et al., 2016). This situation changed with the transition to a mar-

ket economy, when general education increased in popularity (Brunello et al., 2010). The returns to education in transition countries were estimated by, among others, Coupé and Vakhitova (2011). 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. Importantly in the context of the presented paper, they noted that returns to education in Poland were among the highest in the transition countries.

Another analysis of the returns to education in transition economies was presented by Andersson et al. (2013), who found that in transition economies, returns to vocational education were 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.

2.2. Wage premiums for different levels of education: A review of Polish literature

Analyses of wage levels and wage distribution amongst employees with different types of education in Poland 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 employed data from the early 1990s, the results cannot be compared with those of later studies.

It has been demonstrated that returns to higher education in Poland are among the highest in Europe. This topic was analysed by Strawiński (2006 and 2008): according to data from the Polish Household Budget Survey, the annual rate of return to higher education was around 6.5% to 9.5%, from 1998 to 2005. In addition, earnings of people with higher education were on average 30% higher than those with secondary education. The study also showed that investment in higher education in Poland returns after 12 to 15 years, assuming a low, real interest rate.

Myck et al. (2009) estimated the rates of return 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 demonstrated the importance of selection correction in their conclusion. Annual rates of return to university education varied from 6.7% to 9.7% for men and from 8.0% to 13.4% for women, when results using net monthly wages (without correcting for labour-market selection) were compared with results using gross hourly wages (a selection-corrected specification).

To the best of our knowledge, very little research has investigated wage premia for education across occupational groups. Gajderowicz et al. (2012) used the Polish Labour Force Survey (PLFS) data that 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. In addition, significant differences were observed between the private and public sectors. In the latter half of the 1990s, 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 27–34% in 1995 to 14–15% in 2009), which can be associated with significant increases in the number of workers having tertiary 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, namely plant and machine operators and assemblers, in which most workers have vocational education.

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

Using the Structure of Wages and Salaries by Occupations Database, Roszkowska and Majchrowska (2014) analysed the differences in wages of men and women with different educational levels, and their changes from 2004 to 2010. Their 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. The researchers found that the wage premium for vocational education was much higher among men than for 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 from 17% to 10% among women, with

regard to primary and incomplete primary education). From 2008 to 2010, the reverse trend was observed. The wage premium for vocational education increased from 20% to 22% among men, and from 10% to 16% among women. Another interesting finding showed that the 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 the wage premium from 2004 to 2008, and an increase from 2008 to 2010.

Wages of workers with vocational education were analysed by Rogut and Roszkowska (2007), who inspected 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. They showed that between 2001 and 2004, wages of university graduates were approximately 30% to 50% higher than the average salary in Poland, and that the wages of workers with vocational education were 20% lower. In these years, the relative wages of workers with vocational education further decreased.

3. Data and descriptive analysis

In the analysis, we used micro-level data from the Polish Labour Force Survey (PLFS) for the time span of 1995 to 2013. The PLFS itself is a representative, individual-level survey; the population examined by the survey was targeted through households. The information was collected quarterly, with a focus on labour-market activity. In 1995–2009, each quarter, the survey gathered information from about 50,000 individuals. Since 2010, the number of individuals in each sample has doubled.

Several methodological problems were found with the dataset, such as those caused by redesigns of the survey. From a macroeconomic perspective, the major concern with the dataset is the survey discontinuity that occurred during the second and third quarters 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, various steps were taken to improve data coherency. The information collected by the PLFS in previous years was limited: for instance, prior to 2004, there was no information regarding individual field of study. The second issue affecting data harmonisation was changes made to the questionnaire items. These changes limited the analysis of the present study to those 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 ad-

ditional categories were created: *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 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 relevant 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 the fact that post-secondary education is the highest achieved level of education for only slightly more than 2% of the active Polish labour-market population.

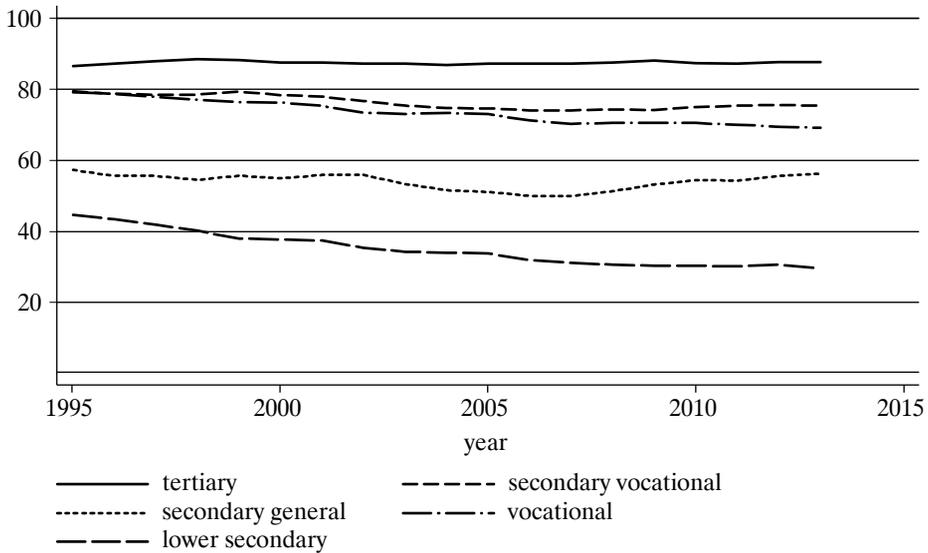
To calculate labour activity and educational measures, the data from all quarters of the respective years was aggregated. This method is also used by Eurostat and national statistical offices to calculate yearly statistics. The statistics for employed, unemployed, and inactive individuals are directly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

As shown in Figure 3, the activity rate 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.

We will begin the analysis with our findings regarding 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 more accurate 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.

The evolution of relative wages achieved on average by young workers aged 19 to 30 is presented in Figure 4. The most significant change in the period of 1995 to 2013 concerns wages of young workers with tertiary education. In the late 1990s, the median wages of young men with tertiary education were more than 40% higher than the general median wages in Poland (Figure 4). Since then, tertiary education wage premium has been almost constantly declining. In 2013, young

Figure 3
Labour market activity by education level in Poland in 1995–2013 (%)



Source: Polish Labour Force Survey 1995–2013.

men with tertiary education earned only about 20% more than the median wage in the economy.

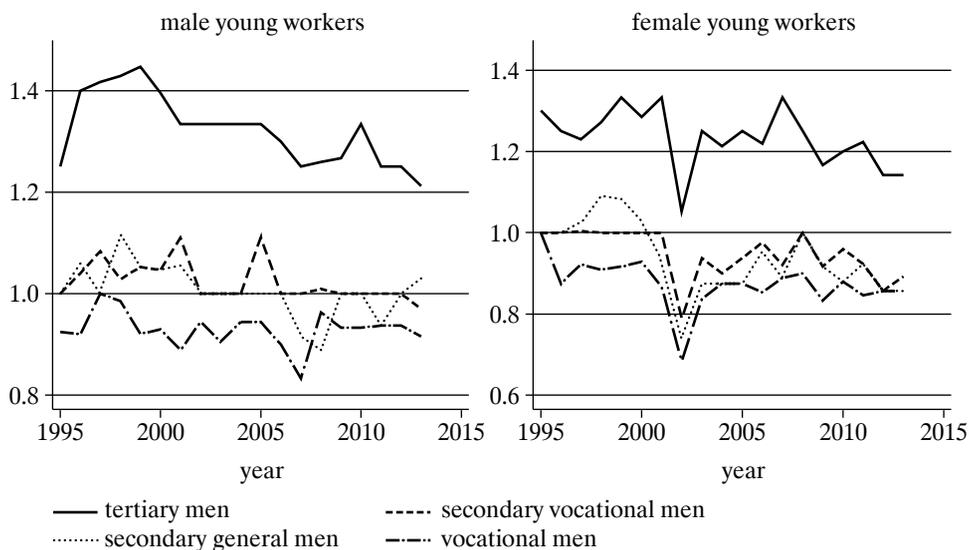
The evolution of wages of young women with tertiary education is very similar to that observed in the case of young men. At the beginning of the 2000s, wages of women aged 19 to 30 with tertiary education were about 30% higher than median wages of young women in general (Figure 4). Since then, the differences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

Regarding the wages of young men with other types of education, it can be observed that their relation to median wages was rather stable in the analysed period: only a slight decrease is visible in the relative wages of workers with secondary-general education. 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%.

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

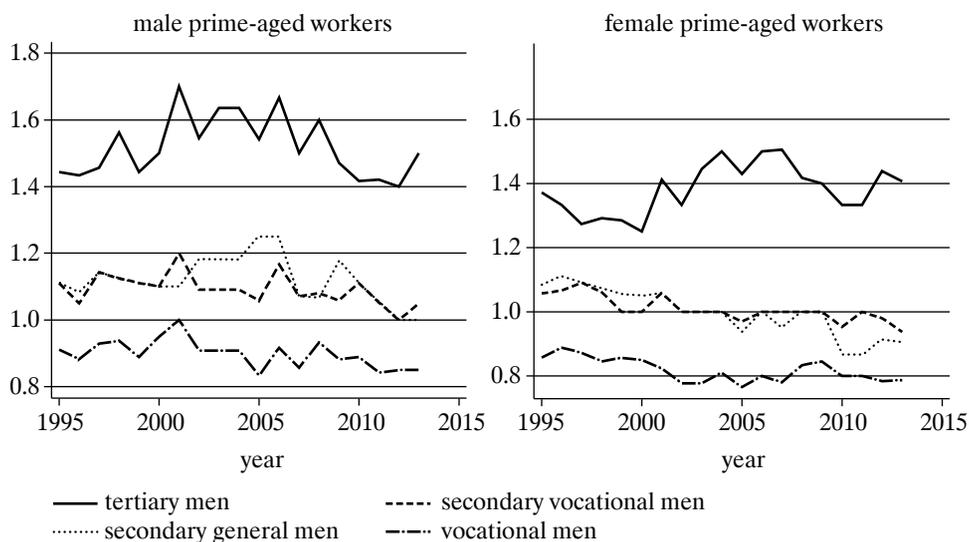
In 1995, prime-aged men with tertiary education earned slightly over 40% higher wages than the median wage of prime-aged workers. During the next few years, the ratio increased to 60%. Only since as recently as the latter half of the 2000s, the relative wages of prime-aged workers with tertiary education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

Figure 4
Relative median wage of young workers (19–30 years old) in Poland in 1995–2013
by educational level



Source: Authors' calculations based on PLFS 1995–2013 data.

Figure 5
Relative median wage of prime-aged workers (31–50) in Poland in 1995–2013
by educational level



Source: Authors' calculations based on PLFS 1995–2013 data.

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

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, relative wages increased from 125% to 150% of median wages from 2000 to 2008. Since then, a 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 relative wages of prime-aged women with lower than tertiary levels of education. Relative 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

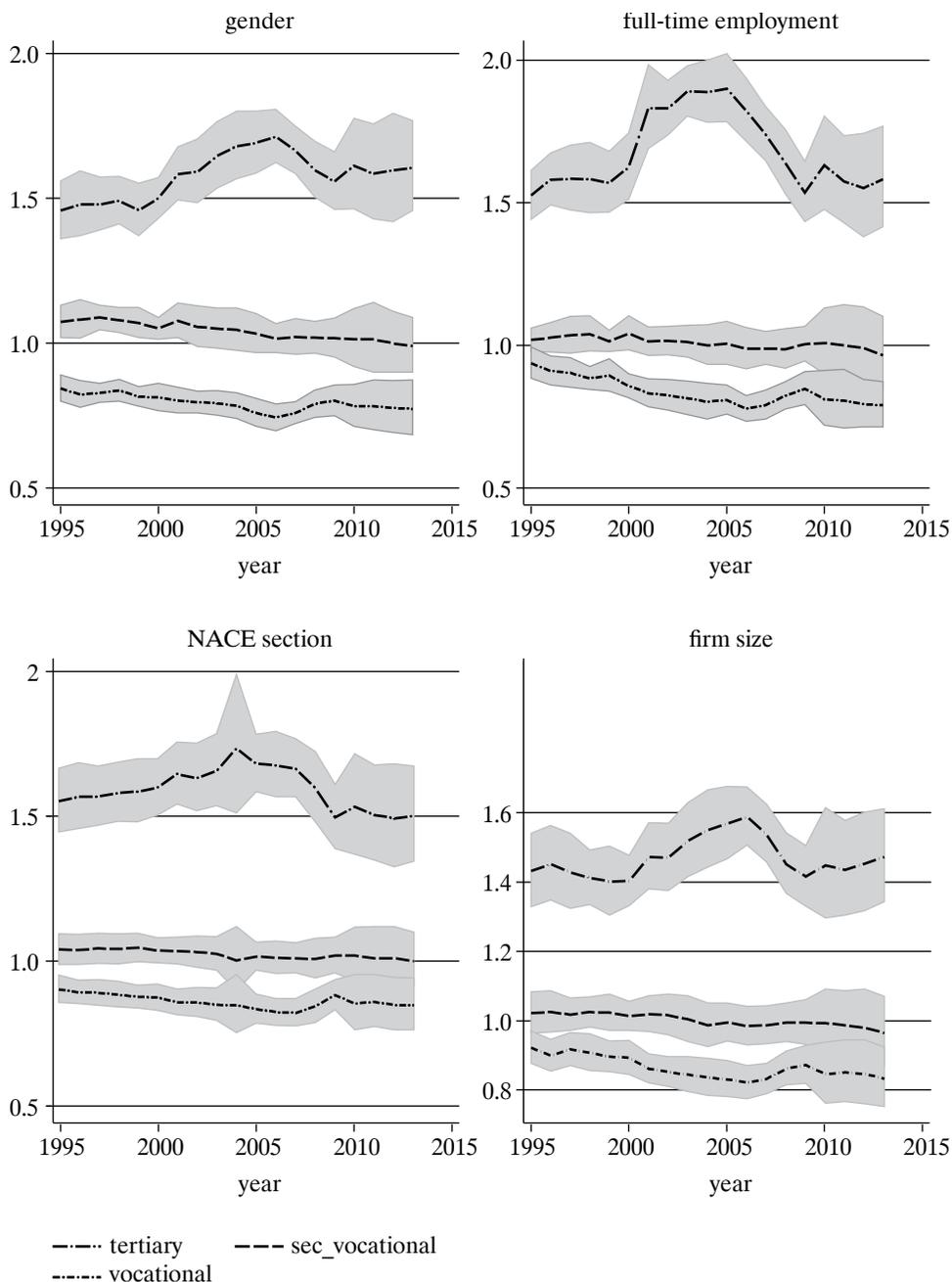
4.1. Modelling strategy (methodology)

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. At this stage, we disregarded the issue of possible selection effects. As the analysis considers median wages, a median regression was used (for details, see for instance Koenker and Basset 1978).

Different characteristics of individuals and their workplaces were used to adjust the raw median wage-gap. We define median wage-gap as percentage difference between median wage of persons with particular education level and median wage in the economy. 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 the European Community) section of the economy is presented, and in the bottom right panel, the wage-gap according to firm size is shown. 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 the graphs; only the sizes of the estimated gaps differ. People with tertiary education earned significantly higher than median wages, but the size of the gap seems to decline over

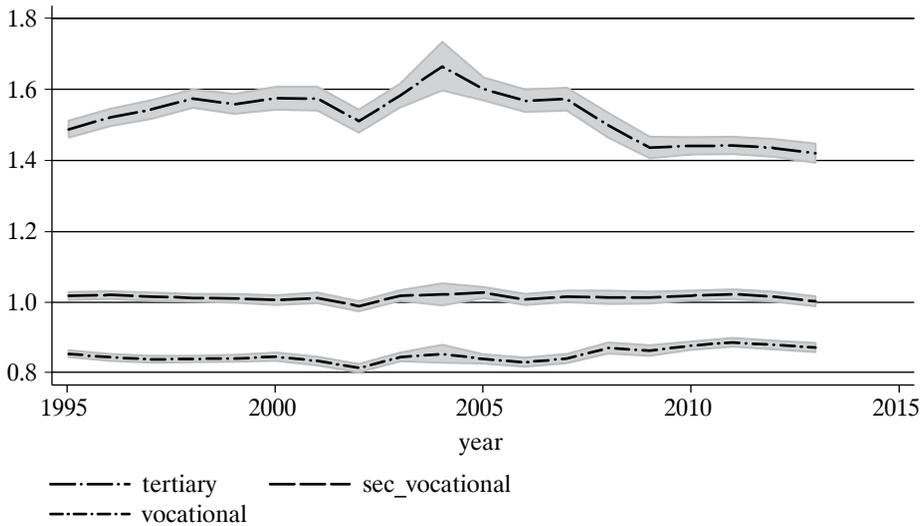
Figure 6
Education-related wage gaps in Poland from 1995 to 2013,
controlling (respectively) for gender, form of employment,
NACE section, and size of the firm (as a percentage of median wage)



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

time. Those with secondary or secondary-vocational education earned median wages; thus, the wages of these two groups are omitted from the graph. The median wages of the most interesting group, for the purpose of the analysis – namely, individuals with vocational education – were well below the national median in the late 1990s. Moreover, they appear to have declined further since 1999 and risen slightly after 2003. This general picture remained almost unchanged when all factors were controlled simultaneously (see Figure 7).

Figure 7
Wage gap between education levels controlling for all factors



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

4.2. Selection model

The simple differences in wages omit two important effects: selection occurring between successive stages of education, and selection on the labour market. In both educational systems, during the transfer to upper-secondary school (ISCED 3 level), usually the highest-achieving pupils chose general education (lyceum), and the lowest-achieving pupils chose vocational schools.⁵ The existing negative selection effects on the labour market affect especially those with lower-secondary and secondary-general education.

To adjust our estimates for the aforementioned effects, resulting in different employment shares for different educational levels, we used the two-stage selection model, as this version is more robust with regard to misspecification than

⁵ Depending on the results of entry exams before 1999, or the general test score.

the one-step selection model estimated by maximum likelihood. To avoid identification problems in the data before 2004, we decided to use a single selection equation that captures both effects: selection caused by educational choices and selection in the labour market. After the reform, rising educational aspirations meant that after finishing lower-secondary school (gymnasium), the vast majority of pupils chose upper-secondary general education in lyceums (about 58%⁶). Given this relative number of students at upper-secondary education level, we believe that selection into upper-secondary education is effectively controlled by the rural dummy.⁷ Moreover, in the wage equation, we used the median regression introduced by Koenker and Basset (1978), instead of the traditional mean regression. We controlled for selection, adding the polynomial of the selection equation with a fitted value, a method proposed by Buchinsky (2001).

Specifically, in the selection equation, the dependent variable was a dummy variable that indicated whether or not the person was employed. The set of explanatory variables included the following personal characteristics: educational level, gender, marital status, and disability; as well as household localisation characteristics, namely 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. Unfortunately, the LFS data does not contain variables that affect educational choice rather than labour market status (for instance, parents' level of education or number of books at home). Therefore, due to the identification problem, we used a single-selection equation.

The wage equation employed the standard Mincer-type form in which wages usually are explained by the education level measure, measure of working experience and other control factors. As education measure years spent in educational system or the highest achieved level of education are used. For the experience, according to the human capital theory, working experience and its square to reflect diminishing returns to that factor. The dependent variable was a natural logarithm of declared, monthly net wage. The right-hand side variables included 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 analytic formula for the selection model is as follows:

$$LMS = \alpha EDU + \beta IND + \gamma HOU + \nu \quad (1)$$

⁶ In 2005, 47% in lyceums; in 2010, 62% in lyceums.

⁷ The urban-rural gap at the gymnasium level is over 20%, but a proportion of rural-based students choose upper-secondary schools in towns, as these are rare in rural areas.

$$wage = \alpha EDU + \beta EXP + \gamma FIRM + \delta HOU + SEL + \varepsilon \quad (2)$$

where *LMS* is the labour market status dummy, taking value 1 if a person receives a wage, 0 otherwise; *EDU* is a set of educational dummies; *IND* are individual characteristics; *HOU* are household location indicators; *EXP* are working experience related variables; and *FIRM* are firm characteristics. Equation (1) is estimated as a probit model, while equation (2) is a median regression. The element *SEL* controls for non-random selection, and comprises the polynomial of the third degree of fitted values from the probit model (1).

The parameters of the model 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 (Figure 8). 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 regarding work experience) of young workers. Interestingly, the analyses indicated 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 basic 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 can be seen that relative wages of young workers with vocational education significantly increased. In 2013, wages for this group were only slightly lower than the median wage, and wages of prime-aged workers in this group were much more stable: they remained at around 90% of the median wage.

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 is 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.

Our results indicated that the significant recent changes in the structure of employment with regard to education in Poland have important implications for wage

structure. In particular, the entry of many young workers with tertiary education into the labour market has resulted in a significant decline in the average level of wages they receive (Figure 9). On the other hand, a noticeable decrease in the number of vocational education graduates and deficits in the labour supply in some occupations have translated into an increase in relative wages for this type of workers.

5. Summary and conclusions

The aim of this paper was to analyse the evolution of the 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 have been due to the Polish educational reform of 1999.

One of the positive consequences of the educational reform has been the increase in the quality of secondary education in Poland. The results of the Programme for International Student Assessment (PISA) tests confirm the systematic increase in the quality of secondary education in Poland, in areas including mathematics, reading and science.

One of the negative consequences of the reform has been a dramatic fall in enrolment at vocational schools. Moreover, due to the appearance of a huge number of private schools offering tertiary education at bachelor's and master's level, tertiary education has become much easier to complete, and many young people have decided to follow this educational route. As a result, the share of the population with tertiary education in Poland has significantly increased.

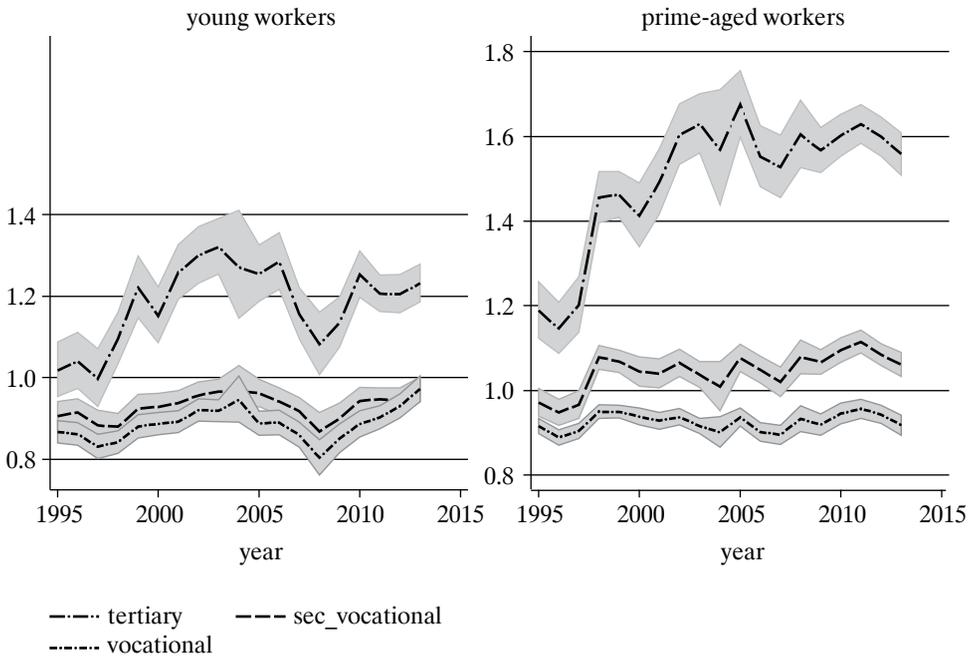
Our results indicate that the changes in the educational structure of Poland have had a significant impact on wage structure. A decline in the number of vocational school graduates has led to a shortage of skilled labour in some labour market segments. Consequently, an increase in the relative wage premium 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, tertiary educated workers. Looking at the occupational and educational employment structure of young workers, one can observe that part of the young labour force is overeducated. There are also some hints that the quality of tertiary education in Poland also decreased. In consequence, the relative wage premium for workers with tertiary education has significantly decreased.

We are aware of the weaknesses of the Polish Labour Force Survey data which we use in our analyses. The PLFS data concerning wages of individuals are to some extent biased due to relatively high share of non-responses to the question about wages. However, these are the only data where the information about the level and type of education completed and wage level of individuals are available not

Figure 8

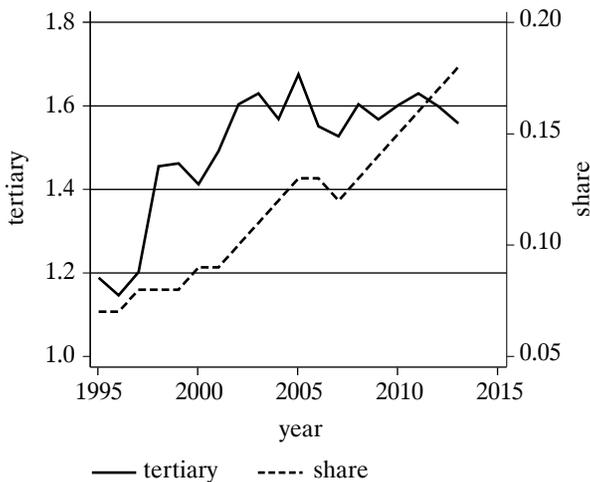
Selection-adjusted wage gap (differences between median wages of workers with given levels of education and median wages) in Poland from 1995 to 2013



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

Figure 9

Tertiary wage premiums and tertiary education share among prime-aged workers



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

only in Poland but in most of the European countries. Although these weaknesses could influence the accuracy of the estimates, they do not affect the main results.

The results of our study have important implications for educational policy in Poland. There is a strong indication that vocational qualifications are important in the Polish labour market, and that their importance will grow with time. This leads us to recommend 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 to enrol in these programmes. The results of the paper and the recommendations are especially important taking into account the recent changes in Poland – at the time of writing this paper the policy makers have changed the educational system to return to the pre-reform one. In our opinion all the advantages and disadvantages of such a step have to be very much discussed. Unfortunately, the effect of changes will be observed on the labour market not earlier than in fifteen to twenty years.

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ZWROT PŁACOWY Z WYKSZTAŁCENIA W POLSCE

Streszczenie

Celem artykułu było przeanalizowanie zmian w premii płacowej uzyskiwanej przez pracowników z tytułu wykształcenia w Polsce w latach 1995–2013. W okresie tym nastąpiły duże zmiany w strukturze zatrudnienia rozpatrywanej według poziomu i typu wykształcenia. Udział pracowników z wyższym wykształceniem znacznie wzrósł, a udział pracowników z podstawowym wykształceniem zawodowym znacznie zmalał. Autorzy oszacowali relatywną premię płacową z różnych rodzajów i poziomów wykształcenia, stosując standardowe równanie płac typu Mincer. Wyniki wskazują, że zachodzące ostatnio zamiany w strukturze zatrudnienia mają ważne konsekwencje w zakresie struktury płac. W szczególności wejście na rynek pracy wielu młodych ludzi z wyższym wykształceniem spowodowało spadek relatywnego poziomu ich wynagrodzeń. Jednocześnie wyraźny spadek liczby absolwentów szkół zawodowych i niedobór pracowników w niektórych zawodach pociągnęły za sobą wzrost relatywnego poziomu płac w tej grupie pracowników. Wyniki tej analizy są istotne dla polityki edukacyjnej w Polsce.

Słowa kluczowe: ekonomia edukacji, premia płacowa, zwrot płacowy z wykształcenia, kształcenie, Polska

JEL: I21, I26, J24, J31.

WAGE RETURNS TO DIFFERENT EDUCATION LEVELS. EVIDENCE FROM POLAND

Summary

The aim of the paper is to analyse the changes in the wage premiums for workers with different types and levels of education in Poland in 1995–2013. Important changes regarding the educational structure of employees have taken place during this period. The share of employed with tertiary education has significantly increased and the share of employed with basic vocational education substantially decreased. The relative returns to different types and levels of education were estimated using a standard Mincerian wage equation framework. The results indicate that recent changes in the structure of employment have important implications for wage structure. In particular, the entry of many young workers

with tertiary education into the labour market has resulted in a decline in the relative 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 have translated into an increase in relative wages for this type of workers. The results are important for educational policy in Poland.

Key words: educational economics, wage premium, returns to education, education, Poland

JEL: I21, I26, J24, J31.

ОКУПАЕМОСТЬ ОБРАЗОВАНИЯ С УЧЕТОМ ВЕЛИЧИНЫ ЗАРАБОТНОЙ ПЛАТЫ В ПОЛЬШЕ

Резюме

Статья посвящена анализу изменений в области окупаемости образования через заработную плату в Польше в 1995–2013 гг. В этот период произошли большие изменения в структуре занятости по уровню и типу образования. Доля работников с высшим образованием значительно увеличилась, а доля работников с неполным средним профессиональным образованием значительно уменьшилась. Авторы оценили относительную премию, получаемую в зарплате при различных видах и уровнях образования, применяя стандартное уравнение зарплат типа Минцера. Результаты показывают, что происходящие в последнее время изменения в структуре занятости имеют важные последствия в области структуры зарплат. В частности, появление на рынке труда большого количества молодых людей с высшим образованием привело к падению относительного уровня их вознаграждения. С другой стороны, заметное понижение количества выпускников профессиональных школ и недостаток работников в некоторых профессиях повлекли за собой рост относительного уровня зарплат в этой группе работников. Результаты этого анализа имеют существенное значение для политики в области образования в Польше.

Ключевые слова: экономика образования, премия в области зарплаты, окупаемость образования с учетом заработной платы, образование, Польша

JEL: I21, I26, J24, J31