THE EFFECTS OF MINIMUM WAGE ON A LABOUR MARKET WITH HIGH TEMPORARY EMPLOYMENT

In this paper, we use propensity score matching and a difference-in-differences estimator to study the impact of minimum wage hikes on labour market outcomes in Poland in 2002-2013. We focus on job separations, adjustments of hours worked, share of full-time jobs and of real wages. We distinguish between permanent and temporary jobs and also study flows between these types of jobs in the context of rising incidence of temporary employment in Poland. Our findings show that the minimum wage increases in Poland were not only associated with higher wages and better working time standards for workers who retained their jobs, but also more job separations, especially among temporary workers, and higher flows from permanent to temporary jobs. After the policy shift in 2008, the number of separations attributed to the minimum wage hikes rose and in 2008-2013 amounted to 1% of the total employment of people aged 15-54. Women with temporary jobs constituted more than 50% of workers suffering from these separations.

Agnieszka **Kamińska**

Piotr **Lewandowski**

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INSTYTUT BADAŃ STRUKTURALNYCH

The effects of minimum wage on a labour market with high temporary employment

Agnieszka Kamińska[*], Piotr Lewandowski[♦][♥]

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Abstract

In this paper, we use propensity score matching and a difference-in-differences estimator to study the impact of minimum wage hikes on labour market outcomes in Poland in 2002-2013. We focus on job separations, adjustments of hours worked, share of full-time jobs and of real wages. We distinguish between permanent and temporary jobs and also study flows between these types of jobs in the context of rising incidence of temporary employment in Poland. Our findings show that the minimum wage increases in Poland were not only associated with higher wages and better working time standards for workers who retained their jobs, but also more job separations, especially among temporary workers, and higher flows from permanent to temporary jobs. After the policy shift in 2008, the number of separations attributed to the minimum wage hikes rose and in 2008-2013 amounted to 1% of the total employment of people aged 15-54. Women with temporary jobs constituted more than 50% of workers suffering from these separations.

Keywords: minimum wage, unemployment, temporary employment, matching difference-in-differences

JEL: J21, J38, J63

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Introduction

Although hundreds of papers and reports have been written about the minimum wage and its impact on the labour market, the debate about the minimum wage has revived in recent years. Germany introduced a national minimum wage as per 1st January, 2015. In 2014 Swiss voters rejected a proposal to introduce the highest minimum wage in the world. A heated debate continues in the United States about the minimum wage. Many developing countries are considering the introduction or increase of the minimum wage. This can be related to the fact that policy makers and researchers have been paying more attention to wage and income inequalities since the Great Recession. Against this background, Poland provides an interesting case of rapid minimum wage increases implemented from 2008 onwards and during the global economic slowdown. Moreover, an increase in the minimum wage coincided with a rise in temporary employment in Poland. In 2013, 27% of workers in Poland had a temporary contract, and among people earning below the minimum-wage this share stood at 58%. What is more, 30% of temporary workers had a so-called civil law contract which was not subject to the Labour Code and minimum wage regulations. The aim of this paper is to assess the impact of minimum wage increases on the labour market outcomes in Poland, with particular attention paid to the differences of the impact on temporary and permanent workers and transitions between these two groups.

Even though the first empirical studies into the impact of a minimum wage on the labour market were conducted in the 1920s (Neumark, Salas, & Wascher, 2013), literature has still not come to a consensus about the effect of the minimum wage on employment. Brown, Gilroy and Cohen (1982) reviewed the existing literature on the minimum wage and concluded that a 10% increase in the minimum wage would reduce teenage employment by 1% to 3%. The debate intensified again in early 1990s when Neumark and Wascher (1992) argued that the minimum wage has a small negative effect on employment, while Katz and Krueger (1992) and Card (1992a) found that it has a positive effect and (Card, 1992a) found no significant effect. Neumark and Wascher (2008) reviewed about 90 empirical studies from 1995-2007 and concluded that minimum wages reduce the employment of low-skilled and young workers. Several recent studies seem to confirm these findings. Sabia, Burkhauser, and Hansen (2012) showed that increases in the minimum wage significantly reduced the employment rates of less-skilled, less-educated New Yorkers. Fidrmuc and Tena (2012) found evidence of the impact of minimum wage increases on youth employment in the UK, where people under the age of 18 and aged 18-21 had separate sub-minimum wages in the assessed period (1999-2009).[1] Clemens & Wither (2014) argued that mandatory minimum wage increases had significant, negative effects on the employment and income growth of targeted workers during the Great Recession in the US.

On the other hand, some studies found the minimum wage to have no effect on employment. According to Stewart (2004), the minimum wage introduced in the UK in 1999 had no adverse effect on employment, neither for adults (both men and women), nor for young people. Addison, Blackburn, and Cotti (2011) found the minimum wage increases to have no effect on employment in the U.S. during the 2005-2010 period. Giuliano (2013) found that in the US, the average effect of the 1996 compulsory wage increase on employment was negative for adults, but for teenagers it varied

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[1] In the UK young workers who earn the NMW rate relevant for their age experience a sharp wage increase upon turning 18 and at 22.

across markets and could be positive or negative. Bhorat, Kanbur and Mayet (2013) investigated the influence of sectoral minimum wages introduced in South Africa between 2001 and 2006 on employment, the number of hours worked and wages. They found no clear evidence of a significant impact on employment in the analysed sectors (retail and wholesale, domestic workers, forestry, taxi and private security), but some evidence of a significant increase in real hourly wages (in 4 out of 5 sectors) and significant adjustments on intensive margin as a result of the introduction of a sectoral minimum wage.

The results for Central and Eastern Europe countries are diverse, although the literature reveals a mainly negative impact of minimum wage on employment. Fialová and Mysíková (2009) found the minimum wage to have a significant positive effect on the unemployment rate and a negative effect on the probability of low-paid workers being employed in the Czech Republic. However, Eriksson and Pytlikova (2004) show that large increases in the minimum wage in the 1999–2002 period in the Czech and Slovak Republics resulted in moderate job losses, whereas their effect on wages was strongly positive. The impact of the minimum wage on the Polish labour market was rarely studied. Ruzik (2007) used a logit model of 2002-2003 data to find the negative effect on employment, especially for unskilled workers. Baranowska-Rataj and Magda (2015) find that young people affected by the minimum wage hike are likely to experience a drop in employment but those who remain employed are likely to work more hours.

We follow the example of Baranowska-Rataj and Magda (2015) and combine propensity score matching with a difference-in-differences estimator to study the impact of minimum wage increases on job separations in Poland. However, we explicitly distinguish between separations of permanent and temporary jobs and also analyse transitions between these two types of employment. Furthermore, we also study adjustments to the intensive margin (hours worked, incidence of full-time jobs) and real wages. The paper is structured as follows: the first section presents regulations and the evolution of the minimum wage in Poland between 2001 and 2013. The second section discusses the incidence and socio-economic characteristics of workers earning up to the minimum wage. The third section explains data and econometric strategy. The fourth section presents empirical results. The fifth section brings out the conclusions and policy implications.

1. Regulations and the evolution of the minimum wage in Poland

Minimum wage regulations have been in force in Poland since 1956. In the 1990-2002 period the level of the minimum wage was set by the Minister responsible for Labour and Social Affairs. In 2002 the regulations were changed and since then the minimum wage has set annually by the Tripartite Commission for Social and Economic Affairs,[2] upon proposals submitted by the government. If the Tripartite Commission cannot reach a consensus, the government decides independently. Additionally, since 2003 the minimum wage proposed in a given year must not be lower than the minimum wage from the previous year, adjusted by the forecasted change of the Consumer Price Index (CPI). Moreover, since 2006, if the minimum wage in a given year is lower than 50% of the average wage in the economy, then in the following year the minimum wage shall be increased by at

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[2] The Commission is composed of representatives of the Government (members of the Council of Ministers), employees (trade unions) and employers (employers' organisation).

least 2/3^{rds} of the forecasted nominal GDP growth. There are also special minimum wage conditions for labour market entrants in Poland. The subminimum for people in work for less than one year has been in force since 2003, and is set at 80% of the general minimum wage. Another subminimum for those with a tenure between one and two years was introduced between 2003 and 2005, at 90% of the minimum wage.

Figure 1. Monthly minimum wage in 2013 prices and as a share of the mean wage in Poland, 2000-2013.
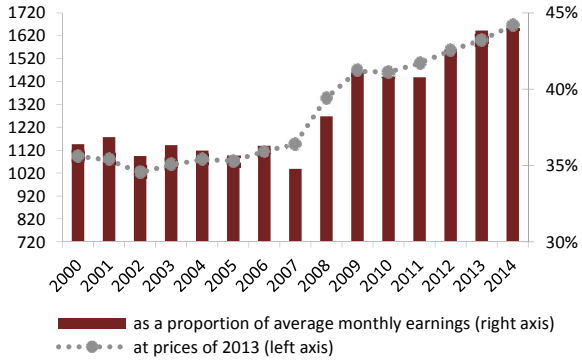
Source: Own calculations based on the Central Statistical Office of Poland data

Figure 2. Monthly minimum wage as a share of the median wage in Poland, 2000-2012.
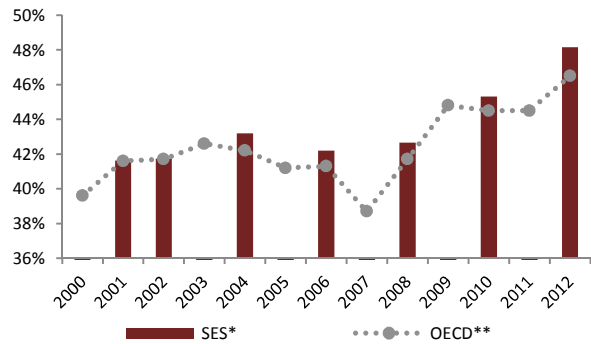
Note: SES – median wage based on the Structure of Earning Survey data (conducted every two years);
OECD - median wage from the OECD Statistics database
Source: OECD Statistics (retrieved in August 2014) and the Structure of Earning Survey

After the 2002 law change, the level of the minimum wage remained fairly stable until 2007, both in the real terms (on average 1083 PLN based on 2013 prices)[3] and in relation to the mean wage (on average 36%). In relation to the median wage it even declined slightly (cf. Figure 1 and 2). However, after 2007 a series of increases has been implemented and the minimum wage rose from 1148 PLN in 2007 to 1600 PLN in 2013, which translated into an increase in real terms of 28%. At the same time, the mean wage rose by 11% in real terms meaning that the minimum to mean wage ratio increased from 35% in 2007 to 44% in 2013. The minimum to median wage ratio increased from 39% in 2007 to 47% in 2012 (Figure 2). The largest increases, both in absolute and relative terms, were implemented in 2008 and 2009 (Figure 3).

Figure 3. Annual changes of the minimum wage in Poland (in real terms), 2000-2014.
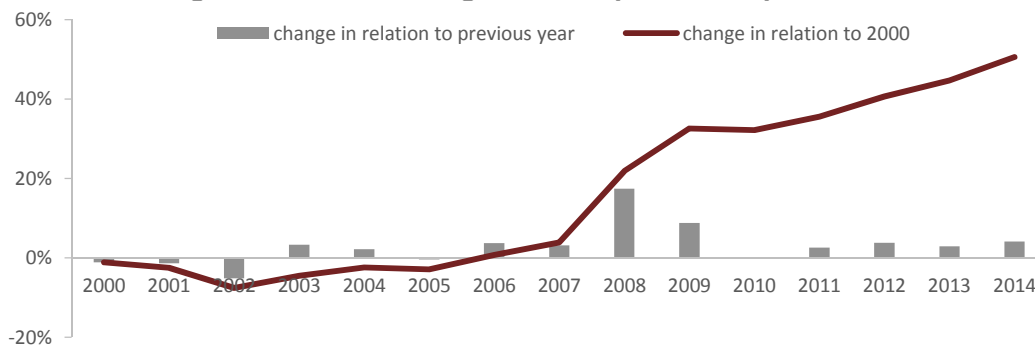

Source: Own calculations based on data from The Polish Ministry of Labour and Social Policy, and The National Bank of Poland.

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[3] Unless stated otherwise, monetary values are given in real terms as per 2013 prices.

Out of the 20 EU member states that had a national minimum wage as per 2011,[4] Poland was one of 11 countries where the minimum wage increased (in real terms) during the 2008-2012 period. In Poland the increase was one of the highest (15% in real terms) and comparable to Hungary, Lithuania and Bulgaria. However, even after these increases the Polish minimum wage seems moderately high (Figure 4). According to the OECD data, in 2012, at 47% of the median wage and 38% of the mean wage, the Polish minimum wage was comparable to the minimum wage in the Netherlands, Slovakia or the United Kingdom.[5]

Figure 4. Monthly minimum wage as a proportion of mean and median wage* in the OECD countries, 2012.
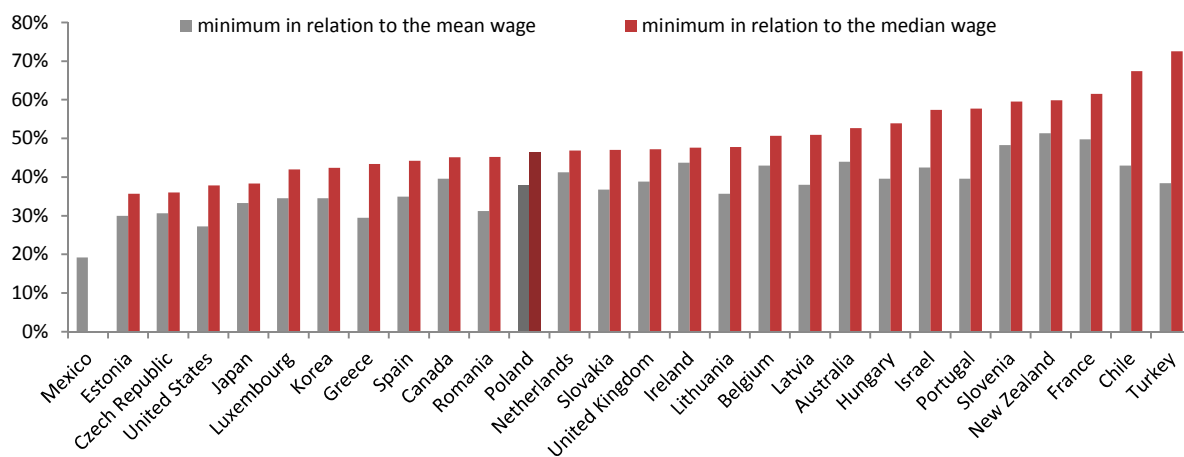
Note: minimum wage as a proportion of mean and median wage of full-time workers
Source: OECD Statistics (retrieved in August 2014)

There are some cross-country differences in the coverage of workers by the minimum wage regulations. They result from the different definitions of who is entitled to a minimum wage and the differences in the composition of employment by the type of contract and eligibility across the countries (Garnero, Kampelmann, & Rycx, 2013). In Poland coverage is, in essence, uniform – all workers with an employment contract based on the labour code are covered. However, people who are self-employed and those working on civil law contracts (i.e. contracts of mandate and contracts for products) are not. Civil law contracts are, by definition, temporary. The size of both these groups and their share of total employment has been increasing since the early 2000s (Arak, Lewandowski, & Żakowiecki, 2014). According to the Labour Force Survey (LFS) data, in 2013 out of 15.6 million workers in Poland, approx. 1.1 million individuals were self-employed outside of the agricultural sector and did not have any employees (in 2002 it was 880,000), and 974,000 people worked solely on civil law contracts (580,000 in 2002, Ministry of Finance data).[6] The self-employment ratio increased from 6% of the working population in 2002 to approx. 7% in 2013, and the share of people

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[4] According to Eurostat and Schulten (2014) these were Belgium, Bulgaria, Croatia, Czech Republic, Estonia, France, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, United Kingdom. The remaining 7 EU countries had sectoral minimum wages. The national minimum wage was introduced in Germany as per 1st January, 2015.

[5] In Slovenia, New Zealand, France, Chile and Turkey the minimum wage was at least 60% of the median wage. On the other hand, in Mexico, Estonia, Czech Republic or the US it did not exceed 40% (or even 30% in the US) of the median wage.

[6] Based on a survey conducted among firms employing at least 9 workers, GUS (2014b) estimates that there were 547 thousand such individuals in 2010, in 2011 this figure rose to 1.01 million, reaching the level of 1.35 million in 2012.

working solely on civil law contracts – from 4.2% to 6.4% of the total working population and to 7.2% of non-agricultural workers. Consequently, in 2013 the minimum wage regulations were not applicable to 13.5% of workers, and to 30.2% of all temporary workers. Unfortunately, in both the LFS and Household Budget Survey (HBS) it is impossible to distinguish between workers with fixed-term labour code contracts (who are entitled to the minimum wage) and those with civil contracts (who are not). Both groups are classified together as temporary workers together with employees with fixed-term labour code contracts. The same applies to EU-LFS and EU-SILC data.

2. Minimum wage earners in Poland

In this section we look at the incidence of minimum wage earners working outside of agriculture in Poland and their socio-economic characteristics. The share of workers earning below the minimum wage has, on average, been higher since the series of minimum wages increases starting in 2008 (Figure 5). According to the LFS data, it amounted to 8.9% of all non-agricultural full-time workers in 2008-2013, compared to 7.2% in 2001-2007.[7] According to the HBS data it was 9.2% and 7.9% respectively.[8] The LFS data shows that the share of workers earning up to the minimum wage among full-time workers[9] rose substantially after the minimum wage increases in 2008 and 2009, reaching its highest level of 10.3% of all full-time workers in 2012, but declined in 2013 to 8.4% (Figure 5). Among all non-agricultural workers (full-time and part-time) the percentage of earners below the minimum wage was also higher in the 2008-2013 period (11.9%, LFS) than from 2001-2007 (10.3%).

The shift in minimum wage policy in 2007 substantially changed the number of workers who were directly affected by the policy, i.e. those whose (FTE) wages in a given year were below the minimum wage set for the following year (Figure 6). In 2001-2004 the share of these workers employment amounted to 11.0% on average (1.37 million people), while in 2005-2006 it was 15.1% (1.93 million), and in 2007-2008 22.5% (3.09 million). The 2007 shift in policy meant that 1.35 million more workers (out of a total of 13.55 million) were directly affected by the increase in minimum wage between 2007 and 2008 than between 2006 and 2007. The share in question was again lower in 2009-2012 and amounted to 14.0% on average (1.88 million).

The share of workers earning below the minimum wage has been consistently higher among temporary workers compared to permanent workers (Figure 7).[10] Among the latter it reached the highest levels in 2008 and 2012 (8.3% and 8.2%, respectively), and in 2013 was slightly lower at 7.3%. Among temporary workers the share of earners below the minimum wage was around 23% and was slightly higher in the 2001-2007 period (24.3%), than in 2008-2013 on average (22.5%). However, as the share of temporary workers among all workers has been increasing strongly since 2001, in 2013 the majority (58%, LFS) of earners below the minimum wage were people with temporary jobs. Their share in this group was more than double their share in total employment (27%). As a result in the next section we will look at the impact of the minimum wage increases on permanent and temporary workers separately.

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[7] We exclude agricultural workers because employment in Polish farming is dominated by self-employed farmers, their family members and help workers for whom the minimum wage regulations are not applicable.
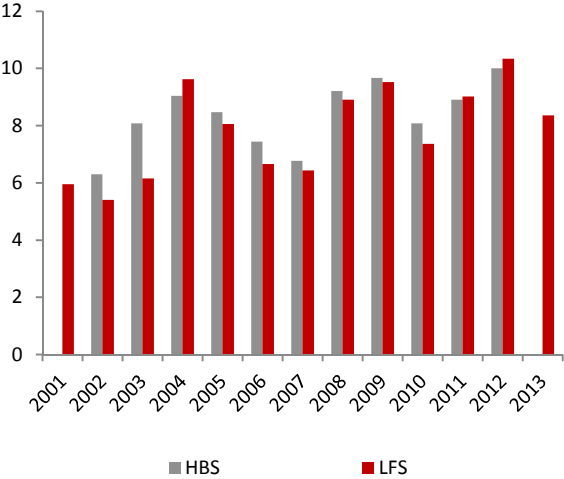
[8] HBS does not contain data on exact number of hours worked, so to compare HBS and LFS results we use full-time workers.

[9] This group contains both workers with labour code and civil law contracts.

[10] In 2001-2013 the correlation between these two shares was 60%.

Gender was another important factor here, as females were largely over-represented in the earners below the minimum wage (Figure 8). The share of women in this group has been stable at around 60% since 2001. In 2013 it equalled 59%, which was by 11 percent higher than the share of women in total non-agricultural employment (48%).

Figure 5. Percentage of full-time* workers** earning below the minimum wage in Poland, 2001-2013.

Note: *HBS does not contain data on hours worked;
** non-agricultural workers
Source: own calculation based on HBS and LFS data

Figure 6. Number and share of workers* affected by increases in the minimum wage in Poland,** 2002-2013.
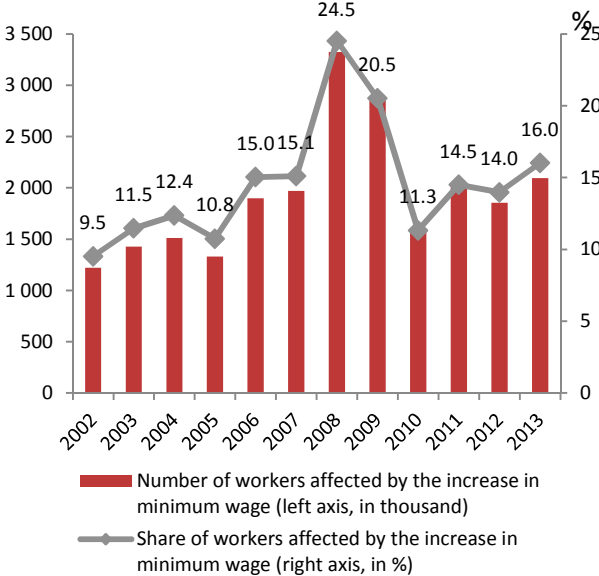
Note: *non-agricultural workers
** workers affected by the increase in minimum wage: non-agricultural workers earning in a year *t* less than the minimum wage in *t+1*, full time equivalent wages. Numbers on X axis relate to the year of minimum wage increase, *t+1*.
Source: own calculation based on LFS data

Figure 7. Percentage of earners below minimum wage* among permanent and temporary workers in Poland, 2001-2013.
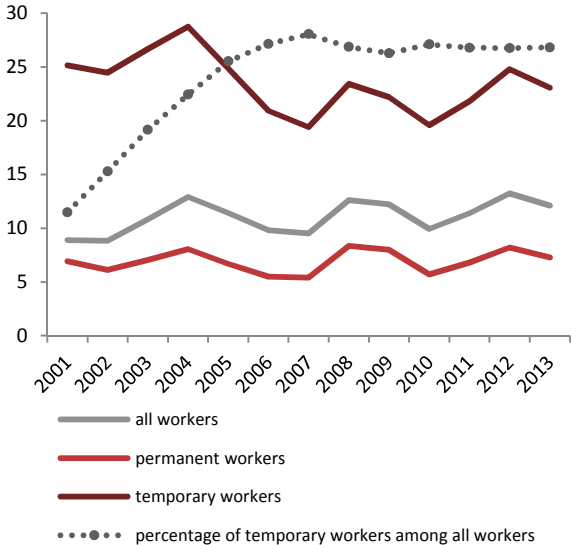
Figure 8. Share of females among earners below the minimum wage* in Poland, 2001-2013.

Note: *non-agricultural workers
Source: own calculation based on LFS data.
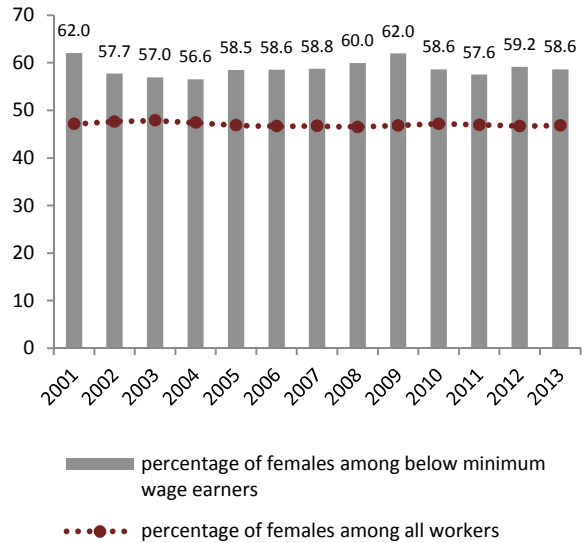
The incidence of minimum wage was also related to age. The highest share of the earners below the minimum wage (28% in 2013) was recorded among workers aged 15-24. Young workers constituted 16.8% of the all earners below the minimum wage in 2013 (Figure 9). However, the share of young workers in this group declined by 6.6 pp. between 2001 and 2013 due to the evolving age structure of the workforce. In 2013, the majority (65.2%) of earners below the minimum wage were of prime working age (25-54 years of age), even though the share of earners below the minimum wage among workers in the prime age was the lowest (about 10%). Among workers aged 55-64 this share was slightly higher (13.3% in 2013) and this group constituted 16.2% of the earners below the minimum wage in 2013. Interestingly, in the 2001-2013 period this share increased almost four-fold (from 4.2% to 16.2%), while the share of people aged 55-64 in total employment doubled. People over the age of 65 were relatively often paid up to the minimum wage (20.4% in 2013), but the share of the 65+ group among earners below the minimum wage was low (1.8% in 2013) due to the low employment rate in this group.

Figure 9. Percentage of earners below the minimum wage* among workers by age in Poland, 2013.

Figure 10. Structure of earners below the minimum wage* by age in Poland, 2013.

Note: *non-agricultural workers
Source: own calculation based on LFS data.

Figure 11. Percentage of earners below the minimum wage among workers, by educational attainment (in 2013).
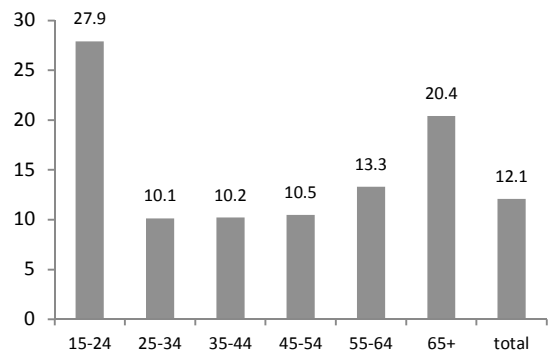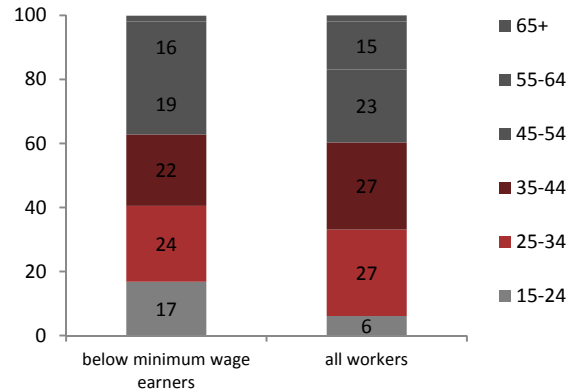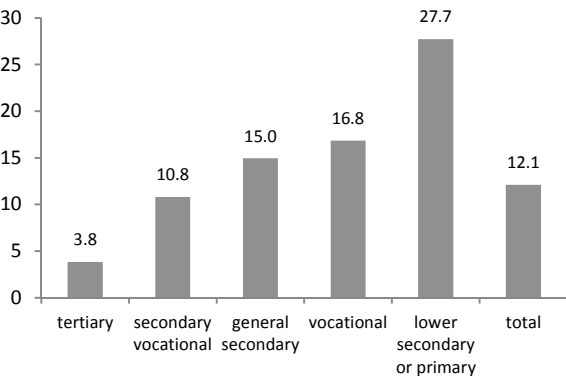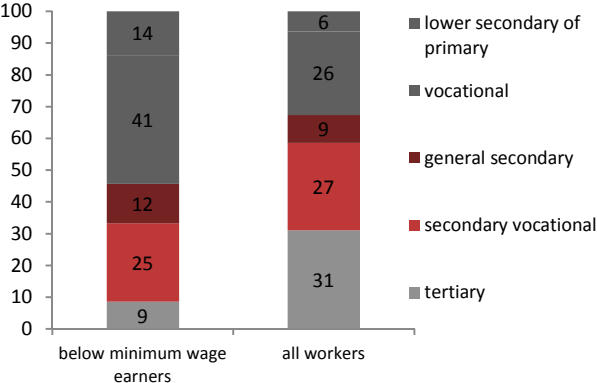

Figure 12. Structure of earners below the minimum wage by educational attainment (in 2013).

Note: *non-agricultural workers
Source: own calculation based on LFS data

Workers with lower secondary or primary education were the group with the highest share (27.7% in 2013) of earners below the minimum wage (Figure 12). The incidence of wages below the legal minimum among workers with vocational and general secondary education was also relatively high (16.8% and 15.0% respectively in 2013). In 2013, these three groups jointly constituted 66.7% of the earners below the minimum wage and 41.4% of all workers. On the other hand, only 3.8% of workers with tertiary education earned less than the minimum wage in 2013. In 2001 the share of people with tertiary education was over five times lower among earners below the minimum wage (2.9%) than among all workers (14.9%). This ratio has decreased in 2001-2013, and the share of people with higher education was three times lower among earners below the minimum wage (8.6%) than among all workers (31.1%) in 2013. Interestingly, the share of workers with secondary vocational education in total employment (24.8%) was lower than the share of this group among earners below the minimum wage (27.5%), and 10.8% of them were earning up to the minimum wage in 2013.

3. Data and econometric strategy

We use the Labour Force Survey data to estimate the impact of increases in the minimum wage on job separations and other labour market outcomes in Poland. The Polish LFS has the form of a rotational panel. Individuals are surveyed for two consecutive quarters, then have a 2 quarter break, and are then interviewed again in two successive quarters. On that basis we constructed a year-by-year panel for the 2001-2013 period. In total we therefore studied 12 changes to the level of the statutory minimum wage. The main disadvantage of LFS is the declarative wage variable and low response rate in recent years. In 2013 it was 28% among all non-agricultural workers. The analysis covers the population aged 15-54. Workers over the age of 55 are excluded from the sample because their labour market flows have been mainly driven by retirement and pre-retirement policies and decisions (IBS, 2010). The focus is on one-year labour market flows. We use full-time equivalent (FTE) net wages. Part-time workers are included in models on LFS data, but excluded in models on HBS data due to a lack of information about the hours worked. The estimations are conducted for the total working population, in order to assess the impact of minimum wage increases on the total labour market outcomes, and for selected sub-groups, defined by age (distinguishing between 15-29, 30-44, and 45-54 year olds), gender, education level (distinguishing between people with tertiary, post-secondary and secondary vocational, general secondary, basic vocational, lower secondary and primary education attained). We also distinguish between temporary and permanent workers to analyse the influence of the minimum wage increases on the employment structure in this respect.

We follow the approach of Baranowska-Rataj & Magda (2015) and combine Propensity Score Matching (PSM) and Difference-in-Differences (DiD). The advantage of this approach over traditional PSM is that it allows controlling for unobserved time-fixed characteristics[11] and combining them with observed or complementary information (Villa (2013), Blundell & Costa-Dias (2009), Heckman, Ichimura, & Todd (1998)). Using this method we try to find the effect of the minimum increases on the various labour market outcomes: job separations, fraction of workers with permanent contracts, fraction of workers with full-time jobs, hours worked per week and real wage.

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[11] In the context of this study, some unobserved differences between the treated and the control group may occur in the bargaining power of employees, or some of their soft skills that influence their inclusion in a particular group.

Table 1. Structure of the treated and control group after PSM and the bias between groups (in percent), 2001-2013.

Percentage of:		Treated	Control group after matching	Bias (%)
married		59.9	60.2	0.48
woman		62.0	61.3	-1.07
students		9.5	9.2	-3.36
employed in public sector		19.9	19.3	-3.01
Size of the place of residence	over 100 k	16.5	16.8	1.57
	under 100 k	37.3	37.2	-0.40
	rural area	46.2	46.1	-0.22
Education	higher	5.3	5.3	0.38
	post-secondary and secondary vocational	26.5	26.4	-0.45
	secondary general	10.4	10.2	-1.35
	vocational	44.4	44.8	0.81
	lower secondary and lower	13.4	13.3	-0.82
Occupation	representatives of public authorities	0.5	0.5	6.52
	specialists	1.5	1.5	0.00
	technicians and associate professionals	4.9	4.9	-1.22
	office workers	7.7	7.6	-1.30
	personal service workers	30.3	29.8	-1.55
	farmers. gardeners. foresters	0.1	0.1	0.00
	craftsmen and industrial workers	22.5	22.7	0.84
	machine operators and assemblers	10.5	10.9	4.02
	elementary occupations	22.1	22.1	-0.09
Company size	up to 10 workers	34.5	34.3	-0.58
	11 - 49	34.1	34.2	0.38
	50 - 100	12.9	12.8	-0.85
	101 and more	18.5	18.7	0.97
Sector	industry	30.8	31.3	1.36
	construction	7.1	7.3	3.12
	trade. repair of motor vehicles. accommodation and food service activities. transportation and storage	35.1	35.2	0.31
	financial. insurance and real estate activities	8.1	8.1	0.12
	public administration. education. health	19.0	18.2	-4.01
Average tenure (months)		59.0	59.7	1.19
Average age (years)		36.0	36.1	0.28
Number of observations (in the *t* year)		18 896	31 705	-

Source: own calculations based on LFS data

Firstly, we determined the "treated" and "control" groups. The treated group comprises workers who at the moment *t* are earning less than the minimum wage from the moment *t+1*. The control group is defined as workers who at the moment *t* earn more than 100% and less than 130% of the minimum wage level from the moment *t+1*.[12] The upper limit is set to make both groups comparable in terms of unobserved features that may not be captured in the PSM.[13] PSM is conducted to eliminate differences in the structures of the treated and control groups.[14] The results of the matching are presented in Table 1. The quality of the matching is high, as shown by the low bias

[12] We also drop all observations in which the value of any variables used in the subsequent analysis was missing and as a result we get a 12-year LFS panel dataset with a total of 101,000 observations (including 38,000 observations from the treated group).

[13] We also consider other definitions of the control group to verify the robustness of results. The Appendix presents results of the estimations for the control groups who at the moment *t* earn (i) between 100% and 120%, and (ii) between 110% and 140% of the minimum wage from the t+1 moment.

[14] Of the two matching algorithms (kernel and nearest neighbour) that were tested in the study, the kernel one gave the better results (lower bias), so it was used.

between the control and the treated groups. All of variables presented in Table 1 are used as covariates in the matching algorithm. The final step was the difference-in-differences estimation. In the difference-in-differences regression matching, the changes in the outcomes of individuals from the treated group and the most similar ones (in terms of propensity scores) from the control group are compared, across the observation period. We examine whether individuals who received the treatment by the minimum wage increase in a given year *t* experienced different changes in various labour market outcomes between *t* and *t+1* than those experienced by their counterparts in the control group whose wages already exceeded the *t+1* minimum wage in year *t*.

4. Empirical results

4.1. Labour market outcomes of the total population

In this section we present the difference-in-difference results for the labour market outcomes of the total population of workers directly affected by minimum wage increases in Poland. Table 2 shows that the increases in the minimum wage had a statistically significant, negative impact on the fraction of workers remaining in employment. In 2002-2013 it amounted to 6.1 pp. On average, out of 1,923,000 workers directly affected by the minimum wage increases each year, 317,000 became jobless. Our results suggest that 37% of these separations, i.e. on average 116,000 separations per year, can be attributed to increases in the minimum wage.[15]

In relative terms the impact of the increases in the minimum wage on jobs separations (and consequently the share of workers remaining in employment) is found to be similar in the period of flat (2002-2007) and steep (2008-2013) minimum wage increases. It was even slightly weaker, although still negative and significant, in the second period. This can be explained by both the macroeconomic environment and the nature of policy itself. Firstly, the Great Recession had a modest impact on the Polish economy (IBS, 2013). Although the unemployment rate increased (from 7.0% in 2008 to 10.3% in 2013 in the 15-64 age group, LFS data), the employment rate also rose (from 57.0% in 2007 to 60.0% in 2013) and total outflows from employment were lower in 2008-2013 than in 2002-2007. The shift in minimum wage policy coincided with an overall improvement in labour demand (in comparison to 2002-2007, in 2008-2013 the outflows from employment in the treated group were lower by 3.8 pp. on average, and in the control group by 1.9 pp.). Secondly, the shift in minimum wage policy from 2007 substantially increased the number of jobs which were required by law to adjust the wage to a new legal minimum (see Figure 6). The number of these jobs (per year) in 2008-2013 was on average 736,000 higher than in 2002-2007. The relative bargaining power of affected workers might have increased so the fraction of them losing jobs due to higher minimum wage declined. However, in absolute terms the number of separations attributed to minimum wage hikes was, in 2008-2013, 7,000 people per year higher than in 2002-2007.

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[15] This means that 6.1% of all workers affected by the minimum wage increases were moving out of employment due to a higher minimum wage.

We find that among workers remaining in employment, the minimum wage increases did not directly affect their structure with regards to temporary and permanent jobs. However, there were indirect effects due to differences in the impact of the minimum wage on temporary and permanent workers which we discuss below. Regarding other outcomes, increasing the minimum wage had a significant negative impact on the share of full-time workers (especially in the 2008-2013 period) and hours worked.[16] Moreover, even after the reduction of hours assigned to minimum wage increases, the average hours worked by the treated group were above the legal standard of 40 hours per week. The impact of the minimum wage on the average hours worked was stronger in 2003-2007,[17] but remained significant in 2008-2013 and the reduction of the (extra) hours worked continued. The higher minimum wages may have acted as a fair labour standard, discouraging companies from employing minimum-wage earners for long extra hours. Finally, minimum wage increases led to significantly higher real wage growth among those affected and remaining in employment.[18] However, we find that the more pronounced minimum wage increases in 2008-2013 did not lead to relatively stronger real wage increases compared to 2002-2007, because wages in the control group also rose faster in 2008-2013. The Appendix presents the wage dynamics and distribution of wage adjustments in the treated and control groups before and after a hike in the minimum wage.

Table 2. DiD results for the labour market outcomes of workers earning the minimum wage and below in Poland, 2002-2013.

	Employment rate (in pp.)	Share of permanent workers (in pp.)[#]	Share of full-time workers (in pp.)[#]	Hours worked per week[#]	Real wage (in PLN, 2013 prices, FTE)[#]
2002-2013	-6.05*** (0.31)	1.01 (0.67)	-1.07** (0.39)	-0.75*** (0.11)	75.11*** (3.30)
2002-2007	-6.81*** (0.48)	-0.34 (1.03)	-0.49 (0.63)	-0.83*** (0.18)	73.28*** (3.27)
2008-2013	-4.92*** (0.43)	1.280 (0.91)	-1.62** (0.52)	-0.36** (0.13)	46.42*** (3.95)

Note: p-value: * - 0.05; ** - 0.01; *** - 0.001

- effect for people remaining in employment in the *t+1* period

Source: own calculations based on LFS data

Table 3 shows that there were substantial differences in how minimum wage increases affected permanent and temporary workers. The impact on job separations was statistically significant and negative in both groups, but it was by 4.7 pp. stronger among temporary workers. On average in 2002-2013, out of 116,000 job separations attributed to minimum wage increases each year, 83,000 (71%) affected temporary workers. Moreover, this proportion was higher in 2008-2013 (72%) than in 2002-2007 (59%). At the same time, permanent workers remaining in employment were significantly more likely to move to temporary jobs than their counterparts in the control group. In 2002-2013 this effect amounted to 1.2 pp. on average, translating into 10,000 workers moving each year from permanent to temporary jobs due to increases in the minimum wage.[19] Among temporary workers (remaining in employment) the impact on the share of workers stuck in temporary jobs was significant only in the 2002-2007 period. Our results suggest that the policy reduced transitions to

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[16] The relative decrease in the share of full-time workers was mainly due to increasing share of full-time workers in the control group (especially in 2008-2013) as this share in the treated group was quite stable at 91-92%.

[17] The average hours of workers affected by the policy were by 2.5 hours higher in 2002-2007 than in 2008-2013.

[18] All wage effects studied are for full time equivalent, real wages.

[19] In the 2008-2013 period, flows from permanent to temporary employment were higher than from 2002-2007 for both treated and control groups, but the difference between them remained unchanged.

permanent jobs in that period by 3.8 pp., equivalent to 21,000 workers per year.[20] Consequently, the minimum wage increases may have not only prompted dismissals, but also contributed to the rise of temporary employment in Poland.[21]

The negative effect on a share of workers with full-time jobs is found to be slightly stronger for temporary workers (who were characterised by a lower share of full-timers than permanent workers), especially in the 2008-2013 period. The negative effect on hours worked is found to be comparable for both groups, but permanent workers benefited to greater extent from the shortening of extra hours.[22] At the same time, real FTE wage effects were stronger for temporary workers than for permanent workers, leading to a convergence of wages between the two groups. These results again suggest that higher minimum wages might have improved labour standards for workers paid the minimum wage who remained in employment.

Table 3. DiD results for labour market outcomes of workers earning the minimum wage and below, by period and type of contract in Poland, 2002-2013.

	Employment rate (in pp.)	Share of permanent workers (in pp.)[#]	Share of full-time workers (in pp.)[#]	Hours worked per week[#]	Real wage (in PLN, 2013 prices, FTE)[#]
Permanent workers					
2002-2013	-3.31*** (0.33)	-1.19*** (0.21)	-0.88* (0.42)	-0.90*** (0.13)	54.58*** (4.08)
2002-2007	-4.20*** (0.53)	-1.30*** (0.26)	-0.76 (0.66)	-1.08*** (0.21)	58.65*** (3.49)
2008-2013	-2.23*** (0.44)	-1.21*** (0.31)	-1.20* (0.57)	-0.30 (0.16)	19.70*** (5.03)
Temporary workers					
2002-2013	-8.03*** (0.57)	-0.88 (0.51)	-1.68* (0.72)	-0.84*** (0.18)	96.45*** (5.47)
2002-2007	-9.02*** (0.92)	-3.78*** (0.85)	-0.85 (1.26)	-0.74* (0.34)	95.39*** (6.49)
2008-2013	-6.31*** (0.74)	0.40 (0.65)	-2.51** (0.90)	-0.66** (0.22)	71.26*** (6.14)

Note: p-value: * - 0.05; ** - 0.01; *** - 0.001
- effect for people remaining in employment in the *t+1* period
Source: own calculations based on LFS data

4.2. Labour market outcomes by gender, age and education

In this subsection the effects of minimum wage increases by gender, age, and education are studied.[23] The impact of minimum wage rises on the employment rate of women (on average constituting 61% of earners below the minimum wage in 2002-2013) was 1.5 pp. greater than among men (6.7 vs. 5.2 pp.). This difference was driven by different impacts on temporary workers as there were no significant gender differences in the employment effects for permanent workers (3.3 pp. vs 3.5 pp.). Women with temporary contracts were affected to the highest extent – the impact on the fraction of those remaining in employment amounted to 9.4 pp. (on average in 2002-2013). Among

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[20] Even though the share of temporary workers moving to permanent jobs in the treated group declined from 16.3% in 2002-2007 to 13.5% in 2008-2013, the parallel share of the control group declined from 20.1% in 2002-2007 to 13.1% in 2008-2013. Therefore no effect is assigned directly to the minimum wage increases in 2008-2013, even though the transitions of low-paid workers to permanent jobs decreased.

[21] Because of LFS limitations, it is not possible to directly test whether higher inflows to temporary jobs were related to inflows to civil law contracts for which the minimum wage is not binding, or to temporary labour code contracts.

[22] Individuals in the control group exhibited lower and more stable working hours than in the treated group for both temporary and permanent workers

[23] In this subsection we focus on the average effects in 2002-2013. Results for 2002-2007 and 2008-2013 separately are available upon request.

men in temporary employment the effect was lower (6.7 pp.). As a result, on average in 2002-2013, among 116,000 workers separated from jobs each year due to minimum wage increases, 54,000 (46%) were women with temporary jobs, 21,000 (18%) women with permanent jobs, 27,000 (23%) men with temporary jobs and 14,000 (12%) men with permanent jobs.

Permanent workers remaining in employment after the minimum wage increase were more likely to end up with temporary jobs. This effect was similar for both genders (1.1 pp. vs. 1.2 pp.), translating into 6,000 women and 4,000 men moving from permanent to temporary jobs each year due to minimum wage hikes. Women, especially temporary workers, were also significantly negatively affected in terms of the share of full-time workers. For men there were no significant effects. However, both genders were significantly and to similar extent affected by the decreasing hours worked. For all types of workers – both permanent and temporary, male and female – this was related to substantial reductions in extra hours. At the same time, the share of full-time workers in the control group was increasing, especially among women, and the gap in hours worked between less paid (treated group) and better paid (control group) workers declined after the minimum wage increases. Consequently, we think that increasing the minimum wage contributed to improving the work standards of the minimum wage earners who retained their jobs, and the redistribution of some of the workload to slightly better paid but previously underutilised workers. The wage effects were higher for males than females for all categories of workers, and for both genders the effects were larger for temporary than for permanent workers.

Table 4. DiD results for labour market outcomes of workers earning the minimum wage and below, by gender and type of contract in Poland, 2002-2013.

	Employment rate (in pp.)	Share of permanent workers (in pp.)[#]	Share of full-time workers (in pp.)[#]	Hours worked per week[#]	Real wage (in PLN, 2013 prices, FTE)[#]
Men					
All workers	-5.19*** (0.48)	0.527 (1.04)	-0.06 (0.48)	-0.67*** (0.18)	81.07*** (5.51)
Permanent workers	-3.54*** (0.53)	-1.13** (0.37)	-0.39 (0.50)	-1.12*** (0.23)	59.80*** (6.80)
Temporary workers	-6.28*** (0.83)	-0.47 (0.79)	-0.13 (0.88)	-0.48 (0.28)	101.8*** (8.95)
Women					
All workers	-6.72*** (0.41)	1.371 (0.88)	-1.88*** (0.56)	-0.81*** (0.13)	70.44*** (4.09)
Permanent workers	-3.33*** (0.43)	-1.21*** (0.24)	-0.97 (0.61)	-0.78*** (0.15)	51.54*** (5.09)
Temporary workers	-9.35*** (0.77)	-1.16 (0.68)	-3.03** (1.06)	-1.13*** (0.24)	90.94*** (6.80)

Note: p-value: * - 0.05; ** - 0.01; *** - 0.001
- effect for people remaining in employment in the *t+1* period
Source: own calculation based on LFS data

Age turns out to be a differentiating factor. Table 5 shows that young workers (aged 15-29 who constituted 35% of the treated group in the 2002-2013 period) were affected most by minimum wage increases – the impact on job separations amounted to 10.1 pp. of pre-hike employment (on average in 2002-2013). As a result, we find that 39% of all job separations resulting from minimum wage increases affected people aged 15-29. The impact of minimum wage increases on the probability of job loss was much lower among prime-age workers. For the 30-44 and the 40-54 age groups (37% and 29% respectively of earners near the minimum wage level) this amounted to 4.0 pp. We find that in absolute terms 41% of all separations assigned to minimum wage increases affected workers aged 30-44, and 20% affected workers aged 40-54.

The strong impact on young workers was driven by the high share of temporary workers among them and the substantial effect on this subgroup – the effect estimated for temporary and permanent workers aged 15-29 was 11.6 pp. and 5.5 pp., respectively. There was a positive effect of minimum wage increases on the share of permanent workers among the young, but this seems to be due to higher layoffs of temporary workers – Table 5 shows there were no composition effects for young permanent or temporary workers separately. Among workers in the prime age, the impact on temporary workers was twice as large as the impact on permanent workers in the 30-44 age group, and slightly less in the 45-54 age group. In both these groups permanent workers remaining in employment were significantly more likely to become temporary workers (by 1.7 pp). On the other hand, in line with the overall results and effects by gender, we find no significant effects on transitions from temporary to permanent employment for either of the age groups. Finally, there were no significant effects for full-time incidence by age group, but there were significant negative effects on the hours worked for all of them. The strongest effect was for people in the prime age and this was due to the substantial reduction of extra hours. Wage effects were strongest for young workers, both in absolute terms and relatively to wages before the minimum wage increase.

Table 5. DiD results for labour market outcomes of workers earning the minimum wage and below, by age group and type of contract in Poland, 2002-2013.

	Employment rate (in pp.)	Share of permanent workers (in pp.)[#]	Share of full-time workers (in pp.)[#]	Hours worked per week[#]	Real wage (in PLN, 2013 prices, FTE)[#]
15-29					
All workers	-10.1*** (0.63)	3.18** (1.21)	-0.99 (0.71)	-0.61** (0.20)	97.50*** (6.19)
Permanent workers	-5.49*** (0.82)	-0.82 (0.57)	-0.84 (0.82)	-1.08*** (0.29)	60.98*** (8.84)
Temporary workers	-11.6*** (0.88)	0.683 (0.81)	-1.35 (1.05)	-0.51 (0.27)	119.0*** (8.44)
30-44					
All workers	-3.95*** (0.46)	-1.37 (1.07)	-0.77 (0.58)	-0.85*** (0.17)	67.97*** (5.02)
Permanent workers	-2.30*** (0.47)	-1.70*** (0.31)	-0.88 (0.62)	-0.90*** (0.20)	53.59*** (6.09)
Temporary workers	-5.37*** (0.93)	-1.66 (0.88)	-0.89 (1.16)	-0.89** (0.32)	90.76*** (8.72)
45-54					
All workers	-4.00*** (0.54)	0.915 (1.19)	-0.85 (0.79)	-0.78*** (0.20)	59.47*** (6.45)
Permanent workers	-2.85*** (0.54)	-0.75** (0.28)	-0.88 (0.62)	-0.79*** (0.22)	52.00*** (7.31)
Temporary workers	-5.01*** (1.20)	-0.65 (1.00)	-0.89 (1.16)	-1.21** (0.43)	79.52*** (12.7)

Note: p-value: * - 0.05; ** - 0.01; *** - 0.001

- Effect for people remaining in employment in the *t+1* period

Source: own calculation based on LFS data

Another important margin was defined by education. In relative terms, workers with general secondary education were the most affected by minimum wage increases – the share of separation (those remaining in employment) was 10.8 pp. higher (lower) than among their counterparts in the control group, and within this group the impact on temporary workers was twice that on permanent workers (see Table 6). As a result, even though workers with general secondary education constituted 10% of workers directly affected by increases in the minimum wage, they were affected by 18% of the resulting job separations. At the same time, they were the only subgroup where there was no significant effect on the hours worked (which was negative for other subgroups). The impact on separations among workers with vocational education – both basic and secondary (or post-secondary) – was substantially lower and amounted to 7.1 pp. and 4.9 pp., respectively, of the

employment rate.[24] As these two groups jointly constituted 71% of workers affected by minimum wage increases,[25] 64% of all the resulting separations involved workers with some kind of vocational education. Among people with basic vocational education, the employment outcomes were more diversified between temporary and permanent workers than among people with secondary or post-secondary vocational education.[26] The effects on other variables in both groups were consistent with the general patterns described in the previous subsection.

The impact of minimum wage increases on separations among workers with primary or lower secondary education was relatively low (5.4 pp.) and not strongly diversified between temporary and permanent workers (5.9 pp. vs. 4.4 pp.). In this educational group the wage gains of those remaining in employment were relatively large, especially in relation to previous earnings.

Table 6. DiD results for labour market outcomes of workers earning the minimum wage and below, by education level attained and the type of contract in Poland, 2002-2013.

	Employment rate (in pp.)	Share of permanent workers (in pp.)[#]	Share of full-time workers (in pp.)[#]	Hours worked per week[#]	Real wage (in PLN, 2013 prices, FTE)[#]
Lower secondary and primary					
All workers	-5.44*** (0.99)	-0.09 (1.95)	-1.67 (1.32)	-1.01** (0.37)	98.59*** (10.0)
Permanent workers	-4.46*** (1.10)	-1.59** (0.52)	-2.76* (1.36)	-1.38*** (0.40)	69.47*** (10.6)
Temporary workers	-5.72*** (1.68)	-3.26* (1.31)	-2.27 (2.41)	-1.02 (0.67)	129.2*** (17.9)
Basic vocational					
All workers	-4.90*** (0.45)	0.16 (1.00)	-0.72 (0.55)	-0.80*** (0.16)	62.16*** (4.67)
Permanent workers	-2.94*** (0.48)	-0.71* (0.28)	-0.31 (0.60)	-0.91*** (0.19)	49.48*** (5.57)
Temporary workers	-6.66*** (0.87)	-0.68 (0.79)	-1.31 (1.06)	-0.83** (0.29)	78.93*** (8.24)
General secondary					
All workers	-10.8*** (1.13)	1.89 (2.17)	-0.61 (1.36)	-0.52 (0.33)	76.22*** (9.96)
Permanent workers	-6.37*** (1.25)	-1.67* (0.78)	0.66 (1.56)	-0.29 (0.44)	45.89*** (13.6)
Temporary workers	-12.2*** (1.77)	-1.21 (1.53)	-1.75 (2.14)	-0.83 (0.48)	99.54*** (14.6)
Post-secondary and secondary vocational					
All workers	-7.14*** (0.56)	1.81 (1.26)	-0.92 (0.73)	-0.65*** (0.19)	67.05*** (6.42)
Permanent workers	-6.37*** (1.25)	-1.53*** (0.41)	-0.29 (0.79)	-0.73** (0.23)	47.33*** (8.40)
Temporary workers	-9.85*** (1.02)	1.84 (1.00)	-2.19 (1.35)	-0.86** (0.33)	86.57*** (10.0)
Tertiary					
All workers	-8.60*** (1.34)	0.33 (2.72)	-4.42** (1.53)	-0.97* (0.40)	171.7*** (16.3)
Permanent workers	-3.00* (1.51)	-2.36* (1.27)	-4.40* (1.93)	-1.20 (0.62)	135.6*** (25.0)
Temporary workers	-10.48*** (2.09)	-4.91* (2.20)	-2.70 (2.39)	-0.74 (0.54)	184.0*** (21.9)

Note: p-value: * - 0.05; ** - 0.01; *** - 0.001

- effect for people remaining in employment in the *t+1* period

Source: own calculation based on LFS data

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[24] This finding is consistent with Lis and Miazga (2014) assertion that people with vocational education fare slightly better on Polish labour market than those with general but lower than tertiary education.

[25] And 65% of workers earning up to minimum wage in a given year (on the average in the period studied).

[26] Workers with basic vocational education remaining in employment were also to lowest extent affected in terms of flows between types of contracts, whereas among workers with secondary vocational (or post-secondary) education flows from permanent to temporary jobs in the aftermath of minimum wage increases were significantly higher than in the control group (see Table 6).

Workers with tertiary education constituted 9% of those earning the minimum wage or less, but 5% of the treated group. They were affected more strongly by policy changes than the average worker (8.6 pp. vs. 6.1 pp.) so that 7% of all separations resulting from minimum wage increases affected this group. Among them, the impact was strongly differentiated between temporary and permanent workers (10.5 pp. vs. 3.0 pp.). Moreover, temporary workers with tertiary education faced significantly lower flows to permanent jobs than their counterparts who were not directly affected by the minimum wage increases. Workers with tertiary education were also the only educational subgroup where the increase in the minimum wage had a significant negative impact on the incidence of full-time jobs among those remaining in employment. On the other hand, those retaining jobs enjoyed the strongest wage increases of all educational groups – both absolutely (by 172 PLN on average) and relative to previous earnings (by 20% on the average). However, workers with tertiary education were usually young (71% of them were aged 20-29), and had a relatively short amount of work experience (on average 8.3 years less than other workers in the treated group). Our results suggest that even among tertiary graduates the effects of minimum wage increases on young workers with little experience could have been substantial.

4.3. Decomposition of job separations

In this subsection we discuss how the job separations attributed to minimum wage increases evolved in 2002-2013. The main peak was related to the shift in policy and abrupt increase in minimum wage in 2008 and another one in 2009. After eight years of a relatively flat minimum wage, these two rapid increases affected the largest pool of workers. The number of separations attributed to minimum wage hike in 2008-2009 was on average 187,000, which was 1.4% of total employment of people aged 15-54. In 2010-2013 the number of these separations was lower than in 2008 and 2009 – on the average it amounted to 114,000 per year (0.8% of the 15-54 employment). However, it was higher than in the period of small-scale minimum wage changes – the average number of separations attributed to minimum wage rises in 2002-2007 is 94,000 (0.7% of the 15-54 employment).

Figure 13 shows that women consistently formed the majority of people separating from jobs because of minimum wage hikes. Women with temporary jobs experienced the largest growth in the number of separations related to minimum wage increases, from 33,000 per year on average in 2002-2004, to 103000 in 2008, and 69,000 per year on average in 2011-2013. On the other hand, the number of separations among men with permanent contracts was relatively low and fairly stable at 11-14,000 per year over the entire period studied, with the exception of 2008-2009 when it averaged 21,000 per year. The importance of the type of contract is also shown by the fact that although in general, men were influenced less by minimum wage increases, more separations affected men with temporary jobs than women with permanent jobs.

Figure 13. Job separations attributed to the minimum wage increases by gender and type of contract, Poland, 2002-2013 (thousands of workers).
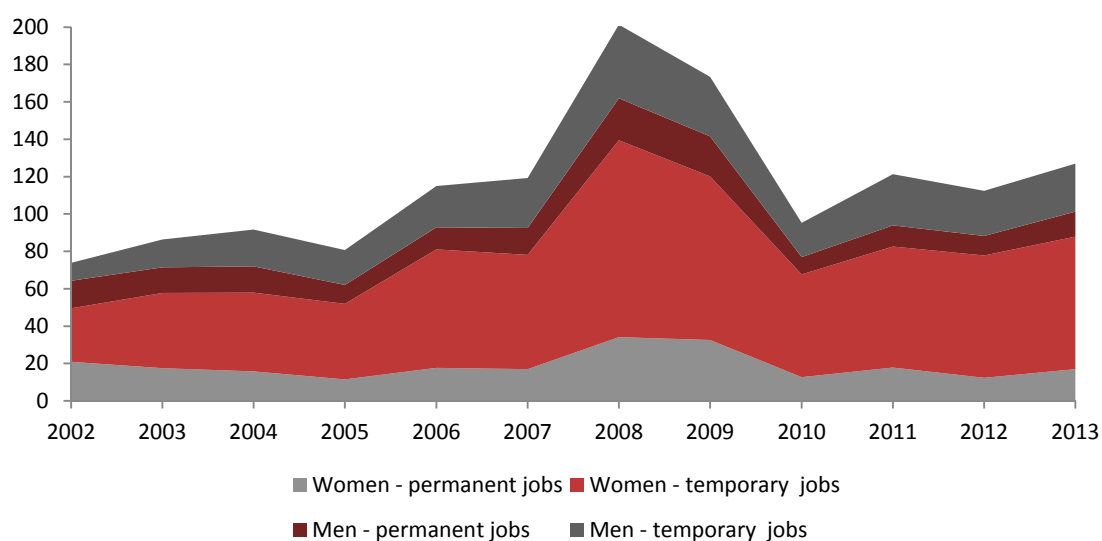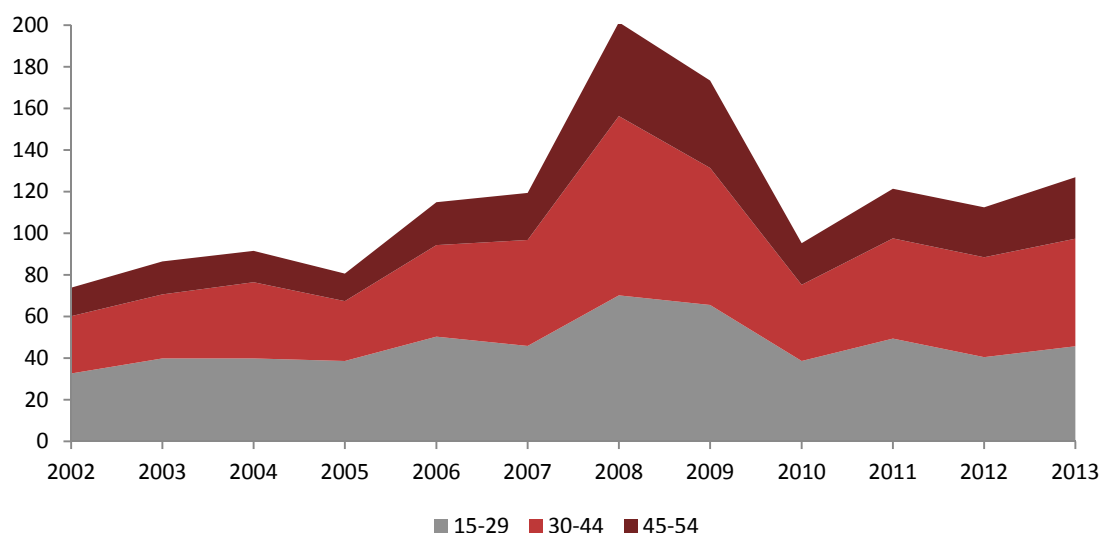

Note: Number of separations calculated as a product of the number of workers in a given category in year *t* earning less than the minimum wage in year *t+1*, and the DiD effect on a given category of workers estimated for the entire period.

Source: own calculations based on estimations on LFS data

Figure 14 shows that people aged 15-29 were the most numerous groups of workers experiencing separations attributed to minimum wage hikes until 2007. The shift in policy from 2008 increased the number of prime-aged workers whose wages had to be adjusted to the new minimum, and although in relative terms they were less likely to become jobless than young workers, after 2008 most of the separations occurred among prime-aged workers. Workers aged 45-54 were the least populous groups among those separating from jobs due to minimum wage hikes, but their number doubled between 2002-2007 and 2008-2013, partly due to demographic factors.

Figure 14. Job separations attributed to the minimum wage increases by age, Poland, 2002-2013 (thousands of workers).
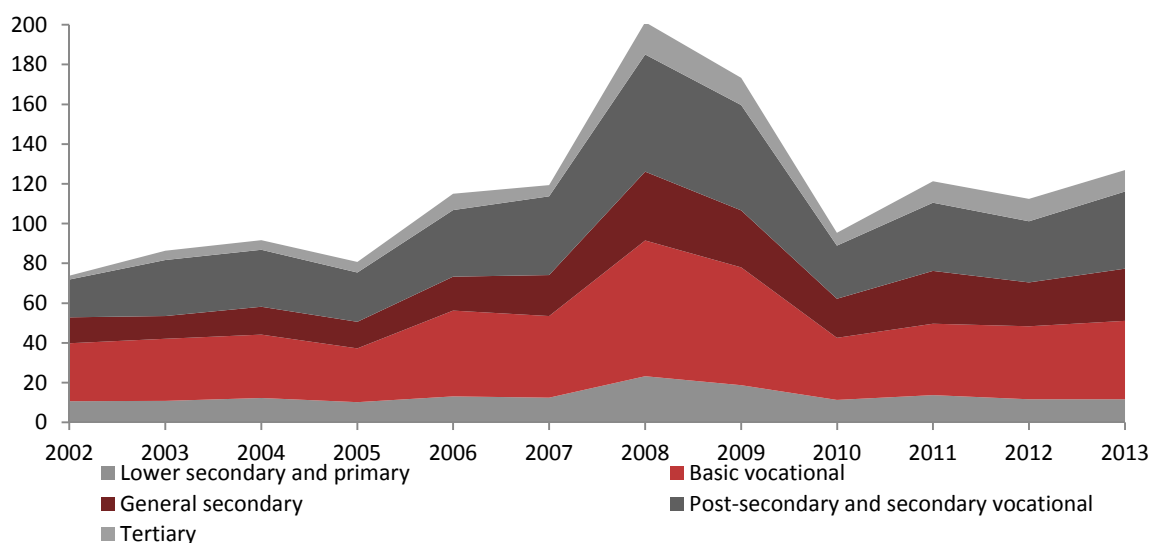

Note: Number of separations calculated as a product of the number of workers in a given category in year *t* and earning less than the minimum wage in year *t+1*, and the DiD effect on a given category of workers estimated for the entire period.

Source: own calculations based on estimations on LFS data

Workers with basic, secondary and post-secondary vocational education constantly constituted the most numerous groups of those affected. However, after the peak of separations in 2008-2009, the number of separations involving these groups was the same as before the peak. The same goes for workers with primary education, who were far less numerous among those affected. As a result, the increase in the total number of separations related to minimum wage hikes in 2010-2013 (in comparison to 2002-2007) can be attributed workers with general secondary and tertiary education. However, even though the number of minimum wage related separations affecting tertiary workers doubled, they still constituted the least numerous group of all workers separating from jobs because of increases in the minimum wage.

Figure 15. Job separations attributed to the minimum wage increases by education level attained, Poland, 2002-2013 (thousands of workers).

Note: Number of separations calculated as a product of the number of workers in a given category in year *t* and earning less than the minimum wage in year *t+1*, and the DiD effect on a given category of workers estimated for the entire period.

Source: own calculations based on estimations on LFS data

5. Conclusions and policy implications

Between 2002 and 2013, Poland experienced two periods of contrasting minimum wage policy. The minimum wage remained flat in 2002-2007 both in real terms and in relation to the average wage, but increased sharply from 2008 onwards. The largest hikes, both in absolute and relative terms, were implemented in 2008 and 2009. The policy of increases was continued so that the ratio of the minimum to average wage rose from 35% in 2007 to 44% in 2013. Our results suggest that job separations resulting from minimum wage hikes were higher after the policy shift, but mainly because the pool of workers, whose wages had to be adjusted, increased substantially. Between 2002 and 2013 Poland also experienced a proliferation of temporary employment. We find that temporary workers were affected to a much higher extent by the separations triggered by minimum wage increases than permanent workers. Our results show that more than 50% of workers who became jobless because of the rise in minimum wage were women with temporary jobs. At the same time, workers with open-ended contracts remaining in employment were more likely to move to temporary jobs. Young workers were the ones most likely to become jobless after the minimum

wage hike, but the 2008 shift in policy led to increasing (minimum wage related) separations among prime-aged workers. On the other hand, we find that increasing the minimum wage brought some benefits for workers, in the form of a reduction of (extra) hours worked among workers for whom the minimum wage was becoming binding, and stronger growth in real wages than among workers not directly affected by the policy.

The minimum wage is still a controversial issue because of political economy arguments. It is a relatively simple policy to implement, much simpler than other policies which aim at similar goals of reducing inequalities or the abuse of low-paid workers. It also is politically nearly impossible to abolish or reduce the minimum wage. According to Polish regulations introduced in 2006, if the minimum wage in a given year is lower than 50% of the average wage in the economy, then in the following year the minimum wage has to be increased by at least 2/3[rds] of the forecast nominal GDP growth. In 2014 the ratio in question was 44%, and in 2015 the minimum wage has been increased further by 85 PLN (5% of the 2014 value) to 1750 PLN. Further minimum wage increases are expected in Poland. In light of our results and the broadly discussed issues of labour market segmentation, we think that this rule should be changed and alternative policies to improve the income and living standards of low-paid workers should be pursued.

One of them is to reduce the tax wedge imposed on individuals with relatively low earnings. OECD data shows that the tax wedge on low earners (and single parents) in Poland is significantly higher than the EU average. Arak, Lewandowski and Żakowiecki (2014) argue that the total tax wedge[27] on labour income in Poland is relatively flat. In 2013, the total tax wedge on the minimum wage (1600 PLN gross) equalled 37.2%, whereas for 2/3 of the average wage in the economy (2433 PLN gross) it amounted to 39.8%, and for the average wage (3650 PLN gross) it was 40.8%. The tax wedge on low-paid workers could be reduced by raising the tax deductible expenses related to income earned from paid work, in particular under the employment relationship. Arak, Lewandowski and Żakowiecki (2014) give an example of this kind of fiscally neutral tax reform. If the tax deductible expenses are increased four and a half fold, and the basic income tax rate is raised from 18% to 20%,[28] the net income of minimum wage earner in 2013 would increase by 52.5 PLN per month, which is slightly more than the 2013 minimum wage increase in net terms. This policy would also increase the net income of all workers earning less than the average wage, which would potentially increase household income more than the minimum wage increases do. It would also not reduce labour demand which in 2008-2013, according to our results, led to job separations amounting to 1% of the total employment of people aged 15-54.

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[27] Including income tax and social security contributions and in relation to total employer's cost of labour.

[28] The second income tax rate remains at 32% and the tax brackets also remain unchanged.

References

Sabia, J., Burkhauser, R., & Hansen, B. (2012). Are the Effects of Minimum Wage Increases Always Small? New Evidence from a Case Study of New York State. *Volume 65 | Number 2, 65*(2).

Addison, J., Blackburn, M., & Cotti, C. (2011). Minimum Wage Increases in a Soft U.S. Economy. *273 Economics Series, Institute for Advanced Studies, Vienna* .

Allegretto, S., Dube, A., & Reich, M. (2011). Do Minimum Wages Really Reduce Teen Employment? Accounting for Heterogeneity and Selectivity in State Panel Data. *IRLE Working Paper #166-08*.

Arak, P., Lewandowski, P., & Żakowiecki, P. (2014). Dual labour market in Poland – proposals for overcoming the deadlock. *IBS Policy Paper 01/2014*.

Baranowska-Rataj, A., & Magda, I. (2015). The impact of minimum wage on job separations and hours of work among young people in Poland. *Institute of Statistics and Demography of Warsaw School of Economics Working Paper no. 45*.

Bhorat, H., Kanbur, R., & Mayet, N. (2013). The Impact of Sectoral Minimum Wage Laws on Employment, Wages, and Hours of Work in South Africa. *IZA Journal of Labor & Development 2013, 2:1*.

Blundell, R., & Costa-Dias, M. (2009). Alternative approaches to evaluation in empirical microeconomics. *Journal of Human Resources 44(3)*, 555-640.

Brown, C., Gilroy, C., & Cohen, A. (1982). The Effect of the Minimum Wage on Employment and Unemployment. *Journal of Economic Literature, XX*, 487-528.

Caliendo, M., & Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys, 22(1)*, 31-72.

Card, D. (1992a). Do Minimum Wages Reduce Employment? A Case Study of California, 1987-1989. *Industrial and Labor Relations Review, 46*(1), 38-54.

Card, D. (1992b). Using Regional Variation in Wages to Measure the Effects of the Federal Minimum Wage. *Industrial and Labor Relations Review, 46*(1), 22-37.

Clemens, J., & Wither, M. (2014). The Minimum Wage and the Great Recession: Evidence of Effects on the Employment and Income Trajectories of Low-Skilled Workers. *National Bureau of Economic Research Working Paper No. 20724*.

Eriksson, T., & Pytlikova, M. (2004). Firm-level Consequences of Large Minimum-wage Increases in the Czech and Slovak Republics. *LABOUR 18 (1)*, pp. 75–103.

Fialová, K., & Mysíková, M. (2009). Minimum Wage: Labour Market Consequences in the Czech Republic. *IES Working Paper: 6/2009, Institute of Economic Studies, Faculty of Social Sciences Charles University in Prague*.

Fidrmuc, J., & Tena, J. (2012). National minimum wage and the labour market outcomes of young workers. *Working Paper 12-12, Statistics and Econometrics Series 09, Departamento de Estadística, Universidad Carlos III, Madrid*.

Garnero, A., Kampelmann, S., & Rycx, F. (2013). Sharp teeth or empty mouths? Revisiting the minimum wage bite with wectoral data. *Working Paper N°13-05.RS.*

Giuliano, L. (2013). Minimum Wage Effects on Employment, Substitution, and the Teenage Labor Supply: Evidence from Personnel Data. *31*(1).

Heckman, J., Ichimura, H., & Todd, P. (1998). Matching As An Econometric Evaluation Estimator. *Review of Economic Studies*, 261-294.

IBS. (2010). *Employment in Poland 2009. Entrepreneurship for work.* Warsaw: Human Resources Development Centre, Institute for Structural Research (IBS).

IBS. (2013). *Employment in Poland 2012. Labour market during the recovery from the crisis.* Warsaw: Human Resources Development Centre, Institute for Structural Research (IBS).

Katz, L., & Krueger, A. (1992). The Effect of the Minimum Wage on the Fast-Food Industry. *Industrial and Labor Relations Review, 46*(1), 6-21.

Lis, M., & Miazga, A. (2014). Time for quality in vocational education. *IBS Policy Paper 03/2014*.

Majchrowska, A., & Źółkiewski, Z. (2012). The impact of minimum wage on employment in Poland. *Investigaciones Regionales 24*, 211-239.

Neumark, D., & Wascher, W. (1992). Employment Effects of Minimum and Subminimum Wages: Panel Data on State Minimum Wage Laws. *Industrial and Labor Relations Review, 46*(1), 55-81.

Neumark, D., & Wascher, W. (2008). *Minimum Wages.* Cambridge, London: The MIT Press.

Neumark, D., Salas, J., & Wascher, W. (2013). Revisiting the Minimum Wage-Employment Debate: Throwing Out the Baby with the Bathwater? *IZA DP No. 7166*.

Ruzik, A. (2007). Minimalne wynagrodzenie - analiza wpływu na zatrudnienie w Polsce. *Polityka Społeczna 1/2007*, 5-9.

Schulten, T. (2014). *Minimum Wage Regimes in Europe.* Berlin: Friedrich-Ebert-Stiftung.

Stewart, M. (2004, March). The employment effects of the national minimum wage. *The Economic Journal*, pp. 110-116.

Villa, J. M. (2009). DIFF: Stata module to perform Differences in Differences estimation. *Statistical Software Components S457083, Boston College Department of Economics, revised 22 Nov 2014*.

Villa, J. M. (2013). Simplifying the Estimation of Difference in Differences Treatment Effects with Stata. *MPRA Paper No. 43943*.

Appendix

Robustness of DiD results for the choice of control group

In this section we verify to what extent our results depend on the definition of the treated and the control group. The basic control group comprises people who at the moment *t* earn more than 100% and less than 130% of the minimum wage level from the *t+1* moment. To verify the robustness of the results we repeat all estimations for the control groups who at moment *t* earn (i) between 100% and 120%, and (ii) between 110% and 140% of the minimum wage from the *t+1* moment.

The results are presented below. The estimated effects differ slightly depending on the definition of the control group, but the statistical significance of the results doesn't depend on the choice of the control group, and the quantitative differences in the estimated effects are moderate. Moreover, in the case of the two first definitions (100%-130% and 100%-120% of the *t+1* minimum wage), the bias between the treated and control group was low and almost identical. All these findings point to the robustness of our results when it comes to choosing the control group.

Table 7. DiD results for labour market outcomes of workers earning the minimum wage and below in Poland, 2002-2013.

	Employment rate (in pp.)	Share of permanent workers (in pp.)[#]	Share of full-time workers (in pp.)[#]	Hours worked per week[#]	Real wage (in PLN, 2013 prices, FTE)[#]
Control group: workers earning 100% - 130% of the minimum wage from t+1 period					
2002-2013	-6.05*** (0.31)	1.01 (0.67)	-1.07** (0.39)	-0.75*** (0.11)	75.11*** (3.30)
2002-2007	-6.81*** (0.48)	-0.34 (1.03)	-0.49 (0.63)	-0.83*** (0.18)	73.28*** (3.27)
2008-2013	-4.92*** (0.43)	1.28 (0.91)	-1.62** (0.52)	-0.36** (0.13)	46.42*** (3.95)
Control group: workers earning 100% - 120% of the minimum wage from t+1 period					
2002-2013	-5.81*** (0.35)	1.03 (0.75)	-0.65 (0.43)	-0.68*** (0.12)	69.91*** (3.64)
2002-2007	-6.70*** (0.54)	-0.44 (1.16)	0.16 (0.70)	-0.86*** (0.21)	72.52*** (3.63)
2008-2013	-4.41*** (0.48)	1.32 (1.02)	-1.24* (0.57)	-0.27* (0.15)	38.38*** (4.35)
Control group: workers earning 110% - 140% of the minimum wage from t+1 period					
2002-2013	-6.88*** (0.40)	0.62 (0.88)	-1.48** (0.53)	-0.70*** (0.14)	74.47*** (4.61)
2002-2007	-7.48*** (0.60)	-0.80 (1.25)	-1.33 (0.83)	-1.00*** (0.25)	85.22*** (4.07)
2008-2013	-6.16*** (0.55)	1.85 (1.22)	-2.19** (0.70)	-0.28 (0.18)	39.62*** (5.93)

Note: p-value: * - 0.05; ** - 0.01; *** - 0.001

- effect for people remaining in employment in the *t+1* period

Source: own calculation based on LFS data

The distribution of wages in treated and control groups

The minimum wage increases were associated with a rise of wages in both treated and control groups. Among workers in the treated group who were employed in both periods (t, $t+1$), wages increased by 15.6% per year on average in the period 2002-2013 (in real terms). Workers in the control group benefited less – their wages rose by 4.7% on average. The wages of the total workforce grew by 3.1% per year on average (in real terms), which is less than in the control group, suggesting that there might have been spillover effects from hikes in the minimum wage. 2008-2009 was the period when the average change of wages was strongest in the entire period 2002-2013. In this period the minimum wage in Poland increased by 17% (in real terms) which was the biggest change in the 2002-2013 period. At the same time, in 2008 and 2009 the average percentage change of real wages in the control group was virtually the same as among all workers, and 2.6 times lower than in the treated group. In all other years, the average percentage change of real wages in the treated group was 4.3 times higher than in the control group.

Table 8. Average real percentage change in wages before and after the minimum wage increase among all workers and people from the treated and control group in Poland (in %), 2001-2013

	2002*	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	All
Treated	15.7	11.1	17.3	12.4	20.8	17.3	24.2	16.5	13.8	11.8	7.8	8.4	15.6
Control	4.7	3.5	4.2	2.2	5.4	7.4	9.3	6.1	3.5	2.4	1.1	0.2	4.7
All workers	2.5	2.4	3.2	0.9	5.7	5.2	9.2	5.3	1.5	1.2	-0.1	0	3.1

Note: * the year denotes the second out of two years of observation in the panel (t, $t+1$), and the percentage denotes the average difference between real wage in the $t+1$ and t year for those who remained in employment.
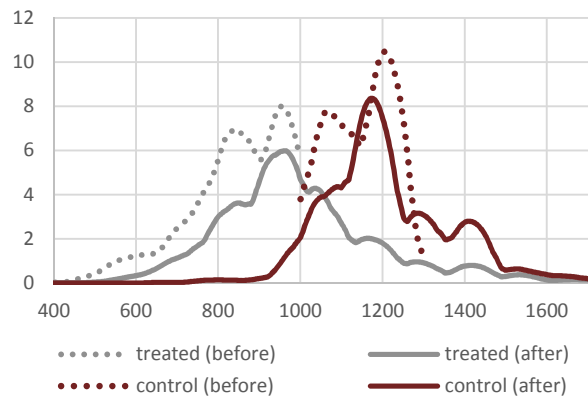*Source: own calculation based on LFS data*

Figure 16. The distribution (kernel density) of the real percentage wage change in the treated and control group before and after the minimum wage increase in Poland, 2001-2013
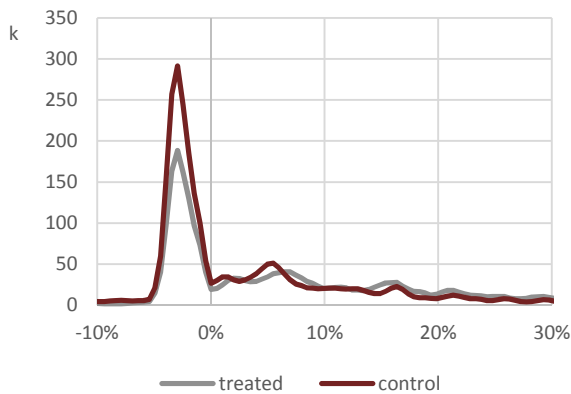
Source: own calculation based on LFS data

Figure 17. The distribution (kernel density) of the real FTE wage in the treated and control group before and after the minimum wage increase in Poland, 2007-2008.

Source: own calculation based on LFS data