LOW WAGES – COINCIDENCE OR A RESULT? EVIDENCE FROM POLAND

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The article evaluates the influence of a wide range of socio-demographic, job and company-related characteristics on the likelihood of low earnings by applying logistic regression on a broad range of Labour Force Survey data. We evidenced that the average impact of the company-related characteristics is three times stronger than the impact of personal characteristics. We also found that working full-time considerably decreases this risk of low wages, but company-related and personal characteristics (except for the kind of company's economic activity) have not provided a rent (benefit) from working full-time. The underlying conclusion is that reforms decreasing the size of the low-wage sector in the former transition countries should be focused on targeted employment programmes enhancing transitions to more profitable economic activities instead of possibly maintaining the unprofitable industries at all costs. Additionally, the reforms should be concentrated on introducing employment regulations to harmonise the rules of employment among all contract types, which would put the part-timers and the underemployed on a more equal footing with full-time workers especially in terms of pension schemes and access to training.

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1. INTRODUCTION

While the majority of empirical research analyse the importance of the low or minimum wages (Bartkus 2016), the novelty of our study is explaining the probability to be paid low, following Belman et al. (2015) in this line of research. The issue is relevant (Schmitt 2012) because the expansion of the low-wage sector is a serious problem faced by many European Union (EU) countries. The growing number of individuals with low earnings in te EU and, particularly, in the transition countries is linked to increasing labour market segmentation, reflected in the development of temporary work, underemployment or involuntary self-employment. These changes in the labour market are caused by the rapid rise in importance of information technologies, shifting labour market demand away from low-skilled towards high-skilled workers and global competition leading businesses to pursue urgent cost reductions (Frazer et al. 2011; European Commission 2011). There also might be a consequence of the national institutional context, for example, expansion of *welfare-to-work policies* (Spannagel 2013).

Low-wage employment causes negative consequences to individuals and to the whole economy (Pimenta et al. 2011). Low earnings increase the risk of in-work poverty, despite that only one quarter of the risk can be attributed to low wages (Strengemann-Kuhn 2003). Nevertheless, from an economic standpoint, employment should be the best prevention against poverty. Unfortunately, working full-time and on a permanent contract in Poland and in other post-communist countries, might not be a sufficient condition to avoid being poor (Bardone – Guio 2005; European Commission 2011).

Additionally, low wages discourage individuals from taking up a job, especially if they are aware of state assistance, when the incentives to take up a job may be weakened by the discouraged worker effect (Gałecka-Burdziak – Pater 2016). Low wages may lead to the expansion of informal or parallel job markets. Moreover, Meuris – Leana (2015) provide evidence that low earnings contribute to profound psychological consequences that may spill over into organizational functioning. Finally, Cooper et al. (2014) prove that low income adversely affects individuals' good health. All this creates valid implications for the public policy, while improvements in the labour market in this respect may increase the quality of public life (Ręklewski – Ryczkowski 2016).

In the article we test two hypotheses. First, we expect that *job, company and workplace-related characteristics are more important than personal characteristics* when explaining the risk of low-wage employment (H1). The reasoning behind the hypothesis is that the labour market segmentation reflected in the development of unstable employment and low wages is perceived sometimes as a result of the job-related features but not of the employee-related ones (Kryńska

1996). Certain job characteristics linked to the secondary labour market might be transferred to the employees, and thereby impeding the access to higher paid jobs (Sengenberger 1987). This hypothesis is also supported by Mosthaf et al. (2010), who argued that there do exist dead-end jobs and dead-end firms where workers face a very high risk of getting a low pay. The hypothesis seems to be, however, contradictory to the considerable importance of human capital (Ormiston 2016) and to the sizable impact of gender and/or age-discrimination (Cataldi et al. 2011; Mysíkova 2012).

In the second hypothesis we assume that *full-time employment decreases* the odds ratios (i.e. the risk) *to be low-paid* due to the socio-demographic, job and company-related characteristics (H2). In line with that, full-time employment should weaken the impact of factors that increase the probability to be low-paid and strengthen the influence of these, which reduce the risk of getting a low pay. The reasoning behind this hypothesis is that in accordance with the dual labour market theory (Doeringer – Piore 1971; Kryńska 1996) full-time employment is a feature of the primary labour market characterized by stable employment, relatively high wages, training opportunities and better prospects for career advancement. Access to jobs in the primary labour market is hampered by the strict criteria of employment and clearly defined career ladders. Following this theory, we believe that full-time employment constitutes a kind of protection for employees against overly low wages. Additionally, we aim to verify the impact of underemployment. A rising trend of involuntary part-time employment has been observed in most EU countries during the Great Recession and its aftermath (Veliziotis et al. 2015) making it an important problem of the modern labour market.

While the relevance of the different factors on wages has been verified in the previous studies, the research on the impact of the job and company-related characteristics, full-time employment and underemployment on the probability to be paid low is rather scarce and underestimated in debates concerning wages in Central and Eastern European (CEE) countries. Our article fills in this gap. Isolating factors responsible for low earnings may constitute a valuable contribution to communities and to policy makers responsible for formulating macroeconomic policies to fight this unfavourable phenomenon both at regional and national levels in the former transition countries with considerable share of low-wage earners and the economies similar to the Polish one. Therefore, the conclusions are not one-country oriented and the subsequent discussion concerns a wide range of countries.

In the neoclassical production function, output is a function of capital, labour and land, while marginal product of labour is equal to real wage. Although the research could be perceived as if the authors implicitly accepted the neoclassical production function (at least slightly), our goal was not to explain the wage setting behaviour but the probability to fall into low wages, while this might

diverge from the concept of relative scarcity and marginal productivity of labour. It is because the reasons to be a low earner may stem, for instance, from the education completed, the individual choices concerning the work-life balance issues or mobility. The socio-demographic characteristics which we consider are at odds with neoclassical labour homogeneity as well as we do not account for any aggregated measure of capital. We examine the whole range of company-related characteristics instead.

The paper is organised as follows: Section 2 offers a review of the literature on the factors that may influence earning low. The data set and the methodology applied to verify their relative importance is presented in Section 3, while the empirical results of our econometric analysis are displayed and discussed in Section 4.

2. LITERATURE REVIEW

Previous studies suggest that typical reasons for low-wage work (a significant pathway leading into in-work poverty) are personal characteristics such as gender, age and educational attainment, etc. In particular, women are over-represented in low-wage jobs. To a given extent, it is argued to be a result of undervaluation of women's work, women's lower reservation wage and discriminatory workplace effects (Grimshaw 2011). Their upward wage mobility is also expected to be lower due to the interruptions in working life and the related loss of human capital, which was confirmed by Deding (2002) for Denmark and the USA, Viera (2005) for Portugal and Mosthaf et al. (2010) for Germany. Mason – Salverda (2010), in turn, found evidence for the significantly greater risk of a low pay among young workers and showed that the risk does not differ between male and female employees. Meanwhile, the mobility out of low-wage work is relatively high for young workers (Sloane – Theodossiou 2000; Westergaard-Nielsen 2008) because low-wage jobs may serve for them as stepping stones to better paid jobs (Mosthaf et al. 2010). Nevertheless, the importance of age factor in explaining the likelihood of low-wage work varies across the EU countries (European Commission 2011).

As for educational attainment, the higher the level of qualification obtained, the lower the incidence of low-wage work (European Commission Report 2011), which was also evidenced by Trejo (1997) for the Mexican Americans. Stewart – Swaffield (1999) confirmed that education and professional experience reduce the risk of being trapped in a low-wage situation. Pavlopoulos et al. (2008) in a comparative analysis for the selected EU countries evidenced that greater upward wage mobility is more often associated with being highly qualified in France, Netherlands, Finland, the United Kingdom and Greece. In spite of the opposite

result for Austria, Italy, Spain and Denmark, the low-skilled individuals are more often argued to face a greater risk of non-employment (Mosthaf 2014), involuntary part-time work (Kjelstad – Nymoen 2012), and then in consequence of being low earners.

It is evidenced that other characteristics such as, for instance, race, ethnicity or origin and migrant status might also be associated with low-wage employment (Grimshaw 2011). With regard to the United States, Pitts (2008) found evidence for a much higher incidence of low-wage work among black workers in full- and part-time jobs compared to whites. Being a migrant also played a significant role in explaining the higher risk of low-wage employment in the United Kingdom (Mason et al. 2008) and Denmark (Westergaard-Nielsen 2008). It seems, however, that these characteristics are of much less importance in the CEE countries, due to a considerable homogeneity of the labour force in terms of race, ethnicity and migrant status.

Except for individual characteristics, employees may face a greater risk of low-wage employment because of where their job is located (formal or informal sector, agriculture or other sections of economic activity, small or large, state or private-owned company). According to the study by Grimshaw (2011), low-wage work is usually concentrated in economic activities such as, for instance, retail and wholesale trade, hotels and restaurants, transport, social services, food processing and textiles. The size and sector affiliation of a company also significantly affects the individuals' probability of reaching a higher-paid job. This was confirmed by Cappellari (2002); Vieira (2005); Blázquez (2006); Grün et al. (2008); Schank et al. (2009); and Mosthaf et al. (2010). Larger companies compared to smaller ones more often have internal job markets with hierarchical wages and create better perspectives of career promotions offering their employees further training and other forms of human capital accumulation. In terms of upward wage mobility, Mosthaf et al. (2010) concluded that the best and usually most successful way to escape low-paid work is a change of occupation.

Finally, some researchers warn that low-wage work is a 'sticky' state and does not appear to be a self-correcting problem (Mishel – Eisenbrey 2015). In many EU countries, low-wage jobs do not seem to serve any longer as bridges between unemployment and stable and higher-paid employment. In a comparative study between Germany and Austria, Grün et al. (2008) found evidence for a great scale of low-wage persistence. This may lead to a threat of in-work poverty (Spannagel 2013), social cohesion (Schmitt 2012) and unemployment (Stewart 2007). In spite of the fact that some low-wage jobs can work as springboards to better-paid jobs (Knabe – Plum 2013), reducing the scale of the low-wage sector is beneficial for the economy and should remain one of the key objectives for national policies.

3. METHODOLOGY AND DATA

Our data stem from the 2014 Polish Labour Force Survey (LFS). To meet the LFS definition of an employee, persons aged 15 and over were taken into account. The term 'employment' covers all persons engaged in productive activity that falls within the production boundary of the national accounts. Persons in employment are employees or the self-employed (European Union 2013 for more detail[1]).

We define low-wage thresholds at 2/3rd of the median and first quartile of the gross monthly earnings (around 362 and 256 EUR net, respectively) in the main place of work. The threshold is proposed by the OECD[2] to define a low pay and it is often used in the relevant literature (Maitre et al. 2012; Grimshaw 2011). Earnings include paid over-hours and bonuses recalculated to one month-value. For both thresholds separate logit models are estimated. Additionally, for the median threshold we estimate the logistic regression on the sample restricted to the full-time employees. An analogous model for the 1st quartile does not make sense as the wage would be below the minimum one. Full-time employees in our study are persons who usually work 40 hours a week in the main place of work and their work agreement has a written form.

Logistic regressions are models with the discreet endogenous variable. The response Y of a subject may take two values denoted by 1 and 0 (if the employee earns low wage or less than the threshold then $Y=1$, and if the employee earns more than the threshold then $Y=0$). To explain the effects of the explanatory variables (represented by the vector: $x = (x_1, x_2, ...)$ on the binary response Y, the applied logit models take the form (Hosmer – Lameshow 1989) of:

$$\text{logit}\{P(y=1|x)\} = \log\left(\frac{P(y=1|x)}{1-P(y=1|x)}\right) = \beta_0 + x'\beta,$$

where β_0 is an intercept and β is the slope parameter vector. The left side of the equation is the logarithm of the odds ratio, while the odds ratio is a relationship of the probability that $Y=1$ to the chance that $Y=0$. The unknown parameters in β were estimated with a maximum likelihood method by finding values that maximize the likelihood function: $\prod_{i=1}^{N} p_i^{Y_i}(1-p_i)^{1-Y_i}$, where i was the number of an individual with the probability p to earn a low wage. We set the cut off value based on the Receiver Operating Characteristic (ROC) (King – Langche 2001) according to the formula given by DeLong et al. (1988). The threshold was deter-

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[1]   http://ec.europa.eu/eurostat/web/esa-2010.
[2]   https://data.oecd.org/earnwage/wage-levels.htm.

mined with the Youden index, the maximum vertical distance between the ROC curve and the 45-degree line (Kumar – Indrayan 2011).

The vector x consisted of over one hundred binary variables representing socio-demographic characteristics, NUTS 2 regions and place of residence, company, contract and job-related characteristics, subjective individual's assessment on being in underemployment, on the main source of income and on the desire to work more for a higher wage, active search for another job, and upskilling through participation in courses, seminars or trainings within recent month. Statistically significant parameters, which entered the final models (for $\alpha \leq 0.1$) were presented in bold font (*Tables 1–2* in *Appendix*).

4. EMPIRICAL RESULTS

The estimated regressions (*Tables 1–2*) fit significantly better than the reduced model with just the constant. The null hypothesis of the likelihood ratio tests was rejected. The odds ratio (*OR)* value is greater than unity[3], which confirms the goodness of the fit (Kufel 2007: 145). The values of McFadden *R*-squared and Adjusted *R*-squared are typical for regressions estimated on individual data and range between 0.3 and 0.35, while higher values are common for aggregated data and time series (Wooldridge 2009). The percentages of correctly predicted cases range from 79 per cent (for both models with 2/3rd median thresholds) to 94 per cent (for the model with 1st quartile threshold). Sensitivity of the models with 2/3rd median threshold amounts to 70 per cent, while for the 2/3rd of the 1st quartile it is 80 per cent. Specificity of all the models is similar at about 83–86 per cent. In summary, the estimated regressions seem to have identified well the effects of the explanatory variables on the probability of earning low wages.

In all of the estimations, we evidenced that company-related characteristics (the company's size, sector of the ownership and economic activity) have a higher impact on the probability to earn low-wages than the personal characteristics (gender, age, the highest completed level and field of education). With regard to the whole sample model, the average impact of the company-related characteristics is over 3.5 times higher than the average impact of the personal char-

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[3] $OR = \dfrac{n_{11}n_{00}}{n_{01}n_{10}}$, where n_{11} is the number of cases when predicted and actual values =1 (i.e. true positives – number of persons found by the model to be paid low, which are actually paid low), n_{00} is the number of cases when predicted and actual values = 0 (i.e. true negatives), while n_{01} is the number of cases when the actual $Y = 0$ but the model estimated unity (i.e. false positives) and n_{10} is the number of cases when the actual $Y = 1$ but the model estimated zero (i.e. false negatives).

acteristics. The standard deviations of the probabilities to earn low in case of both models are also substantially higher for the company-related characteristics than for the group of personal ones (2.1 times more in the whole sample model and 1.9 times more in the primary market model). This suggests that attaching importance by an individual to company-related characteristics should be done with a great deal of caution, because the choice gives a broader range of returns and penalties to the probability of earning low wages than the personal group of factors does. Thus, we accepted (H1) in an even stronger version, since we found that *company-related characteristics are more important than all of the analysed groups of variables* in influencing the probability to earn low wages. We, therefore, confirmed the existence of a firm size gap (Balkan –Tumen 2016), substantial differences in earnings across sectors (Magda et al. 2011) and the importance of the public and private ownership (Melly – Puhani 2013).

At first glance, the result may seem, however, to be at odds with studies which assign a leading role to education in shaping earnings and often demonstrate the positive relation between the highest completed level of education, its field, high school employment and future earnings (Trejo 1997). Possibly, our result could be explained by the evidence provided by Prime et al. (2016), who found that the presence of better educated people does not significantly increase the wage for any individual education cohort (but it results in a higher median wage in the whole community) and even the high school employment does not necessarily create occupation-specific human capital (Ormiston 2016). Therefore, while we do not deny the considerable and positive impact of education on the general wage level and following Ormiston (2016) to the role that education plays in building general human capital, our study indicates that the role of education is subordinate to the company-related features in influencing the risk of extremely low wages. We claim that sizable companies are usually associated with better chances of further training and other forms of human capital accumulation and thus with better perspectives for career promotions. Paying higher wages by big companies may also be treated by them as an effective labour turnover stabilizing tool (Duhautois et al. 2016).

With reference to (H2), full-time employment is a feature of the primary labour market and we expected it to lower the probability of being low-paid separately for each of the personal and company-related characteristics. Nevertheless, the estimated probabilities to be paid low for the whole sample (*Table 1*) and for the employed only full-time (*Table 2*) are very similar in case of the majority of the coefficients. More than 75 per cent of the estimated coefficients turned out to have the same sign and to be significant in both regressions. If we exclude the coefficients that make the greatest discrepancy between the two models, namely, the coefficients associated with economic activity sections, being over 70 and having

job experience of less than one year, the standard deviation of the differences between the models' estimated probabilities (corresponding to analogous coefficients) amounts to less than 5 p.p. Moreover, the slight improvement stemming from full employment concerns merely 50% of the estimated variables. Only in case of economic activity sections, the probabilities to be paid low in the primary, more-secure-job market are significantly lower, roughly by two to six times. This may suggest that employees with less-secure jobs are simply paid less (Pinheiro – Visschers 2015) but the difference seems to be driven by company's economic activity, while other company-related or personal characteristics do not provide a rent (benefit) from working full-time. In consequence, we *rejected (H2)*.

Despite the rejection of (H2), it is argued in the literature of this subject that contingent jobs (part-time, dispatch or temporary workers) are usually associated with the secondary market and may have a lasting effect on the welfare of the individual (Esteban-Pretel et al. 2011). Indeed, we found that working part-time significantly increased the likelihood of being in a low-wage situation (compare: Paul 2016). As noticed by Matteazzi et al. (2014), this effect may be particularly strong in Poland and in the United Kingdom, where part-timers are mostly concentrated in low-skilled occupations. Our results indicate that the willingness to work longer in return for a higher pay and underemployment (that is a willingness to work longer while working part-time) is strongly correlated. In all of the models we always found one of the two variables to be significant. In the models with the 2/3rd of the median threshold, the risk was increased by over 45 per cent. In the model with the 2/3rd of the first quartile threshold (which we do not present to save space), the underemployment translated into an upsurge of the mentioned risk by over 4,000 per cent. This indicates that below a certain wage, the desire to escape from the unfavourable situation rises markedly. The results contribute to filling the gap in the literature which pays relatively little attention to the problem of underemployment. Meanwhile, the underemployed should be of special concern for policymakers, since according to our study the group is highly endangered by the increased probability of low wages. Otherwise, underemployment may lead to persistent poverty (Caceres – Caceres 2015) mostly for the secondary labour market that typically involves low-skill, low-pay work with a high turnover (Kjelstad – Nymoen 2012).

In our analysis we have also found several other thought-provoking results. While most studies confirm the existence of the gender pay gap in the CEE countries (Goraus –Tyrowicz 2014; Śliwicki – Ryczkowski 2014; Perugini – Selezneva 2015), our results deliver novel evidence that women's inferior situation may also exist in terms of the probability to fall into the group of low earners. Indeed, we found that men's probability to earn low was almost 73 per cent smaller. This may suggest potential discrimination, although the difference might be the result of

females' lower average number of overtime hours, work-life balance problems, lesser interest in taking top managerial positions (Oczki 2014) or less aggressive wage negotiations (Leibbrandt – List 2015). As for the marital status, we found that especially high risk of low earnings concerns single individuals. Thus, we confirmed the results of Kim (2000) concerning the unfavourable impact of being single, although his sample consisted only of women.

Having family duties considerably increased the probability of earning low wages as well. Thus, we contributed to the lesser recognized impact of 'household activities' on wages in the literature. In this respect, our results are close to Bryan – Sevilla-Sanz (2010), however, they concluded that this effect was present for both married and single men and women working full-time, while housework penalty concerned only single women among women working part-time.

Youth's probability of earning low is 21 and 13 per cent lower for the 15–24 and 25–30 age groups, respectively, than that of the prime-wage workers in the middle-age. Meanwhile, several studies for different EU countries indicated a higher risk for young people to be low earners (Westergaard-Nielsen 2008; Mosthaf et al. 2010). We argue that while young age is rewarded, young persons have penalties for usually shorter job experience. Indeed, our estimates indicate that job experience significantly reduced the odds of being low-paid, which is consistent with human capital theory (Becker 1964; Mincer 1974). This conclusion, we believe, may have practical applications as according to our results the regional or national support should be rather targeted not only to the young, as it is explicitly or implicitly argued in many studies (Kim 2000; Grimshaw 2014), but rather to those with no or only shorter job experience. Considering age, the probability to earn low wages starts increasing with the age of 50. This may indicate an unfavourable situation for people over 50 in the labour market and might be interpreted as contradictory to the results of Deelen – Euwals (2014), who provided evidence of a wage cushion in the private sector that allows wages to continue to increase with age. We believe that our results are complementary by indicating that the situation of people over certain older age becomes diversified and the group should not be treated as homogeneous. While some older people face greater risks of earning low wages, the group of presumably the most educated, valuable employees makes use of their job-experience-rent.

Surprisingly, the fact of being employed in education, professional, scientific and technical activities, and also in real estate creates the highest risk of a low-wage situation. Meanwhile other authors point rather to retail and wholesale trade, hotels and restaurants, transport, home-care as industries with fastest growing low-wage sector (Grimshaw 2011; Howes 2015). This could be possibly due to the fact that we estimated the basic 21 NACE Rev. 2 sections, which may lead to overly general treatment of some sub-sections. Nevertheless, the

outcome for education in terms of low wages is disappointing. It may partly be associated with an unfavourable demographic situation which causes a decrease in demand for educational services and thus reduces upward pressure on wages. High incidence of low-wage work in such sectors, such as education and scientific activity seems to be a serious barrier to innovate and build a knowledge-based economy in Poland.

Our results confirmed that the higher the university degree, the lower is the risk of earning low. At the same time low-skilled individuals have an increased likelihood of being low-wage earners. Possible explanations include different mobility to better jobs among people with particular education attainments (Knabe – Plum 2013, compare with: Pavlopoulos et al. 2008) or due to globalisation and offshoring (Giesicke – Verwiebe 2009; Wolszczak-Derlacz – Parteka 2016). We also found that individuals who live in less economically developed regions are more likely to be in a low-wage situation, which may be explained by the geography of access to markets (Cieślik – Rokicki 2016).

5. CONCLUSIONS

We found that the low-wage situation could be interpreted largely as a result of socio-demographic, job and company-related characteristics. The novelty of the article is explaining the probability to be paid low, as opposed to the majority of the subject literature which often deals with the levels of low or minimum wages. The issue raised in the article is relevant as the expanding low-wage sector translates into severe consequences for the economy and individuals. The study complemented the scarce evidence on the importance of company-related attributes in comparison to other factors. We found that the average impact of company-related characteristics was three times stronger than the impact of personal ones. We accepted, thus, the first hypothesis. In turn, although the employed part-time and underemployed exhibited a greater risk to be paid little, the personal and company-related traits (except for the kind of company's economic activity) have not provided a rent (benefit) from working full-time. The second hypothesis was, therefore, rejected. We evidenced, thus, the existence of a firm size gap and substantial differentiation of the low-wage risk across the economic activity sections. Our results suggest that decreasing the size of the low-wage sector should be carried out by policies focused not only on raising the general human capital of an individual, but also on enhancing transitions of employees to companies conducting more profitable economic activities, instead of possibly maintaining the employees in unprofitable industries at all costs. This could be dealt with by enacting special employment programs targeted toward hard-hit communities

and aimed at increasing their incomes from work (Mishel – Eisenbrey 2015). The favourable results for the information and communication suggest that the priority should be given to the high-tech industries and branches. Meanwhile, for Poland and for some other post transition countries there still exists an urgency to reform the uncompetitive industries, including the coal industry. Following Richardson (1999: 11), we believe that the power of government should be used to prevent unfair and desperate exchanges 'of work for pay'. In case of part-timers, underemployed and temporary workers, we think that introducing labour market reforms that seek to improve labour standards and aim to put precarious workers on a more equal footing with permanent, full-time workers, especially in terms of pension schemes and access to training, could bring substantial benefits (Dobbs et al. 2016). These kinds of reforms have been already introduced in Denmark, Germany and the Netherlands. Meanwhile, the inferior position of women in terms of higher risk to earn extremely low, could be improved. We believe that the development of institutional care, especially caring and housework services would enable women to work longer (which would decrease the unfavourable impact of underemployment, part-time employment or 'household activities') and to take higher and better-paid job positions. In turn, the regional or national support, according to our results, should be rather targeted not only to the young as it is explicitly or implicitly argued in many studies but rather to those with no or only shorter job experience. The limits of the research are associated with the lack of taking into account non-cognitive (Lundborg et al. 2014) and some cognitive skills due to the limitations of the LFS database. Additionally, we have not analysed whether low-wage employment is transitory or persistent. We leave it for future research.

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APPENDIX

Table 1. Parameter estimates of being a low-wage earner (2/3 of the national median),
all employees, Poland, 2014

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Constant	2.522	0.170	14.87			
Male	−1.304	0.042	−31.41	−0.29	0.27	−72.86
Single	0.195	0.047	4.14	0.05	1.22	21.51
Widowed	0.093	0.108	0.85	0.02	1.1	0.1
Divorced	0.103	0.074	1.4	0.02	1.11	0.11
Age 15-24	−0.239	0.094	−2.55	−0.05	0.79	−21.26
Age 25-30	−0.136	0.063	−2.14	−0.03	0.87	−12.72
Age 50-59	0.396	0.060	6.61	0.09	1.49	48.54
Age 60-69	0.665	0.113	5.91	0.16	1.95	94.52
Age 70 plus	1.152	0.406	2.84	0.28	3.16	216.41
Retirement	1.290	0.151	8.52	0.31	3.63	263.12
Disability pension	1.225	0.222	5.53	0.30	3.40	240.46
Being a kept person	0.673	0.364	1.85	0.16	1.96	96.04
Having a farm	0.279	0.078	3.60	0.07	1.32	32.22
Family responsibilities	0.663	0.200	3.32	0.16	1.94	94.10
Student	0.615	0.504	1.22	0.15	1.85	0.85
Disabled	0.655	0.545	1.2	0.16	1.92	0.92
Ph.D. degree and higher	−1.578	0.449	−3.51	−0.25	0.21	−79.36
Master degree	−0.883	0.068	−12.92	−0.18	0.41	−58.66
Bachelor	−0.244	0.079	−3.10	−0.05	0.78	−21.63
Vocational education, no examination	0.261	0.082	3.18	0.06	1.30	29.82
Secondary school*	−0.797	0.092	−8.69	−0.16	0.45	−54.91
Secondary school, no examination	−0.547	0.131	−4.17	−0.11	0.58	−42.14
Basic vocational education	0.520	0.049	10.71	0.12	1.68	68.21
Gymnasium	−0.706	0.181	−3.91	−0.14	0.49	−50.66
Primary	−1.46	1.603	−0.91	−0.25	0.23	−0.77
Post-secondary school	−0.038	0.095	−0.4	−0.01	0.96	−0.04
College	0.443	0.75	0.59	0.11	1.56	0.56
No overall job tenure	1.876	0.155	12.11	0.43	6.53	552.75
Overall job tenure less than 1 year	1.414	0.118	12.00	0.34	4.11	311.16
Overall job tenure more than 1 year and less than 5 years	0.608	0.069	8.86	0.15	1.84	83.59
Overall job tenure more than 10 years and less than 20 years	−0.414	0.058	−7.11	−0.09	0.66	−33.87

Table 1. continued

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Overall job tenure more than 20 years and less than 30 years	–0.640	0.065	–9.89	–0.14	0.53	–47.28
Overall job tenure more than 30 years and less than 40 years	–1.019	0.084	–12.11	–0.20	0.36	–63.89
Overall job tenure more than 40 years	–1.025	0.131	–7.81	–0.19	0.36	–64.12
Upskilling	–0.511	0.137	–3.73	–0.11	0.60	–40.01
PL 51 dolnośląskie	–0.247	0.079	–3.11	–0.05	0.78	–21.92
PL 61 kujawsko-pomorskie	0.418	0.074	5.64	0.10	1.52	51.87
PL 31 lubelskie	0.430	0.064	6.71	0.10	1.54	53.71
PL 21 małopolskie	–0.207	0.075	–2.77	–0.05	0.81	–18.67
PL 12 mazowieckie	–0.407	0.060	–6.83	–0.09	0.67	–33.45
PL 32 podkarpackie	0.750	0.073	10.24	0.18	2.12	111.71
PL 34 podlaskie	0.419	0.067	6.23	0.10	1.52	52.00
PL 33 świętokrzyskie	0.436	0.073	5.97	0.10	1.55	54.62
PL 62 warmińsko-mazurskie	0.274	0.070	3.93	0.06	1.32	31.51
PL 41 wielkopolskie	0.155	0.069	2.25	0.04	1.17	16.74
PL 11 łódzkie	0.057	0.105	0.54	0.01	1.06	0.06
PL 52 opolskie	–0.092	0.108	–0.85	–0.02	0.91	–0.09
PL 63 pomorskie	–0.098	0.101	–0.98	–0.02	0.91	–0.09
PL 22 śląskie	–0.001	0.103	–0.01	–0.0003	0.99	–0.0006
PL43 lubuskie	–0.004	0.108	–0.03	–0.001	0.99	–0.004
Rural area	0.403	0.048	8.43	0.09	1.50	49.70
City with less than 2 thousand inhabitants	0.471	0.354	1.33	0.11	1.60	0.60
City with more than 2 thousand and less than 5 thousand inhabitants	0.271	0.102	2.67	0.06	1.31	31.15
City with more than 5 thousand and less than 10 thousand inhabitants	0.383	0.093	4.10	0.09	1.47	46.61
City with more than 10 thousand and less than 20 thousand inhabitants	0.280	0.068	4.12	0.07	1.32	32.26
City with more 20 thousand and less than 50 thousand inhabitants	0.297	0.062	4.83	0.07	1.35	34.56
City with more than 50 thousand and less than 100 thousand inhabitants	0.260	0.064	4.05	0.06	1.30	29.67
Company with 11–19 employees	–0.123	0.052	–2.37	–0.03	0.88	–11.58
Company with 20–49 employees	–0.299	0.052	–5.80	–0.07	0.74	–25.86

Table 1. continued

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Company with 50–100 employees	−0.357	0.056	−6.36	−0.08	0.70	−30.01
Company with 101–250 employees	−0.535	0.061	−8.81	−0.11	0.59	−41.44
Company with more than 251 employees	−0.953	0.056	−16.94	−0.19	0.39	−61.45
Private employer/sector	−0.187	0.048	−3.86	−0.04	0.83	−17.02
Agriculture, forestry and fishing	0.385	0.172	2.24	0.09	1.47	46.92
Mining and quarrying	1.069	0.125	8.52	0.26	2.91	191.14
Manufacturing	0.813	0.116	7.00	0.19	2.25	125.49
Water supply, sewerage, waste management and remediation activities	0.521	0.140	3.73	0.13	1.68	68.34
Construction	0.646	0.165	3.92	0.16	1.91	90.80
Wholesale trade	−0.17	0.776	−0.22	−0.04	0.84	−0.16
Transportation and storage	0.552	0.206	2.68	0.13	1.74	73.59
Accommodation and food service activities	0.821	0.205	4.01	0.20	2.27	127.17
Information and communication	0.069	0.78	0.09	0.02	1.07	0.07
Financial and insurance activities	0.649	0.280	2.32	0.16	1.91	91.41
Real estate activities	1.583	0.573	2.76	0.37	4.87	386.74
Professional, scientific and technical activities	1.587	0.274	5.79	0.37	4.89	388.76
Administrative and support service activities	0.893	0.281	3.17	0.22	2.44	144.28
Education	1.976	0.171	11.53	0.45	7.22	621.53
Human health and social work activities	1.134	0.132	8.62	0.27	3.11	210.70
Arts, entertainment and recreation	1.215	0.556	2.19	0.29	3.37	236.91
Other service activities	1.173	0.208	5.65	0.28	3.23	223.11
Activities of households as employers	0.738	0.199	3.70	0.18	2.09	109.18
Activities of extraterritorial organisations and bodies	0.909	0.113	8.08	0.21	2.48	148.27
Legislators, senior officials and managers	−2.658	0.134	−19.90	−0.34	0.07	−92.99
Professionals	−2.260	0.085	−26.50	−0.37	0.10	−89.56
Technicians and associate professionals	−1.419	0.067	−21.04	−0.26	0.24	−75.79
Clerks	−0.698	0.069	−10.14	−0.14	0.50	−50.26

Table 1. continued

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Skilled agricultural and fishery workers	–0.14	0.204	–0.69	–0.03	0.87	–0.13
Craft and related trades workers	**–0.416**	**0.063**	**–6.55**	**–0.09**	**0.66**	**–34.02**
Plant and machine operators and assemblers	**–0.552**	**0.065**	**–8.48**	**–0.12**	**0.58**	**–42.44**
Elementary occupations	**0.613**	**0.069**	**8.92**	**0.15**	**1.85**	**84.67**
No occupation	**–1.231**	**0.637**	**–1.93**	**–0.21**	**0.29**	**–70.79**
Mobile worker	**–0.676**	**0.083**	**–8.13**	**–0.14**	**0.51**	**–49.14**
Work commuting distance – longer than 50 km	**–1.226**	**0.101**	**–12.12**	**–0.22**	**0.29**	**–70.65**
Work commuting distance – longer than 21 km and shorter than 50 km	**–0.577**	**0.060**	**–9.66**	**–0.12**	**0.56**	**–43.83**
Work commuting distance – longer than 6 km and shorter than 20 km	**–0.173**	**0.038**	**–4.53**	**–0.04**	**0.84**	**–15.91**
Work-at-home	0.059	0.28	0.21	0.01	1.06	0.06
Full-time employment	**–2.306**	**0.097**	**–23.80**	**–0.51**	**0.10**	**–90.03**
Willingness to work longer in return for higher pay	**0.398**	**0.055**	**7.26**	**0.09**	**1.49**	**48.90**
Search for another job	**0.494**	**0.118**	**4.19**	**0.12**	**1.64**	**63.83**
ISCED field of Education 100	–0.123	0.098	–1.26	–0.03	0.88	–0.12
ISCED field of Education 440	**0.364**	**0.177**	**2.05**	**0.09**	**1.44**	**43.90**
ISCED field of Education 460	–0.026	0.444	–0.06	–0.01	0.97	–0.03
ISCED field of Education 481	**0.310**	**0.145**	**2.13**	**0.07**	**1.36**	**36.35**
ISCED field of Education 482	–0.733	1.358	–0.54	–0.15	0.48	–0.52
ISCED field of Education 500	0.00	0.062	0.00	0.00	1.00	0.00
ISCED field of Education 600	**0.134**	**0.076**	**1.78**	**0.03**	**1.14**	**14.38**
ISCED field of Education 700	**0.302**	**0.091**	**3.32**	**0.07**	**1.35**	**35.20**
ISCED field of Education 800	–0.068	0.08	–0.85	–0.01	0.93	–0.07
ISCED field of Education 900	0.134	0.624	0.21	0.03	1.14	0.14
ISCED field of Education 000	**0.859**	**0.078**	**11.04**	**0.21**	**2.36**	**136.01**

Notes: Statistically significant parameters (for $\alpha \leq 0.1$) were bolded. Number of cases correctly classified: 79.4%, sensitivity: 69%, specificity: 86%, Odds ratio: 14, McFadden *R*-squared: 0.35, Adjusted *R*-sq: 0.34, Likelihood ratio test: Chi-square (87) = 12569.3 [p-value 0.00 < 0.1], *N* = 26933. NUTS 2013 codes, ISCED fields of education 2011 codes, *high school certificate.

Source: Own calculation on LFS data.

Table 2. Parameter estimates of being low-wage earner (2/3 of the national median), sample restricted to full-time employees, Poland, 2014

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Constant	0.983	0.112	8.80		2.67	
Male	−1.317	0.045	−29.04	−0.28	0.27	−73.20
Single	0.214	0.053	4.07	0.05	1.24	23.88
Widowed	0.16	0.122	1.31	0.03	1.17	−0.17
Divorced	0.133	0.084	1.6	0.02	1.14	−0.14
Age 15–24	−0.281	0.105	−2.67	−0.06	0.76	−24.46
Age 25–30	−0.148	0.071	−2.07	−0.03	0.86	−13.73
Age 50–59	0.398	0.067	5.93	0.09	1.49	48.81
Age 60–69	0.674	0.126	5.35	0.16	1.96	96.12
Age 70 plus	2.241	1.030	2.18	0.50	9.41	840.51
Retirement	0.95	0.21	4.54	0.23	2.59	159.3
Disability pension	1.13	0.30	3.80	0.27	2.59	211.0
Being a kept person	0.49	0.43	1.14	0.11	1.63	0.63
Having a farm	0.22	0.09	2.67	0.05	1.26	0.26
Family responsibilities	0.645	0.237	2.72	0.15	1.91	90.69
Disabled	0.417	0.639	0.65	0.08	1.52	0.52
Ph.D. degree and higher	−1.157	0.596	−1.94	−0.19	0.31	−68.54
Master degree	−0.862	0.076	−11.35	−0.16	0.42	−57.77
Bachelor	−0.290	0.088	−3.31	−0.06	0.75	−25.21
Vocational education, no examination	0.298	0.091	3.29	0.07	1.35	34.72
Secondary school*	−0.743	0.102	−7.32	−0.14	0.48	−52.43
Secondary school, no examination	−0.523	0.146	−3.59	−0.10	0.59	−40.72
Basic vocational education	0.539	0.053	10.19	0.12	1.71	71.38
Gymnasium	−0.522	0.216	−2.42	−0.10	0.59	−40.70
Primary	−1.422	1.673	−0.85	−0.22	0.24	−0.76
College (*kolegium*)	0.118	0.856	0.14	0.01	1.12	0.12
Post–secondary school	0.031	0.105	0.29	0.01	1.03	0.03
No overall job tenure	1.873	0.172	10.90	0.44	6.51	551.05
Overall job tenure less than 1 year	1.551	0.133	11.66	0.37	4.72	371.64
Overall job tenure more than 1 year and less than 5 years	0.595	0.077	7.70	0.14	1.81	81.37
Overall job tenure more than 10 years and less than 20 years	−0.455	0.065	−7.00	−0.09	0.63	−36.58
Overall job tenure more than 20 years and less than 30 years	−0.657	0.072	−9.15	−0.13	0.52	−48.18
Overall job tenure more than 30 years and less than 40 years	−1.108	0.094	−11.82	−0.20	0.33	−66.97

Table 2. continued

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Overall job tenure more than 40 years	−1.064	0.146	−7.29	−0.18	0.34	−65.51
PL 51 dolnośląskie	−0.244	0.090	−2.70	−0.05	0.78	−21.67
PL 61 kujawsko–pomorskie	0.457	0.085	5.36	0.10	1.58	57.96
PL 31 lubelskie	0.447	0.075	5.99	0.10	1.56	56.38
PL 11 lódzkie	0.147	0.086	1.70	0.03	1.16	15.79
PL 21 małopolskie	−0.235	0.085	−2.76	−0.05	0.79	−20.96
PL12 mazowieckie	−0.324	0.072	−4.53	−0.07	0.72	−27.68
PL 52 opolskie	−0.184	0.089	−2.06	−0.04	0.83	−16.79
PL 32 podkarpackie	0.722	0.084	8.58	0.17	2.06	105.80
PL 34 podlaskie	0.394	0.077	5.09	0.09	1.48	48.24
PL 33 świętokrzyskie	0.422	0.081	5.18	0.10	1.52	52.44
PL 62 warmińsko–mazurskie	0.215	0.079	2.72	0.05	1.24	24.05
PL 41 wielkopolskie	0.213	0.080	2.66	0.05	1.24	23.70
PL 63 pomorskie	−0.042	0.113	−0.38	−0.02	0.96	−0.04
PL 22 śląskie	0.039	0.114	0.35	0.002	1.04	0.04
PL43 lubuskie	0.042	0.12	0.35	0.01	1.04	0.04
Rural area	0.404	0.053	7.69	0.09	1.50	49.77
City with less than 2 thousand inhabitants	0.443	0.426	1.04	0.09	1.56	0.56
City with more than 2 thousand and less than 5 thousand inhabitants	0.257	0.109	2.35	0.06	1.29	29.35
City with more than 5 thousand and less than 10 thousand inhabitants	0.340	0.105	3.23	0.08	1.41	40.54
City with more than 10 thousand and less than 20 thousand inhabitants	0.291	0.076	3.83	0.06	1.34	33.76
City with more 20 thousand and less than 50 thousand inhabitants	0.350	0.069	5.05	0.08	1.42	41.90
City with more than 50 thousand and less than 100 thousand inhabitants	0.328	0.071	4.61	0.07	1.39	38.76
Company with 11–19 employees	−0.199	0.058	−3.40	−0.04	0.82	−18.01
Company with 20–49 employees	−0.309	0.057	−5.38	−0.06	0.73	−26.60
Company with 50–100 employees	−0.413	0.062	−6.65	−0.08	0.66	−33.82
Company with 101–250 employees	−0.576	0.066	−8.70	−0.11	0.56	−43.78

Table 2. continued

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Company with more than 251employees	−1.052	0.062	−17.04	−0.19	0.35	−65.06
Agriculture, forestry and fishing	−0.092	0.801	−0.12	−0.001	0.91	−0.09
Mining and quarrying	0.416	0.089	4.69	0.09	1.52	51.54
Manufacturing	0.196	0.072	2.72	0.04	1.22	21.67
Water supply, sewerage, waste management and remediation activities	−0.055	0.789	−0.07	0.02	0.95	−0.05
Construction	0.086	0.794	0.11	0.04	1.09	0.09
Wholesale, retail trade, repair of motor vehicles and motorcycles	−0.739	0.169	−4.38	−0.13	0.48	−52.25
Transportation and storage	−0.059	0.807	−0.07	0.01	0.94	−0.06
Accommodation and food service activities	0.343	0.805	0.43	0.10	1.41	0.41
Information and communication	−0.592	0.199	−2.97	−0.11	0.55	−44.66
Financial and insurance activities	0.147	0.831	0.18		1.16	0.16
Real estate activities	1.096	0.624	1.76	0.26	2.99	199.22
Professional, scientific and technical activities	0.872	0.292	2.99	0.21	2.39	139.21
Administrative and support service activities	0.171	0.834	0.21	0.05	1.19	0.19
Education	1.580	0.159	9.91	0.38	4.85	385.28
Human health and social work activities	0.464	0.100	4.63	0.11	1.59	59.08
Arts, entertainment and recreation	0.608	0.983	0.62	0.19	1.84	0.84
Other service activities	0.436	0.205	2.12	0.10	1.55	54.67
Activities of households as employers	0.189	0.807	0.23	0.07	1.21	0.21
Activities of extraterritorial organisations and bodies	0.230	0.065	3.54	0.05	1.26	25.88
Legislators, senior officials and managers	−2.678	0.148	−18.10	−0.30	0.07	−93.13
Professionals	−2.289	0.097	−23.67	−0.33	0.10	−89.87
Technicians and associate professionals	−1.452	0.073	−19.96	−0.24	0.23	−76.58
Clerks	−0.755	0.075	−10.13	−0.14	0.47	−53.01
Skilled agricultural and fishery workers	0.039	0.243	0.16	0.02	1.04	0.04
Craft and related trades workers	−0.354	0.070	−5.08	−0.07	0.70	−29.79

Table 2. continued

Explanatory Variables	Coef-ficient	Std. error	Z	Slope	Odds ratio	Δ low wage risk (%)
Plant and machine operators and assemblers	−0.502	0.071	−7.04	−0.10	0.61	−39.47
Elementary occupations	0.685	0.076	9.00	0.16	1.98	98.34
Mobile worker	−0.616	0.098	−6.31	−0.12	0.54	−46.00
Work commuting distance – longer than 50 km	−1.107	0.114	−9.69	−0.18	0.33	−66.94
Work commuting distance – longer than 21 km and shorter than 50 km	−0.557	0.066	−8.39	−0.11	0.57	−42.69
Work commuting distance – longer than 6 km and shorter than 20 km	−0.136	0.043	−3.19	−0.03	0.87	−12.71
Work-at-home	−0.414	0.386	−1.07	−0.08	0.66	−0.34
ISCED field of Education 100	0.069	0.115	0.6	0.01	1.07	0.07
ISCED field of Education 440	0.360	0.195	1.84	0.08	1.43	43.29
ISCED field of Education 460	0.116	0.519	0.22	0.02	1.12	0.12
ISCED field of Education 481	0.267	0.157	1.70	0.06	1.31	30.55
ISCED field of Education 482	0.639	1.154	0.55	0.11	1.89	0.89
ISCED field of Education 500	−0.026	0.068	−0.38	−0.01	0.97	−0.03
ISCED field of Education 600	0.069	0.094	0.73	0.01	1.07	0.07
ISCED field of Education 700	0.274	0.105	2.62	0.06	1.32	31.53
ISCED field of Education 800	−0.063	0.088	−0.71	−0.01	0.94	−0.06
ISCED field of Education 900	−0.793	0.745	−1.07	−0.13	0.45	−0.55
ISCED field of Education 000	0.840	0.086	9.76	0.19	2.32	131.52

Notes: Statistically significant parameters (for $\alpha \leq 0.1$) were bolded. Number of cases correctly classified: 78.5%, sensitivity: 70%, specificity: 83%, Odds ratio: 11, McFadden R-squared: 0.31, Adjusted R-sq: 0.30, Likelihood ratio test: Chi-square (71) = 8547.25 [p–value 0.00 < 0.1], N = 20816. NUTS 2013 codes, ISCED fields of education 2011 codes, *high school certificate.

Source: Own calculation on LFS data.