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An analysis of the determinants behind having an additional job by employees[1]

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Abstract: Apart from having the main job, many people in Poland decide to take additional jobs. There are many potential factors which determine having a second job. These include varied needs of individuals, such as the desire to improve their material status, family situation, or the opportunities arising from human capital. In this study, apart from the aforementioned needs, the features of individuals, such as age, sex, place of residence and the features of the main workplace have been included. Unfortunately, some determinants of the studied phenomenon cannot be clearly observed or are generally unobservable. Hence, the models with unobservable heterogeneity, which were used in this study, are of particular importance in modelling this type of phenomena. The purpose of this paper was to show the demographic profile of a two-job worker. This has been done by the assessment of the impact of selected determinants on having an additional job. Furthermore, the scale of the impact of the studied determinants has been compared in the case of women and men. The study used the Bayesian logistic regression model.

***Keywords*:** additional job, logistic regression, Bayesian inference

JEL codes: *J60, J29*

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1. Introduction

The situation on the labour market in Poland has improved significantly in recent years. According to Eurostat, the unemployment rate fell from 10.3% in 2013 to 6.2% in 2016 (Eurostat, 2017). Such a situation on the labour market may result in a potential increase in the

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chances of finding a job by the unemployed. In addition, people who have a job, but want to be more professionally involved have more opportunities to find an additional employment. The question arises then what factors influence the fact that some people, in addition to having a basic workplace, take an additional job. Are they people who have high professional ambitions, or people who are in a difficult financial situation, which makes them take up additional work? The purpose of this study was to show the demographic profile of a two-job worker. This goal was achieved through the identification and assessment of the impact of selected determinants on the probability of working multiple jobs by salaried employees. The level of professional activity depends on the age of the investigated persons. According to the data (CSO, 2015), the unemployment rate starts to increase after the age of 44. In addition, considering the high share of youth studying among people aged up to 18, only people aged 18-44 were considered in this study.

Having an additional job, just like having a job, depends on many socio-demographic and economic factors. In labour market research, the impact of characteristics, such as age, education, place of residence and region (Socha and Sztanderska, 2000; Landmesser, 2013; Ulman, 2015) have been analysed most often. It can be assumed that the direction of the influence of some of them, such as age, education or sex, on the probability of having an additional job will be the same as in the case of the studies of having a job, but its scale can be different. In the study of the determinants of an additional job the characteristics related to the respondent's basic workplace, such as earnings or whether the primary job is part-time, also should be taken into account. A separate group of characteristics of people with an additional employment are their needs and preferences related to professional self-development.

The data on people who, in addition to doing their primary work, did some other work for which they were paid, can be found in the research report of the International Social Survey Programme (Czapiński and Jerzyński, 2016). This report shows how frequently people belonging to individual socio-economic groups did multiple jobs. In our study, the construction of an appropriate statistical model allowed examining the simultaneous influence of the determinants on the probability of having an additional job, which made it possible to define the demographic profile of people working multiple jobs. Unfortunately, there is no database available for Poland, containing all relevant characteristics of these people. In addition, some determinants of the studied phenomenon cannot be well observed or they are generally unobservable. Therefore, the

analysis of socio-economic and demographic phenomena should be carried out in such a way that it is possible to assess the impact of the heterogeneity of the studied population on the obtained results (Caselli et al., 2005). In the model, heterogeneity may result from the omission of observable or unobservable explanatory variables discriminating examined individuals (Allison, 2009b). Therefore, in this study, to model the phenomenon under consideration, which is having an additional job, both models with fixed and random effects were used. In addition, the Bayesian approach was used for econometric modelling of this phenomenon (Gelman et al., 2000). The use of this approach made it possible to compare received posterior distributions for selected groups of employees.

2. Data and methods

In this work, data from the Labour Force Survey (LFS) for 2015 were used to model the phenomenon of having an additional job. The information contained in this data made it possible to distinguish three categories of working people:

- self-employed, i.e. are employers and self-employed persons not having employees;
- employees, who are employed on the basis of employment relationship;
- a family member helping the family for free.

In line with the research objective, our study selected persons belonging to the second group, who were aged 18-44, at the time of the LFS research. A sample of 20,225 respondents was received, of whom 1,187 (5.87%) had an additional job. The employees sample was varied not only by having an additional job, but also by many other factors. A set of potential exogenous variables (Table 1) was chosen based on the results of previous studies on the subject of having a job and theoretical considerations presented in this study.

Table 1. Sample characteristics

Variable	Categories	Labels of levels	Percent
Sex	Woman Man	0 1	45.53 54.47
Age group	From 18 to 24 years old From 25 to 34 years old From 35 to 44 years old	1 2 3	13.13 42.45 44.42
Marital status	Married	0	39.97

	Unmarried, a widower, a widow, separated or divorced	1	60.03
Education	Higher	1	37.88
	Post-secondary and secondary professional	2	25.49
	Secondary general	3	10.92
	Basic vocational	4	20.83
	Primary school	5	4.89
Presence of a child under 15 in a household in which the respondent is his or her spouse's head	No	0	39.89
	Yes	1	60.11
Place of living	Village	0	39.86
	Town	1	60.14
Region of Poland	Central (łódzkie, mazowieckie)	1	16.36
	Southwest (dolnośląskie, opolskie)	2	13.48
	South (małopolskie, śląskie)	3	14.70
	Northwest (wielkopolskie, zachodniopomorskie, lubuskie)	4	15.74
	North (kujawsko-pomorskie, warmińsko-mazurskie, pomorskie)	5	17.90
	East (lubelskie, podkarpackie, świętokrzyskie, podlaskie)	6	21.81
Net earnings in the main job	<=1400 PLN	1	13.11
	>1400 PLN and <3000 PLN	2	24.78
	>=3000 PLN	3	62.11
The main workplace is a public institution	Yes	0	24.27
	No	1	75.73
Type of employment contract	Other	0	34.68
	Contract for an indefinite period	1	65.32
Type of job	Other	0	5.32
	Full-time	1	94.68

Source: Author's own elaboration based on: the LFS data, 2015.

In this study, due to the binary nature of endogenous variable, the modelling was carried out using logistic regression models. These models can be considered as models with fixed or random effects (Allison, 2009a). In a logistic regression model with fixed effects, unobservable differentiations between individuals are treated as constant values, and the estimation of such models is carried out by applying standard methods used in the case of logistic regression models. In the regression model with random effects, unobservable heterogeneity can be captured, using random variables with a specific distribution (Collett, 2003). Then, the logit probability of success for *k* explanatory variables and *n* analysed individuals in the model with unobservable heterogeneity with random effects is given by the formula:

$$\text{logit}(p_i) = \beta_0 + \beta_1 x_{1i} + \cdots \beta_k x_{ki} + u_i, \qquad (1)$$

where $\beta_0, \beta_1, \ldots, \beta_k$ are unknown parameters and u_i expresses the random effect, $i = 1, \ldots, n$. Assuming normal distributions with a mean zero and variance σ_u^2 for random variables, this model can be presented in the following form:

$$\text{logit}(p_i) = \beta_0 + \beta_1 x_{1i} + \cdots \beta_k x_{ki} + \sigma_u z_i, \qquad (2)$$

where z_i is realization of a random variable with a standard distribution.

In the Bayesian approach, the statistical inference about unknown parameters of the models is based on posterior distributions, which are obtained using Bayes' theorem. These distributions contain information about the parameter derived from the likelihood function and a priori distributions.

Let $\boldsymbol{\theta}$ denote the vector of all parameters of the model, $\mathbf{p(\theta)}$ - its prior distribution, and $\mathbf{p(y|\theta)}$ - the density function depending on the parameter vector $\boldsymbol{\theta}$. Then, the formula for posterior distribution has the form:

$$\mathbf{p(\theta|y)} = \frac{\mathbf{p(y|\theta)p(\theta)}}{\int \mathbf{p(y|\theta)p(\theta)d\theta}} = \frac{\mathbf{p(y|\theta)p(\theta)}}{\mathbf{p(y)}}, \qquad (3)$$

where $\mathbf{p(y)}$ is the marginal distribution of the observed data. Inference about arbitrary element of a parameter vector takes place from the marginal posterior distribution. Frequently, analytical methods to determine marginal posterior distributions turn out to be insufficient. Then, the methods based on simulations are used, including Markov Chain Monte Carlo (MCMC) method used in this work (Chib, 2001).

3. Model estimation

At the first stage of the research, two models were estimated for the entire sample tested: one with the fixed effects, and the other with random effects. Taking into account the large sample size, all models in this study were estimated with non-informative a priori distributions. For all regression parameters of all considered models, non-informative independent normal prior distributions with 0 mean and variance of 10^6 have been used. The model with random effects includes an additional parameter, which is the variance of the random component of the model. For this parameter, a non-informative inverse gamma prior distribution with shape and scale parameters equalling 0.01 has been chosen. Moreover, in order to minimize the impact of initial values on posterior inference for the first two models, it was assumed that the number of burn-in

iterations will be 10000, and the number of iterations after burn-in will be 50000. Metropolis algorithm was used for sampling.

The statistics of the deviance information criterion (DIC) were used to compare the model with fixed effects to the model with random effects. For a model with random effects, the value of DIC statistics was 4108.259, while for a model with fixed effects, 4132.663. This means that the model with random effects is the model better matching the actual data. Posterior characteristics for a logistic regression model with no random effects are presented in Table 2, while for a model with random effects – in Table 3. The values of posterior characteristics for the considered models do not differ significantly, but the effect of unobserved heterogeneity on the estimated values is visible.

Table 2. Posterior sample mean and interval statistics for a model with fixed effects

Parameter	Mean	Standard Deviation	Highest Probability Density Interval (α=0.05)		Exp(Mean)
Intercept	-2.1191	0.1901	-2.5030	-1.7550	-
Men	0.6107	0.0676	0.4713	0.7339	1.8417
Contract for an indefinite period	0.2027	0.0764	0.0505	0.3450	1.2247
Earnings >1400 PLN and <3000 PLN	-0.0384	0.1073	-0.2422	0.1742	0.9623
Earnings >=3000 PLN	-0.3288	0.0991	-0.5164	-0.1299	0.7198
Main workplace not a public institution	0.4662	0.0698	0.3349	0.6074	1.5939
Full-time job	-0.8996	0.1291	-1.1534	-0.6483	0.4067
Age from 25 to 34 years	0.5059	0.1398	0.2282	0.7665	1.6585
Age from 35 to 44 years	0.8362	0.1454	0.5588	1.1220	2.3076
Post-secondary and secondary professional education	-0.3903	0.0818	-0.5486	-0.2277	0.6769
Secondary general education	-0.6628	0.1373	-0.9441	-0.4067	0.5154
Basic vocational education	-0.3828	0.0924	-0.5625	-0.2009	0.6819
Primary school education	-0.7090	0.1826	-1.0552	-0.3486	0.4921
Presence of a child under 15 in the household	0.3718	0.0753	0.2234	0.5224	1.4503
Living in town	-0.8574	0.0635	-0.9851	-0.7348	0.4243
Central region	-0.0913	0.0846	-0.2591	0.0693	0.9127
South-Western region	-0.8303	0.1108	-1.0344	-0.5978	0.4359
Southern region	-0.5606	0.1016	-0.7631	-0.3635	0.5709
North-Western region	-0.6945	0.1018	-0.8952	-0.4953	0.4993
Northern region	-0.8870	0.1041	-1.0950	-0.6900	0.4119

Source: Author's own elaboration based on: the LFS data, 2015.

Table 3. Posterior sample mean and interval statistics for a model with random effects

Parameter	Mean	Standard Deviation	Highest Probability Density Interval (α=0.05)		Exp(Mean)
Intercept	-2.1414	0.2001	-2.5474	-1.7671	-
Men	0.6285	0.0750	0.4789	0.7729	1.8748
Contract for an indefinite period	0.2072	0.0800	0.0564	0.3666	1.2302
Earnings >1400 PLN and <3000 PLN	-0.0453	0.1154	-0.2741	0.1797	0.9557
Earnings >=3000 PLN	-0.3258	0.1062	-0.5319	-0.1195	0.7219
Main workplace not a public institution	0.4877	0.0780	0.3331	0.6361	1.6286
Full-time job	-0.9053	0.1297	-1.1490	-0.6407	0.4044
Age from 25 to 34 years	0.4955	0.1449	0.2092	0.7776	1.6413
Age from 35 to 44 years	0.8447	0.1511	0.5415	1.1292	2.3273
Post-secondary and secondary professional education	-0.4222	0.0905	-0.5954	-0.2441	0.6556
Secondary general education	-0.6988	0.1408	-0.9813	-0.4300	0.4972
Basic vocational education	-0.4503	0.1033	-0.6591	-0.2525	0.6374
Primary school education	-0.7452	0.1869	-1.1114	-0.3806	0.4746
Presence of a child under 15 in the household	0.3917	0.0793	0.2376	0.5485	1.4795
Living in town	-0.8795	0.0710	-1.0194	-0.7425	0.415
Central region	-0.1392	0.0976	-0.3416	0.0434	0.8701
South-Western region	-0.8817	0.1233	-1.1287	-0.6476	0.4141
Southern region	-0.6111	0.1101	-0.8344	-0.3999	0.5428
North-Western region	-0.7462	0.1144	-0.9768	-0.5314	0.4742
Northern region	-0.9541	0.1138	-1.1738	-0.7302	0.3852
Variance	0.1745	0.0571	0.0740	0.2931	-

Source: Author's own elaboration based on: the LFS data, 2015.

The significance of the considered parameters was assessed based on the highest probability density interval of posterior density function [Bolstad, 2007]. At the level of 0.05 statistical insignificance was obtained for the second level of the variable *Net earnings in the main job* and the first level of *Region of Poland* variable. In addition, the values of the Monte Carlo standard error (MCSE) for the parameters of both considered models were compared (Table 4). It turned out that the values of these errors are slightly smaller for the model with random effects. Before the interpretation of the obtained results was performed, the convergence of generated chains using the Geweke test also have been assessed (Table 4). Based on the results obtained for both models, there was no reason to reject the hypothesis that the chains for individual parameters of both models are convergent at the significance level of 0.01.

Table 4. The Geweke convergence diagnostics and MCSE for models with fixed and random effects

Parameter	Model with fixed effects			Model with random effects		
	Geweke diagnostic		MCSE	Geweke diagnostic		MCSE
	z	p-value		z	p-value	
Intercept	-2.2459	0.0247	0.00640	1.9366	0.0528	0.0045
Man	0.7980	0.4249	0.00248	-0.8053	0.4207	0.0019
Contract for an indefinite period	-1.0485	0.2944	0.00266	0.1582	0.8743	0.0018
Earnings >1400 PLN and <3000 PLN	0.3385	0.7350	0.00375	-0.3103	0.7563	0.0026
Earnings >=3000 PLN	1.1070	0.2683	0.00348	-0.3854	0.7000	0.0025
Main workplace not a public institution	1.7144	0.0865	0.00258	0.2773	0.7816	0.0017
Full-time job	1.7034	0.0885	0.00471	-0.4056	0.6850	0.0030
Age from 25 to 34 years	0.4597	0.6457	0.00462	-1.3876	0.1653	0.0032
Age from 35 to 44 years	0.4702	0.6382	0.00510	-1.4990	0.1339	0.0032
Post-secondary and secondary professional education	1.2700	0.2041	0.00267	0.6574	0.5109	0.0021
Secondary general education	0.2941	0.7687	0.00493	-2.1755	0.0296	0.0033
Basic vocational education	0.6221	0.5339	0.00321	0.0689	0.9450	0.0027
Primary school education	0.6569	0.5113	0.00655	-1.2752	0.2022	0.0043
Presence of a child under 15 in the household	0.4464	0.6553	0.00258	-1.2517	0.2107	0.0018
Living in town	-0.8927	0.3720	0.00235	0.6312	0.5279	0.0016
Central region	1.7559	0.0791	0.00293	0.3476	0.7282	0.0023
South-Western region	0.3967	0.6916	0.00376	-1.5091	0.1313	0.0027
Southern region	-0.5352	0.5925	0.00372	0.2660	0.7903	0.0024
North-Western region	1.2547	0.2096	0.00359	0.3358	0.7370	0.0026
Northern region	-0.0449	0.9642	0.00412	0.5911	0.5545	0.0026
Variance	-	-	-	-0.1425	0.8867	0.0055

Source: Author's own elaboration based on: the LFS data, 2015.

Based on the DIC statistics, it was obtained that the model better suited to the empirical data is that with random effects. Therefore, the results obtained for this model have been interpreted. All interpretations given in this article are binding in each of the considered sets of explanatory variables, assuming *ceteris paribus*.

It follows from this study that the age of respondents had a statistically significant impact on the chances of having an additional job. People aged from 25 to 34 years old had by 64.13% higher chances to have an additional job than people from the youngest age group. However, people ranging from 35 to 44 years old had higher chances of having an additional job by as much as 132.73% compared with the youngest group. When considering the level of education, it was found that people with lower education than a university degree had less chance of having an additional job. Furthermore, people with post-secondary and secondary professional education had 34.44% lower chances of having an additional job than people with higher education. In addition, people with secondary education had lower chances to have an additional job by about 50.28%, people with secondary vocational education by about 36.26%, and people with primary education by about 52.54%, compared with the best educated. The presence of a child under 15 in the household had a positive impact on the chances of having an additional job. Our study shows that people belonging to such households had these chances higher by 47.95% compared with other people.

Considering the place of residence, people living in a town had by 58.5% lower chances of having an additional job than people living in a village. In addition, residents of all other regions were less likely to have an additional job compared with the Eastern region residents. These chances were lower by 58.59% for the South-Western region, 45.72% for the Southern region, 52.58% for the North-Western region and 61.48% for the Northern region, in all cases in comparison with the Eastern region.

The characteristics of the current workplace also had an impact on having an additional job. People with contracts for an indefinite period and those working in non-public institutions had a better chance of having an additional employment by 23.02% and 62.86%, respectively. However, the negative impact on the chances of having an additional job had high earnings and full-time work. People whose net income exceeded PLN 3,000 had a 27.81% lower chance of having an additional job compared with the lowest-paid employees. On the other hand, full-time employees had 59.56% lower chances of having an additional job compared with other people.

Furthermore, it can be concluded that the sex of the respondents also had a significant statistical impact on taking an additional job. Men had about 87.48% higher chance to have an additional job than women. At the next stage of this research, we examined to what extent the influence of individual factors on the chances of having an additional job, was different in the

case of women and men. For this purpose, two models with random effects were estimated, one for women, and one for men. The corresponding posterior results are provided in Tables 5-7. In the case of women, factors, such as contract for an indefinite period, earnings above PLN 1,400 and below PLN 3,000, earnings above PLN 3,000 and age from 25 to 34 years old did not have a statistically significant impact on the chances of having an additional job, with a significance level of 0.05. In contrast, for men, statistical insignificance was obtained for earnings above PLN 1,400 and below PLN 3,000 and for the Central region. On the basis of the Geweke test, it has been found that there is no indication that Markov chains have converged at the 0.05 level of significance for both models, except for living-in-a-town factor in the case of the model developed for men, where a p-value of 0.0367 was obtained.

Table 5. Posterior sample mean and interval statistics for a model with random effects for women

Parameter	Mean	Standard Deviation	Highest Probability Density Interval (α=0.05)		Exp(Mean)
Intercept	-2.4329	0.3075	-3.0486	-1.8479	-
Main workplace not a public institution	0.5685	0.1269	0.3218	0.8169	1.7656
Full-time job	-0.7455	0.1665	-1.0678	-0.4153	0.4745
Age from 25 to 34 years	0.3960	0.2612	-0.1135	0.9142	1.4859
Age from 35 to 44 years	0.8359	0.2617	0.3283	1.3591	2.3069
Post-secondary and secondary professional education	-0.4693	0.1572	-0.7870	-0.1688	0.6254
Secondary general education	-0.7025	0.2278	-1.1438	-0.2493	0.4953
Basic vocational education	-0.4682	0.1977	-0.8496	-0.0806	0.6261
Primary school education	-0.8004	0.4001	-1.5800	-0.0286	0.4491
Presence of a child under 15 in the household	0.4609	0.1314	0.2235	0.7331	1.5855
Living in a town	-0.6073	0.1218	-0.8459	-0.3686	0.5448
Central region	-0.4735	0.1763	-0.8091	-0.1244	0.6228
South-Western region	-1.0268	0.2097	-1.4434	-0.6313	0.3582
Southern region	-0.6804	0.1937	-1.0548	-0.3052	0.5064
North-Western region	-0.5817	0.1888	-0.9360	-0.2041	0.5589
Northern region	-0.9487	0.2012	-1.3332	-0.5527	0.3872
Variance	0.1599	0.0820	0.0159	0.3064	-

Source: Author's own elaboration based on: the LFS data, 2015.

Table 6. Posterior sample mean and interval statistics for a model with random effects for men

Parameter	Mean	Standard Deviation	Highest Probability Density Interval (α=0.05)		Exp(Mean)
Intercept	-1.2645	0.2804	-1.8020	-0.7086	-
Contract for an indefinite period	0.2677	0.1044	0.0595	0.4656	1.307
Earnings >1400 PLN and <3000 PLN	-0.0704	0.1503	-0.3608	0.2228	0.932
Earnings >=3000 PLN	-0.4230	0.1433	-0.7040	-0.1451	0.6551
Main workplace not a public institution	0.4436	0.1042	0.2413	0.6481	1.5583
Full-time job	-1.1255	0.2088	-1.5402	-0.7216	0.3245
Age from 25 to 34 years	0.5879	0.1796	0.2464	0.9521	1.8002
Age from 35 to 44 years	0.8903	0.1881	0.5273	1.2659	2.4359
Post-secondary and secondary professional education	-0.4050	0.1129	-0.6254	-0.1827	0.667
Secondary general education	-0.6847	0.1799	-1.0498	-0.3445	0.5042
Basic vocational education	-0.4396	0.1210	-0.6711	-0.2010	0.6443
Primary school education	-0.7743	0.2093	-1.1947	-0.3737	0.461
Presence of a child under 15 in the household	0.3770	0.1044	0.1709	0.5799	1.4579
Living in a town	-1.0632	0.0931	-1.2494	-0.8854	0.3453
Central region	0.0339	0.1176	-0.1966	0.2640	1.0345
South-Western region	-0.8150	0.1570	-1.1199	-0.5081	0.4426
Southern region	-0.5941	0.1422	-0.8744	-0.3169	0.5521
North-Western region	-0.8782	0.1503	-1.1697	-0.5849	0.4155
Northern region	-0.9938	0.1470	-1.2769	-0.7083	0.3702
Variance	0.1333	0.0697	0.0139	0.2639	-

Source: Author's own elaboration based on: the LFS data, 2015.

Table 7. The Geweke convergence diagnostics and MCSE for models with random effects for women and men

Parameter	Model for women			Model for men		
	Geweke diagnostic		MCSE	Geweke diagnostic		MCSE
	z	p-value		z	p-value	
Intercept	1.5009	0.1334	0.00687	-0.5564	0.5779	0.00570
Contract for an indefinite period	-	-	-	-0.6347	0.5256	0.00223
Earnings >1400 PLN and <3000 PLN	-	-	-	-0.3853	0.7000	0.00322
Earnings >=3000 PLN	-	-	-	0.2828	0.7773	0.00302
Main workplace not a public institution	-1.6850	0.0920	0.00259	-0.6479	0.5171	0.00222
Full-time job	-0.8982	0.3691	0.00365	1.0351	0.3006	0.00422
Age from 25 to 34 years	-0.8633	0.3880	0.00559	0.1244	0.9010	0.00375

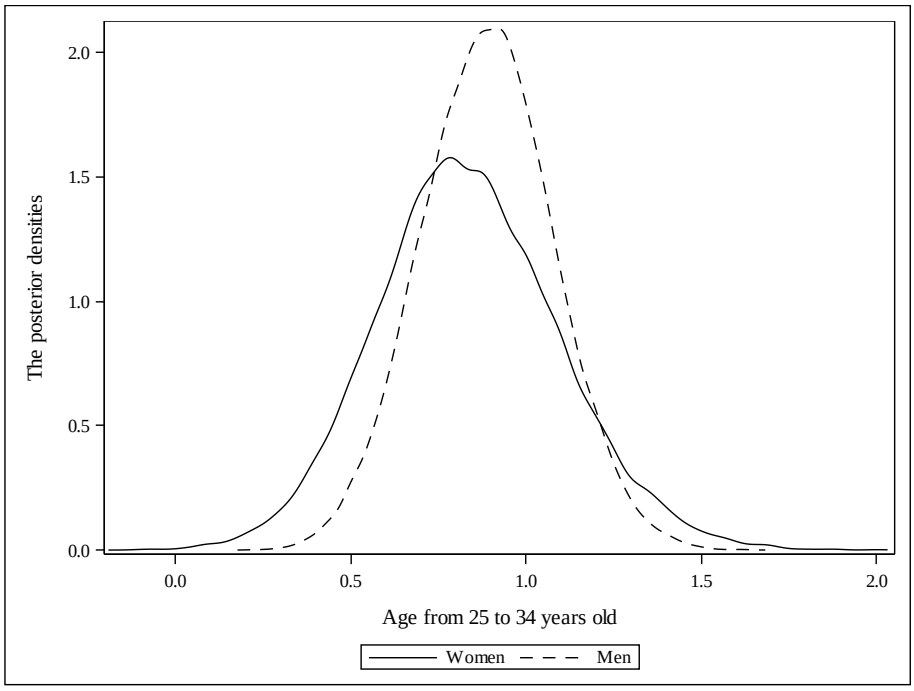
Age from 35 to 44 years	-0.5337	0.5935	0.00579	1.2397	0.2151	0.00403
Post-secondary and secondary professional education	-0.4343	0.6641	0.00382	0.0208	0.9834	0.00230
Secondary general education	-0.9465	0.3439	0.00466	-0.5844	0.5590	0.00411
Basic vocational education	-1.5179	0.1291	0.00429	-0.7426	0.4577	0.00276
Primary school education	0.4079	0.6833	0.00839	0.9348	0.3499	0.00472
Presence of a child under 15 in the household	-0.6082	0.5431	0.00269	-1.3938	0.1634	0.00239
Living in a town	-0.9741	0.3300	0.00253	-2.0889	0.0367	0.00207
Central region	0.3389	0.7347	0.00382	0.2670	0.7895	0.00288
South-Western region	-0.1756	0.8606	0.00496	-0.6009	0.5479	0.00375
Southern region	2.0725	0.0382	0.00501	1.2045	0.2284	0.00317
North-Western region	0.0412	0.9671	0.00463	1.0458	0.2956	0.00362
Northern region	0.1791	0.8579	0.00578	0.0934	0.9256	0.00379
Variance	-1.6850	0.0920	0.00666	-1.0451	0.2960	0.00784

Source: Author's own elaboration based on: the LFS data, 2015.

Most of the determinants behind taking up an additional job were at a similar level for both men and women. The biggest differences were obtained for variables describing *The institution of the main workplace is public* and *Place of living*. Women employed in non-public institutions were found to have 76.56% greater chance of having an additional job, compared with other women; for men employed in non-public institutions these odds were higher by 55.83%. In addition, women living in cities had a 45.52% lower chance of having an additional job compared with women living in a village; in the case of men, the odds were lower by about 65.47%. Considering the variable *Age group*, it was found out that men aged 25 to 34 had an 80% greater chance of having an additional job, compared with the youngest of the considered age groups, whereas for men aged 35 to 44 these chances were higher by 143.59%. For women, the first factor turned out to be statistically insignificant, and in the case of the latter, the value obtained was only slightly lower. In order to examine the differences in the chances of having an additional job by women and men, the resulting posterior distributions were determined for selected factors (Figures 1-3). It was obtained that, despite similar posterior means, the distributions obtained may vary in dispersion. This was obtained, for example, for the primary

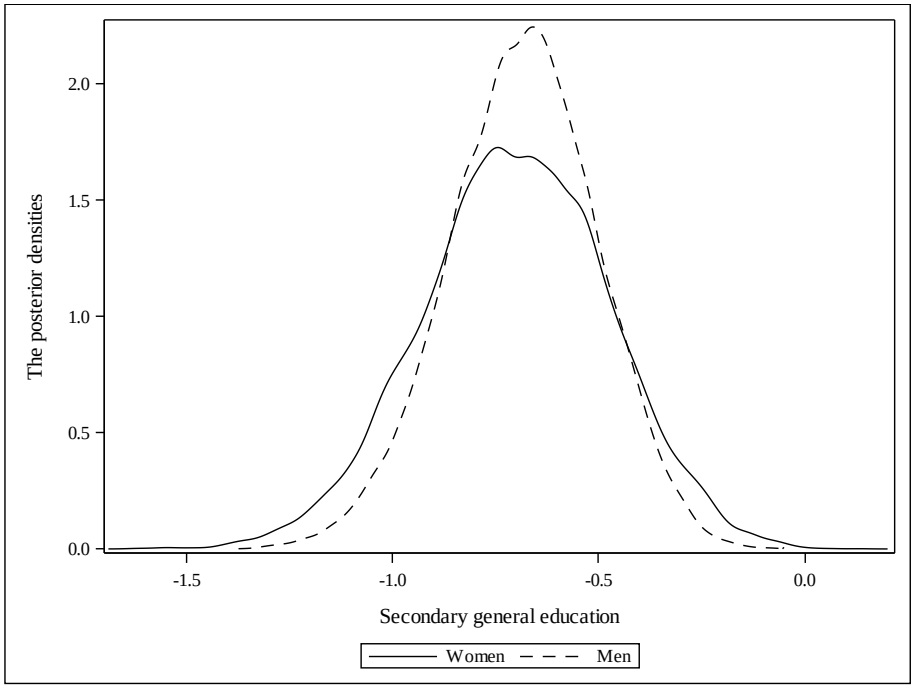
school education feature (Figure 3), which indicates a greater variation in the investigated behaviour among women than among men.

Figure 1. The posterior densities for women and men between 35 and 44 years old



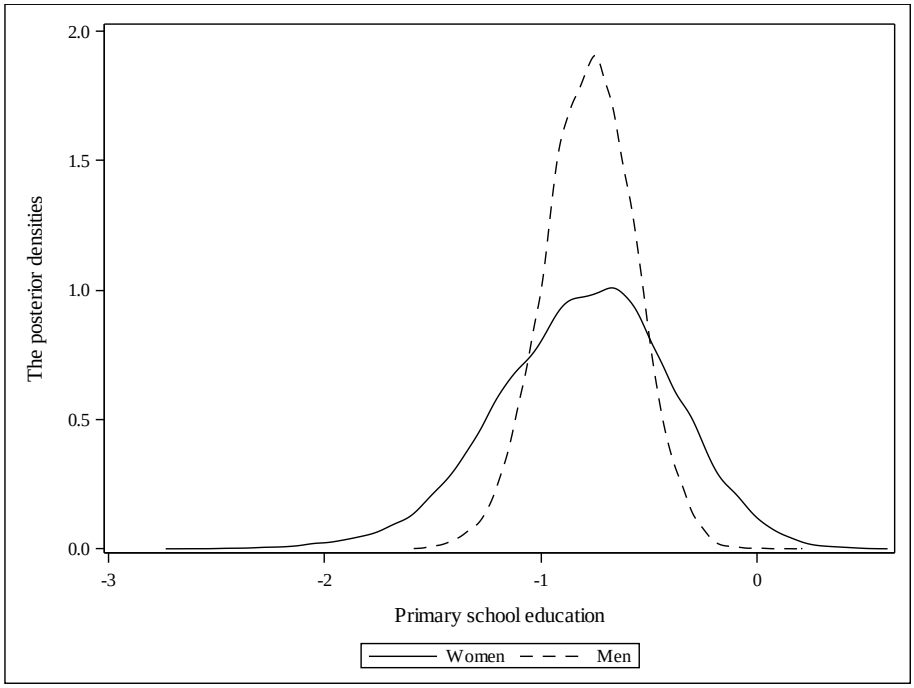
Source: Author's own elaboration based on: the LFS data, 2015.

Figure 2. The posterior densities for women and men having secondary general education



Source: Author's own elaboration based on: the LFS data, 2015.

Figure 3. The posterior densities for women and men having primary school education



Source: Author's own elaboration based on: the LFS data, 2015.

4. Summary and conclusions

In this study, the strength and direction of the impact of selected exogenous factors on the chances of having an additional job by salaried employees was examined. This approach allowed the identification of the demographic profile of a two-job worker. In addition, the effect of the unobserved heterogeneity of the test sample on the estimation results was examined. The values of parameter estimates in the model with fixed effects did not differ significantly from the values obtained in the model with random effects. Nevertheless, the model with random effects turned out to be a model better matching empirical data and consequently the results obtained using this model were interpreted.

Based on the analysis performed in this study, it can be presumed that the decisions about taking an additional job most often result from economic factors. This is confirmed by the result obtained for the variable describing the level of income in the basic place of employment. The analysis shows that people with the highest income had less chance to take up an additional job than people with the lowest income. The results obtained for individual regions of Poland also suggest economic reasons. Most often, additional work was taken by the inhabitants of the Eastern region, which is a region with potentially the lowest wages in Poland. In addition, it was found that additional work was more often taken by people with a child aged under 15 in the household, compared with other respondents, which may be related to the costs associated with having children.

According to Eurostat, the employment rate for the youngest people (from 15 to 24 years) in Poland in the period 1997-2015 was about 30% (Eurostat, 2017). It follows from our study that these people also had the least chance of having an additional job. Based on the results of other studies (CSO, 2015; Grzenda, 2017), it can be concluded that persons with higher education have the highest chance of having a job. Furthermore, this employee group also had the highest chances of having an additional job, compared with people with other levels of education.

Considering the results in the context of gender equality, the study reveals that men had a much higher chance of having an additional job compared to women. This may mean that if the income in the household is insufficient, then the additional employment is more often taken by a man than a woman. This confirms that Poland still has a traditional family model, in which men are assigned responsibility for providing means of subsistence, and women are mainly

responsible for running the home. In addition, people living in a village were more likely to have an additional job than residents of cities. This result may be due to the fact that it is easier to find additional employment in a village; it is usually seasonal or occasional work.

In summary, this research reveals that additional employment was most frequently taken by people being over 25 years of age, having low income, having a child under 15, well-educated and more often by men than women, under the *ceteris paribus* condition. Moreover, people with an adequate level of income, full-time work were found to be less inclined to take up an additional job. On the one hand, it can be concluded that this could result from their preferences in the context of having a balance between work life and family life; on the other one, it may be due to the fact that their primary work could be so intensely engaging that it made it impossible to take also another job at the same time.

Literature

Allison, P.D. (2009a). *Fixed Effects Regression Models, Quantitative Applications in the Social Sciences*. United States: SAGE Publications.

Allison, P.D. (2009b). Logistic Regression Using the SAS®: Theory and Application. North Carolina: SAS Institute.

Caselli, G., Vallin, J., Wunsch, G. (2005). *Demography: Analysis and Synthesis, Four Volume Set: A Treatise in Population*. Amsterdam: Elsevier.

Central Statistical Office of Poland (2015). *Labour force survey in Poland*. I quarter 2015. Warsaw: Central Statistical Office of Poland.

Chib, S. (2001). Markov Chain Monte Carlo Methods: Computation and Inference. In: Heckman, J. J.; Leamer, E. (eds). *Handbook of Econometrics* 5: 3569-3649. Amsterdam: Elsevier.

Collett, D. (2003). *Modelling binary data*, 2nd edition. London: Chapman& Hall.

Czapiński, J., Jerzyński, T. (2016). *Międzynarodowy Program Sondaży Społecznych ISSP 2015. Raport*. Warszawa: Instytut Studiów Społecznych.

Eurostat (2017). Employment statistics. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Employment_statistics#Employment_rates_by_sex.2C_age_and_educational_attainment_level. Accessed 16 February 2018.

Eurostat (2017). Unemployment statistics. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Unemployment_rate_2005-2016_(%25)_new.png. Accessed 16 February 2018.

Gelman, A., Carlin, J.B., Stern, H.S., Rubin, D.B. (2000). *Bayesian Data Analysis*. London: Chapman & Hall/CRC.

Grzenda. W. (2017). The analysis of chances of young and middle-aged people for having a job using Bayesian logistic regression model. *Quantitative Methods in Economics* 8(1): 27 – 37.

Landmesser, J. (2013). Wykorzystanie metod analizy czasu trwania do badania aktywności ekonomicznej ludności w Polsce. Warszawa: Wydawnictwo SGGW.

Socha. M., Sztanderska, U. (2000). Strukturalne podstawy bezrobocia w Polsce. Warszawa: Wydawnictwo Naukowe PWN.

Ulman, P. (2015). *Statystyka Pracy. Wybrane zagadnienia.* Kraków: Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie.

Analiza determinant posiadania dodatkowej pracy przez pracowników najemnych

Streszczenie

Wiele osób w Polsce oprócz posiadania podstawowego miejsca pracy podejmuje inną dodatkową pracę. Istnieje wiele potencjalnych czynników determinujących posiadanie dodatkowego zatrudnienia. Można do nich zaliczyć indywidualne potrzeby jednostek, takie jak chęć poprawy statusu materialnego, sytuację rodzinną, czy też możliwości wynikające z posiadanego kapitału ludzkiego. W niniejszym badaniu, oprócz powyższych uwzględniono ponadto takie cechy jednostek, jak: wiek, płeć, miejsce zamieszkania oraz charakterystyki podstawowego miejsca pracy. Niestety niektórych determinant badanego zjawiska nie można dobrze zaobserwować lub są one generalnie nieobserwowalne. W związku z tym szczególne znaczenie w modelowaniu tego typu zjawisk mają, wykorzystane w niniejszej pracy, modele z nieobserwowalną heterogenicznością. Celem niniejszego artykułu było pokazanie profilu demograficznego pracownika, który oprócz swojej głównej pracy, wykonywał jeszcze jakąś inną pracę. W toku przeprowadzonych badań dokonano oceny wpływu wybranych determinant na posiadanie dodatkowej pracy przez pracowników najemnych. Ponadto porównano skalę wpływu badanych cech w przypadku kobiet i mężczyzn. W badaniu wykorzystano bayesowski model regresji logistycznej.

Słowa kluczowe: dodatkowa praca, regresja logistyczna, wnioskowanie bayesowskie.