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# Main sources of income of women and men in Poland

## Introduction

Polish women are better educated than men. In 2011, 22.8% women and 18.2% men aged over 25 had higher education. For every 100 men with higher education, there are 139 women with such education. It is also worthwhile to add that 56.1% of women aged over 18 have secondary, post-secondary or higher education, while for men the percentage is 47.1%<sup>1</sup>.

Despite the above-mentioned differences favouring women, in Poland, the level of professional activity<sup>2</sup> among women is lower than among men. In 2014, only 48.5% of women aged 15 and more were economically active, while this percentage for the same population of men was 64.7%. Thus, the population of those economically inactive is to a large extent feminised – women constitute over 61% of this population<sup>3</sup>. In 2014, there were 546 economically inactive men per 1000 economically active, and as many as 1062 economically inactive women per 1000 economically active.

The employment rate<sup>4</sup> of women is also noticeably lower than the employment rate of men. In 2014, it was 43.8% in case of women and – by over 15 p.p. more – in case of men. The employment rate of women in Poland is one of the lowest in Europe [Sikorska 2012:65].

What is more, the difference in the popularisation of higher education among women and men is not reflected in the employment rate of people with the highest level of education. Women with higher education are less often economically active in comparison with men having the same level of education. For example, in Q4 2014, there were 80.1% economically active men with higher education and only 74.2% economically active women [GUS 2015:240].

It is also worthwhile to point out that the unemployment rate<sup>5</sup> of women is higher than the unemployment rate of men. In 2014, it was 9.6% in case of women and 8.5% in case of men. It is more difficult for women to find a job, in particular for women who return to the labour market after a longer break (especially due to motherhood) and those looking for their first job [*Kobiety i mężczyźni...* 2014:12]. What is important the unemployment rate of women is higher than the unemployment rate of men for all levels of education [GUS 2015:257].

Among those particularly disadvantaged are people who have been searching for a job for more than 2 years. In 2014 in Poland, every fourth (26.4%) unemployed woman belonged to a group of long-term unemployed<sup>6</sup>. At that time, the percentage of men unemployed for more than 24 months was 20.9%. This means that women are much more often than men threatened with long-term unemployment.

The educational superiority of women is not reflected in their earnings – women in Poland are paid less than men for the same work. In October 2014, the average gross pay of women was by PLN 764.18 lower than this of men. This means that average pay of women accounted for only 82.9% of average pay of men [GUS 2015:275].

Women much more often than men work on a part-time basis. It is particularly interesting, however, why women pursue this type of employment. One of the main reasons mentioned by Polish women is their inability to find a full-time job [Polkowska, Łucjan 2013:143]. It is, therefore, apparent that in case of women part-time employment is usually the necessity – an alternative to being unemployed – rather than a convenient solution. In the

fourth quarter of 2014, only 4.9% of men worked part-time, while in case of women this percentage reached 10.8%, thus was more than twice as high<sup>7</sup>.

The above analyses lead to several conclusions. It can be undoubtedly concluded that with the progressive changes in society, women have managed to achieve quite a lot, although gender equality is still incomplete. The data cited indicate that there still exist inequalities in the labour market, as well as a number of various obstacles blocking women's access to more rewarding fields in the professional sphere [Mazur-Łuczak 2010:17-18]. Undoubtedly, gender stereotypes in the perception of social roles, including pursuance of a traditional family model – still dominant in Poland, in particular in small towns and villages – have a not insignificant impact on unequal, in comparison with men, chances of women for professional self-realisation. Stereotypical perception of what is “typically masculine” and “typically feminine” are so deeply rooted in Poland that women still do not find it easy to achieve professional success. These barriers are not only a result of biological factors but of a culturally imposed obligation in accordance with which the primary role of women is to take care of the family and children and perform household chores.

Women in Poland, less often than men, have their own source of income (64.2% and 66.5% respectively). However, of particular interest may be the results of analysis of the structure of female and male populations in terms of their source of income. What is interesting is the scale of differences that exist in this respect between the sexes and whether these differences are getting blurred or are becoming deeper and deeper year after year. Finding an answer to this question has become the focus of research carried out in the further part of this article.

## Idea of the research conducted

The research was conducted among the inhabitants of Poland having their own source of income, regardless of whether it is a source of earned or unearned income. Therefore, the only group excluded from the analysis are those supported by other members of their household.

For the purpose of this article, the main sources of income were divided into eighteen separate and comprehensive categories. The groups are as follows:

A. paid blue-collar<sup>8</sup> work<sup>9</sup> (in Poland and abroad);

B. paid non-blue-collar<sup>10</sup> work (in Poland and abroad);

C. casual paid work (in Poland and abroad);

D. the use of an agricultural farm<sup>11</sup>;

E. helping in the use of an agricultural farm<sup>12</sup>;

F. permanent self-employment<sup>13</sup> (in Poland and abroad);

G. casual self-employment (in Poland and abroad);

H. helping in self-employment;

I. old-age pension from the non-agricultural insurance system;

J. old-age pension of individual farmers;

K. disability pension from the non-agricultural insurance system;

L. family pension;

M. disability pension of individual farmers;

N. unemployment dole and other benefits for the unemployed;

O. any other social benefits (e.g., foreign old-age pensions, foreign disability pensions, other domestic and foreign social benefits);

P. property income (e.g., interest, dividends), income from property rental (in Poland and abroad);

Q. donations and alimony from individuals (from Poland and abroad);

R. other income not mentioned above (e.g., sale of assets, savings).

Most adult inhabitants of Poland have only a single source of income<sup>14</sup>. Then, this single source is called the main (in other words – basic) source of income. If the number of sources is larger, the main source is to be the one that prevails.

Undoubtedly, the society structure by the main source of income is influenced by a number of factors, such as age, level of education or place of residence<sup>15</sup>. However, it is worthwhile to check whether gender is among the factors that differentiate inhabitants of Poland in terms of the type of their main source of income. That is why finding an answer to the question to what extent the fact that a grown-up inhabitant of Poland is a woman or a man has an impact on the type of source from which they derive their income has become a focus of this study. Given the defined objective, a hypothesis was formulated that distributions of the main sources of income in the populations of women and men are not identical, as they are to a large degree determined by gender.

Three research tasks have been accomplished in the article:

1) checking whether the distribution of the main sources of income is the same in the female and the male populations;

- 2) determining the strength of the relationship between gender and the main source of income for a Polish citizen who is not a dependent of another person;
- 3) checking in case of which sources of income the fraction of women that derive their income from a given source is larger (smaller) than the fraction of men.

Task 1) was executed using the Kolmogorov-Smirnov test. The chi-square test of independence was used in order to check whether there is a relationship between the examined variables (such as gender and the main source of income). Cramer's  $V$  was used to measure the strength of the existing relationships. Verification of the hypotheses on the existence of statistically significant differences between the female and male fractions having the particular sources of income was carried out on the basis of a parametric test of significance.

The analysis was conducted separately for eight subsequent years between 2005 and 2012. All the calculations included in the article were made on the basis of non-identifiable individual data from the household budget survey<sup>16</sup>. The survey was conducted among 69,468 persons (35,874 women and 33,594 men) having their own source of income in 2005, 76,316 such persons in 2006 (39,282 women and 37,034 men), 76,558 in 2007 (39,462 women and 37,096 men), 76,541 in 2008 (39,344 women and 37,197 men), 75,648 in 2009 (38,967 women and 36,681 men), 75,502 in 2010 (38,799 women and 36,703 men), 75,141 in 2011 (38,520 women and 36,621 men) and 74,235 in 2012 (38,249 women and 35,986 men). Notably, the Central Statistical Office carries out the study of household budgets using a representative

method, thanks to which the results may be generalised for all the households in Poland [*Budżety...* 2015:14].

## Checking the correspondence of distributions of the main sources of income of women and men in Poland

Two statistical populations were separated from the group covered by the survey carried out by the Central Statistical Office (GUS) – a population of women and a population of men. Then, the null hypothesis was formulated that claims the cumulative, distribution functions of the same variable in both populations are the same in contrast to the alternative hypothesis claiming they are different [Razali, Wah 2011:23]. The null hypothesis was verified separately for each examined year. The obtained values of statistics  $D$ <sup>17</sup> and  $\lambda$ <sup>18</sup> are entered in table 1.

The adopted level of significance is  $\alpha = 0,001$ . A critical value for the assumed coefficient  $\lambda$  read from the table of asymptotic  $\lambda$  Kolmogorov distribution is  $\lambda_\alpha = 1.95$  ( $\alpha = 0.001$ ). Since  $\lambda \geq \lambda_\alpha$  is received for each year, the value of the statistic  $\lambda$  is in the critical area and the hypothesis  $H_0$  should be rejected. **Therefore, one may not conclude that in the investigated populations of women and men, the examined variable is equally distributed.** This means that differences between the values of empirical distribution functions in the samples were so large that the assumption concerning identical distributions in the populations was rejected<sup>19</sup>.

**Table 1.** Values of empirical statistics  $D$  and  $\lambda$  as well as the results of hypothesis verification

Year	The value of the statistic		Verification of hypothesis	
	$D$	$\lambda$	relation between $\lambda$ and $\lambda_\alpha$	decision on the null hypothesis
2005	0.160	21.01	$21.01 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected
2006	0.170	23.40	$23.40 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected
2007	0.176	24.35	$24.35 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected
2008	0.177	24.48	$24.48 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected
2009	0.176	24.22	$24.22 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected
2010	0.176	24.12	$24.12 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected
2011	0.189	25.88	$25.88 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected
2012	0.190	25.85	$25.85 = \lambda > \lambda_\alpha = 1.95$	hypothesis $H_0$ should be rejected

Source: own calculations on the basis of non-identifiable individual data from the household budget survey.

## Analysis of the gender impact on the distribution of the main sources of income

The second key task to be accomplished is to find an answer to the question whether there is a relationship between the person's gender and their main source of income. Therefore, one needs to verify hypothesis  $H_0$  claiming that the two examined variables are stochastically independent, in contrast to the alternative hypothesis  $H_1$  claiming that there exists a stochastic relationship between these variables [Aczel 2000:758]. The verification procedure was carried out using the chi-square test of independence. It was repeated eight times, i.e., for each year from the period 2005-2012. The values of statistic<sup>20</sup>  $\chi^2$  and, based thereon, statistic  $V$ <sup>21</sup> were entered in table 2.

The number of the degrees of freedom is 17<sup>22</sup>. If the adopted level of significance  $\alpha$  equals 0.001, the critical value  $\chi^2_\alpha$  for 17 degrees of freedom read from the chi-square distribution table is 40.8. Because inequality  $\chi^2 > \chi^2_\alpha$  is fulfilled for each year covered by the analysis, one needs to reject hypothesis  $H_0$  claiming that the main source of income of inhabitants of Poland does not depend on their gender, with probability of making a wrong decision equal 0.001, in favour of the alternative hypothesis, and to state at the same time that the examined variables are dependent<sup>23</sup> [Sulewski 2013:2-3]. It can, therefore, be argued that **there exists a statistically significant relationship between the frequency of appearance of the enumerated eighteen sources of income and whether a person is a woman or a man**. It turned out that the resulting deviations

between the empirical and theoretical frequencies were large enough to reject the assumption of independence. Additionally it can be concluded on the basis of the values of  $V$ -statistic calculated for particular years that **over the period 2005-2012 the strength of dependence between the examined variables considerably increased**.

## Conducting tests for the differences between the fractions of women and men

The task to be fulfilled is verification of the hypotheses on the equality of the fraction of women  $p_K$  and the fraction of men  $p_M$  having the particular sources of income in two general populations, i.e., the population of women and the population of men<sup>24</sup>. Hence, there is verify of the null hypothesis, in accordance with which in Poland the share of women deriving their basic income from a given source is the same as the share of men, in contrast to the alternative hypothesis claiming that the share of women deriving their basic income from a given source is larger (smaller) than the share of men. In order to carry out verification of the null hypothesis, one needs to determine the value of the statistic  $u$ <sup>25</sup>. In table 3, there are values of this statistic calculated for each of the eight years and each of the eighteen groups of the main sources of income.

One may formulate a relevant alternative hypothesis on the basis of comparison of the value of the fraction  $p_K^*$  determined from the sample of women with the value of the fraction  $p_M^*$  determined from the sample of men, and if there is a relation  $p_K^* > p_M^*$

**Table 2.** Values of test statistics  $\chi^2$  and  $V$  and the results of hypothesis verification

Year	The value of the statistic		Verification of hypothesis	
	$\chi^2$	$V$	relation between $\chi^2$ and $\chi^2_\alpha$	decision on the null hypothesis
2005	6631.7	0.309	$6631.7 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected
2006	7296.4	0.309	$7296.4 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected
2007	7187.7	0.306	$7187.7 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected
2008	7196.6	0.307	$7196.6 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected
2009	7257.0	0.310	$7257.0 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected
2010	7208.3	0.309	$7208.3 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected
2011	7906.4	0.324	$7906.4 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected
2012	7996.8	0.328	$7996.8 = \chi^2 > \chi^2_\alpha = 40.8$	hypothesis $H_0$ should be rejected

Source: the same as in Table 1.

**Table 3.** Value of test statistic  $u$ 

Group \ Year	2005	2006	2007	2008	2009	2010	2011	2012
A	-52.18	-57.05	-57.97	-58.09	-58.41	-58.45	-63.43	-63.63
B	30.83	30.49	30.87	29.87	31.40	30.94	34.25	34.69
C	-15.38	-15.10	-14.23	-13.28	-11.36	-11.00	-7.81	-8.34
D	-21.51	-21.71	-20.52	-20.80	-20.65	-20.99	-21.99	-22.18
E	21.39	22.43	21.96	22.93	21.77	21.38	18.80	17.70
F	-24.06	-22.55	-22.57	-25.43	-26.49	-25.56	-25.98	-26.44
G	-8.23	-4.63	-4.76	-4.81	-3.23	-3.99	-2.45	-2.70
H	3.39	3.55	1.70	3.40	2.59	4.04	3.91	3.39
I	15.22	18.72	21.22	21.79	20.13	20.54	20.01	20.20
J	18.12	20.19	18.70	19.68	19.72	18.82	19.13	19.26
K	-12.30	-15.33	-13.97	-12.17	-12.57	-14.76	-14.96	-14.32
L	28.75	32.35	32.63	31.34	32.93	32.35	34.57	35.51
M	7.62	5.52	5.48	3.71	2.23	0.84	0.44	-0.62
N	-3.33	-4.04	-3.25	-1.92	-1.13	1.03	2.74	3.05
O	19.79	16.76	15.66	15.27	13.51	14.09	14.77	13.86
P	2.56	0.73	1.52	1.57	2.25	3.15	2.24	2.85
Q	6.68	9.12	7.13	7.57	7.12	6.72	5.39	4.67
R	-2.54	-1.12	-2.99	0.22	-2.40	-2.32	-2.54	-3.85

Source: the same as in Table 1.

**Table 4.** Form of hypothesis  $H_i$ 

Group \ Year	2005	2006	2007	2008	2009	2010	2011	2012
A	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$
B	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
C	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$
D	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$
E	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
F	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$
G	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$
H	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
I	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
J	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
K	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$
L	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
M	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K < p_M$
N	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
O	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
P	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
Q	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$	$p_K > p_M$
R	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K > p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$	$p_K < p_M$

Source: own work.

for a given variant of the variable and a given year, the hypothesis  $H_1$  should have the form  $p_K > p_M$ . On the other hand, if the inequality  $p_K^* < p_M^*$  is fulfilled, the hypothesis  $H_1$  takes the form  $p_K < p_M$ . Table 4 shows the versions of alternative hypotheses selected for the hundred and forty-four tests conducted.

At the next stage of the verification procedure, a critical value should be determined and  $u_\alpha$  then compared with the value of the calculated statistic  $u$ . The level of significance, adopted a priori, is  $\alpha = 0.001$ . The critical value  $u_\alpha$  for the critical region on the right-hand side is 3.09, and for the critical region on the left-hand side  $u_\alpha = -3.09$ . Table 5 shows information on the decision taken on the basis of the carried out test, where „yes” means that the null hypothesis was rejected in favour of the alternative hypothesis, and „no” means that there were no grounds to reject  $H_0$ .

In table 5, the rows in case of which the value of the statistic  $u$  is in the one-sided critical region in each of the eight years covered by the study are marked in bold. On the other hand, if at least for one year the value of statistic  $u$  was not in the determined critical region, it was concluded that the difference between  $p_K^*$  and  $p_M^*$  is statistically negligible

and can be regarded as accidental. Thus, for the following categories of the main sources of income:

- G. casual self-employment;
  - H. helping in self-employment;
  - M. disability pension of individual farmers;
  - N. unemployment dole and other benefits for the unemployed;
  - P. property income, income from property rental;
  - R. other (e.g., sale of assets, savings);
- there are no grounds to reject the null hypothesis claiming that parameters  $p_K$  and  $p_M$  are equal in the general population. On the other hand, in case of the following sources:
- B. paid non-blue-collar work;
  - E. helping in the use of an agricultural farm;
  - I. old-age pension from the non-agricultural insurance system;
  - J. old-age pension of individual farmers;
  - L. family pension;
  - O. other social benefits;
  - Q. donations, alimony from individuals;
- the null hypothesis is to be rejected in favour of the alternative hypothesis in the form  $p_K > p_M$ . In turn, for the categories:
- A. paid blue-collar work;

**Table 5.** Result of verification of hypothesis  $H_0$

Year Group	2005	2006	2007	2008	2009	2010	2011	2012
A	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
B	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
C	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
D	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
E	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
F	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
G	yes	yes	yes	yes	yes	yes	no	no
H	yes	yes	no	yes	no	yes	yes	yes
I	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
J	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
K	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
L	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
M	yes	yes	yes	yes	no	no	no	no
N	yes	yes	yes	no	no	no	no	no
O	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
P	no	no	no	no	no	yes	no	no
Q	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>	<b>yes</b>
R	no	no	no	no	no	no	no	yes

Source: own work.

- C. casual paid work;  
 D. the use of an agricultural farm;  
 F. permanent self-employment;  
 K. disability pension from the non-agricultural insurance system;
- hypothesis  $H_0$  needs to be rejected in favour of hypothesis  $H_1$  and a claim needs to be made that  $p_K < p_M$ .

## Summary

Transformation of the contemporary world has brought about a significant increase in the women's professional activity. Due to social and economic changes, the traditional model of a family maintained exclusively thanks to the work and pay of the men – as the only bread-winner – has become uncertain and insufficient for the purpose of satisfying the important needs of all the family members. For most women, work is no longer an option but rather a necessity [Polkowska, Łucjan 2013:140].

Although the higher and higher level of education and professional activity of women in Poland improve women's chances in life, the labour market is still characterised by inequality – the situation of women is still less favourable than the situation of men [Szalewa 2014:5-6]. Of course, one can observe that year after year more and more women are being employed in positions of responsibility in enterprises and public institutions and are taking part in important public debates. This, however, seems insufficient to effectively go beyond the existing stereotypes or hackneyed schemes.

The purpose of the article was to answer the question whether the population of adult women and the population of adult men have the same distribution of the main sources of income, and if not, what is the impact of gender on what type of source the inhabitants of Poland derive their main income from. Three study tasks were conducted in order to accomplish this objective.

Fulfilment of the first study task consisted in verifying the statistical hypothesis claiming that the distributions of the examined variable in the two populations are the same, thus the existing differences in the values of cumulative distribution functions calculated on the basis of test results are statistically negligible. The truth of this hypothesis was ascertained using the Kolmogorov-Smirnov test. For all the analysed years, the value of the empirical statistic  $\lambda$  was in the critical region. **Therefore, the assumption that distributions of the main**

**sources of income are identical in the populations of women and men had to be rejected for each of the eight years.**

The hypothesis on the lack of dependence between the distribution of the main sources of income of the Polish inhabitants and gender was rejected in the second task fulfilled as part of the study. It was, therefore, concluded that gender has statistically significant impact on differentiating Poles in terms of the appearance of particular sources of income, and it was proven that the **fact that someone is a man or a woman to a considerable** and – what seems to be extremely important and surprising – **greater and greater extent affect on the main source of income of a given person.**

What is more, several detailed conclusions were drawn on the basis of the third study task. They are as follows:

- deriving income from own business is typical of men;
- using an agricultural farm is a relatively more popular source of income in case of men than in case of women. On the other hand, in case of women, in contrast to men, helping in the use of an agricultural farm is relatively more often the main source of income;
- as regards sources of earned income of Polish women, income from paid work definitely plays a dominant role;
- women in Poland relatively more often derive income from paid non-blue-collar work, while men relatively less often derive their income from this type of work. Men, on the other hand, relatively more often derive their income from paid blue-collar work or casual paid work;
- receiving old-age pensions, family pensions and other social benefits, as well as receiving donations and alimony from individuals is typical of women<sup>26</sup>.

In case of the other categories of the sources of income, one may conclude that they appear equally frequently in case of women and men.

<sup>1</sup> Own calculations on the basis of [GUS 2012:190; GUS 2015:210].

<sup>2</sup> The economically active included the employed and unemployed people.

<sup>3</sup> Own calculations on the basis of [GUS 2015:238].

- <sup>4</sup> The employment rate is the share of employed people in the population of those aged 15 and more.
- <sup>5</sup> The unemployment rate is the number of unemployed people as a percentage of those economically active.
- <sup>6</sup> Own calculations on the basis of [GUS 2015:256].
- <sup>7</sup> Own calculations on the basis of [GUS 2015:240].
- <sup>8</sup> Blue-collar workers are persons employed in positions associated with: a) conducting operations that product manufacturing processes or service provision processes consist of (direct production workers), as well as positions associated with the performance of auxiliary works and providing service necessary in order to ensure smoothness of the production process (indirect production workers, private soldiers); b) operations of the service character which comprise processes in the sphere of circulation (in transport, communication, trade, etc.), as well as in the field of social services (employees in the positions related to blue-collar workers' positions) [Budżety... 2015:22].
- <sup>9</sup> A paid worker is a person hired by an employer, regardless of the type of contract concluded between them [Budżety... 2015:22].
- <sup>10</sup> Non-blue-collar workers are persons employed in positions which are not referred to as blue-collar positions [Budżety... 2015:22].
- <sup>11</sup> A user of a private farm in agriculture is a person who works on the agricultural farm that they use and manages the work of the members of his/her household who help him/her in the use of the agricultural farm and makes decisions on the direction of this farm's production – regardless of whether the person is an owner or a lessee of the farm or whether he/she uses it on the basis of any other title thereto [Budżety... 2015:22].
- <sup>12</sup> A person helping on an agricultural farm is a person who is a member of a given household, permanently and without any contractual remuneration helps the user of a private farm in agriculture in the running thereof [Budżety... 2015:22].
- <sup>13</sup> Among the self-employed are self-employed persons who do not work on a private farm in agriculture and those who pursue freelance professions. Entrepreneurs who are employers and entrepreneurs who do not hire any employees fall within the category in question [Budżety... 2015:22].
- <sup>14</sup> In 2012, 90% of people in Poland having their own source of income had only a single source of this type. In 2011, it was 90%, in 2010 – 89%, in 2009 – 88%, in 2008 – 88%, in 2007 – 87%, in 2006 – 87% and in 2005 – 86% (own calculations on the basis of the database of the Central Statistical Office (GUS) cited further in footnote 16).
- <sup>15</sup> The share of persons for whom the means to earn their livelihood is paid work is definitely larger among people aged thirty and forty than – for example – among those aged seventy or eighty. On the other hand, the percentage of persons who have unearned income is larger among people aged seventy and eighty. Another factor which affects the structure of population in terms of the main source of income is the level of education. It turns out that persons with secondary and higher education relatively more often derive their main income from paid work or from self-employment outside agriculture than persons with basic vocational education, lower secondary education or primary education. On the other hand, for persons with primary, lower secondary or basic vocational education sources of unearned income relatively more often constitute the main source of income. Place of residence also affects the type of income source of a given person. In case of persons living in urban areas paid work and self-employment outside agriculture relatively more often constitute the basic source of income than in case of persons living in the country. Those who live in the country, on the other hand, relatively more often derive their income from self-employment in agriculture [Ludność... 2013:29, 32-34, 36-39].
- <sup>16</sup> The Central Statistical Office (GUS) conducts the household budget survey in question on an annual basis. The base of non-identifiable individual data created as a result of these surveys for the years 2005-2012 was made available by the Central Statistical Office (GUS) under Contract no. 20/Z/DI-6-611/632/2013/RM concluded with the University of Szczecin.
- <sup>17</sup> For each outcome of the variable, using the Kolmogorov-Smirnov test, we calculate the difference between the cumulative distribution functions and we look for the maximum absolute value of the difference. The value found in this manner is designated by the symbol  $D$  [Taylor, Emerson 2011:34].
- <sup>18</sup> In the test in question, the  $D$ -statistic is used to determine  $\lambda$ -statistic for expressed as a formula [Rószkiewicz 2012:304]:
- $$\lambda = D \sqrt{\frac{n_K n_M}{n_K + n_M}},$$
- where  $n_K$  is the sample frequency taken from the population of women, while  $n_M$  is the sample size taken from the population of men.
- <sup>19</sup> It does not seem reasonable to lower the level of significance below 0.001. On the other hand, if its value increases above 0.001, the critical value will decrease (for example for  $\lambda = 0.01$  the value of  $\lambda_\alpha$  found in the table is only 1.63). This means that raising the level of significance would result in increasing the critical area and all the more the null hypothesis would need to be rejected. Thus, an increase of  $\alpha$  would have no impact on the results of the conducted verification.
- <sup>20</sup> The value of the test statistic  $\chi^2$  is calculated in accordance with the formula [Ankarali, Cangur 2013:95]:
- $$\chi^2 = \sum_{i=1}^r \sum_{j=1}^s \frac{(n_{ij} - n_{ij}^*)^2}{n_{ij}^*},$$
- where  $n_{ij}$  are the empirical sample size calculated for each  $i$ -th variant of the first variable and  $j$ -th variant of the second variable, while  $n_{ij}^*$  are theoretical frequencies corresponding to the individual empirical frequencies  $n_{ij}$ .
- <sup>21</sup> Cramer's  $V$  is used to measure the relationship between the variables. This is an unitless and normalised quantity value from the range  $<0, 1>$  only [Pułaska-Turyńska 2005:254]. If it equals 0, there is no relationship between the variables. On the other hand, the closer to 1 it is the stronger the relationship is. Cramer's  $V$  is calculated according to the formula [Buga, Kassyk-Rokicka 2008:121]:
- $$V = \sqrt{\frac{\chi^2}{n \cdot \min(r-1)(s-1)}},$$
- where  $r$  is the number of variants of the first variable, and  $s$  is the number of variants of the second variable.
- <sup>22</sup> Assuming that hypothesis  $H_0$  is true, statistic  $\chi^2$  has asymptotic chi-square distribution with  $(r-1)(s-1)$  degrees of freedom. Because the number of variants of the first variable (i.e. the main source of income) is  $r = 18$ , and the number of variants of



the second variable (i.e. gender) is  $s = 2$ , the number of degrees of freedom amounts to  $(18 - 1)(2 - 1) = 17 \cdot 1 = 17$ .

<sup>23</sup> It does not seem reasonable to lower the level of significance below 0.001. On the other hand, if its value increases above 0.001, the critical value will decrease (for example for  $\alpha = 0.01$  the value of  $\chi^2_\alpha$  found in the table is only 33.4). This means that raising the level of significance would result in increasing the critical area and all the more the null hypothesis would need to be rejected. Thus, an increase of  $\alpha$  would have no impact on the results of the conducted verification.

<sup>24</sup> The examined quality variable has a two-point distribution in both populations with parameter  $p_K$  and  $p_M$  respectively, where parameter  $p_K$  means the fraction of persons selected in the first general population (i.e., the population of women), while parameter  $p_M$  – the fraction of persons selected in the second general population (i.e. the population of men).

<sup>25</sup> The value of  $u$ -statistic is expressed with the formula [Zeliaś 2000:275]:

$$u = \frac{p_K^* - p_M^*}{\sqrt{\bar{p}(1 - \bar{p}) \frac{n_K + n_M}{n_K n_M}}},$$

where:

$p_K^*$  – the fraction of persons selected in the sample of women,

$p_M^*$  – the fraction of persons selected in the sample of men,

$\bar{p}$  – the average fraction calculated from the combined samples of women and men.

<sup>26</sup> As regards the sources of unearned income, only the disability pensions from the non-agricultural insurance system are more often received by men than by women.

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