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Olsztyn Economic Journal is indexed and abstracted in The Central European Journal of Social
Sciences and Humanities (CEJSH) (<http://cejsh.icm.edu.pl>)
and in Index Copernicus Journal Master List (<http://lista2012.indexcopernicus.com/index.htm>)

The Journal is also available in electronic form on the web sites

<http://www.uwm.edu.pl/wne/oiej.php>
<http://wydawnictwo.uwm.edu.pl> (subpage Czytelnia)

The print edition is the primary version of the Journal

PL ISSN 1897-2721

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Olsztyn 2013

Wydawnictwo UWM
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Ark. wyd. 8,5; ark. druk. 7,0; nakład 130 egz.
Druk – Zakład Poligraficzny UWM w Olsztynie
zam. nr 225

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**CHARACTERISTICS AND PERSPECTIVES
OF HIGHLY SKILLED GRADUATES
IN THE ITALIAN LABOUR MARKET**

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Key words: Higher Education, Graduates, Employability, Macro-areas.

Abstract

The central aim of this paper is to examine the relationships and implications of the education-employment nexus for recent university graduates in Italy by analysing the main elements that influence college graduates' employment probabilities three years after graduation. In addition, it provides a comparison among Italian macro-areas regarding graduates' region of residence in 2010.

In this sample, continuous work experience during undergraduate studies, further postgraduate studies, older graduation ages and being married or divorced are characteristics that increase the probability of being employed compared to being unemployed three years after graduation.

We used micro-data from a nation-wide survey carried out by the Italian Institute of Statistics (ISTAT) in 2011 on a representative sample of 33,696 graduates belonging to the 2007 cohort.

The results confirmed the existence of significant differences in graduates' employment among Italian macro-areas. Graduates who were employed in the South in 2010 have shown a strong marked profile that is unfavorable to women and is distinguished by the oldest ages of graduates at the time of graduation and in post-graduation pursuits.

**CHARAKTERYSTYKA I PERSPEKTYWY ZATRUDNIENIA WYSOKO
WYKWALIFIKOWANYCH ABSOLWENTÓW WYŻSZYCH UCZELNI
NA WŁOSKIM RYNKU PRACY**

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Słowa kluczowe: szkolnictwo wyższe, absolwenci, szanse znalezienia zatrudnienia, makro-obszary.

¹ The paper represents a joint research venture.

Abstrakt

Głównym celem artykułu jest określenie zależności między wykształceniem a zatrudnieniem oraz ich implikacji dla młodych absolwentów uczelni wyższych we Włoszech przez analizę głównych czynników wpływających na szanse zatrudnienia absolwentów w okresie trzech lat po ukończeniu studiów. Porównano również włoskie makroobszary z uwzględnieniem regionu zamieszkania absolwentów w 2010 r.

W badanej próbie doświadczenie zawodowe wyniesione z praktyk i stażów podczas studiów pierwszego stopnia, ukończenie studiów podyplomowych, bardziej zaawansowany wiek w momencie ukończenia studiów oraz pozostawanie w związku małżeńskim lub bycie osobą rozwiedzioną zwiększają szanse zatrudnienia w porównaniu z pozostawaniem bezrobotnym trzy lata po ukończeniu studiów.

W pracy wykorzystano mikrodane z ogólnonarodowego badania przeprowadzonego przez Włoski Instytut Statystyki (ISTAT) w 2011 r. na reprezentatywnej próbie 33 696 absolwentów, którzy ukończyli studia w 2007 r.

Otrzymane wyniki potwierdziły istnienie istotnych różnic w poziomie zatrudnienia absolwentów między badanymi makroobszarami Włoch. W grupie absolwentów zatrudnionych na południu kraju w 2010 r. stwierdzono wyraźny trend niesprzyjający zatrudnieniu kobiet. Wyróżnikiem profilu tej grupy był także najstarszy wiek absolwentów w momencie ukończenia studiów oraz podczas późniejszych poszukiwań pracy.

Introduction

With the economic crisis of 2008, recent university graduates began to worry about the impact of the crisis, and they currently seem to be affected in different ways. Particularly in Italy, the education system is rigid, and this situation has made the labour market increasingly flexible. This rigid system is due principally to the fact that the education system is not able to reduce the gap between experience and degree obtainment.

Although the percentage of workers in Italy having accomplished either the first or second stage of tertiary education increased from 12% to 19% between 1999 and 2012 which represents a figure 1.7 times higher in absolute terms (Eurostat 2013), specific policies that are useful to valorising the skills and competences required by the labour market have not been implemented. The lack of policies has resulted in inadequate solutions to the growing unemployment such as temporary employment and unstable jobs.

The central aim of this paper is to examine the relationships and implications of the education-employment nexus for graduates in Italy by analysing the main elements that influence college graduates' employment probabilities three years after graduation. In addition, it provides a comparison among Italian macro-areas regarding graduates' region of residence in 2010. The data set is drawn from the Graduates' Vocational Integration Survey conducted by the Italian National Institute of Statistics (ISTAT) in 2011 on a single level of graduates three years after their graduation (in this study, the cohort grad-

uated in 2007). It also allows territorial disaggregation according to graduates; place of residence in 2010.

The paper is organised as follows.

Section 1 provide an introduction. Section 2 outlines some generic indications about the labour market performance of Italian university graduates. Section 3 presents the data set and methodology used for the descriptive and empirical analysis. Section 4 discusses the territorial heterogeneity of graduates; employment across three Italian macro-areas. Section 5 shows an econometric specification of the model and the subsequent findings.

Finally, further steps are discussed in the conclusions.

The literature framework on higher education and employment and regional disparities: some issues

The employability concept has been broadly treated in the economics literature.

Among EU member states, Italy seems to be one of most interesting countries with regard to the employability of university graduates. BIGGERI et al. (2001) considered not only the characteristics of graduates but also the characteristics of universities and course programmes. In fact, they indicated that students that take less time to graduate also take less time to obtain a job, that graduates with previous work experience are more likely to obtain a job and that older graduates seem to be in a disadvantageous situation with relation to younger graduates.

QUINTANO et al. (2004) did not find any effects of gender or of parents' professional status and concluded that the probability of being employed is strongly related to the duration of the university degree programme. POZZOLI (2009) analysed Italian graduates in 1998 and indicated that graduates become less selective and adjust their job search efforts when unemployed, which allows for an increase in the level of information about job opportunities, and especially older and female graduates and those who live in Southern and Central Italy are found to have particularly lower probabilities of obtaining their first jobs. Most recently, CIRIACI (2012) showed that the current Italian university reform is providing a lowering in dropout rates, changing the duration of degrees.

The literature indicates that there are also wide regional differences in graduate employment (CIRIACI 2006, 2005, BRUNELLO et al. 2001) due to the persistence of socio-economic divergences between the central-northern and southern regions (CIRIACI, PALMA 2008, QUATRARO 2009). PARTICULARLY, GALEGO, SARAIVA (2013), in studying the Portuguese case, underlined that

employability is higher for graduates of degree programmes in the south of the country and in the islands. DI PIETRO (2013), analysing the Italian case, indicated that study abroad programmes, which permit students to gain abilities that can overcome difficulties experienced as a result of having disadvantages backgrounds, have a meaningful effect on the likelihood of being employed three years after graduation.

Data and methods

The micro-data used for our analysis of university graduates' employment come from a nation-wide survey conducted by ISTAT in 2011 on a representative sample of 33,696 graduates belonging to the 2007 cohort. The individuals of the sample were questioned three years after graduation about their current labour market status, further qualification activities, job characteristics and career aspirations as well as retrospectively on topics related to their studies and the transition process from university to work.

The data collection took place in two different phases. The first phase surveyed universities regarding their graduates from the year 2007 to obtain the areas from which to extract the sample of graduates to be interviewed. The second phase directly addressed the graduates previously selected in the sample.

The models were computed introducing a set of control variables (both categorical and dummies) regarding: sex (gender of the respondent: 1 = Male; 2 = Female), the age group at the time of degree achievement (21–24, 25–29, 30+), the disciplinary group to which the graduate's course of study belongs (Scientific, Socio-economics and Politics, Humanities, Law, Architecture/Engineering, Medicine), whether the respondent worked before graduation (Work experience = 1; No work experience = 2), marital status (Single = 1; Married/partnered = 2; Other, divorced/widowed = 3), progeny (With children = 1; without children = 2), the graduate's region of residence in 2010 (North = 1; Centre = 2; South = 3), whether the respondent changed residences after graduation (Not-Changing residence = 1; Changing residence = 2), whether the respondent was satisfied with the degree obtained (Satisfied = 1; Not satisfied = 2), whether the respondent achieved postgraduate degrees', such as First or Second Level Master's degree or a not University Master's degree or PhD (With a post-graduate degree = 1; Without a post-graduate degree = 2), and whether the respondent obtained a Bachelor's degree (Laurea triennale = 2) or a degree after a 3-years course of university study (Laurea Specialistica or vecchio ordinamento = 1).

The disciplinary groups, built by following the D.M. 4/10/2000, aggregate single academic sectors in wider fields. The first group encompasses Area 1 to

Area 5 (all Scientific Faculties) and Area 7 (Agricultural Sciences and Veterinary Medicine). The second group encompasses Area 13 (Economic Sciences and Statistics) and 14 (Social and Political Sciences). Areas 10 and 11 belong to the third group (Humanistic sciences), and Area 12 belongs to the fourth group (Law). Group 5 embodies Area 8 (Civil Engineering and Architecture) and Area 9 (Industrial and information Engineering), and the sixth group encompasses Area 6 (Medicine).

Parental background was initially included in the models, but its introduction did not substantially improve the fit of the model, nor did it have a significant impact on the coefficients. Therefore, this variable was omitted from the final specification.

The empirical analysis has been divided into two parts. In the first, the dependent variable (which measures the likelihood of being employed in 2010) is computed as follows:

- 1 = if the respondent was employed in 2010 and
- 2 = if not.

In the second part, employment analyses were disaggregated by the macro-areas of residence to distinguish any statistically significant territorial heterogeneities.

Territorial employment heterogeneity in Italy

Figure 1 gives the evolution of employment rates in Italy since 1977. It shows the decrease in employment from 45.6% in 1980 to 41.9% in 1989, with a rough plateau until 2001 and with cyclical declines and increments during the 1990s. Over the last ten years, the growth in the employment rate was reversed in 2006 (46.9%) due to the economic crisis, losing two percentage points in five years.

How much of the increase registered at the beginning of the millennium reflects an increase in the employment rates of females? The answer is straightforward: since 2000, male employment rates have been almost constant, approximately 61–62%. Instead, women's employment has shown a steadily increasing trend. Consequently, the increase in the employment rate in the period considered reflects, for the most part, an increase in female employment rates.

Regarding geographical macro-areas, Figure 2 shows the employment rates in the North, Centre and South of the country. The plot shows the large heterogeneity of employment across the three Italian macro-areas. Such heterogeneity has always been present (at least since 1977), but has been more marked since the end of the 1980s. The employment rates in the North have

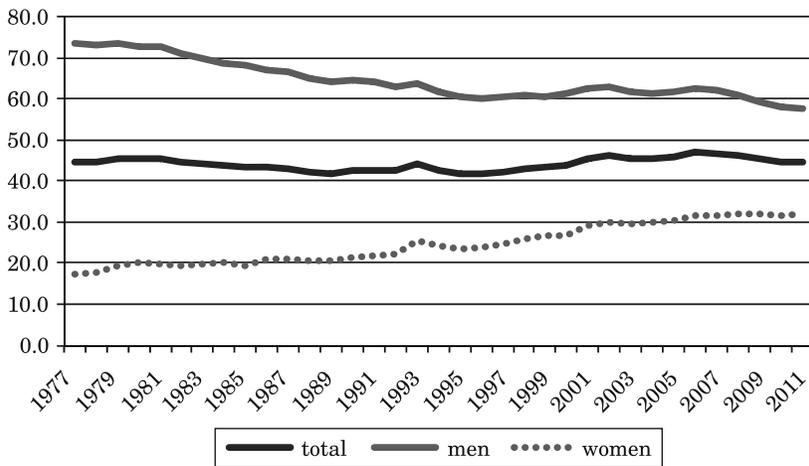


Fig. 1. Italy. Employment rates by gender. Years 1977–2011

Source: The author's own elaboration, Istat.

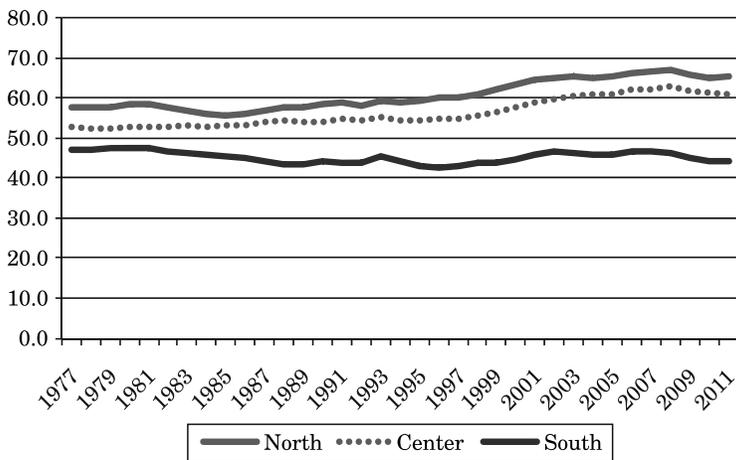


Fig. 2. Italy. Employment rates by Macro-areas. Years: 1977–2011

Source: The authors' own elaboration, Istat.

consistently been the highest: under but near 60% until 1998 and between 62–66% thereafter. The employment trend in the Centre of Italy has been more similar to the one observed in the North, but with slightly lower rates. The distance between the curves confirm a territorial gap in which the employment rates in the South remain the lowest in Italy.

Moving from the Labour Force Survey data to the 2011 University Graduates' Vocational Integration Survey data, Figure 3 presents the regional

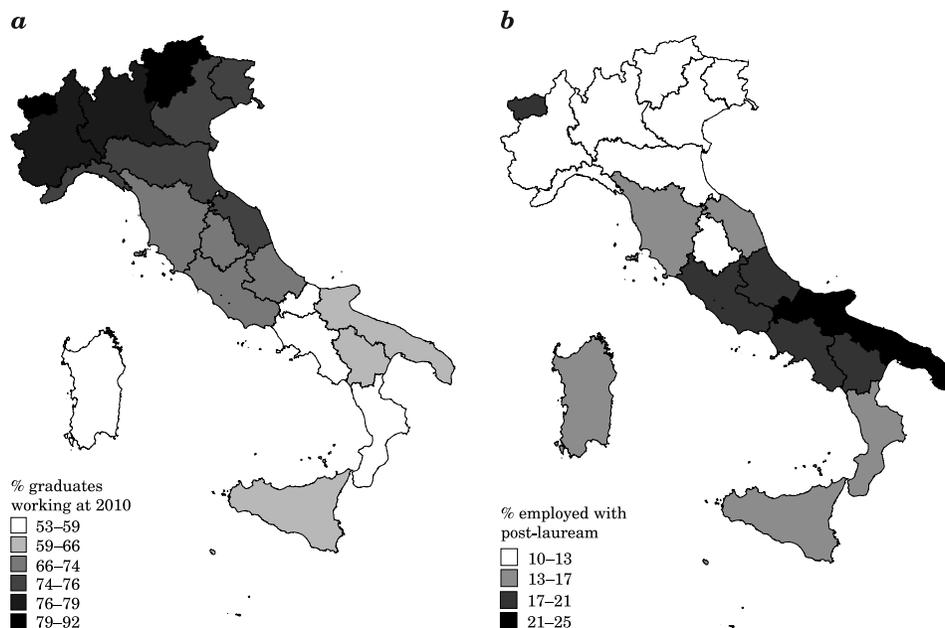


Fig. 3. Italy. Percentage of graduates employed in 2010 (a) and employed in 2010 with post-graduate specialisations (b)

Source: The authors' own elaboration, University Graduates' Vocational Integration Survey, 2011.

allocation of graduates who were employed in 2010. The first part could be considered a proxy of the recent employment distribution of individuals with tertiary education in Italy, read as the percentage of graduates working in 2010 (three years after graduation). There is a clear regional path in which the highest proportion of employed graduates is concentrated in the Aosta Valley, Trentino Alto Adige, Piedmont, Lombardy, Liguria, Emilia-Romagna, Veneto, Friuli-Venezia-Giulia and Marche and the lowest proportion is observed in Central and Southern regions such as Tuscany, Lazio, Umbria, Abruzzo, Apulia, Basilicata, Sicily, Molise, Campania, Calabria and Sardinia.

The second part of the figure is dedicated only to graduates who were employed in 2010 and had obtained a post-graduate qualification (Master's degree, PhD). When analysing the regional distribution of working graduates disaggregated by post-graduate specialisation, no observation exceeded 25%. However, employment seems to be more strongly linked to further qualifications in the South than in the North of the country. Apulia, Molise, Abruzzo, Lazio, Basilicata, Campania (and Aosta Valley) show the highest proportions of graduates employed with post-graduate degrees. There are several possible explanations for this result.

First, graduates residing in the South seem to be encouraged to continually develop their working skills, qualities and experiences to compete in the graduate labour market.

Second, given the lower employment rates in the South, graduates continue their post-graduate educational path while waiting to find a job.

An intermediate group formed by Sicily, Sardinia, Calabria, Tuscany and Marche represents the regions of residence for 15–17% of the sample with post-graduate degrees while in the North (and Umbria) the percentage of graduates with post-graduate degrees reaches approximately 13%.

Employment probabilities and territorial differences

The data analysis was conducted in two stages. In the first, the association of graduates' employment status in 2010 with their socio-demographic profiles was examined using binary logistic regression analyses:

$$\ln \left[\frac{\hat{\pi}}{(1 - \hat{\pi})} \right] = b_0 + b_1X_1 + b_2X_2 \dots + b_kX_k.$$

The binary dependent variable measures employment status (0 = not working; 1 = working) three years after graduation. The variables of gender, age at degree achievement, the degrees' disciplinary group, work experience, marital status, progeny, residence change, satisfaction with degrees, post-graduate qualifications and duration of the degree programmes were included in these regressions to adjust for their potential effects.

These analyses were conducted for the whole sample and were repeated in the subsample of graduates residing in the North, Centre or South of Italy (Table 1).

In the first specification, graduates who were employed in 2010 were less likely to be females ($B = -0.26$; ref.: males), to have a degree in Law or Medicine ($B = -0.56$ and -0.22 , respectively, ref.: scientific) and to live in the South or Centre of Italy ($B = -0.90$ and -0.47 , ref.: North). They were also more likely to have achieved a degree when over 30 years old of age ($B = 0.86$; ref.: 21-24 years old), to have obtained a degree in the Socio-economics, Politics and Architecture/Engineering fields ($B = 0.41$ and 0.53 , ref.: scientific) to have gained some previous work experience ($B = 0.66$, ref.: without), to be married or divorced ($B = 0.49$ and 0.75 , ref.: single) and to have post-graduate qualifications ($B = 0.39$, ref.: without).

The values of the Wald coefficient are useful for sorting the independent variables based on their influence on the dependent variable. In this sense, the

ranking of the top six categories that determine the highest graduate employment probabilities in 2010 are the following: living in the South ($W = 953,40$), accumulating work experience in labour market activities ($W = 610,46$), obtaining a degree at age 30 or older ($W = 302,79$), being married ($W = 192,85$), living in Central Italy ($W = 190,56$) and have a post-graduate degree ($W = 109,37$).

Repeating these analyses in the subgroups disaggregated by the macro-area of residence in 2010 produced some interesting results that highlight the existence of diverse employment results of graduates in the Italian territory.

In Models 2, 3 and 4, the covariate of the age at the time of degree achievement tends to gain importance if graduates reside in the Centre or South of the country when compared to the North. In fact, the likelihood of obtaining a degree when 30 years of age or older is 0.62 in the North, 0.90 in the Centre is and 1.05 in the South. A similar path is observed when examining work experience ($B = 0.47$ N, 0.80 C, 0.75 S) and graduates' satisfaction with degree ($B = 0.08$ N, 0.12 C, 0.21 S).

Instead, a decreasing trend is shown with regard to divorced graduates ($B = 1.14$ N, 0.70 C, 0.54 S), with holding a 3-year degree ($B = 0.26$ N, 0.34 C, 0.21 S) exerting a positive influence. If the attention is focused on negative coefficients, the probabilities of employment for females become even lower for graduates living in the Centre and South ($B = -0.13$ and -0.22) compared to the North ($B = -0.37$). Another interesting outcome concerns progeny; only graduates residing in the Central and Southern regions of Italy had lower working probabilities in 2010 if they did not have children ($B = -0.16$ and -0.13).

The covariate measuring a change in the region of residence is positive only for graduates who were living in the South in 2010, implying a greater mobility for employment – related motives. Graduates who changed their residence between the time of university attendance (before 2007) and 2010 are more likely to be employed in the South ($B = 0.25$) and less likely to live in the North ($B = -0.25$) or Centre ($B = -0.29$).

The Wald classifications for Italian macro-areas Models present some remarkable heterogeneity. For graduates living in Northern Italy, the most important variables influencing employment in 2010 are as follows: work experience gained ($W = 113.84, +$), being married ($W = 82.05, +$), having a Law degree ($W = 80.99, -$) or an Architecture/Engineering degree ($W = 60.65, +$) and, finally, the age at time of graduation ($30+, W = 52.03, +$). For graduates residing in both the Centre and the South, two most influential variables are work experience ($W = 188.28, +, C; W = 314.05, +, S$) and the covariate of being older than 30 years old at the time of graduation ($W = 70.42, +, C; W = 203.12, +, S$). The third and the fourth most influential variables are

Table 1
Italy. Results of the binary logistic regression. Dependent variable: working three years after graduation by graduates' region of residence in 2010

Variables	1			2			3			4						
	working in 2010			working in 2010 (North)			working in 2010 (Centre)			working in 2010 (South)						
	B	Wald	Exp (B)	Sig.	B	Wald	Exp (B)	Sig.	B	Wald	Exp (B)	Sig.				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
(Male)																
Female	-0.26	94.89	0.77	***	-0.13	9.12	0.88	***	-0.22	13.96	0.80	***	-0.37	73.41	0.69	***
(21-24)																
25-29	0.08	5.57	1.08	***	-0.11	3.89	0.90	**	0.15	4.14	1.16	***	0.30	32.27	1.35	***
30 +	0.86	302.79	2.37	***	0.62	52.03	1.86	***	0.90	70.42	2.46	***	1.05	203.12	2.85	***
(Scientific)																
Socio-economics	0.41	67.31	1.50	***	0.51	37.40	1.66	***	0.73	40.20	2.07	***	0.23	9.22	1.26	***
Politics	-0.06	1.23	0.94		-0.07	0.67		0.93	0.15	1.49	1.17		-0.10	1.54	0.90	
Humanities	-0.56	102.68	0.57	***	-0.81	80.99	0.45	***	-0.32	5.84	0.73	***	-0.39	21.41	0.67	***
Law	0.53	102.94	1.70	***	0.68	60.65	1.97	***	0.88	52.38	2.42	***	0.30	13.43	1.34	***
Arch/eng	-0.22	19.75	0.81	***	-0.39	25.39	0.68	***	-0.05	0.23	0.95		-0.02	0.08	0.98	
Medicine																
(No work experience)																
Work experience	0.66	610.46	1.93	***	0.47	113.84	1.59	***	0.80	188.28	2.22	***	0.75	314.05	2.11	***
(Single)																
Married/partnered	0.49	192.85	1.63	***	0.48	82.05	1.62	***	0.47	40.26	1.61	***	0.47	60.02	1.60	***
Other (divorced, widowed)	0.75	32.03	2.12	***	1.14	18.70	3.12	***	0.70	6.76	2.02	***	0.54	8.04	1.72	***
(With children)																
Without children	-0.08	2.53	0.92		0.06	0.44	1.06		-0.16	2.18	0.85	**	-0.13	2.79	0.87	**
(North)																
Centre	-0.47	190.56	0.62	***												
South	-0.90	953.40	0.41	***												
(Not changing residence)																
Changing residence	-0.09	7.30	0.91	***	-0.25	21.39	0.78	***	-0.29	17.18	0.75	***	0.25	17.57	1.29	***

cont. table 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
(No Degree satisfaction) Degree satisfaction	0.15	27.44	1.17	***	0.08	2.54	1.08		0.12	3.33	1.12	***	0.21	21.49	1.23	***
(No post-graduate degree) With post-graduate degree	0.39	109.37	1.48	**	0.39	31.67	1.47	***	0.53	42.89	1.70	***	0.35	40.56	1.41	***
(+3 year Degree) Bachelor's degree (3 years)	0.24	59.78	1.28	***	0.26	24.82	1.30	***	0.34	24.15	1.41	***	0.21	17.81	1.23	***
Constant	0.42	26.02	1.53	***	0.56	17.97	1.76	***	-0.35	3.69	0.70	***	-0.59	22.01	0.55	***
N			33,696				14,638				7,171				11,887	
Log likelihood			37,453.18				14,650.2				7,833.4				14,421.2	
R-squared Nagelkerke			0.17				0.11				0.18				0.18	

Source: The authors' own elaboration, University Graduates' Vocational Integration Survey, 2011.

diverse, including having an Architecture/Engineering degree ($W = 60.65, +$) and a post-graduate specialisation ($W = 60.65, +$) for graduates living in the Central Region and being a woman ($W = 73.41, -$) and being married ($W = 60.02, +$) for the graduates living in the South.

Conclusion

The present study was designed to determine the effect of several independent variables on the employment probabilities of a cohort (2007) of Italian graduates three years after obtaining a degree. The findings indicate that the most relevant variable that determines graduates' employment is their region of residence in 2010, followed by their work experience gained in the labour market during undergraduate studies and their age group at time of degree achievement.

The statistical analysis of the main employment determinants for university graduates in Italy three years after graduation has revealed the positive and negative impacts of several covariates. Continuous work experience during undergraduate studies, further postgraduate studies, older graduation ages and being married or divorced are characteristics that increase the probability of being employed vs. unemployed three years after graduation.

Conversely, living in the South or Centre of Italy in 2010, being a woman and having studied Law or Medicine decrease this probability.

The results confirmed the existence of significant differences in graduates' employment among Italian macro-areas. Graduates who were employed in the South in 2010 have shown a strong marked profile that is unfavorable to women and is distinguished by the oldest graduates at the time of graduation and in post-graduation pursuits.

Finally, this research was limited in several ways. First, this paper used a convenience sample restricted to the short-run employment outcomes of 2007 graduates cohort in Italy. Even if the dataset were nationally representative, the findings might not be transferable to other cohorts of graduates.

This research highlighted many questions that are in need of further investigation.

Future studies should be conducted to establish how employment probabilities are affected by the role of work experience accumulated in the labour market while studying and whether working skills become more or less relevant for individuals who graduated when older (30+). In addition, future research should concentrate on the investigation of the role played by the Italian University System, considering the quality and geographical position of universities according to data collected with regard their graduates.

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**MACROECONOMIC CONDITIONS DETERMINING
THE LEVEL AND THE RATE OF CHANGES OF WAGES
AND SALARIES IN POLAND IN 2007–2012**

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Key words: wages, kind of wages, determinants of wages.

Abstract

This study characterized and evaluated the level and rate of change in wages and salaries in Poland in 2007–2012 and analysed the main macroeconomic determinants of their development. The analysis present changes to average wage, minimal wage and fair wage. Their level and rate of change are determined by macroeconomic factors, particularly economic growth processes, changes in productivity of labour, inflation rate and the situation on the labour market. A quite strong correlation can be observed between the rate of changes of the real GDP and the development of average nominal wages. Inflation processes affect the growth of nominal wages but they lead to a decrease in real wages. The growth of the unemployment rate affected the reduction of the growth rate of nominal wages.

**MAKROEKONOMICZNE UWARUNKOWANIA DYNAMIKI ZMIAN POZIOMU
WYNAGRODZEŃ W POLSCE W LATACH 2007–2012**

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Słowa kluczowe: wynagrodzenia, rodzaje wynagrodzeń, determinanty wynagrodzeń.

Abstrakt

Celem opracowania jest charakterystyka i ocena poziomu i dynamiki zmian wynagrodzeń w Polsce w latach 2007–2012 oraz ukazanie głównych, makroekonomicznych determinant ich kształtowania. Analizą objęto wynagrodzenia przeciętne, wynagrodzenia minimalne i tzw. wynagrodzenie godziwe. Do głównych czynników makroekonomicznych, determinujących zmiany poziomu tych wynagrodzeń, zaliczono: zmiany realnego PKB, zmiany wydajności pracy, procesy inflacji

i zmiany sytuacji na rynku pracy. Wyniki przeprowadzonych badań pozwoliły stwierdzić, że zmniejszenie dynamiki wzrostu wynagrodzeń nominalnych w ostatnich latach wynikało zwłaszcza z osłabienia dynamiki wzrostu PKB, wzrostu stopy bezrobocia i osłabienia dynamiki wzrostu wydajności pracy, procesy inflacyjne zaś przyczyniły się do spadku wynagrodzenia realnego i wzrostu rozbieżności między nim a wynagrodzeniem nominalnym.

Introduction

This study characterized and evaluated the level and rate of change in wages and salaries in Poland in 2007–2012 and analysed the main macroeconomic determinants of their development. Attainment of this objective is related to the important functions fulfilled by wages and salaries in each economic system. They determine the level of satisfaction of social needs. From the perspective of social and economic development, they constitute an important incentive factor and are a key element of the business costs of enterprises. These costs, in turn, affect the employment rate and, consequently, the situation on the labour market.

Remuneration involves complex, multi-aspect social and economic categories as well as legal and ethic aspects. Its level and rate of change on the scale of the economic system are determined by macroeconomic factors, particularly economic growth processes, changes in social productivity of labour, inflation rate and the situation on the labour market. The analysis of these determinants is aimed at evaluating their influence on the development of wages and salaries and the trends of these changes.

Nature, features and functions of remuneration

Remuneration is a complex category, examined not only in its economic aspects, but also in social, legal and ethical aspects. These aspects are emphasized in various definitions of remuneration in economic literature, legal regulations, international documents and treaties and in the statistics. Let us take a look at some of them.

According to the Convention of the International Labour Organisation No. 95, ratified by Poland on 1 July 1949, concerning the protection of wages, „wages means remuneration or earnings, however designated or calculated, capable of being expressed in terms of money and fixed by mutual agreement or by national laws or regulations, which are payable in virtue of a written or unwritten contract of employment by an employer to an employed person for work done or to be done or for services rendered or to be rendered”. On the other hand, Convention No. 100 emphasizes the need of equal remuneration

for men and women workers for work of equal value (*Konwencje i zalecenia Międzynarodowej Organizacji Pracy* 1996, pp. 400–411). In turn, in the Treaty Establishing the European Community of 1967, „pay means the ordinary basic or minimum wage or salary and any other consideration, whether in cash or in kind, which the worker receives directly or indirectly, in respect of his employment, from his employer” (*Traktat...* 2006, art. 141, point 2).

In 1993, the International Conference of Labour Statisticians defined remuneration as payments in cash and in kind paid to employees, as a rule at regular intervals, for time worked or work done together with remuneration for time not worked, such as for annual vacation, other paid leave or holidays. Earnings exclude employers’ „contributions that their employees paid to social security and pension schemes and also the benefits received by employees under these schemes. Earnings also exclude severance and termination pay” (KARASZEWSKA 2003, p. 20). This definition differs, as far as remuneration components are concerned, from the definition used in the statistics of the Central Statistical Office. Although the general definition is identical, since „wages and salaries include monetary payments as well as the value of benefits in kind or their equivalents due to employees for work performed” (*Rocznik Statystyczny Rzeczypospolitej Polskiej* 2011, p. 250), but the components of personal remuneration cover various types of bonuses and allowances or compensation benefits.

A broad definition of remuneration, described as payment for work performed in a position of subordination for the employer, is used in research by S. BORKOWSKA (2012, pp. 13, 14, 23). The author distinguishes remuneration in cash and additional benefits. Remuneration in cash includes a regular salary, which covers: basic pay, regular bonuses to the basic pay (e.g. seniority allowance) and remuneration for time not worked. Another element of remuneration in cash is variable pay, including short-time incentives (e.g. bonuses, awards, commissions) and long-term incentives (e.g. a share in profit). Additional benefits can be of a financial nature (e.g. severance payments, service anniversary awards, allowances), but they also include in-kind bonuses (e.g. health care, recreation or training benefits). Therefore, this definition corresponds to the concept and the method for calculating remuneration applied in statistical analyses of the Central Statistical Office as far as payments and in-kind benefits are concerned.

The basic legal act in Poland regulating conditions and principles of remuneration for work is the Labour Code (Dz.U. 1998). Due to the fact that the regulations of the labour law do not provide a uniform definition of remuneration for work, the Supreme Court ruled that this is an obligatory benefit, paid by the employer to an employee at least once a month for the time of work on a specified time basis, with an asset-increasing nature, established

according to the type, amount and quality of the work performed (SEKUŁA 2011, p. 22). An important principle set forth in the Labour Code is observation of equal rights for equal fulfilment of the same duties. This refers, in particular, to equal treatment of men and women in employment and remuneration, but also prohibition of any of signs of discrimination. Principles of remuneration, i.e. its amount, remuneration rates for work of a specific type or at a specific position, and other additional components of pay can be included in the collective bargaining agreements or in the remuneration regulations (if the employer hires at least 20 employees) or in the employment contract (if the employer hires less than 20 employees).

The definitions presented above highlight certain common features of remuneration, which include:

- an obligatory nature, meaning the employer's obligation to pay remuneration to the employee for work performed;
- an individual (i.e. personal) character of remuneration, which emphasizes the unquestionable right of every employee to receive remuneration, the impossibility of relinquishing it or transferring the right to remuneration to another person;
- an asset-increasing nature, indicating the role of remuneration in developing a proper level of income and satisfying the current and future needs of the employee;
- equivalence, which means that remuneration must correspond, in particular, to the type of the work performed, qualification required for its performance and must take into consideration the quality of the work performed;
- non-discriminatory character, meaning equal treatment of each employee in remuneration for work of equal value;
- reciprocity, understood as the employee's obligation to perform work of a specific type for an employer, under his supervision, in the place and time determined by the employer, enabling the achievement of the objectives of the enterprise.

The above list should be extended by two more features, namely:

- legitimisation of a minimum wage as a basis to establish higher rates of remuneration;
- fairness, meaning remuneration ensuring a fair standard of life for the employee and his family.

The nature of remuneration determines their functions, of which the most frequently mentioned in the economic literature include: income, motivation, social, cost and market functions (BORKOWSKA 2012, p. 26).

The income function of remuneration is analysed from the perspective of an employee, for whom it is usually the main source of income. The amount of

remuneration determines the level of satisfying the needs of the employee and his family. Therefore, he will strive for increasing his remuneration, to ensure a higher standard of life and development of his own personality. The significance of the income function is demonstrated in ensuring a fair wage, and its main measure is the real level of remuneration. According to the idea of performance-dependent pay, fair remuneration for work contributes to improvement of the performance of the enterprise, allows employers to maintain valuable employees and prevents unreliable delivery of their duties (KWIATKOWSKI 2002, p. 183).

The incentive function of remuneration is the basis for differentiating wages in view of the type, amount and quality of work and labour productivity of the employee. It specifies the place of the employee in the staff hierarchy, makes it possible to develop desired attitudes and behaviours and realize the current and strategic aims of the organisation. The nature of the incentive function of remuneration is reflected in prompting the employees to improve their qualifications, undertake increasingly more complex tasks, or change their profession. This means that wages should demonstrate a positive correlation with the value of work (SEKUŁA 2003, pp. 26, 27). They should be fairly developed and differentiated, according to clearly specified rules.

The social function of remuneration reflects its social aspect. It shows that the level of pay determines the social status, prestige and recognition for a specific profession. Satisfaction of the social function requires establishing and protecting the minimum level of remuneration to prevent impoverishment of employees, reduce excessive differentiation of wages and solve social conflicts in this respect (SEKUŁA 2003, p. 30).

The cost function indicates that remuneration is a significant component of costs of the business activity of the enterprise, and therefore it affects the prices of produced goods and services. Thus, the employer will strive to maintain labour costs at the minimum level, in view of strengthening the competitive position of the company. The cost function can be seen in searching for appropriate relations between labour costs and its productivity. In order to minimize the unit labour cost, while establishing the level of remuneration, the rule that should be observed is that the growth of pay cannot precede an increase in labour productivity (BORKOWSKA 2001, p. 16).

According to the market function of remuneration, the amount of pay depends on the rarity or the surplus of labour supply in the labour market in relation to the demand of the employers. Unsatisfactory supply of specific employees in relation to the demand results in increased remuneration for work.

The literature also indicates other functions of wages and salaries. An example can be a participatory function, demonstrating the participation of

employees in the management of the company, or a political function, related to making decisions at the macroeconomic level concerning admissible growth of pay, the amount of minimum wage, and regulation of wages and salaries in the public sector (SEKUŁA 2003, p. 26).

Z. JACUKOWICZ (2010, pp 33–37) broadens the catalogue of functions of wages and salaries from the perspective of their relations to various disciplines of knowledge. In addition to social and economic functions, he also distinguishes: organisational, ethical, physiological and legal functions. The organisational function emphasizes those methods of work organisation that enable fair remuneration. The ethical function of remuneration indicates the need to apply fair wages and ethics in business, reflected in the manner of treating employees, as well as observing the rules of remuneration, such as timeliness of payments and other benefits in the established amounts. The physiological function denotes an appropriate relation between time and conditions of work with remuneration, e.g. work in hazardous and harmful conditions should be appropriately rewarded. A legal function indicates that regulations of the labour law form the basis for the remuneration system, providing the employees with a sense of security.

It should be noted that functions of remuneration are closely related, although some conflicts may occur between them, e.g. between income and cost functions, or between income and incentive functions due to a limited nature of financial means.

Trends of changes in the average nominal gross wages and salaries in Poland in 2007–2012.

Minimum wage vs. fair wage

The average monthly gross wage paid per employee is one of the basic measures and reference points in research on remuneration relations. It is defined as the ratio of the sum of all earnings for the work performed (e.g. personal gross wages and salaries, share in profits, royalties) to the average number of persons employed at a given time. The level and tendencies of changes in those wages and salaries in Poland are presented in Table 1.

On the basis of data presented in Table 1, it can be claimed that average nominal wages and salaries demonstrated a growing trend in the years under examination. In a 6-year period, they grew by PLN 849.09 (31.5%). Their development was varied. In the period of good economic conditions of 2007–2008, the average gross wages and salaries grew by 8–10%. Deterioration of market conditions as a result of the financial crisis contributed to a reduc-

Table 1
Level and changes in the average monthly nominal gross wages and salaries in Poland in 2007–2012

Year	Average monthly gross wages and salaries in PLN	Indices of changes previous year = 100
2007	2,672.58	107.9 ^a
2008	2,942.17	110.1
2009	3,101.74	105.4
2010	3,224.13	103.9
2011	3,403.51	105.6
2012	3,521.67	103.5

^a In 2006, the average monthly gross remuneration was PLN 2,475.88.

Source: *Rocznik Statystyczny Rzeczypospolitej Polskiej 2008*, p. 258; 2011, p. 252; *Mały Rocznik Statystyczny Polski 2012*, p. 176, GUS, Warsaw, http://stat.gov.pl/gus/5848_1630_PLK-HTML.htm [accessed on: 27.06.2013], own calculations.

tion in the rate of remuneration growth, which ranged from 3–5%. The lowest growth was recorded in 2012, by 3.5% in relation to the previous year.

As result from the available statistical data, in October 2010, 57.1% of employed persons received wages and salaries below the average remuneration (PLN 3,224.13), of which 8.6% received very low pay. Wages above the average level were received by 42.9% of employees, while 8% employed persons received pay twice as high as the average (between PLN 6,378.31 and 9,921.81 and more) (*Rocznik Statystyczny RP*, 2011, pp. 256–257)¹.

The research of the Central Statistical Office of 2013 (KUROWSKI 2013, pp. 34–36) concerning the minimum living wage, shows the strengthening of the extent of extreme poverty in Poland under conditions of the economic slowdown. The minimum living wage, also referred to as the biological minimum, defines the lowest standard of life, i.e. a lower limit of poverty, below which a biological risk to human life and psychophysical development emerges. For a single person at productive age, the living wage in 2012 (annual mean) was PLN 521.11. In 2011–2012, the share of persons at risk of extreme poverty was 6.7%. In 2008–2010, the percentage of those persons was lower, amounting to 5.6–5.7%. Extreme poverty is particularly high in households with unemployed persons (32.9%) and in families with children (27% families with four and more children). The social support offered to those persons is based on the income threshold criterion in a given year. In 2012, this limit was PLN 542 for a single person, and PLN 456 for a person living in a family. But the estimated living wage for households of three and five persons exceeded the income threshold qualifying for social support.

¹ The data concern full-time and part time employees, and include entities employing more than nine persons.

A close relationship exists between the average wage and the minimum wage. An increase in the minimum wage may increase the average wage, but a growth of the average wage can also contribute to the growth of the minimum wage. The minimum wage is the lowest legally-regulated remuneration for full-time work performed within the employment relationship, which is to satisfy basic needs of employees and their families (GOLNAU 2007, p. 16). The establishment of the minimum wage provides a basis for establishing higher rates for work requiring higher qualifications and more responsibility, i.e. a vertical range of wages and salaries (JACUKOWICZ 2007, pp. 15–16). In Poland, pursuant to the Constitution of the Republic of Poland (Art. 65.4), a minimum level of remuneration for work, or the manner of setting its levels should be specified by statute. The Minimum Wages Act of 10 October 2002 (Dz.U. of 2002, No. 200, item 1679) provides such a legal basis. Pursuant to this Act, every year, the amount of the minimum level of remuneration for work is a subject of negotiation in the Tripartite Commission, comprising representatives of the government, employers and trade unions. This level is uniform for the entire country, and the amount of pay is indexed every year, at least to the level equal to the anticipated increase of consumer price indices.

The data concerning the amount of the minimum wage and its changes are presented in Table 2.

Table 2

Level and changes to the minimum nominal wage in Poland in 2007–2012

Year	Minimum monthly wage in PLN	Changes to the minimum wage previous year = 100	The minimum-to-average wage ratio
2007	934	103.9 ^a	0.35
2008	1,126	120.6	0.38
2009	1,276	113.3	0.41
2010	1,317	103.2	0.41
2011	1,386	105.2	0.41
2012	1,500	108.2	0.43

^a In 2006 the minimum wage was PLN 899 a month.

Source: Own study based on: *Wynagrodzenia w Polsce według GUS – płaca minimalna*, http://www.wynagrodzenia.pl/gus_płaca_minimalna.php [accessed on: 27.06.2013].

As results from the data presented in Table 2, the minimum nominal wage in Poland demonstrated a growing trend in the examined years, growing over six years by PLN 564 (60.6%). Its highest increase occurred in 2008 (by 20%), causing the highest growth of the average wage by 10%. The lowest increase of the minimum remuneration took place in 2010, only by 3.2%, causing a growth

in the average wage by 3.9%. In 2010–2011, growth indices for minimum and average wages were similar. In 2012, the minimum wage increased by 8%, while the average wage grew only by 3.5%. Although increases in the minimum wage are determined, to a high extent, by the inflation rate, what is also important is the aspect of the living standard it ensures, since it is the main source of income for some households.

While analysing the level of the minimum wage, it is compared to the average wage and the minimum subsistence level, reflecting the necessary costs of maintaining a family. As results from a comparison of both wages, in 2007–2008, the minimum wage made 35–38% of the average wage. In 2009–2011, this relation remained at a steady level of 41%. In 2012, the minimum wage accounted for 43% of the average wage. According to the recommendations of the International Labour Organisation, the minimum wage should constitute 50% of the average wage. To reach the target value, the minimum wage in 2012 would have to grow to the level of PLN 1,761, i.e. by PLN 261. Although the minimum wage in 2013 is, in fact, PLN 1,600, since the average wage has also grown, it can be assumed that the 50% relation between the wages has not been reached.

The amount of the minimum wage raises numerous controversies. Supporters of this remuneration emphasize that it prevents reduction of wages by entrepreneurs and abusing persons with the lowest qualifications. Opponents of the minimum wage claim that it hinders entrepreneurship and leads to a growth of unemployment, increases social inequalities and dimensions of poverty and is contrary to free market principles (SEKUŁA 2003, pp. 27, 28, GOLNAU 2007, p. 69). Therefore, postulates emerge claiming that the amount of the minimum wage should be regionally differentiated and it should take into account the conditions of the labour market, as well as maintenance conditions and costs (KASPROWICZ 2013, p. 16).

While comparing the minimum wage with the minimum subsistence level, i.e. the index measuring costs of household maintenance under price and market conditions on the basis of mean annual data of 2012, it can be observed that the value of the minimum subsistence level for a single person was PLN 1,026.94, i.e. it was lower than the minimum wage by PLN 473.06, making 68.5% of this wage. For two adults in the employee household, the subsistence level was assessed at the level of PLN 1,698.42, i.e. it exceeded the minimum wage. However, for multiple-person households, the minimum subsistence level was still higher than the minimum wage, e.g. in a 5-person household (two adults and three children), it reached the amount of PLN 4,103.92 (KUROWSKI 2013, pp. 31–34). With the assumption that two persons are employed and receive a minimum wage of PLN 3,000, a problem arises with meeting the needs of such a family.

The basis for evaluating the level of the minimum wage in the Polish economy is its comparison to minimum wages of 20 other member states of the European Union, where they are established by statute. In seven states, the minimum wages are not established by law. These countries include: Germany, Austria, Denmark, Cyprus, Finland, Sweden and Italy. The minimum wages in some of those countries are varied according to professions and business sectors (Cyprus, Italy), or established by employers, who take into consideration regulations set forth in collective bargaining agreements and postulates of trade unions (Germany, Austria, Scandinavian countries).

Table 3
Minimum wages in selected countries of the European Union in: 2008, 2011, 2012 (in EUR)

Country	2008	2011	2012
Luxemburg	1,570	1,758	1,801
Ireland	1,462	1,462	1,462
Netherlands	1,335	1,424	1,446
Belgium	1,310	1,415	1,444
France	1,280	1,365	1,398
United Kingdom	1,242	1,136	1,202
Greece	794	863	877
Slovenia	539	748	763
Spain	700	748	748
Malta	617	665	680
Portugal	497	566	566
Poland	313	349	336
Slovakia	241	317	327
Czech Republic	300	319	310
Hungary	272	281	296
Estonia	278	278	290
Latvia	230	282	286
Lithuania	232	232	232
Romania	139	157	162
Bulgaria	112	123	138

Source: Eurostat, Minimum wages, <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00155&plugin=1> [accessed on: 26.02.2013]

According to the data provided in Table 3, in the years under analysis, Poland (with a minimum wage of EUR 336 in 2012) was ranked the 12th among 20 EU member states. This represents a five-fold lower minimum wage than the highest pay in Luxemburg. The lowest level of minimum wages occurred in

Bulgaria and Romania. These were the only EU countries in which the amount of the minimum wage did not reach EUR 200 in the years under analysis. The highest minimum wages (above EUR 1,000) were effective in developed EU states, such as Luxemburg, Ireland, Netherlands, Belgium, France and the United Kingdom.

While examining the development of minimum wages in 2008–2012, it should be emphasized that they increased in comparison to 2008 in almost all EU states. The only exceptions are Ireland and Lithuania, in which the minimum wage remained at the same level in the years under examination, and the United Kingdom, where its level decreased by 3.2%. The lowest growth rate of the minimum wage was observed in the Czech Republic, amounting only to 3.3%. The highest growth of this wage, reaching 41.6%, could be observed in Slovenia and was relatively high in such states as: Luxemburg (by 14.7%), France (by 9.2%) and Slovakia (by 35.7%). Against the background of other member states, Poland in 2012 was ranked the 14th in terms of the dynamics of the minimal wage growth, which amounted to 7.3% in relation to 2008. In Bulgaria, the minimum wage increased by 23.2%, and in Romania it increased by 16.5% in the analysed years, although, as it is known, the ranking of those countries did not improve.

An important feature of the remuneration, namely its fair nature, is worth analysing. The right to fair (sufficient and satisfactory) remuneration was established in 1948 in the Universal Declaration of Human Rights. On the European level, the notion of fair remuneration can be found in the European Social Charter, a document of the Council of Europe, which was adopted on 18 October 1961. In 2001, in Poland, the Constitutional Tribunal, on the basis of the Constitution of the Republic of Poland, ruled that remuneration cannot be agreed upon only on the basis of market principles, or through negotiation between the employer and the employee. It is necessary that the work should be fairly paid (SEKUŁA 2011, pp. 42, 43). The right of the employee to fair remuneration for work is included in the Labour Code (Art. 13).

Due to difficulties with the interpretation of the fair remuneration, the Committee of Independent Experts (appointed by the Council of Europe) formulated its own definition: Fair pay must ensure satisfaction of all economic, social and cultural needs of employees and their families, adequately to the degree of social and economic development of the country where they live. This is remuneration received by the most numerous group of employees in a given country at a given time. The right to a fair remuneration is vested in persons employed on the basis of an employment contract and it does not apply to self-employed persons. In addition, methods of estimating the level of fair remuneration have been specified, namely, assuming that:

- it amounts to 68% of the gross average wage,
- 66% of the national income to be divided per capita.

Data for Poland, concerning fair remuneration are presented in Table 4.

Table 4

Fair remuneration as 68% of the average gross monthly wages and salaries in Poland in 2007–2012, in PLN

Year	Average gross monthly wages and salaries (1)	Fair remuneration (2)	Difference (1–2)
2007	2,672.58	1,817.35	855.23
2008	2,942.17	2,000.67	941.50
2009	3,101.74	2,109.18	992.56
2010	3,224.13	2,192.41	1,031.72
2011	3,403.51	2,314.38	1,089.13
2012	3,521.67	2,394.74	1,126.93

Source: Own calculations on the basis of Table 1.

Assuming 68% of the average gross wage as the basis for fair remuneration, it can be claimed that the amount of income ensuring a fair standard of life significantly exceeds the level of the minimum wage between PLN 800 and PLN 900, e.g. in 2012 it was PLN 894.74.

The average monthly gross wages and salaries vary across voivodships. This situation is presented in Table 5.

While analysing the data for 2008, voivodships with pay above the average level for Poland can be indicated, amounting to over PLN 3,000. These are: Mazowieckie (with the highest remuneration over PLN 4,000), Śląskie, Pomorskie, Dolnośląskie and Małopolskie, with activities concentrated in the developed sector of services and industry. Remunerations ranging from PLN 2800 to PLN 3000, close to the average value for Poland, were recorded the following voivodships: Zachodniopomorskie, Wielkopolskie, Lubelskie, Łódzkie, Podlaskie and Świętokrzyskie. In other voivodships: Kujawsko-Pomorskie, Lubuskie, Podkarpackie, Warmińsko-Mazurskie, average remunerations varied from PLN 2,600 to PLN 2,700 a month.

Over five years, a growth in wages in all voivodships was observed. The highest growth occurred in Łódź Province, by 19.2%, corresponding to the growth of the average remuneration for Poland, related to diversification and modernization of the business structure. A relatively high growth of the average remuneration, ranging from 16% to 17%, concerned the following voivodships: Lubelskie, Podkarpackie and Warmińsko-Mazurskie, classified as economically poorer regions. It should be emphasized that in 2012, in all

Table 5
Average monthly wages and salaries in Poland per voivodships in 2008 and 2012

Voivodships	Average gross monthly wages and salaries		Indices of changes	
	2008 (1)	2012 (2)	in PLN (2-1)	in % (2:1)
Dolnośląskie	3,225	3,634	+409	12.7
Kujawsko-Pomorskie	2,761	3,159	+398	14.4
Lubelskie	2,825	3,323	+498	17.6
Lubuskie	2,748	3,142	+394	14.3
Łódzkie	2,822	3,363	+541	19.2
Małopolskie	3,020	3,498	+478	15.8
Mazowieckie	4,105	4,721	+616	15.0
Opolskie	2,978	3,349	+371	12.5
Podkarpackie	2,680	3,117	+437	16.3
Podlaskie	2,853	3,259	+406	14.2
Pomorskie	3,278	3,692	+414	12.6
Śląskie	3,347	3,830	+483	14.4
Świętokrzyskie	2,823	3,239	+416	14.7
Warmińsko-Mazurskie	2,692	3,123	+431	16.0
Wielkopolskie	2,976	3,424	+448	15.1
Zachodniopomorskie	2,974	3,352	+378	12.7
Total	2,942	3,522	+548	12.7

Source: *Roczniki Statystyczne Województw*, Central Statistical Office, Warsaw, years 2009 and 2012 <http://stat.gov.pl/gus/> [accessed on: 27.06.2013].

voivodships, the average gross remuneration exceeded PLN 3,100. The lowest wages were still observed in the same voivodships as in 2008.

It should be noted that differences between the highest and the lowest gross remuneration increased across the voivodships. In 2008, this difference was PLN 1,425, increasing to PLN 1,604 in 2012. Diversification of wages and salaries results from differences in the social and economic structure of voivodships, e.g. agricultural regions are characterised by a lower level of wages (e.g. Warmia and Mazury), while voivodships with modern industry and services sections, with a large concentration of business activity, have relatively higher wages.

An increase in average remuneration on the scale of the entire country means that the fair remuneration also increases. In individual voivodships, the fair remuneration is varied in relation to differences in the level of average remuneration. Its value was usually lower than the average value by PLN 1,000–1,200, only in the case of the Masovia by PLN 1,511. On the other hand, the fair income in each voivodship was higher than the minimum wage effective in Poland, which in 2012 amounted to PLN 1,500.

Table 6

Fair income as 68% of the monthly gross remuneration in the voivodships of Poland in 2012

Voivodships	Average gross monthly wages and salaries	Fair income (in PLN)
Poland	3,521.67	2,394.74
Dolnośląskie	3,634	2,471.12
Kujawsko-Pomorskie	3,159	2,148.12
Lubelskie	3,323	2,259.64
Lubuskie	3,142	2,136.56
Łódzkie	3,363	2,286.84
Małopolskie	3,498	2,378.64
Mazowieckie	4,721	3,210.28
Opolskie	3,349	2,277.32
Podkarpackie	3,117	2,119.56
Podlaskie	3,259	2,216.12
Pomorskie	3,692	2,510.56
Śląskie	3,830	2,604.40
Świętokrzyskie	3,239	2,202.52
Warmińsko-Mazurskie	3,123	2,123.64
Wielkopolskie	3,424	2,328.32
Zachodniopomorskie	3,352	2,279.36

Source: Own study on the basis of data in Table 5.

Macroeconomic determinants of changes in the level of wages and salaries in Poland

The basic factors determining fluctuations in wages and salaries include: rate of change of the gross domestic product (GDP), labour productivity, inflation rate and changes in the situation in the labour market.

Let us analyse now the relations between changes of GDP and the average gross nominal remuneration in Poland in 2007–2012.

Table 7

Changes in the average monthly gross wages and salaries vs. changes in GDP in Poland in 2007–2012 (previous year = 100)

Specification	2007	2008	2009	2010	2011	2012
Changes of remuneration – gross nominal	107.9	110.1	105.4	103.9	105.4	103.6
Changes of GDP at constant prices	106.8	105.1	101.6	103.9	104.3	103.1

Source: *Mały Rocznik Statystyczny Polski 2012*, GUS, Warsaw, p. 476 and p. 179 and as in Table 1.

Gross domestic product is the basic measure of business activity, reflecting the value of goods and final products produced in the economic system in a given year. Its fluctuations reflect changes in the business situation. Data provided in Table 7 prove the existence of a close correlation between the examined variables. In years of good economic results (2007–2008), when the GDP grew by 6.8%, the remuneration increased by almost 8%. A year later, a slightly lower growth of GDP (5%) resulted in the highest remuneration in the examined period (an increase in the nominal remuneration by 10%) which also resulted, as we recall, from an increase in the minimum wage. The financial crisis observed in 2009 in the form of a large decrease in GDP growth to 1.6%, also resulted in weakening the growth of the average remuneration to 5.4%. A higher rate of GDP growth in 2010–2012 (between 3% and 4% a year) brought about an increase in wages at the same, or at a similar, rate.

To justify the relations presented above, GDP per capita will be compared to the average net remuneration. GDP per capita is one of the most popular measures of economic well-being (level of the standard of living). Those relationships are presented in Figure 1.

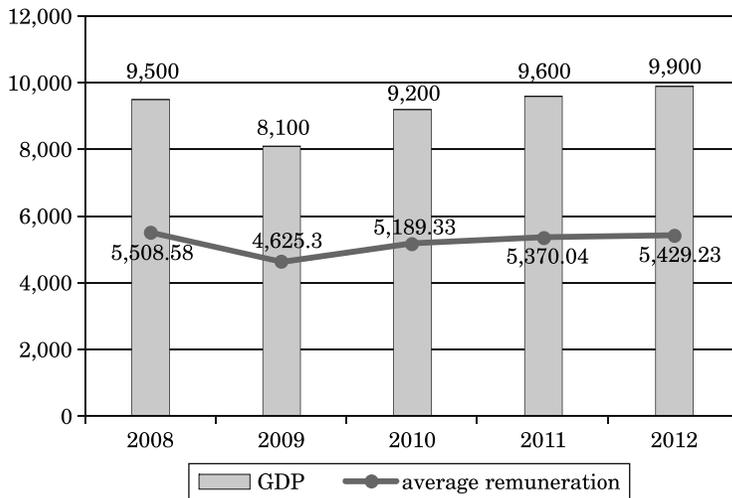


Fig. 1. GDP per capita and the average remuneration in Poland in 2008–2012, in euro
 Source: Own study on the basis of Eurostat: GDP per capita – annual data <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do> [accessed on: 19.06.2013] and annual net earnings, http://appsso.eurostat.ec.europa.eu.nui/show.do?dataset=earn_nt_net&lang=en [accessed on 22.03.2013].

This graphical illustration supplemented with data confirms the strong relationship between GDP per capita and the level of wages. A decrease in GDP per capita by 14.7%, observed in 2009, resulted in a decrease in the nominal

wages by 12% compared to 2008. An increase in GDP per capita in 2010 by 13.6% contributed to an increase in remuneration by 12.2%. A slightly lower growth rate of GDP per capita in subsequent years (in 2011 by 4.3% and in 2012 by 3.1%) also resulted in a weaker growth of the average remuneration (by 3.5% and 1.1%, respectively). Therefore, the conclusion can be drawn that a higher standard of living and its growth is reflected in a higher growth rate of wages, and vice versa, a lower level of economic well-being is related to a lower level of remuneration.

It is worth remembering that 66% GDP per capita is also a measure of fair remuneration. In 2008–2012, its value in euro would amount to: 6,270, 5,346, 6,072, 6,336, and 6,534, respectively, i.e. it would be lower by about EUR 3,000 than the level of GDP per capita.

Another factor determining changes in wages salaries are changes in labour productivity. According to assumptions of neoclassical economics and the so-called „wage gap” concept, an increase in real wages is economically justified only when the labour productivity grows. This relation affects the amount of demand for labour. If real remuneration grows faster than labour productivity, then the number of workers will be reduced. On the other hand, an increase in the number of workers will take place at a lower growth of real wages in relation to labour productivity (BACKHOUSE 1991, pp. 124, 125).

Table 8
Changes in labour productivity and the average real gross monthly wages and salaries in Poland in 2007–2011 (previous year = 100)

Year	Real labour productivity ^a	Real gross wages and salaries	Real wages and salaries /labour productivity
2007	100.0	105.5	1.06
2008	102.8	105.9	1.03
2009	102.4	102.0	0.99
2010	105.9	101.4	0.96
2011	107.2	101.2	0.94

^a Calculated as a quotient of GDP at constant prices of 2007 and the number of workers in a given year

Source: Own calculations on the basis of *Kwartalna informacja o rynku pracy*, Central Statistical Office, Warsaw 2006, pp. 4, 6; *Kwartalna informacja o aktywności ekonomicznej ludności*, Central Statistical Office, Warsaw 2009, p. 4; 2011, p. 6; 2012, p. 1; *Mały Rocznik Statystyczny Polski 2008*, p. 473; 2012, p. 475, 478.

As results from the data presented in the table, in 2007–2008, real gross remunerations grew faster than labour productivity. A high rate of GDP growth, exceeding the growth rate of labour productivity, contributed to this effect. The relation of those values was higher than 1. Starting from 2009, the

growth rate of labour productivity was higher than the growth rate of real wages. The relation between those values was 0.9 and it should translate into the growth of demand for work. It should be emphasized that this relation complies with the recommendation of the European Commission that state governments should maintain a remuneration growth rate and labour productivity growth rate at the level of 0.9 (MÜLLER 2013, p. 19).

The development of remuneration policy is significantly affected by relations occurring between inflation and wages. Inflation processes illustrate changes in the consumer price index.

Table 9

Changes of nominal wages, consumer prices and real wages in Poland in 2007–2012,
previous year = 100

Specification	2007	2008	2009	2010	2011	2012
Changes in average monthly gross nominal wages and salaries	107.9	110.1	105.4	103.9	105.4	103.6
Consumer price index	102.3	104.0	103.3	102.5	104.1	103.7
Changes in average monthly gross real wages and salaries	105.5	105.9	102.0	101.4	101.2	99.9

Source: *Mały Rocznik Statystyczny Polski 2012, 2013*, Central Statistical Office, Warszawa, p. 179.

The data presented in Table 9 show a positive relation between the growth rate of the average monthly nominal gross remuneration and the consumer price index. In each of the examined years, inflation processes resulted in a growth of nominal wages, but at the same time, they caused a decrease in real wages and lowered their growth rate. In 2007–2008, the growth of nominal wages was significantly higher than the growth of the consumer price index, which also affected the growth of real wages by more than 5%. In 2009–2011, nominal wages grew more slowly, exceeding the growth of the price index by 1–2 percentage points. This decreased their purchasing power, which can be seen in the decrease of the growth rate of real income. In 2012, the growth of prices slightly exceeded the growth of nominal income, which contributed to a decrease in the real income by 0.1 percentage point. Therefore, it can be claimed that the higher inflation, the larger discrepancy between the nominal and the real remuneration.

The last of the macroeconomic factors affecting the level of remuneration is the situation in the labour market. Table 10 presents the data concerning this issue.

Table 10

Changes in employment, registered unemployment, registered employment rates, average nominal and real gross wages in 2007–2012

Specification	2007	2008	2009	2010	2011	2012
Change in employment (previous year = 100)	104.2	103.0	99.3	101.2	100.8	99.9
Change in unemployment (previous year = 100)	75.6	84.4	128.4	103.3	101.4	104.5
Registered unemployment rate in %	11.4	9.5	11.9	12.4	12.5	12.8
Change in nominal gross wages and salaries (previous year = 100)	107.9	110.1	105.4	103.9	105.4	103.6
Change in real gross wages and salaries (previous year = 100)	105.5	105.9	102.0	101.4	101.2	99.9

Source: *Kwartalna informacja o aktywności ekonomicznej ludności*, Central Statistical Office, Warsaw 2009, p. 4; 2011, p. 6; 2012, p. 1; 2013, p. 3; *Mały Rocznik Statystyczny Polski 2008*, p. 153; 2010, p. 155; 2012, p. 159; *Rocznik Statystyczny Rzeczypospolitej Polskiej 2011*, p. 235.

In 2007–2008, an improvement in the labour market, started in 2004, was continued. Downward trends of unemployment and unemployment rate were closely related to an increase in GDP and employment in the Polish economy. In this period, a quite significant growth of nominal and real wages was observed. Deterioration of the economic situation in 2009–2012 contributed to an increase in the number of unemployed persons. A particularly high growth, by 28.4%, occurred in 2009, in relation to a decrease in the rate of the GDP growth to 1.6% and employment growth by 0.7%. In subsequent years, the growth of the unemployment level was much weaker, particularly in 2011 only by 1.4%, and in 2010 and 2012 by 3–4.5%. Employment slightly increased by 1.2% and 0.8% in 2010–2011, and in 2012, it decreased by 0.1%. Basically, we can observe a stable level of employment in this period, which was related to the higher labour productivity of employees. On the other hand, growing trends in the unemployment rate were observed since 2009 – from 11.9% to 12.8% in 2012. A deterioration of the situation in the labour market was accompanied by a reduction of the growth rate of nominal wages. Therefore, higher unemployment weakens the pressure on the growth of wages.

Conclusions

An analysis of the level of average gross wages and salaries in Poland and their fluctuations shows that remunerations were characterized by a growing trend, although the rate of this growth was varied: relatively high (7.9–10%) in 2007–2008 and much weaker (3–5%) in 2009–2012, along with a deterioration in the economic situation.

The minimum wage demonstrated a growing trend and increased over the six years under analysis by PLN 564 (by 60.3%). In 2010–2011, the growth rates of minimum wages and average wages were similar. In 2012, the growth of the minimum wage was higher than the average wage, which was caused, to a great extent, by the inflation rate.

The proportion of the minimum wage to the average wage increased from 35% (2007) to 43% (2012). The target value of this relation of 50% was not achieved; the minimum wage would have to be higher by PLN 260 in 2012 and amount to PLN 1760.84.

The minimum wage in Poland is still relatively low, particularly in relation to EU-15 countries.

The level of income ensuring a fair standard of life, the so-called fair remuneration, was at a higher level than the minimum wage (by PLN 894.74 in 2012), and on a lower level than the average wage (by PLN 1,126.93 in 2012). Taking four persons in a household as a point of reference for the fair income (according to the definition) in 2012 it should amount to PLN 3,381.31 (PLN 845.33 per person), according to estimates of the minimum subsistence level.

The diversity of remuneration across provinces increased in the examined years, despite their growing trends. The difference between the highest and the lowest gross remuneration was PLN 1,425 in 2008 and in 2012 it grew to PLN 1,604.

It can be claimed that the income function of remuneration still has a dominating importance in the Polish economy, due to the relatively large share of low wages. However, the awareness of advantages in the form of higher remuneration in the future for a growing quality of human capital is increasing higher, which will strengthen the incentive function of remuneration.

A quite strong correlation can be observed between the rate of changes of the real GDP and the development of average nominal gross wages. In 2007–2008, a high rate of GDP growth caused a high growth of nominal wages. Deterioration of the growth dynamics of GDP in subsequent years resulted in a reduction of the growth rate of wages, while their increase was similar to the increase in GDP (except for 2009).

An economic justification for the growth of real wages is an increase in labour productivity, and the correlation between them should amount to about 0.9. Such a situation occurred in the Polish economy after 2009, when the growth rate of labour productivity was higher than the growth rate of real wages.

It should be noted that there is a relationship between the inflation rate and the development of nominal and real wages. Inflation processes affect the growth of nominal remuneration, but at the same time, they lead to a decrease in real wages and weakening of their growth rate. It can be observed that a higher level of inflation results in a higher discrepancy between the nominal and the real wages. This was particularly noticeable in 2011–2012.

While examining the correlation between the situation in the labour market and wages, the conclusion can be drawn that a higher unemployment rate weakens the pressure on the growth of wages. The growth of the unemployment rate observed in 2009–2012 affected the reduction of the growth rate of nominal wages at a quite stable level of employment.

Translated by JOANNA JENSEN

Accepted for print 31.12.2013

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IS THE MINIMUM WAGE DETRIMENTAL TO THE ECONOMY?

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Key words: minimum wage, unemployment, inflation, labour market.

Abstract

The minimum wage in Poland is relatively low. It amounts only 1,600 PLN in 2013. Therefore, it is no surprise that the trade unions have been making efforts to have it raised to the level of 50% of the average salary. However, this has been met with staunch resistance from employers. The liberal model of the economy, which dominates in Poland, favours employers. Moreover, the attitude of the government, politicians, the media, as well as many scientists towards this is not favourable.

These are the objections usually raised against the increase of minimum wage:

- raising the minimum wage entails unemployment growth;
- an increase in the minimum wage entails an increase in the average pay, with a consequent increase in the inflation rate;
- the amount of the minimum wage and its growth rate is frequently the basis for an index-linked pay increase in the budget institutions and some social benefits, which results in an increase in fixed budget spending, which is not justified economically;
- the minimum wage level, regarded by employers as too high, results in the practice of paying workers outside the official payroll, thereby extending the grey area;
- an increase in the minimum wage is a threat to businesses, especially to micro-enterprises, which operate on the brink of insolvency and may face bankruptcy;
- an increase in the minimum wage raises the cost of labour and makes businesses less competitive.

This paper, in its later part, provides arguments against the allegations. There is a one-sided view of the issue of the minimum wage in Poland. Wages are regarded exclusively as an element of the cost of labour and, as such, they should not increase as this is detrimental to entrepreneurs and to the economy. Such analyses disregard the social and economic (in a broad context) aspects of having a minimum wage.

CZY PŁACA MINIMALNA SZKODZI GOSPODARCE?

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Słowa kluczowe: płaca minimalna, bezrobocie, inflacja, rynek pracy.

Abstrakt

Płaca minimalna w Polsce jest relatywnie niska. W 2013 roku wynosiła zaledwie 1600 zł. Nie jest więc zaskoczeniem, że związki zawodowe od kilku lat zabiegają o jej podniesienie do 50% płacy przeciętnej. Napotykają jednak stanowczy opór rządu i pracodawców. Liberalny model polityki gospodarczej realizowany w Polsce wyraźnie sprzyja przedsiębiorcom. Nieprzychylna jest też postawa rządu, polityków, pracodawców, mediów, a także wielu naukowców wobec płacy minimalnej.

Przeciwnicy płacy minimalnej najczęściej wysuwają następujące zarzuty:

- podnoszenie płacy minimalnej przyczynia się do wzrostu bezrobocia;
- wzrost płacy minimalnej sprzyja wzrostowi przeciętnego wynagrodzenia w gospodarce, co z kolei wywołuje inflacyjną spiralę płacowo-cenową;
- wysokość płacy minimalnej i tempo jej wzrostu często stanowi podstawę do dokonywania waloryzacji płac w sferze budżetowej oraz niektórych świadczeń socjalnych, co prowadzi do nieuzasadnionego kryteriami ekonomicznymi zwiększania sztywnych wydatków budżetu państwa;
- poziom płacy minimalnej uznawany przez przedsiębiorców za zbyt wysoki prowadzi do upowszechnienia praktyki płacenia pracownikom „pod stołem” i pogłębia rozmiary szarej strefy;
- wzrost płacy minimalnej zagraża istnieniu przedsiębiorstw, zwłaszcza mikropodmiotów, które działają na granicy opłacalności i może prowadzić do ich bankructwa;
- wzrost płacy minimalnej podnosi koszty pracy i obniża konkurencyjność gospodarki.

W artykule na podstawie danych statystycznych i wyników badań podjęto polemikę z wymienionymi zarzutami. Autorzy uważają, że w Polsce dominuje jednostronne podejście do płacy minimalnej. Jest ona traktowana jako element kosztów pracy, w konsekwencji więc jako kategoria, która nie powinna wzrastać, gdyż szkodzi to przedsiębiorcom i gospodarce. W analizach tych pominięto społeczny, a także ekonomiczny (w szerszym kontekście) aspekt płacy minimalnej.

Introduction

The minimum wage in Poland is relatively low. Therefore, it is no surprise that the trade unions have been making efforts to have it raised to the level of 50% of the average salary. However, this has been met with staunch resistance from employers. Moreover, the attitude of the government, politicians, the media, as well as many scientists towards this is not favourable.

The opponents of the minimum wage usually object that its increase will have a damaging effect on the economy. This paper, based on statistical data and research results, provides arguments against such claims.

The analysis indicates the following conclusion: there is a one-sided attitude toward the issue of the minimum wage in Poland, which views it merely as an element of the cost of labour.

The effect of the minimum wage on the Polish economy

The liberal model of the economy, which dominates in Poland, favours employers. This is reflected, amongst other things, in decreasing tax rates, a more flexible labour market, a small, short-term unemployment allowance, a reduced scope of social benefits and a tolerance of the vast grey labour

market, which gives employers the possibility to evade taxation, as well as employing workers on short-term contracts with unsatisfactory wage conditions. Moreover, the attitude of the government, politicians, the media, as well as many scientists towards the minimum wage is not favourable.

These are the objections usually raised against the increase of minimum wage:

- 1) Raising the minimum wage entails unemployment growth;
- 2) An increase in the minimum wage entails an increase in the average pay, with a consequent increase in the inflation rate;
- 3) The amount of the minimum wage and its growth rate is frequently the basis for an index-linked pay increase in the budget institutions and some social benefits, which results in an increase in fixed budget spending, which is not justified economically;
- 4) The minimum wage level, regarded by employers as too high, results in the practice of paying workers outside the official payroll, thereby extending the grey area;
- 5) An increase in the minimum wage is a threat to businesses, especially to micro-enterprises, which operate on the brink of insolvency and may face bankruptcy;
- 6) An increase in the minimum wage raises the cost of labour and makes businesses less competitive.

These allegations in the extreme way expressed by WYŹNIKIEWICZ (2005) have not been confirmed by statistical data on the Polish economy or the results of empirical data. This paper, in its later part, provides arguments against the allegations.

The minimum wage and unemployment

It must be admitted that there is no unanimity on the issue, either in terms of theory or in the findings of scientific research. According to the assumptions of classical economics, which assumes a perfectly competitive labour market, introducing a minimum wage results in an increase in the unemployment rate (BEGG et al. 1993, pp. 103, 319). However, the minimum wage does not have to entail a slump in employment in a monopsony and it may even entail an employment increase when certain conditions are met (KAMERSCHEN et al. 1999, p. 696).

The findings of empirical studies are also inconclusive. A review of American, Canadian and Polish studies, made by BORKOWSKA (2005, p. 90–94), has shown that an increase in the minimum wage leads to an increase in unemployment, mainly among young people. However, there have been several

other papers presenting the findings of studies, mainly conducted in the USA, which do not confirm the negative impact of a minimum wage on the labour market; cf. ANDERSON (2013), AUERBACK (2012).

The level of correlation coefficients between the minimum wage to average pay ratio and the unemployment rate in the EU countries (Table 1) does not provide grounds for clear conclusions, because among the 20 countries with a minimum wage in place:

– the correlation coefficients are positive in 8 countries, which means that there is a relationship between an increase in the minimum wage to average pay ratio and an increase in the unemployment rate (or a decrease in the ratio leads to a decrease in the unemployment rate),

Table 1

Correlation coefficients between the minimum wage to the average pay ratio and the unemployment rate

Country	Unemployment rate	
	total	among people under 25 years old
Belgium	-0.46	-0.59
Bulgaria	-0.49	-0.55
Czech Republic	0.00	-0.23
Estonia	0.60	0.69
France	0.05	0.26
Greece	0.00	-0.03
Spain	-0.10	-0.02
The Netherlands	-0.13	-0.33
Ireland	0.37	0.36
Lithuania	0.49	0.40
Luxembourg	0.53	0.50
Latvia	0.69	0.74
Malta	-0.47	-0.45
Poland	-0.59	-0.53
Portugal	-0.03	-0.05
Romania	0.52	0.64
Slovakia	-0.38	0.01
Slovenia	0.78	0.52
Hungary	-0.80	-0.81
UK	0.51	0.70

Source: The author's calculations based on Eurostat data (2000–2012).

– the correlation coefficients are negative in 6 countries, therefore, when the growth rate of the minimum wage is higher than that of average pay, it does not result in an increase in the unemployment rate (which means that an increase in the unemployment rate is caused by other factors than an increase in the minimum wage),

– the correlation coefficients are close to 0 in 6 countries, which means that the relationships between the variables under study are insignificant.

Statistical data for Poland indicate that changes in the unemployment rate are affected to the greatest extent by economic fluctuations (Table 2). In 2000–2011, when the minimum wage accounted for 34% of the average pay, the unemployment rate ranged from 7.1% (when the GDP growth rate was 5.1%) to 18.3–20% (when the GDP growth rate was 1.1–1.3%). The unemployment rate, especially among young people, started to drop after Poland's accession to the European Union, due to a mass migration of young Poles, mainly to the UK and Ireland. However, the global economic downturn reduced the trend significantly.

Table 2
The GDP growth rate, unemployment rate and the minimum wage

Year	Unemployment rate		Minimum wage in relation to		GDP growth rate
	total	among people under 25 years of age	average pay	median	
2000	16.1	35.1	0.33	0.40	4.2
2001	18.3	39.5	0.34	0.42	1.1
2002	20.0	42.5	0.34	0.42	1.3
2003	19.8	41.9	0.35	0.43	3.6
2004	19.1	39.6	0.35	0.42	5.3
2005	17.9	36.9	0.34	0.41	3.5
2006	13.9	29.8	0.33	0.41	6.2
2007	9.6	21.6	0.31	0.39	6.8
2008	7.1	17.2	0.34	0.42	5.1
2009	8.1	20.6	0.37	0.45	1.6
2010	9.7	23.7	0.36	0.45	3.9
2011	9.7	25.8	0.36	0.45	4.3
2012	10.1	26.5	.	.	2.0

Source: Eurostat data.

The minimum wage and inflation rate

Both economic theorists and practitioners have pointed out frequently that an increase in the minimum wage favours an increase in the average pay in the economy, which induces a pay-price spiral. This situation would occur if the pay grew faster than work productivity. Statistical data (Table 3) show that the GDP and work productivity, when expressed in current prices, grew faster than the pay. For example, assuming for the year 2000 = 100, the economic categories mentioned above were the following:

gross average pay – 180.0

gross minimum wage – 198.0

GDP at current prices – 204.6

work productivity (counted as GDP per employed person) – 220.4.

Table 3

Average pay, minimum wage, GDP and work productivity

Item	2011				
	1992 = 100	1995 = 100	2000 = 100	2005 = 100	2010 = 100
Average nominal pay	955.9	400.5	180.0	144.0	105.6
Minimum wage	1,143.0	499.5	198.0	163.2	105.2
GDP at current prices	1,325.2	462.2	204.6	154.9	107.5
Work productivity at current prices (GDP per employed person)	1,394.7	488.3	220.4	141.4	106.7

Source: author's calculations based on the *Statistical Yearbook of the Republic of Poland*, GUS, Warsaw 1994, 2004, 2012.

Similar relationships have been observed earlier (since 1992). Since the average pay has been growing more slowly than GDP and work productivity per employed person (except in 2005) it does not stimulate inflation. On the other hand, the faster growth of the minimum wage than the average pay can be regarded as a more general regularity which is observed in the economies under transformation. The level of minimum wages in the new EC member states was very low compared to the EU-15 countries and remains so (Table 4). However, it is noteworthy that only in Slovenia was the minimum wage growth rate in 2000–2013 lower than in Poland, but the minimum wage in that country is nearly twice as high as in Poland.

The absence of any relationship between an increase in the minimum wage and inflation has been confirmed by a recent survey conducted by the Economic Institute of the National Bank of Poland. The following are the main findings of the report: “An increase in wage pressure in 2006–2008 had only

a short-term impact on inflation. Wage rises kept pace with the changes of work productivity in 2009. In 2011, the employer's market reduced pressure to stimulate pay increases. Despite an increase in the minimum wage, pay expectations of the unemployed have not increased since 2011, which has a relieving effect on pay increases throughout the economy" (*Badania ankietowe*, 2012, p. 4).

Table 4

Minimum wage in EU countries in 2000 and 2013

Country	2000			2013			2000 = 100
	position	euro	Poland = 100	position	euro	Poland = 100	
Luxembourg	1	1,221	731	1	1,874	497	153.5
The Netherlands	2	1,111	665	3	1,469	390	132.2
Belgium	3	1,096	656	2	1,502	398	137.0
France	4	1,083	649	5	1,430	379	132.0
Ireland	5	944	565	4	1,462	388	154.9
UK	6	936	560	6	1,264	335	135.0
Greece	7	540	323	7	863	229	159.8
Malta	8	509	305	10	697	185	136.9
Spain	9	496	297	9	753	200	151.8
Slovenia	10	372	228	8	784	208	210.8
Portugal	11	371	222	11	556	150	152.6
Poland	12	167	100	12	377	100	225.7
Czech Republic	13	126	75	16	312	83	247.6
Lithuania	14	112	67	17	289	77	258.0
Hungary	15	98	59	13	340	90	346.9
Slovakia	16	94	56	14	338	90	359.6
Estonia	17	89	53	15	320	85	359.6
Latvia	18	87	52	18	287	76	329.9
Bulgaria	19	38	23	19	158	42	415.8
Romania	20	34	20	20	157	42	416.8

Source: author's calculations based on Eurostat data.

Minimum wage and social benefits

The allegation that the minimum wage and its growth rate provides the basis for indexing salaries in budget-financed institutions and some social benefits, which results in an unjustified increase in fixed budget spending, has no basis in either the social policy pursued in Poland nor in statistical data.

With the year 2000 as the basis, it turns out that the minimum wage in 2011 reached the level of 198.0, whereas the average pay in the public sector was lower – 193.0 (*Statistical Yearbook of the Republic of Poland, 2012, p. 255*). The growth rate for the main social benefits (except maternity allowance) was also lower than the minimum wage growth rate. This is shown in the following list:

unemployment allowance – 161.6

pre-retirement allowance – 140.8

pre-retirement benefit – 95.6

sickness benefit – 182.5

maternity allowance – 230.1

burial allowance – 125.3

rehabilitation allowance – 140.0

(*Statistical Yearbook of the Republic of Poland, 2012, p. 273, 276*).

No benefit increase pressure was confirmed by the above-mentioned NBP study, which found: “Rare indexing, usually below the productivity growth rate. The lowest pressure was observed in the construction sector and in small enterprises” (*Survey, 2012, p. 4*)

According to statistical data, social budget spending in Poland is decreasing: from 18.1% of GDP in 2004 to 17% in 2010, while at the same it is lower than in the EU-27 countries (Table 5).

Table 5

Public spending in EU-27 and in Poland (w % GDP)

Item	2004	2007	2008	2009	2010	2011
EU-27						
Public sector spending (total)	46.8	45.6	47.1	51.1	50.6	49.1
including salaries in the public sector	10.8	10.4	10.6	11.3	11.1	–
social spending (other than transfers in kind)	19.7	18.9	19.5	21.7	21.6	–
investment expenditure	2.4	2.6	2.7	2.9	2.7	–
cost of servicing public debt	2.8	2.7	2.8	2.6	2.7	2.9
Poland						
Public sector spending (total)	42.6	42.2	43.2	44.5	45.4	43.6
including salaries in the public sector	10.1	9.6	10.0	10.2	10.1	–
social spending (other than transfers in kind)	18.1	16.2	16.1	16.9	17.0	–
investment expenditure	3.5	4.3	4.6	5.3	5.7	–
cost of servicing public debt	2.8	2.3	2.2	2.6	2.7	2.8

Source: *General government expenditure by function, Eurostat (20.07.2012)*.

The counter-cyclical policy pursued by countries of Western Europe has resulted not only in an increase in public spending (from 45.6% of GDP in 2007 to 50.6% in 2010), but it has also resulted in an increase in social spending (from 18.9% of GDP in 2007 to 21.6% in 2010). But it is notable that the proportion of salaries in overall public spending during the global crisis was rather stable (both in Poland and, on average, in EU-27).

Minimum wage and the grey labour market

People can start work in the grey market voluntarily, frequently as an extra job or, because they must, as a sole source of income. The main motive of working in the grey area is to increase the family income, while at the same time reducing their tax burden. According to data provided by Central Office for Statistics (*Praca nierejestrowana*, 2011), over half of the people who worked in the grey area in 2010 took their jobs because they had to and it was their main source of income. This concerned 395 thousand people out of the 732 thousand working in the grey area. Dominating among them were people with low qualifications and residents of villages or small towns, where the unemployment rate is high. They found jobs mainly in the construction industry and in repair work, in gardening and agriculture and in shops. The average monthly income amounted to 827 PLN for men and 540 PLN for women. The gross minimum wage at the time amounted to 1,317 PLN and the net wage amounted to 948.15 PLN, with the total cost of labour incurred by an employer amounting to 1,560.39 PLN, which is nearly twice as much as the average income earned by men in the grey market. This shows the extent of “savings” made by employers and the total disregard for legal standards. However, the large extent of the grey market in Poland is not caused by the existence of the Minimum Wage Act or any concern for it, but rather by the ineffective fiscal system which tolerates such activity, as well as by high unemployment rates (especially in small towns and villages) among young people, as well as the poor social security system, which forces people to accept any conditions proposed by employers.

The minimum wage and the bankruptcy of enterprises

The argument that an increase in the minimum wage is a threat to the existence of enterprises and may result in their bankruptcy was used by Michael Howard, the British Minister of Labour, when he forced through an abolition of the Minimum Wage Act in 1992, arguing that “there is no

justification for a policy which by itself would destroy our economy and limit the prospects of employment” (SLOMAN 2001, p. 213), and by contemporary Polish economists and other experts who deal with social policy. For example, WYŹNIKIEWICZ (2012) claims that an increase in the minimum wage has a detrimental effect on the conditions in which micro-enterprises operate, especially in small towns, because the entrepreneurs cannot ensure the minimum wage to low-qualified workers. Furthermore, to GOLINOWSKA (2005), the minimum wage of about 40% of the average pay is relatively too high because: “Thus defined, the minimum wage is a significant barrier for the development of small enterprises, and this is where the largest numbers of new jobs are created”.

These arguments are based on the assumption that the productivity of a worker who earns the minimum wage is so low that he/she will not produce enough for the employer to be able to pay his/her wage. But this would mean that productivity depends only on the worker, which is not the case. It is largely affected by the means of production provided and work organisation. Moreover, if work productivity is regarded not in technical, but in commercial categories (as the value of products sold or added value per a person employed), then the factors to be taken into account must include entrepreneurship (and the resulting business decisions and the structure of production) as well as the market situation and the company’s market position. If an entrepreneur’s income is so low that he is not able to provide the statutory minimum wage to workers who do simple jobs, it is proof of his poor managerial skills. Therefore, the argument that raising the minimum wage is a threat to the existence of many small, non-competitive enterprises, could be refuted by what the chairman of the OPZZ trade union and deputy head of the Trilateral Commission said: “Entrepreneurs who are unable to pay their employees fairly, should quit their business activities” (GUZ 2011).

The minimum wage and the competitiveness of the economy

The opinion that the minimum wage raises the cost of labour and reduces the competitiveness of the economy is too one-sided and it is contrary to statistical data, according to which:

1) The profitability of the enterprise sector in Poland, even during the global crisis, is high. In 2009, pre-tax profit margin was 4.9% and the net profit margin was 4.1%; in 2010 it even improved to reach: 5.2% and 4.4%, respectively, and in 2012 it was 4.2% and 3.4% (table 6);

2) The investment growth rate is lower than the GDP growth rate. Assuming that the year 2000 = 100, the quantities for 2011 (at current prices) were as follows:

GDP – 204.6;
 investment outlays – 187.2;
 including:
 public investment – 236.1;
 private investment – 154.3 (*Statistical Yearbook of the republic of Poland, 2012*, p. 649).

Therefore, high profits of enterprises are not consumed in full to stimulate their growth and to create new jobs. The low growth rate of investment outlays in the private sector is also a cause for concern.

3) The proportion of employment costs in the GDP is decreasing with other production factors benefiting – from 40.2% in 2000 to 36.0% in 2010 – whereas, for example, in Denmark, it is 55.4%, and in the UK – 53.7% (*Statistical Yearbook of the Republic of Poland, 2012*).

All of these data show that according to the dominant way of thinking of entrepreneurs in Poland, the cost of labour has to be “axed”. However, they do not reflect on whether it is possible to live and think of establishing a family while working for a gross minimum wage of about 1,600 PLN. In addition, they do not reflect the economic consequences of a decreasing proportion of the cost of labour in the GDP with an increasing proportion of other means of production.

Table 6

Profit margin index*

Item	2005	2009	2010	2011
Pre-tax profit margin				
Total	4.8	4.9	5.2	4.8
Public sector	4.5	4.3	7.5	8.6
Private sector	4.9	5.0	4.9	4.3
Net profit margin				
Total	3.8	4.1	4.4	3.9
Public sector	4.4	3.3	6.3	7.3
Private sector	3.9	4.2	4.1	3.5

* the relationship of the gross/net financial result and the revenue from all the activities
 Source: *Statistical Yearbook of the Republic of Poland*, GUS, Warsaw 2012, s. 579.

Conclusions

The issue of the minimum wage has not been given too much attention in Western Europe because it concerns only a small minority of the employed. However, in Poland, the social significance of the minimum wage is much greater for the following reasons:

1) Low-wage workers account for a large portion of the employed population. According to the data provided by GUS, 8.6% of the employed earned about 40% of the average pay. However, in the next interval of the wage level (40–50% of the average pay), the percent of such low-wage earners doubles to reach 17.9% (*Statistical Yearbook of the Republic of Poland*, 2012, p. 258). However, according to the data provided by Eurostat, 24.2% of those working for companies employing 10 and more workers in 2010 earned less than 50% of the average pay (*Low-wage earners*, 2012);

2) The portion of low-wage earners in the total employed population is growing. Only 4.7% of workers (i.e. less than every 20th worker) earned below 50% of the average pay in 1998 (Jacukowicz, 2003, p. 183). Meanwhile, in 2010, according to the data provided by GUS, nearly every 5th worker earned what is referred to as a low wage. Furthermore, taking the Eurostat data, every fourth worker earned a wage referred to as low.

According to the theory of motivation, low wages should be earned by people who do simple, unqualified jobs in normal conditions. However, no significant changes in the production technology or work organisation have been made in Poland during the past quarter of a century which would justify a nearly fourfold increase in the percentage of low-wage earners in the total employment. One would rather expect the trend to be opposite. This means that the wage level in Poland decreased dramatically for non-economic reasons.

This is indicated by the following list, showing the percentage of those earning less than 50% of the average pay in these professions in October 2008 (*Statistical Yearbook of Labour 2010*, p. 286–259):

- specialists of mathematical, physical and technical science – 3.9%
- technicians and middle-level personnel – 9.3%
- internship teachers and instructors – 15.3%
- office service personnel – 14.6%
- financial trade and customer service personnel – 15.0%
- personal service personnel and shop assistants – 49.3%
- industrial workers and craftsmen – 25.7%
- operators and installers of machines and devices – 16.8%
- personnel employed to do simple jobs – 45.0%

These data show that among low-wage earners in Poland there are also people who do jobs regarded as modern. This is a dangerous phenomenon, especially for young people, as it encourages them to consider economic migration.

The percentage of low-wage earners, which has been increasing rapidly, brings a number of economic and social consequences. These are the main ones:

1) it has a negative impact on the global demand, as the savings of the rich are not necessarily spent on investments and creating new jobs. This argument is especially important in an environment when entrepreneurs are reluctant to make investments, which results in low export activity;

2) it is not in line with the theory of motivation and it encourages young people to consider economic migration;

3) It delays the time when young people enter the period of “maturity”, understood to denote financial independence, setting up a family and having children. High rates of unemployment among young people and the low wages they earn can be seen as the cause of an alarmingly low population growth in Poland (0.3 per 1000 people) in 2011, compared to 4.2 in France, and 4.1 in the UK (*Statistical Yearbook of the Republic of Poland*, 2012, p. 762);

4) great, socially unacceptable income diversity, expensive and unaffordable flats – all of this discourages social integration and induces a demanding attitude and populist ideas, which have a negative impact on economic reforms.

These statistical data show that there is a one-sided view of the issue of the minimum wage and low earnings in Poland. Wages are regarded exclusively as an element of the cost of labour and, as such, they should not increase as this is detrimental to entrepreneurs and to the economy. Such analyses disregard the social and economic (in a broad context) aspects of having a minimum wage.

Translated by JOANNA JENSEN

Accepted for print 31.12.2013

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**MODERN METHODS AND INSTRUMENTS
FOR MANAGING LONGEVITY RISK
IN PENSION PLANS**

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Key words: longevity risk, methods and instruments of longevity risk management, longevity SWAP-s, longevity bonds.

A b s t r a c t

Extending the average life span in every next generation is a positive phenomenon – the result of the progress of civilization in the area of working conditions, the level of medical care, etc. However, this process also entails certain risks. Such a threat which can be accurately predicted and calculated and thus also recognized in terms of risk (which can be managed by people) is the longevity risk, or in other words the risk of a longer than expected life expectancy. It applies both to individuals as well as whole generations (demographic cohorts).

The longevity risk threatens public pension systems as well as complementary and supplementary systems (individual and company run) as long as they guarantee payment of benefits for life.

The cognitive aim of this article is to present the theoretical and practical case studies of selected methods and longevity risk management instruments as well as an attempt to evaluate their effectiveness. The author attempts to address a question whether the use of certain instruments to manage longevity risk would not trigger yet another type of risk – the so-called counterparty risk. It poses threat to each party of a contract that the counterparty will not live up to its contractual obligations.

**NOWOCZESNE METODY I INSTRUMENTY ZARZĄDZANIA RYZYKIEM
DŁUGOWIECZNOŚCI W SYSTEMACH EMERYTALNYCH**

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Słowa kluczowe: ryzyko długowieczności, metody i instrumenty zarządzania ryzykiem długowieczności, SWAP-y długowieczności, obligacje długowieczności.

Abstrakt

Wydużanie się w kolejnych pokoleniach średniego okresu trwania życia jest zjawiskiem pozytywnym, efektem postępu cywilizacyjnego w dziedzinie warunków pracy, poziomu opieki medycznej itp. Pociąga za sobą jednak także określone zagrożenia. Takim zagrożeniem dającym się w miarę precyzyjnie przewidzieć i skalkulować, a także ująć w kategoriach ryzyka, którym ludzie mogą zarządzać, jest m.in. ryzyko długowieczności, czy też, stosując inne tłumaczenie terminu angielskiego (*longevity risk*), ryzyko dłuższego niż oczekiwano trwania życia. Odnosi się ono zarówno do jednostek, jak i do całych roczników (kohort demograficznych).

Na ryzyko długowieczności narażone są publiczne systemy emerytalne, ale także systemy uzupełniające i dodatkowe (indywidualne i zakładowe), o ile gwarantują wypłatę świadczeń dożywotnich.

Celem poznawczym artykułu jest przedstawienie podstaw teoretycznych oraz praktycznych przykładów zastosowań wybranych metod i instrumentów zarządzania ryzykiem długowieczności, a także próba oceny ich skuteczności. Autor zamierza też odpowiedzieć na pytanie, czy wykorzystanie niektórych instrumentów zarządzania ryzykiem długowieczności nie spowoduje wystąpienia innego rodzaju ryzyka – tzw. ryzyka kontrahenta (*counter party risk*), polegającego na niewywiązaniu się w przyszłości z przyjętych zobowiązań drugiej strony kontraktu.

Introduction

The aim of this article is to present the methods and financial instruments used for managing the risk of longevity in public and supplementary pension plans. The starting point for the analysis will be to define longevity risk with reference to individuals and communities, and the consequences of this risk realization for social security systems – particularly the pension system. The author also intends to characterize the main financial methods and instruments for hedging longevity risk existing today and to describe the status of development and perspectives for this new, relatively poorly-developed segment of the financial market, where entities interested in transferring liabilities burdened with longevity risk (e.g. private pension funds – company-sponsored or acting for individual customers, private companies managing pension funds operating within public pension schemes, such as OFE in Poland, as well as insurance companies offering life annuities) meet with investors interested in purchasing those liabilities for commercial purposes (e.g. reinsurers, investment banks, other investors in financial markets).

In economically developed countries, subsequent generations are living, on average, for an increasingly longer period of time, and some persons within a given birth cohort live exceptionally long (longer than predicted on the basis of demographic estimations). As results from demographic research, in economically developed countries (using a simplification, this group includes countries included in the International Organisation for Economic Co-operation and Development), life expectancy has increased by two and a half years during a decade, and three months per year (VAUPEL 2013). In Poland (*Trwanie życia...* 2013), the life expectancy of men extended between 1992 and

2012 from 66.5 to 72.7 years (by 6.2 years), and for women in the corresponding period from 75.5 to 81.0 (by 5.5 years).

The fact that the average lifespan has been extended is, of course, a positive phenomenon. This process is the result of the progress of civilisation – improvement of work conditions, progress in technology, medicine and health care, improving the level of education, hygiene and a reduction in wars and military conflicts. However, extension of the average lifespan involves a series of economic, financial and social consequences, particularly the occurrence of longevity risk.

Longevity risk concerns both individuals and entire demographic birth cohorts. **Individual, specific longevity risk** involves a given person living longer than he/she is expected to, which results in total or partial exhaustion of the material resources gathered by this person for old age. Although it is desirable for a human being to live longer than expected, a long life in poverty or a significant lowering of living standards in old age makes it difficult, or almost impossible, to satisfy important life needs (e.g. purchase of medicines, participation in social and cultural life).

There also exists an **aggregate longevity risk** in that in a given generation (birth cohort) the average lifespan will be longer than anticipated. In other words, this is the risk of improper assessment of the future mortality rate trend (BARTKOWIAK 2011, pp. 22–24). Combined specific and aggregate longevity risk make up **total longevity risk** (BLAKE et al. 2010, p. 1–6)¹.

Longevity risk is becoming an increasingly important problem for social policy and a challenge for social security systems (particularly pension plans and health care systems) in economically-developed countries, including Poland. It imposes additional obligations on the state (the ultimate guarantor of the public pension plan and health care benefit payments), additional obligations. In addition, private finance institutions, e.g. pension funds (operating within additional or supplementary – individual or corporate – pension plans), insurance companies or trust funds offering life annuities are exposed to longevity risk.

The question arises as to **whether and how longevity risk can be managed**. Although the precise date of death for specific persons is not known, demographers try to determine the average lifespan for a given generation (birth cohort). It is always possible to make a mistake in this type of projection, but undoubtedly, this type of uncertainty as to future phenomena and states can be referred to as measurable uncertainty and satisfies a commonly-recognized definition of risk as formulated by F.H. Knight, according to whom risk is defined as measurable, quantifiable uncertainty (KNIGHT 2006).

¹ Pensions Institute in Cass Business School, City University in London headed by Prof. David Blake is one of leading longevity research centres in the world, co-organising cyclic international scientific conferences on this subject matter.

As in the case of other risk types, the risk of longevity can also be managed: risk level can be identified and appropriate methods and instruments for its reduction can be applied. At the same time, several basic questions of a theoretical nature and practical implications should be answered:

- Is it possible, at least partially, to transfer this risk from some entities to others?

- Whether, and to what extent, is this type of risk transfer safe and cost effective for the participating entities?

- What financial instruments or legal and institutional solutions should be applied with this end in view?

- Does there already exist a market in which selected longevity risk management methods and instruments are offered? If so, what is the existing development state of this market, and what are the factors stimulating and inhibiting its growth?

The aim of this study is to provide a contribution toward helping to answer the questions raised.

Scenarios in the market of instruments used for longevity risk transfer

The famous saying of Benjamin Franklin that in this world nothing can be said to be certain except for death and taxes has not lost its relevance. Although death is certain, its date is not known in advance. Practically each person (except for very wealthy ones) is exposed to specific longevity risk, thus the risk of exhausting assets accumulated for old age before the end of life.

In order to reduce this risk, apart from public pension plans, additional pension savings can be used, provided by private financial institutions – mainly insurance companies and pension funds. They co-operate with other financial institutions, e.g. reinsurance companies or trust funds, which offer the service of converting assets gathered in the pension fund or insurance capital fund into a stream of lifelong payments (annuity providers).

For example: the amount of a pension mainly depends on the assumptions of models estimating the length of life. If it is assumed in the pension plan in a given country that a citizen lives, on average, until the age of 75, and actually the average age extends to 77, then additional means will be needed for these two years for financing pension benefits. Appropriate financial reserves should be created in social security systems to provide for situations of this type, but generally, they are unsatisfactory (e.g. funds collected so far in the Fund of Demographic Reserve in Poland)². On the basis of data provided by Artemis (a risk managing company) quoted by Łukasz Wróbel (a Noble Securities

financial analyst) “costs related to underestimation of ‘longevity risk’ in the British pension scheme amount to about 1 trillion pounds. Only in 2010, the liabilities of pension funds for this account increased by about 5 billion pounds” (WRÓBEL 2013). Longevity risk practically occurs in all pension plans or, more broadly speaking, social security systems in economically-developed countries, and it is becoming an increasingly serious problem both for state institutions managing social security systems and for private financial institutions.

Among private financial institutions, entities offering life annuity benefit are particularly exposed to aggregate longevity risk (BLAKE et al. 2006). From the moment of selling a life annuity to the end of the (irrevocable) contract, generally up to a dozen years pass. Institutions selling life annuities (e.g. an insurance company) assume specific forecasts concerning average lifespan and structures of the dying-out process. Extension of average life expectancy can be quite precisely estimated, but – as D. Stańko accurately observes – “standard deviation from the estimated mean grows at an increasing rate” (STAŃKO 2010, p. 194). Therefore, longevity risk for an annuity provider increases.

For instance: a life insurance company offering life annuities usually sells this financial service (product) for a standard price, taking into account, e.g. the age and the nature of work of the insured and life expectancy anticipated for a given birth cohort. If a sufficiently numerous group of people living extraordinary long emerges within the insurance risk community, then it may be the case that the insurance company will not achieve the assumed profit and will even suffer a loss that will have to be covered from reserve funds (actuarial reserves). The need to increase actuarial reserves for covering longevity risk results in increasing the prices of insurance services offered which, in turn, can decrease the demand for this type of services.

Pension funds are also exposed to longevity risk. At the same time, what is important is the structure (form, calculation method) of financial benefits offered by those entities. For example, company pension plans operating on the basis of defined benefit which offer fund participants lifelong benefits in an amount specified in advance (e.g. as a ratio of the last or the average remuneration from which the premiums to the pension plan were paid), may get into serious financial trouble, and even become insolvent, if more than the predicted number of participants of the pension plan live longer than average, and the financial assets gathered for them in the pension plan become

² N.B. financial means of the Demographic Reserve Fund have been withdrawn several times from this fund by the decision of the Minister of Finance, although they are gathered for the purpose of covering future liabilities if demographic situation deteriorates as a result of the progressive society aging process, which will happen in Poland already in 2020–2030, as follows from the demographic forecast of the Central Statistical Office.

exhausted. Annuity providers can also suffer losses. For example, an insurance company to which assets gathered in a company pension plan are transferred in return for appropriate remuneration and the obligation to pay life annuities to plan participants.

Therefore, it is no wonder that at least some of these entities are interested in longevity risk transfer, making up the demand side of the newly-established modern innovative financial instruments (generally against payment) by assuming all, or a part, of the longevity risk of other entities.

Government institutions, or more broadly: public institutions managing the public pension system or the health care system (e.g. Social Security Authorities (ZUS) or National Health Fund (NFZ) in Poland), can also be potential recipients of longevity risk transfer instruments in the future.

On the other hand, on the financial market there are (although relatively still scarcely) entities interested in accepting longevity risk against payment. They include, e.g. reinsurance companies, who will assume a part of the liabilities from the insurer or the pension plan in the case of realization of longevity risk. Some of them already offer a service consisting in granting a bank guarantee for pension funds, ensuring that they will pay annuity benefits for fund participants living extremely long. In return, reinsurance companies and banks assuming longevity risk take over the assets of the pension fund.

Until recently, pension funds and trust funds protected themselves from longevity risk by buying out – in return for the assets held – life annuities for pension plan participants in insurance companies or investment banks and those entities (annuity providers), in turn, shared against payment of a part of the risk with reinsurance companies. Thus, a transfer of investment risk as well as longevity risk took place. However, this is an expensive solution and not all pension funds or trust funds can afford it.

Additionally, limitations emerge on the side of annuity providers. The possibilities of assuming (absorbing) longevity risk by reinsurers or banks (in this case – investment banks) are limited. Therefore, the capital market becomes a kind of natural channel for longevity risk transfer and this, in turn, requires the application of appropriate financial instruments and attracting investors interested in their purchase.

Another class of stakeholders in longevity risk transfer consists of general investors, who will purchase financial instruments used for longevity risk transfer (LRT).

This role can be fulfilled by investment banks and other institutional investors. As in other financial market segments, some investors in the emerging market of LRT instruments are typical short-term profit-oriented speculators and some are long-term investors. An important role is also played

in this market by regulators (financial institutions) admitting LRT financial instruments for trading and financial analysts and demographers employed in financial institutions who prepare life expectancy tables for various populations when constructing longevity transfer risk instruments. Longevity indices already exist and are constantly updated and based on large demographic data sets, e.g. the special longevity index constructed by specialists from JP Morgan bank, known as LifeMetrics.

Most LRT financial instruments are derivatives and are characterized in more detail later in this article. They are sold for a price determined in advance, but their final clearing takes place in the future and depends on the value assumed by the underlying instruments (such an underlying instrument can be a listed share which will be sold or purchased in a half-year period, but it could also be the lifespan of a specified population, e.g. pension plan participants). Figuratively speaking, most LRT instruments are *de facto* bets on the lifespan of a given population. The basic problem in this market is the reliability of the entity which assumes the longevity risk. Will it fulfil liabilities assumed against persons living exceptionally long, for instance, in twenty or thirty years? Will this entity still exist at all?

A very serious **counterparty risk** emerges in the market of financial instruments used for longevity risk transfer. This is one of the serious limitations of this potentially highly promising new segment of the global financial market (e.g. pension funds on the global scale have at their disposal gigantic assets totalling about USD 23 trillion). For instance, pension funds (e.g. in company pension plans) which want to transfer longevity risk to another entity must be certain that in 20–30 years the purchaser will be able to handle it and deliver the agreement.

The global financial crisis of 2008–2009 forcibly showed that even the largest financial groups – such as the American insurer, AIG – can find themselves very quickly on the brink of bankruptcy. The same applies to the largest reinsurers or investment banks, i.e. possible partners in longevity risk transfer transactions. The example of Greece also shows that states as issuers of financial instruments are not always reliable and sometimes may not meet their financial obligations. State institutions assuming obligations to pay life annuities in return for taking over assets (e.g. payment of pensions from the capital pillar in Poland by ZUS) also does not provide an absolute guarantee that this institution will be able to meet its obligations in 20–30 years.

Selected longevity risk transfer instruments

Insurance and longevity SWAPs

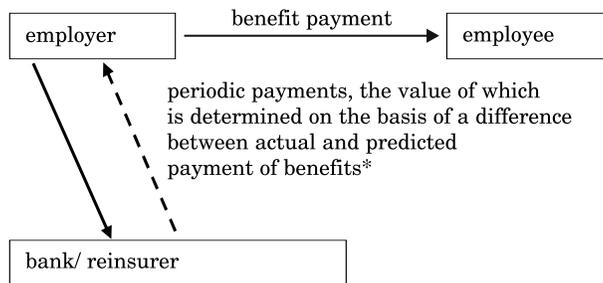
Some insurance companies, in return for payment of premiums, offer a financial service to pension funds in the form of **longevity risk insurance**. The insurance is paid if a given participant of the pension fund lives exceptionally long (exceeds the age limits specified in the insurance agreement). The pension fund pays an insurance premium agreed with the insurers in relation to all participants, while realization of longevity risk happens only in the case of some persons. Thus, the insurance risk community is established. A division of risk takes place which is appropriate for the risk management insurance method (within the insurance risk community) and the risk is transferred to the insurer. In this case, the entire longevity risk is assumed by one entity (the insurer). The insurance company may share at least a part of this risk with the reinsurer, but for the insured (pension fund) this is practically of no importance: the payment of benefits to the participants by the pension fund using this type of insurance for persons living exceptionally long is done exclusively by the insurance company. If longevity risk is not realized, i.e. none of the participants of the insured pension fund lives longer than the number of years specified in the insurance agreement, then, of course, the insurer will not be obliged to pay benefits. Just like other types of insurance, the premium is paid for the insurance coverage and is not refundable if no fortuitous event covered by the insurance (an indemnifiable accident) happens within the term of the agreement.

In the case of a **longevity SWAP**, a bilateral exchange of payment streams takes place, ensuring protection against higher than expected payments of pension benefits to persons living exceptionally long. In other words, longevity SWAP is the exchange of interest payments related to fluctuations of the longevity index. One party (e.g. an employee pension plan) makes regular payments to the other party (usually an investment bank or an insurer) on the basis of agreed assumptions (projections) of the mortality rate. In return, the other party to the contract (the bank or the insurer) will pay in subsequent years amounts based on actual mortality rates for a given group of participants in the pension plan. These are the so-called (mortality) index-based longevity swaps. It is also possible to enter into a longevity SWAP transaction based on the precise number of pension plan participants living to a specified year, and not on the predicted and the actual (averaged) mortality rate. This type of financial stream exchanges based on the real number of persons living to a certain age is known as bespoke (customized, tailored) longevity SWAP. “Customized” or “tailored” longevity SWAPs allow a 100% transfer of longev-

ity risk. Until now, they are the most-often applied and the most popular instrument of longevity risk management (LTR instrument). However, indexed SWAPs are more flexible, since it is easier to establish (on the basis of predicted and actually realized mortality rates in a given year) the amount of financial flows for both parties to the contract (SCHEUENSTUHL et al. 2012, pp. 18–19).

Agreed mutual payments (cash flows) can be made once a year or even once a month.

A diagram of such a transaction based on an employee pension plan periodically exchanging payment streams with a bank, an insurer or a reinsurer is presented in Figure 1.



* The difference between real and predicted payments of benefits from the employee pension plan to the employees – plan participants can be caused by longevity risk realization (some employees live exceptionally long).

Fig. 1. The structure of a longevity SWAP transaction illustrated with an example of the company pension plan

Source: Own work on the basis of *Longevity risk transfer markets...*, pp. 6–7.

For example, regular, fixed payments from the employee pension plan can be based on predicted life expectancy and the assumed mortality rate. Reverse payment streams (from the investment bank or the reinsurer) are of a varied nature, depending on the actual lifespan and the actual mortality rate for a given group (e.g. pension plan participants).

Mutual flows of fixed and variable payments within longevity SWAP transactions can be presented using the example of the pension plan and an institution offering coverage against this type of risk (hedge provider). A graphic illustration of those financial flows is presented in Figure 2, with amount examples in Table 1.

In this example, for the purpose of simplification, it was assumed that 100,000 employees participate in a company pension plan, who in the same month and year pass the age of 65 (1st January of a given year was assumed as

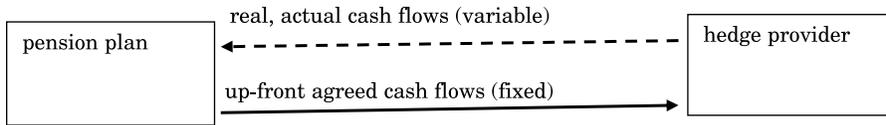


Fig. 2. A diagram of bilateral cash flows of fixed and variable amounts within longevity SWAPs
Source: Own work on the basis of: SCHEUENSTUHL et al. 2012, p. 19.

Table 1
Example of cash flows realized within longevity SWAPs (in GBP)

Date	Current payments of pension benefits	Agreed in advance (defined) fixed payment to the hedge provider	Payments to pension plan
01.02	1,000,000	950,000	50,000
01.03	950,000	930,000	20,000
01.04	900,000	910,000	-10,000
01.05	900,000	890,000	10,000

Source: SCHEUENSTUHL 2012, p. 19.

the initial date for calculating bilateral cash flows). Every month, the pension plan is obliged to pay the up-front determined amount of 10 pounds. Table 1 presents cash flows in four subsequent months, at the assumption that this pension plan uses the hedge against longevity risk in the form of SWAP transactions starting from 1st January of a given year. Both parties to the transaction assumed, on the basis of the population forecast, that out of 100,000 plan participants, 5,000 persons will die in the first month, 7,000 persons after two months, 9,100 after three months, and 10,100 after four months. The pension plan pays a fixed, determined in advance amount to the hedge provider, of 10 pounds \times predicted number of plan participants in a given month. The other party of the SWAP is obliged to provide a payment of a varied amount, according to the actual number of plan participants in a given month (10 \times actual number of plan participants).

Nobody died in the first month. The pension plan was therefore obliged to pay to its participants 100,000 pounds, receiving the missing 50,000 pounds (10 pounds \times 5,000 persons living longer than assumed) from the hedge provider. 5,000 died in the next month, i.e. 2,000 less than assumed. Again, the missing 20,000 pounds for current payments was provided by the hedge institution. Between the third and the fourth month, more persons died than assumed (10,000 instead of 9,000). This time it was the hedge provider who obtained 10,000 pounds from the pension plan, etc. Therefore, longevity SWAP proved a useful financial instrument for transferring longevity risk, since each time when the number of plan participants lived longer than assumed, the plan

obtained additional funds from the other party of the contract (SCHEUENSTUHL et al. 2012, pp. 19–20).

Of course, real pension plans are not homogenous, with participants at various ages, which makes the longevity SWAP structure more complicated. Nevertheless, the idea of converting future streams of fixed payments into payments depending on the number of persons living to a certain age in a given population is maintained.

Longevity bonds

The possibilities of hedging against longevity risk using the insurance or reinsurance method (if the insurer wants to transfer a part of risk to the reinsurer) are limited. The idea of transferring longevity risk using the capital market emerged in the literature relatively not long ago. This, in turn, requires creating appropriate financial instruments. Besides the longevity SWAPS described above, it is also possible to use securities as protection from longevity risk.

D. Blake and W. Borrows put forward a proposal to create longevity bonds (also known as mortality bonds or survivor bonds) that would be indexed to mortality rate (BLAKE, BURROWS 2001, pp. 339–348). Purchasers of longevity bonds would receive payments in the form of interest coupons, the amount of which would be variable, depending on the number of persons in a given population surviving to a particular age. If the mortality rate in a given population is lower than assumed, coupon payments paid from a given bond would be higher. Thus, the purchaser of longevity bonds (e.g. a pension plan, an insurer) would be able to cover additional liabilities related to realization of longevity risk. However, this type of bond would entitle its holder only to payment of interest coupons, and not the principal. Of course, interest coupons in time would decrease, according to the actual mortality rate of a given birth cohort (e.g. a lower amount of persons live to the age of 75 than 65, 80 than 75, etc.). However, over time, since the need for benefit payments would be reduced (e.g. pensions for a given generation), the amounts needed for hedging against longevity risk would be respectively lower and the longevity bond would fulfil its task to a sufficient degree.

For instance, for a cohort of men aged 65, interest coupons starting from the age of 75 would be determined by the amount of the 65-year-olds who actually survive to the age of 75. The payments would continue until the end of the maturity, e.g. for 35 years (until reaching the age of 100 years). The last coupon from longevity bonds would contain a discounted value of all indices for surviving to the age of 100 years (see STAŇKO 2010, p. 195, BLAKE, BORROWS 2001, pp. 339–348).

Other methods and instruments hedging against longevity risk

Among other available and already used methods and instruments protecting against the risk longevity, one should mention **buy-outs** – bulk transactions of assets and liabilities of pension plans, and **buy-ins** – bulk transactions of liabilities burdened with longevity risk.

In the buy-out transaction type, the assets and liabilities of a pension plan are transferred to the insurer in return for a specified advance payment (an up-front premium). The insurer is obliged to pay and to assume full responsibility for annuity payments of benefits for pension plan participants, using assets transferred from the pension plan, and if necessary, the insurer's own funds. On the other hand, in buy-in -type transactions, the sponsor of the pension plan (e.g. an employer in a company pension plan), in return for an initial payment, ensures receiving periodical payments from the insurer, equal to those that the pension plan is obliged to pay to its participants. If the benefits are paid for a longer period than assumed, the payments from the insurer will provide a hedge against realization of longevity risk (*Longevity risk transfer markets...* 2013, p. 5).

However, buy-outs of assets and liabilities of the pension plan by the insurer have certain limitations. Insurers and possibly indemnitors must comply with specific principles of prudence and their possibilities of longevity risk absorption are limited. Thus, the need to search for other financial instruments arises, for exchanging liabilities burdened with longevity risk for securities sold on the financial market (securitization), an example of which are the longevity bonds described above.

The existing status and perspectives of development for the market of instruments for hedging longevity risk (LRT)

Markets of financial instruments used for longevity risk transfer (LRT) are still relatively poorly-developed. Transactions are sporadically concluded in these markets and their value is relatively low in relation to the level of liabilities of private financial institutions and state institutions exposed to longevity risk.

The value of liabilities of pension funds and insurance companies offering annuities burdened with longevity risk amounted at the end of 2012 to between USD 15 and 25 trillion on a global scale (*Consultative documents on longevity risk...* 2013). However, the value of actual transactions with the use

of LTR instruments, which are still quite rarely applied financial innovations, makes up only a small portion of this amount. Great Britain has the most developed market in this field, but even there only 50 billion in pension fund liabilities with defined benefit³ were protected in 2012 against longevity risk with the use of insurance or capital market instruments, while the total value of liabilities to participants of this type of pension plans reached 1 trillion British pounds. It is interesting that the USA – the country with the largest number of company pension plans with the world's largest assets and liabilities towards employees – has an LTR instrument market much less-developed than the British market. Only three major transactions were recorded outside Great Britain in 2012: two bulk buy-outs of assets and liabilities of pension funds and one longevity SWAP deal completed in the Netherlands. The value of the first two transactions was the equivalent of GBP 26 billion and the third transaction was GBP 7 billion (*Longevity risk transfer markets...* 2013, p. 18).

The question arises about the reasons for the under-development of the market for hedging longevity risk transactions in countries with developed financial markets, where many company pension plans and insurers offering life annuities (the financial institutions most interested in minimising this type of risk) operate. One of the reasons is the previously- mentioned counterparty risk, inseparably related to longevity risk transfer. Another reason is the cost of this type of transaction. For instance, pension funds in Chile (where the public pension plan has been completely privatized) were not interested in buy-outs of longevity bonds in a situation when the final guarantor of the annuity benefit payment (at least at the level of the minimum pension) for all fund participants is the state. Moreover, appropriate regulations are still lacking – both on the national and international level – to allow safe trade in this type of longevity risk transfer (LTR) instruments. Some financial experts are afraid that the development of the LTR instrument market will create new threats on the side of the speculative capital (as it was the case in the market of derivatives protecting against other types of risk – e.g. foreign currency risk, where the hedging function was dominated by speculation functions⁴. Let us add that in Poland no instruments at all are applied for hedging longevity risk.

³ Pension funds with defined benefit (DB) use the formula of calculating the benefit guaranteeing payment of the pension in the amount determined in advance in proportion to the last or the average (from the entire work period) remuneration. A DB fund with perpetual annuity is particularly exposed to longevity risk.

⁴ Prof. David Blake, director of Pensions Institute in London and one of the leading researchers on the problem of longevity risk, during the international research conference “Longevity 7: Seventh International Longevity Risk and Capital Markets Solutions” organized in Frankfurt am Main (8-9.09.2011), mentioned the following anecdote. When he presented the idea of using longevity bonds as hedging against longevity risk on the meeting of actuaries (specialist in insurance mathematics) in Great Britain, one of the debaters compared the purchase of this instrument to buying a place in a lifeboat on the Titanic.

To make it possible for the market of instruments for hedging longevity risk to develop on a larger scale, it is necessary to satisfy certain conditions:

- Development of international standards concerning the security of trading in LTR instruments, including specified prudence norms in this domain.
- Cooperation and constant exchange of information concerning LTR instruments by financial market regulators in individual states.
- Making a review of investment policies carried out by public and private institutions managing pension plans and state and private insurance companies as regards longevity risk recognition.
- Disseminating the knowledge of longevity risk in society through educational activities, which could lead to the growth of tendencies to accumulate additional pension savings (in order to avoid realization of specific longevity risk).
- Development of research concerning the processes of the demographic aging of societies, making it possible to improve tools for predicting life expectancy indices for the entire population and individual generations (birth cohorts).

There are many reasons to believe that due to a high exposure to longevity risk and potentially strong demand, the market of instruments for hedging longevity risk will grow first in the most developed financial markets (in Great Britain and other EU states and in the USA) and also gradually in other countries.

Translated by JOANNA JENSEN

Accepted for print 31.12.2013

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**LONG-TERM UNEMPLOYMENT IN POLAND
IN 2008–2012 – TENDENCIES, STRUCTURE
AND SELECTED DETERMINANTS**

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Key words: unemployment, long-term unemployed, logit model.

Abstract

This study presents the structure and tendencies in long-term unemployment in Poland in the years 2008–2012. This study identifies the groups of people with an increased risk of long-term unemployment.

The analyses produced the following conclusions. The groups with the highest risk of long-term unemployment include: singles, people aged of 55 and above and people with a low level of education. Young people with university and general secondary education faced the lowest risk of long-term unemployment.

**BEZROBOCIE DŁGOOKRESOWE W POLSCE W LATACH 2008–2012 –
TENDENCJE, STRUKTURA I WYBRANE DETERMINANTY**

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Słowa kluczowe: bezrobocie, bezrobocie długookresowe, model logitowy.

Abstrakt

Celem opracowania jest przedstawienie tendencji i struktury bezrobocia długookresowego w Polsce w latach 2008–2012. Podjęto również próbę odpowiedzi na pytanie, które grupy ludności są w największym stopniu zagrożone bezrobociem długookresowym.

Z przeprowadzonych analiz wynikają następujące wnioski. W największym stopniu zagrożone bezrobociem długookresowym w analizowanym okresie były osoby stanu wolnego, w wieku 55 lat i więcej, legitymujące się niskim poziomem wykształcenia. Najmniejsze prawdopodobieństwo bycia bezrobotnymi długookresowo miały osoby młode z wykształceniem wyższym i średnim ogólnokształcącym.

Introduction

According to Keynesian theory, an economic downturn results in a decrease in production output, a decrease in the employment rate and an increase in the unemployment rate. In a prolonged downturn period, some of the unemployed become long-term unemployed.

For the past few years, the global economy has been struggling with the greatest economic crisis since the Great Depression. The effects of the crisis have also been felt in Poland. The GDP growth rate may still be positive, but it is much lower than it used to be. The economic slowdown in Poland has resulted in an increase in the unemployment rate, including long-term unemployment.

The aim of this study is to present the trends and structure of long-term unemployment in Poland in the years 2008–2012. It also identifies the population groups with the highest risk of long-term unemployment.

The statistical analyses conducted in the paper are based on a non-parametric method and on a parametric method. The latter method consists in using a logit model.

The effect of long-term unemployment on the economy

Long-term unemployment has a number of negative consequences, both for the unemployed and for the entire economy. Extended periods of unemployment exacerbate the economic situation of the unemployed and their families.

An increase in the long-term unemployment rate also decreases the human capital of the unemployed. According to the theory of human capital, the resources of human capital (like financial capital) can increase and can be depreciated. Human capital can increase provided sufficiently high financial outlays are made for raising the level of education, training and qualifications improvement (cf. KWIATKOWSKI 2002, p. 209, BLAUG 1995, p. 303–305). Human capital can be decreased by a long period of unemployment. With prolonged unemployment periods, the unemployed lose some of their professional skills and experience. This reduces their chances of returning to the labour market.

The effect of human capital loss on the hysteresis of unemployment can be presented in the following manner. In a negative supply shock or a negative demand shock some of the employed lose their jobs. An economic downturn also reduces the chances of the unemployed or of the professionally inactive to find a job. Moreover, technological advancement results in a decrease in the human capital of people without work. Staying out of work for longer periods

leads to deterioration of the human capital of the long-term unemployed. This, in turn, reduces their chance to find a job. An economic upturn does not necessarily result in a decrease in the unemployment rate. A low level of qualifications and professional skills of the unemployed may prevent them from finding a job.

This especially applies to those who are long-term unemployed. The percentage of those affected by long-term unemployment increases in a time of crisis. Extension of the period of unemployment accelerates the process of depreciation of human capital. This considerably reduces the chances of the unemployed to find a job. For employers, those unemployed for a long time are not perfect substitutes for those unemployed only for a short time. Such actions of employers also affect the behaviour of the long-term unemployed. A futile job hunt may be a cause of apathy and decrease the intensity of job-searching, which will intensify the effect of unemployment hysteresis (cf. KWIATKOWSKI 2002, p. 214).

According to the NAIRU theory, the level of long-term unemployment affects the level of equilibrium unemployment. The NAIRU unemployment rate can be changed by factors which affect the level of realistic and demanded real wages. The level of realistic real wages (i.e. the wages which correspond to the capabilities of the economy) depends mainly on work productivity. An increase in work productivity makes it possible to raise wages without precipitating inflation processes. An increase in the realistic real wages, with the assumption of *ceteris paribus*, results in a decrease in the NAIRU.

In turn, the level of demanded real wages depends on: labour market situation (i.e. the unemployment rate), the generosity of the unemployment allowance system, the level of protection of labour conditions, the strength of trade unions in wage negotiations, the insider's position, lack of structural fit between labour supply and demand and the long-term unemployment rate (cf. LAYARD et al. 2005, p. 13–48, KWIATKOWSKI 2002, p. 150).

An increase in the percentage of the long-term unemployed in the total unemployment results in an increase in the level of demanded real wages which, in turn, results in an increase in the NAIRU. As has been said before, since the long-term unemployed lose part of their professional qualifications and skills they cannot successfully compete with the employed or the short-term unemployed to get a job. As a consequence, the higher the long-term unemployment rate is, the higher the wage demands will be, which results in an increase in the NAIRU.

An increase in the wage pressure affects the NAIRU by the following mechanism (see Fig. 1). The W line denotes the demanded real wages, whereas the P line is the price curve (the realistic real wages). The intersection of those curves determines the NAIRU (marked in the figure as u^*).

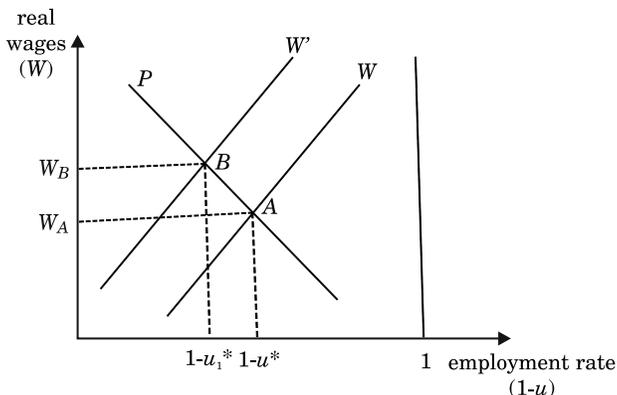


Fig. 1. The effect of an increase in wage pressure on NAIRU

Source: prepared by the author based on: LAYARD et al., 2005, p. 383.

Let us assume that initially the labour market was in the equilibrium state at point A. At that point, the equilibrium employment rate was $(1-u^*)$. An increase in the wage pressure (as a consequence of the percentage of the long-term unemployed) shifts the (demanded) wage curve left to the W' position. As a result of the adaptation processes, the economy shifts to another labour market equilibrium point – B, with a lower equilibrium unemployment rate $(1-u_1^*)$, and, consequently, a higher level of NAIRU (u_1^*).

Changing trends and the structure of long-term unemployment

Let us now analyse the changing tendencies in the long-term unemployment. Figure 2 presents data on the number of the long-term unemployed¹ and the total number of the unemployed in the years 2008–2012. It leads one to the following conclusions. Both quantities changed in the same direction during the period under analysis. Only in 2008 did both of them decrease. From Q1 onwards, the total unemployment and the long-term unemployment increased (with certain fluctuations). In Q4 2008, the number of the long-term unemployed reached the lowest level, while it reached the highest level in Q4 2012 (the number of the long-term unemployed increased during that period by 104.9%). Therefore, one can claim that the economic downturn in Poland has brought about a considerable increase in the long-term unemployment rate.

¹ Long-term unemployment that is lasting more than twelve months.

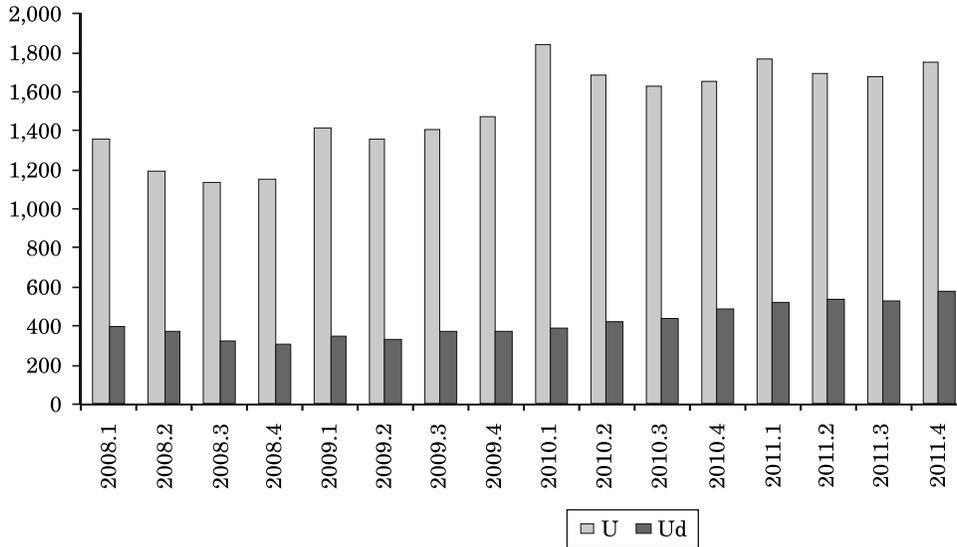


Fig. 2. The total number of the unemployed (U) and long-term unemployed (Ud) in Poland during the period between Q1 2008 and Q4 2012 [per thousand people]

Source: Economic activity of the population of Poland, various editions between 2008 and 2013, GUS, Warsaw.

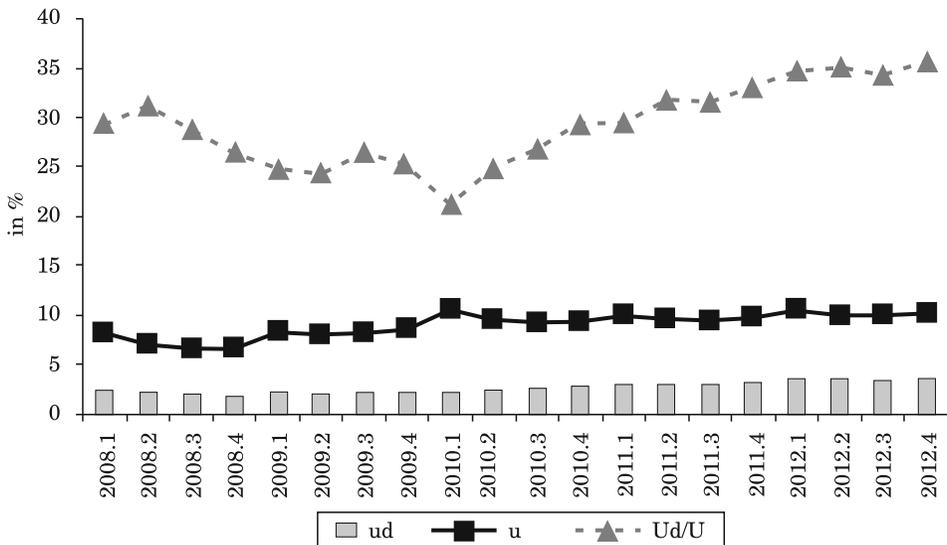


Fig. 3. The total unemployment rate (u), the long-term unemployment rate (ud) and the percentage of the long-term unemployed in the total unemployment (Ud/U) in Poland during the period 2008–2012
Source: as for figure 2.

Figure 3 presents quarterly data on the unemployment rates, long-term unemployment rates² and the percentage of long-term unemployment in total unemployment. From Q1 2009 onwards, both the total unemployment rate and the long-term unemployment rate grew (with certain seasonal fluctuations). The long-term unemployment rate grew from 1.9% in Q4 2008 to 3.6% in Q4 2012. As diagram 2 shows, the percentage of the long-term unemployed in the total unemployment decreased until Q4 2009. Beginning with Q1 2010, a strong increasing tendency of the long-term unemployed percentage in the total unemployment was observed. At the end of the period, the long-term unemployed accounted for 35.7% of all the unemployed.

The highest percentage of the long-term unemployed in the total unemployment in 2009 was observed in the provinces: Świętokrzyskie, Podkarpackie and Lubelskie (see Table 1). These are provinces where a large portion of the population is employed in agriculture and where the service sector is poorly developed. The lowest percentage of long-term unemployed in the same year was recorded in the following provinces: Wielkopolskie, Pomorskie and

Table 1
The percentage of the long-term unemployed in the total unemployment by province in Poland in the years 2009–2012 [%]

Province	2009	2012	Increase
Poland	26.9	35.6	8.7
Łódzkie	25.7	36.5	10.9
Mazowieckie	32.3	39.4	7.1
Małopolskie	27.1	35.1	8.0
Śląskie	21.1	31.2	10.0
Lubelskie	34.1	41.4	7.3
Podkarpackie	34.2	42.9	8.7
Podlaskie	27.2	40.6	13.5
Świętokrzyskie	35.1	37.2	2.1
Lubuskie	21.4	28.1	6.7
Wielkopolskie	19.8	29.3	9.5
Zachodniopomorskie	23.7	34.5	10.7
Dolnośląskie	23.3	32.2	8.9
Opolskie	20.6	31.6	11.0
Kujawsko-Pomorskie	29.5	37.7	8.1
Pomorskie	19.9	31.1	11.2
Warmińsko-Mazurskie	26.7	34.7	8.0

Source: Registered unemployment in Poland, various editions from the years 2009–2013.

² The long-term unemployment rate is the ratio of the long-term unemployed to the total workforce.

Table 2

The structure of the long-term unemployed by sex in Poland in 2008–2012 [%]

Item	2008	2009	2010	2011	2012
Total	100.0	100.0	100.0	100.0	100.0
Men	46.5	48.0	52.2	49.6	50.1
Women	53.5	52.0	47.8	50.4	49.9

Source: as for figure 2, calculations by the authors.

Opolskie. The provinces of Wielkopolskie and Pomorskie are among the best-developed in Poland, whereas for the province of Opolskie, its location on the German border is an important factor.

The table 1 shows that the percentage of the long-term unemployed grew in all provinces in the years 2009–2012. The largest increase in the long-term unemployment during the period under study was observed in the following provinces: Podlaskie, Pomorskie and Opolskie. On the other hand, the lowest increase in the percentage of the long-term unemployed in the total unemployment was recorded in the provinces: Świętokrzyskie, Lubuskie and Lubelskie. Despite the largest increase in the percentage of the long-term unemployed during the analysed period, the provinces: Wielkopolskie, Pomorskie and Opolskie also recorded the lowest percentage of the long-term unemployed in 2012. Moreover, the provinces of Podkarpackie and Lubelskie remained regions with the highest percentage of the long-term unemployed in 2012.

Tables 2–6 present data on the structure of the long-term unemployed by selected social and demographic features. The structure of the unemployment was determined from annual average data from BAEL.

Table 2 indicates that during the analysed period, the structure of the long-term unemployed changed. In the period of 2008–2009 and in 2011, women accounted for the majority of the long-term unemployed. In the other years, men were a majority of the long-term unemployed.

An analysis of the structure of the long-term unemployed indicates the following conclusions (see Table 3). In 2008, the highest percentage of the long-term unemployed were people aged 45 to 55 years, whereas in 2012, those were people aged 25–34. It is a cause for concern that this percentage of the unemployed remained high in the group during the entire period. People at the age of 55 and above accounted for the smallest percent of the long-term unemployed in 2008–2012. The low proportion of the group in the long-term unemployment is a consequence of the fact that the professional activity of the people in this age group is low. If they lose a job, people in this age group do not have much chance to find a new one.

Table 3

The structure of the long-term unemployed by age in Poland in 2008–2012 [%]

Age	2008	2009	2010	2011	2012
Total	100.0	100.0	100.0	100.0	100.0
Under 24	16.0	16.2	14.4	16.1	17.1
25–34	27.1	27.0	29.0	28.7	28.7
35–44	20.9	20.1	19.7	20.4	20.5
45–55	27.7	27.5	25.7	24.0	21.5
55 and more	8.3	9.2	11.2	10.8	12.2

Source: as for figure 2, calculations by the author.

Table 4

Structure of the long-term unemployed by education in Poland in 2008–2012 [%]

Education	2008	2009	2010	2011	2012
Total	100.0	100.0	100.0	100.0	100.0
University	7.5	10.2	9.2	12.1	12.6
Post-secondary	3.9	4.2	3.5	3.4	4.0
Secondary vocational	21.2	20.1	23.1	21.7	19.2
Secondary general	9.4	10.3	10.1	10.5	11.6
Vocational	38.1	35.5	37.2	34.9	35.6
Junior high, primary, incomplete primary	19.9	19.7	16.9	17.4	17.0

Source: as for figure 2, calculations by the author.

The data on the structure of the long-term unemployed by education indicate that people with post-secondary education accounted for the smallest portion of the long-term unemployed. As university education is becoming increasingly common, post-secondary education enjoys less and less popularity among secondary school graduates. People with university and general secondary education accounted for a small percent of the long-term unemployed. However, although the portion of the people with general secondary education increased by 1% between 2008 and 2012, the proportion of the long-term unemployed increased by 2.2% during that time, which is a sign that the university education system should be better adapted to the labour market needs.

It is noteworthy that people with vocational and secondary vocational education dominated among the long-term unemployed in all the years under study. These two groups accounted for more than half of all the long-term unemployed.

Table 5
Structure of the long-term unemployed by the education profile in Poland in 2008–2012 [%]

Item	2008	2009	2010	2011	2012
Total	100.0	100.0	100.0	100.0	100.0
Teachers' education and pedagogy	1.6	1.6	1.5	2.2	2.6
Humanities, linguistics and art	1.9	2.4	1.8	1.9	1.3
Social sciences: economics and law	11.1	14.0	14.1	16.2	15.7
Science: mathematics and computer science	2.9	2.2	3.2	2.6	2.3
Engineering, production processes and construction	33.0	34.1	40.5	36.6	36.2
Agriculture and veterinary medicine	5.5	4.8	4.6	4.3	3.9
Healthcare and welfare	1.4	1.9	1.1	1.2	1.7
Services	13.6	9.4	6.3	7.2	7.9
General syllabus	29.0	29.6	26.9	27.8	28.4

Source: as for figure 2, calculations by the author.

Table 5 indicates that people who graduated from schools teaching engineering, production processes, construction and general syllabuses accounted for the greatest portion of the long-term unemployed in all the years under study. The proportion of the long-term unemployed who graduated from economics or law faculties increased throughout the entire period. This indicates that the labour market was saturated. People who graduated from schools teaching health care and welfare accounted for the smallest portion of the long-term unemployed. There was a decreasing tendency (with fluctuations) in the percent of the long-term unemployed qualified in service-related provisions.

The econometric model and its estimates

In order to estimate the probability of being unemployed for a long time, the unemployed population was divided into two categories: long-term unemployed – people staying out of work for more than 12 months (they were assigned the value of 1) and the unemployed staying out of work for less than 12 months (they were assigned the value of 0).

The probability that an individual with a feature x_i will remain out of work for more than 12 months can be expressed by the following formula (see CHOW 1995, p. 310):

$$P_1(x_i) = P_{1i} = \frac{e^{\beta'x_i}}{e^{\beta'x_i} + 1} \quad (1)$$

where:

x_i – vector of explaining variables,

β – vector of the structural parameters of the logit function.

The vector of explaining variables covers demographic, social and economic features of the individuals under study: age, education, sex, marital status, place of residence, threshold wage and the period of seeking a job. The variables were chosen based on the theoretical knowledge about the factors which increase the risk of being unemployed for a long time.

After a transformation, the formula (1) will have the following form:

$$\ln \frac{P_{1i}}{1 - P_{1i}} = \beta'x_i \quad (2)$$

In order to formulate a function to describe the reliability of a sample, let us introduce an artificial variable: f_{1i} equal to 1, when the i -th individual is unemployed for a long time, and equal to 0 when the individual is unemployed for less than 12 months. The reliability function for a n -element sample is described by the equation (3):

$$L = \prod_{i=1}^n P_{1i}^{f_{1i}} (1 - P_{1i})^{1 - f_{1i}} \quad (3)$$

The unknown structural parameters (β) of the logit model are estimated by the highest reliability method. Our analyses employed the Stata program.

Table 6 presents estimates of odds ratio for remaining unemployed for a long time in selected groups of workforce in Poland in 2010. The value of an odds ratio higher than 1 means that the probability of remaining unemployed for a long time for a group is higher compared to the base category. For example, the estimated value of 0.393 for people aged under 24 (column 2 in table 6) means that for those people, the probability of them remaining unemployed for a long time will be lower by 60.7 compared to individuals in the base category (i.e. people aged 35–44). The shaded estimate values in all the tables are insignificant at the level of significance of 0.05.

Table 6
Estimates of the odds ratio of being long-term unemployed in Poland in Q4 2010

Item	Odds ratio	<i>t</i> -Student statistics
Age (base category: people aged 35 to 44)		
Under 24	0.393	-7.88
25–34	0.901	-1.00
45–54	1.585	4.47
55 and more	1.616	3.79
Education (base category: people with the vocational education)		
University	0.606	-4.01
Post-secondary and vocational secondary	0.924	-0.90
General secondary	0.711	-2.80
Junior high, primary and incomplete primary	1.141	1.33
Marital status (base category: single)		
Married	0.857	-2.01
Sex		
Male	1.014	0.21
Type of place of residence (base category: village)		
Town	0.938	-0.92

Number of observations: 4,188

Log likelihood: - 2,582.59

Sources: authors' calculations based on individual data from BAEL, Q4 2010.

Table 6 shows that young people (under 24 years old) were threatened with long-term unemployment to the least extent compared to the base category. Young people are the most mobile on the labour market, therefore they are not as threatened with long-term unemployment as other people³.

For people at the age of 45–54, the probability of becoming unemployed for a long time was 58.5% higher than the base category. In turn, the odds of people at the age of 55 and more remaining out of work for a long time were 61.6% higher compared to the base category. Labour offices need to focus more on the oldest unemployed people as targets of activation programs.

Among all the categories of education, people with university education were the least threatened with long-term unemployment compared with vocational education. The probability of the former remaining unemployed for a long time was lower by 39.4% compared to the base category. Moreover, people with general secondary education were less threatened with being long-term unemployed than those with vocational education. The majority of

³ Similar findings were obtained by E. Kwiatkowski and L. Kucharski in 2006 (see Kwiatkowski, Kucharski, 2009).

people with general secondary education usually decide to go to university, hence the risk of long-term unemployment is lower.

Among the groups for whom the probability of long-term unemployment is lower than for the base category are married people. Having to provide for their families makes them seek jobs more actively and accept even unattractive job offers.

Conclusions

These analyses indicate the following conclusions.

First, long-term unemployment is an important factor for the macroeconomy. An increase in the percentage of the long-term unemployed leads to an increase in the unemployment equilibrium and an increase in the wage pressure in the economy. As they lose part of their qualifications, the long-term unemployed have less chance of finding a job.

Second, an economic downturn in Poland has resulted in an increase in the long-term unemployment. The number of the long-term unemployment increased more than twofold in the years 2009–2012.

Third, categories of people with the lowest percent in the group of the long-term unemployed included: people under 25 and over 55, with post-secondary, general secondary and university education, qualified in healthcare and welfare-related jobs. It is noteworthy that the percentage of the long-term unemployed with university education has increased.

Fourth, people at the ages of 25–34 and 45–55 with vocational education, whose education is associated with engineering, production processes, construction and general syllabuses accounted for the highest percentage of the long-term unemployed.

Fifth, econometric analyses show that people aged 55 and above and 45–55 were the most threatened with long-term unemployment. Groups most threatened with long-term unemployment also include people with vocational education and singles. Groups which were the least threatened with long-term unemployment included people under 24, with university and general secondary education.

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WIND POWER STATIONS AND MARKET VALUATION

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Key words: renewable energy resource, wind energy, investment project valuation, tax, fee.

A b s t r a c t

This study presents the results of research on the market valuation of wind power stations. The valuation of wind power station projects is an individualized process and there is a growing need for systematization of the valuation theory of wind power stations as specific structures. This will enable reliable reflection of their value at each stage of the investment process, possibly due to consideration for value standards sought by different entities interested in valuation. The theoretical part presents the conditions of the development of the analysed energy sector in Poland and provides the different value categories found in valuation practice, both during project implementation and after power plant start-up. Variation in wind power station project implementation phases was then indicated, recommending the discounted cash flow method as a universal valuation tool for each stage of the project life cycle.

ELEKTROWNIE WIATROWE JAKO PRZEDMIOT I PODMIOT WYCENY

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Słowa kluczowe: odnawialne źródła energii, energia wiatrowa, wycena projektu inwestycyjnego, opodatkowanie, opłaty.

A b s t r a c t

Celem opracowania jest prezentacja wyników badań dotyczących oceny i wyceny elektrowni wiatrowych na rynku zasobów i organizacji. Ocena i wycena projektów elektrowni wiatrowych jest procesem zindywidualizowanym i usystematyzowaniem teorii wyceny specyficznych obiektów, jakimi są elektrownie wiatrowe, jest coraz bardziej pożądaną. Dzięki temu możliwe będzie rzetelne odzwierciedlenie ich wartości na każdym etapie procesu inwestycyjnego. Możliwe to będzie dzięki uwzględnieniu standardów wartości poszukiwanych przez różne podmioty zainteresowane wyceną. W części teoretycznej zaprezentowano uwarunkowania rozwoju analizowanego sektora energetyki

w Polsce, a następnie zwrócono uwagę na różne kategorie wartości występujące w praktyce wyceny, zarówno podczas realizacji projektu, jak i po uruchomieniu elektrowni. Następnie wskazano na zróżnicowanie faz realizacji projektów elektrowni wiatrowych, rekomendując metodę zdyskontowanych przepływów pieniężnych jako uniwersalne narzędzie wyceny, możliwe do wykorzystania na każdym z etapów cyklu życia projektu.

Introduction

Raising public awareness is the most important task and one of the most effective lines of action for institutions participating in the transformation of the current energy system. Depletion of natural energy carriers necessitates seeking possibilities of using unconventional and semi-conventional sources. These include renewable energy sources (RES).

The use of renewable energy sources is currently one of the key subjects in discussions on energy use rationalization and climate protection and in overcoming social resistance to the use of unconventional energy sources. The 3×20% targets adopted by the European Union assume by 2020: a 20% reduction in greenhouse gases, a 20% increase in energy efficiency and raising the share of renewable energy in final energy consumption to 20%, mostly by wind power stations, which makes the subject of regulating the issue of valuation important in legislation. Moreover, the European Union directives on renewable energy sources gave special significance to wind energy. The EU Member States undertook to define and coordinate the respective responsibilities of national, regional and local administrative bodies for authorisation, certification and licensing procedures including spatial planning and determining planning and building applications.

Wind power stations are becoming one of the leading problems in spatial development. They are a sign of the environmental revolution, much as factory chimneys and mine shafts marked the landscape of the 19th–20th centuries. Wind power stations require rational location, calculation of taxes and fees, valuation and value assessment. Proper procedures for location in space must therefore be developed. A more than fortyfold increase in electricity production from wind has been recorded in Poland since 2004 – from 142 GWh to 5822 GWh in 2013 (Polish Wind Energy Association Report www.pwea.pl). Despite the dynamic growth, electricity production using wind met only 2,74% of electricity consumption in Poland in 2012 (Polish Wind Energy Association Report). As investments in wind energy enjoy high popularity among investors, significant rises can be expected in the coming years. Analyses performed by the Polish Wind Energy Association indicate that total power in installed wind turbines can reach the level of approximately 13 GWe (Gigawatt of Electric Energy) in 2020, including 11 GWe in

onshore wind power stations, 1.5 GW in offshore wind power stations and 600 MW in small wind turbines.

Wind energy development favours increasingly numerous transactions whose objects are both operating power plants (wind turbine sets) and the documents and laws under which they can be constructed. For this reason, the subject of the study is the analysis and assessment of procedures in force in Poland, concerning the location, construction and operation, transfer of rights and calculation of taxes and fees on this account.

Conditions of wind energy development

Wind projects can be sold practically at each stage of the investment process and as operating wind power stations. Three functioning phases are distinguished for wind project valuation: design, construction, usage.

The design phase is the period in which the design documents are drawn up and completed and approvals and permits necessary to start construction are acquired. This period ends when the administrative decision is obtained – the building permit.

The construction phase is much shorter than the project preparation phase but requires considerably higher financial outlays. Some 90% of total project costs, which can be estimated at EUR 1.4–1.7 million per one MW of the installed power plant's power, are spent within fifteen weeks.

Operation phase – starts after power plant construction and obtaining the structure occupancy permit and a permit from the President of the Energy Regulatory Office (ERO) for electricity generation. For a wind power station, the permit is the document confirming energy production from renewable sources, necessary to obtain certificates of origin (green certificates), whose sale is an important source of the company's revenue.

Legal and formal conditions of the planned project

The process leading to the issue of the power plant building permit is relatively long in Poland and usually takes from 4 to 7 years (*Wind energy in Poland* 2011, p. 43).

Research carried out in communes (WASIUTA 2013) shows that fees for exclusion of land from agricultural contribute to communal budgets. There is an information gap concerning the allocation of these funds and the possibility of their use. It was also found (WASIUTA 2013) that lease contracts concluded between a farmer and an investor were not controlled. Farmers lease land

Table 1

Implementation stages of legal and formal procedures

Stage	Problem
Inclusion of the project in the study on the commune's land use conditions and directions (SUiKZP)	The commune orders the drawing up of a revision if the project was not included in the study earlier. The investor requests the inclusion of areas for wind power stations in the study.
Change in or drawing up of the local zoning plan (MPZP)	The investor requests a change in or the drawing up of MPZP. The commune orders the drawing up of MPZP.
Re-zoning fee	If the investor needs to buy the land, it must pay a zoning fee equal to 30% of the difference in prices before and after re-zoning. Valuation is required at this stage. If the investor bought the land before the change in MPZP, the fee is not calculated.
Obtaining the building permit precedes the exclusion of the land from agricultural use	Obtaining the building permit requires the exclusion of the land from agricultural use. The decision to exclude the land is issued by the starost. The owner must pay a one-off fee and yearly fees for 10 years.

Source: Own work based on legislation (the Act on Protection of Agricultural and Forest Land and the Act on Spatial Planning and Development).

for an indefinite period of time, but often not longer than 30 years. The contracts are not registered and the rent is not taxed. And this could be revenue to the commune, to the county and to other funds, which should be allocated to land reclamation. Research by A. Wasiuta (2013) shows that there is no single office to supervise all procedures and formalities related to obtaining a building permit. This could involve the energy office to check all formalities: certificates, contracts, fees before purchasing the generated energy. Should the investor not supply the proper documents – the office could not sign the electricity purchase contract. This could also involve the construction supervision authority, which issues facility operation permits.

Conditions of project implementation

Connection to the distributor

One of the most important problems in project implementation is expansion and modernization of network infrastructure for the delivery of generated energy. The ownership of land over or under the power lines and substations is another problem (Fig. 1). The specificity of linear structures is different than for enclosed structures. Linear projects are often tens or hundreds of kilo-

metres long, constructed across many communes, counties and even provinces. However, obtaining permits for such extensive projects is subject to the same regulations as enclosed projects. This requires huge effort from the investor and considerably lengthens the project preparation process. The investor is obliged to conduct negotiations with the owner of each land parcel in a planned project.

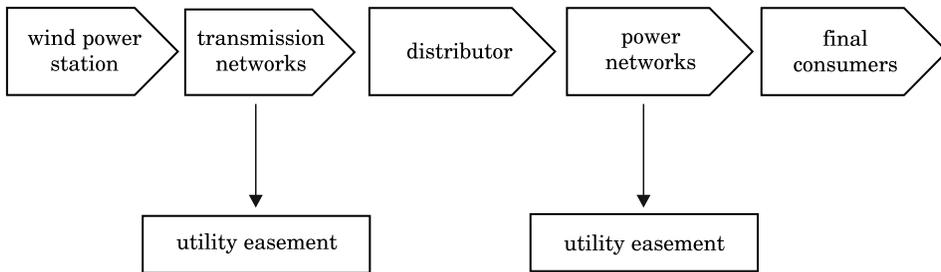


Fig. 2. Utility easement establishment model

Source: own work.

Undetermined legal status of real estate is, in many cases, a factor which sharply increases the risk of a failure in negotiations. Real estate owners often do not seek court decisions on inheritance. Out-of-date information in the land register and difficulties in determining the actual real estate holders may result in major defects of issued decisions to limit the right of ownership. The effect of the negotiations should be a contract in the form of a notarial deed, establishing a utility easement against payment. The duration of this process depends on the length of the planned transmission line and the number of parcel owners.

A transmission system operator can conclude utility easement contracts with land owners¹ and if there is no agreement, can bring the case to court. A court process is necessary if the owner refuses to establish easement, which is necessary to operate the facilities: conduct overhauls, modernization, maintenance and repair of these facilities (DOŁĘGA 2010, p. 84).

The current legal solutions lack, however, strict regulations on the method of valuation for calculating a utility easement. The owners' demands may differ considerably from the operators' financial means. The operators will try

¹ A utility easement is a legal structure, established, among others, for the benefit of a system operator after obtaining the owners' consent or by a court judgment, which has been applicable only from 3.08.2008, i.e. from the date when the amendment to the Act – the Civil Code came into force. Act of 23 April 1964 the Civil Code (Polish Journal of Laws No. 16 of 1964, item 93, as amended).

to shift the costs of such excessive financial claims to the final electricity consumers. In this situation, to facilitate negotiations with parcel owners, it is necessary to develop a uniform model of determining payments for the establishment of a utility easement depending, among others, on the line type, land type (according to the zoning plan), location within the country and land classification. This uniform model of determining payments should be regulated in an amendment to the Act (Act of 23 April 1964 the Civil Code, Polish Journal of Laws No. 16 of 1964, item 93, as amended).

Wind power stations as public utility projects

It is necessary to define the construction and maintenance of energy facilities and systems for the production of fuel and electricity as public utilities (in Art. 6 of the Act on Real Estate Management).

According to Art. 2.5 of the Act on Spatial Planning and Development, a „public utility project” is to be understood as actions with local (communal) and supralocal (county, voivodeship and national) importance, implementing the purposes mentioned in Art. 6 of the Act of 21 August 1997 on Real Estate Management. The Act on Real Estate Management indicates in Art. 6 the types of actions which can be considered public utilities. They are an exhaustive catalogue. This is reflected in the rulings of the Provincial Administrative Court². „A public utility means a utility concerning all people, serving all, intended (available) for everyone. The application of the principles and procedure provided for the location of a public utility project therefore depends on whether the investment projects, requiring the obtaining of the relevant decision, have a ‘public element’”

According to Art. 6.2 of the Act on Real Estate Management, „the construction and maintenance of land drains, conduits and facilities for carrying liquids, steam, gases and electricity and other structures and facilities necessary for using these conduits and facilities” is a public utility, which was confirmed in the judgement of the Provincial Administrative Court of 8 May 2008³. „Only facilities for electricity transmission were included among [public utility facilities], without including among them facilities for its generation, such as a wind power station...” Based on the quoted judicial decisions, a wind power station cannot be treated as a public utility project. If it were, expropriation and payment of compensation to the land owner on the basis of valuation would apply.

² File no. IV SA/Wa 2037/06, 7 March 2007.

³ File no. II SA/Sz 224/08, LEX 435125.

Use of wind power stations

Wind power stations as a subject of taxation

A wind power station consists of: its foundation, a mast, nacelle with a generator, rotor, gearbox, control computer, transformer, power switchboard, alarm system, remote control system and other technical equipment. The contentious issue between the tax authorities and the owners (taxpayers) is the determination of the subject and value of taxation: whether it is only the foundation and the mast or the windmill as a technical and functional whole. For a non-building structure, the tax base is its value determined by the methods recommended by the provisions of the Act on Local Taxes and Fees (Act on Local Taxes and Fees of 12 January 1991, Polish Journal of Laws No. 95 of 2010, item 613). Therefore, the establishment which power plant components actually constitute a non-building structure will determine the amount of tax. According to Art. 2.1 of the Act on Local Taxes and Fees, the subject of taxation with real estate tax are:

- land;
- buildings or their parts;
- non-building structures or their parts related to conducting business activity.

According to a judgement of the Supreme Administrative Court⁴, „Real estate tax is calculated only on foundations and masts, i.e. the constructed parts of a technical plant”. The court stressed in the reasons for the decision that, after an amendment to Art. 3.3 of the Construction Law (Act of 7 July 1994 on Construction Law, Polish Journal of Laws No. 89 of 1994, item 414, as amended), a wind power station was not a non-building structure but a technical plant. Only the constructed parts of a power plant should be considered a non-building structure as technically separate parts of the objects making up the functional whole.

According to the court, only the constructed parts of wind power station, as technically separate parts of the objects making up the functional whole, are subject to real estate tax liability pursuant to Art. 2.1.3 of the Act on Local Taxes and Fees. If a technical plant, such as wind power station, were considered a non-building structure, its constructed parts would not have been defined as a non-building structure. For tax purposes, a non-building structure does not have to be a functional whole because according to Art. 3.3 of the Construction Law, also the constructed parts of technical plant alone can be a non-building structure.

⁴ Judgment of 30 July 2009 (II FSK 202/08).

The ruling shows that a negative definition was used, pointing out that each structure, including also a construction facility, which is not a building or an accessory structure, is a non-building structure, which indicates that the constructed parts of the technical plant and foundations for machines and equipment are always technically separate parts of machines and equipment. Therefore, machines and equipment themselves are not a non-building structure and are not liable to tax. What is more, only the constructed parts of wind power stations are liable to tax. This interpretation decreases the possibility of obtaining higher revenue from the tax, which could contribute to the communal budget.

Wind power stations as companies

The renewable energy market brings together many stakeholders who participate, or intend to participate, in the financing of wind power stations. They then make a number of estimates to determine the return on invested capital or the value of assets securing the funds engaged in the project. Both valuation theory and practice indicate the existence of different standards of value (for example: fair market value, fair value, investment value, intrinsic value, Liquidation value, going-concern value) which reflect the value of the same object of valuation (SZCZEPANKOWSKI 2007, p. 42). The standard of value to be determined should therefore be indicated when estimating the value of a specific project and matched to the client's expectations. Valuations can fulfil different purposes (*General National Valuation Principles...*, p. 5):

- advisory (decision-making) function – providing necessary information related to planned capital transactions and management decisions,
- argumentative function – providing information on the value of the object of valuation, which can strengthen the bargaining power of one party in the conducted negotiations,
- mediatory function – providing necessary information on the value of the object of valuation, for capital transactions in which the parties' views on the value diverge,
- protective function – providing information on the value of the object of valuation, among others, to protect oneself from negative effects of disputes as to the value,
- information function – providing information obtained in the valuation process for company management needs.

Depending on the aim of valuation and the selected value category, the valuator can use different valuation methods, though for wind power stations the spectrum of possibilities is limited by the characteristics of the object of

valuation. Four basic groups of valuation methods (approaches) (PATENA 2011, p. 67): cost, income, comparative and mixed groups are used to estimate the value of real estate.

Selection of the valuation method

The selection of the appropriate method for wind power station valuation will depend on the project implementation phase, the aim of valuation and the sought value category. In the project preparation phase, asset-based methods are applied. This group of methods includes the replacement cost method, according to which the acquisition cost of the right to land should be added to the value of the facility. The acquisition of the right to use an attractively situated real estate (good wind conditions, proximity to the connection point, favourable communications conditions) is of very significant importance from the point of view of project efficiency and often has no direct connection with an expenditure incurred on the conclusion of lease contracts. The acquisition of such land often is not reflected in the company's financial statement because the contracts were concluded other than through a notary public's services, i.e. the right to land does not increase the company's assets and the rent of lease is not included in the company's statement of liabilities. Moreover, a local zoning plan allowing the installation of wind turbines may already exist in the selected location, which does not increase capital expenditures. Book values will not reflect the actual value of a project covering such land. Valuation by the discounted cash flow method, as recommended by the provisions of the Act on the Commercialization and Privatization of State-Owned Enterprises may prove reliable in the preparatory phase, including adjustments to reflect uncertainty connected with delayed project completion.

Mixed methods based on the results of estimates made by the cost and income methods seem to provide fair value determination for securing bank loans or for purposes related to contribution-in-kind procedures.

The use of comparative methods is rather out of the question. Since power plants can use different types of rotors and turbines, the annual revenue obtained from one MW of installed power can also be in different ranges, so an individual approach to each analysed power plant is needed.

The discounted cash flow method, which can be used both in the preparatory phase and at the power plant operation stage, seems the most suitable also for the determination of the value of functioning wind power stations. In this method the most widely used method of discounting is exponential discounting, which values future cash flows as „how much money would have to be invested currently, at a given rate of return, to yield the cash flow in future”. Other methods of discounting, such as hyperbolic discounting (time-inconsist-

ent model of discounting) are not generally used. The discount rate used is generally the appropriate weighted average cost of capital (WACC), that reflects the risk of the cashflows. The discount rate reflects two things: time value of money (risk-free rate) – according to the theory of time preference, investors would rather have cash immediately than having to wait and must therefore be compensated by paying for the delay; risk premium – which reflects the extra return investors demand because they want to be compensated for the risk that the cash flow might not materialize after all.

The discounted cash flow method is useful for the determination of both the intrinsic value and the investment and market values. The value of a wind power station is then determined as the net present value (NPV), calculated as the sum of free cash flows discounted as of the day of valuation (ŁAGUNA 2013). All expenses related to the project launch should be included in the project implementation phase and in the operation phase – cash flows resulting from the operations of the entity running the power plant.

Closing remarks

The obligations assumed by Poland and the prospects of growing benefits from investments in wind power stations have attracted an increasing group of stakeholders. One of the most important groups are investors providing capital support to the implementation of projects and expecting measurable gains in return. Investors can become involved in a project at different stages of its implementation. Additionally, the development stage of a given sector in the market in which they intend to invest their capital also has an unquestionable effect on a project's evaluation from an investors' point of view. The development of the renewable energy source market and, in particular, wind power stations is in the first phase. Legal and formal conditions at each stage: design, project implementation and use may hinder the development of the market. Failure to adapt legislation and procedures at each of the above-mentioned stages may lead, besides hampering the development of the wind energy market, to undesirable actions. Specific investors' expectations indicate that the method for valuation of such a project which takes their expectations into account to the highest degree is the valuation method from the income group, namely, the discounted cash flow method. Proper estimation of both outlays related to the start-up of a wind power station and later, all revenue and expenses involved, enables the accurate assessment of financial gains for a potential investor.

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**OBSERVATION DEPTH MEASURE IN A SAMPLE
IN THE VOIVODESHIP CLASSIFICATION
OF THE PROPERTY MARKET**

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Key words: data classification method, outlying observation, observation depth measure in a sample.

A b s t r a c t

The problem of classification has long been an object of interest in many fields of knowledge. It allows homogeneous groups of objects to be obtained with respect to a given criterion. The selection of the appropriate distance measure, which is used in the clustering of multivariate objects, has an important effect on the obtained classification results.

This paper uses observation depth measure in a sample of voivodeship classification, with respect to selected features concerning the property market in 2011. Voivodeships characterized by typical values for all analysed features were distinguished and those which could be considered outliers were so designated because of high or low values for the studied variables.

**MIARA ZANURZANIA OBSERWACJI W PRÓBIE W KLASYFIKACJI
WOJEWÓDZTW NA RYNKU NIERUCHOMOŚCI**

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Słowa kluczowe: metody klasyfikacji danych, obserwacje nietypowe, miara zanurzenia obserwacji w próbie.

A b s t r a k t

Problem klasyfikacji jest od dawna przedmiotem zainteresowań w wielu dziedzinach wiedzy. Pozwala ona na uzyskanie jednorodnych grup obiektów ze względu na dane kryterium. Wybór odpowiedniej miary odległości, która jest wykorzystywana w grupowaniu obiektów wielowymiarowych, ma istotny wpływ na uzyskane wyniki klasyfikacji.

W pracy zastosowano miarę zanurzenia obserwacji w próbie do klasyfikacji województw, ze względu na wybrane cechy dotyczące rynku nieruchomości w 2011 roku. Wyodrębniono województwa charakteryzujące się typowymi wartościami wszystkich analizowanych cech oraz te, które można uznać za odstające ze względu na osiągnięcie w nich wysokich lub niskich wartości badanych zmiennych.

Introduction

An important problem in the analysis of socioeconomic data is their proper classification. This can be defined as the division of a given set of objects into disjointed and exhaustive subsets (classes, groups) with regard to a specific criterion, based on the features of the classified objects. A class is understood as a set of objects characterized by certain common properties (GRABIŃSKI et al., 1989). The aim of classification is to examine the similarity or difference between objects with respect to a given criterion.

Many criteria for the division of classification methods can be encountered in the literature. Area methods can be distinguished, including similarity-based methods, in which a defined measure of similarity is assigned to an individual pairs of objects, clustering the most similar objects. Other classification method groups include, among others, hierarchical methods, non-hierarchical methods and graphical presentation methods, including multivariate scaling and correspondence analysis (GATNAR, WALESIAK 2004). Algorithms applied in the clustering of multivariate objects use defined distance measures. In practice, different geometric measures of distance in the feature space are most often used. The selection of such a measure has a decisive influence on classification results and is usually connected with a particular clustering method. It should be remembered that the selection of the proper measure is usually determined by the nature of available data and the object and method of classification.

The aim of the paper is to analyse the utility of statistical methods based on observation depth measures in a classification sample of multivariate data. Numerical data for voivodeships with respect to selected features of the property market in 2011 were used for this purpose. The description was primarily limited to the presentation of observation classification using an observation depth measure in a sample. The result of the final analysis is the grouping of voivodeships characterized by similar levels of the studied features.

Description of the classification method

Tukey’s paper (TUKEY 1975) introduced into statistical theory the concept of observation depth in a sample, which refers to the central cluster of multivariate observations. The depth measurement value lies within the closed interval $[0,1]$, with the observations to which its higher values correspond located more centrally in the data set.

Let there be given a set of n objects $O = \{O_1, O_2, \dots, O_n\}$, which are the object of classification and let $C = \{X_1, X_2, \dots, X_p\}$, be the set of p features (variables) which characterize the classification space. A row vector, $x_i = [x_{i1}, x_{i2}, \dots, x_{ip}]$, for $i = 1, 2, \dots, n$ defines the values of the features X_1, X_2, \dots, X_p for the object O_i . The set of n vectors determines a p -variate sample with a size of n , denoted as P_n^p . The classification method uses the Mahalanobis observation depth measure in a sample (LIU et al. 1999, ROUSSEEUW, RUTS 1996), which is based on the following definition:

Definition 1. We call the Mahalanobis depth measure ($Mzan_p$) of point θ in the sample P_n^p the function

$$Mzan_p(\theta; P_n^p) = [1 + Q(\theta, P_n^p)]^{-1} \tag{1}$$

where $Q(\theta, P_n^p) = (\theta - \bar{x})^T S^{-1} (\theta - \bar{x})$ is the Mahalanobis distance of the vector

$$\theta \text{ from the mean vector } \bar{x}, \text{ with } \theta = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \dots \\ \theta_p \end{bmatrix}, \bar{x} = \begin{bmatrix} \bar{x}_1 \\ \bar{x}_2 \\ \dots \\ \bar{x}_p \end{bmatrix}, \bar{x} = \frac{1}{n} \sum_{j=1}^n x_j, S \text{ the matrix}$$

of covariance between the considered p vectors and S^{-1} its inverse matrix.

The classification method based on the observation depth measure in the sample proceeds according to the steps presented below.

Step 1. The set of p features is divided into two-element subsets $\{X_j, X_k\}$ $j, k = 1, 2, \dots, p, j \neq k$. Each of these subsets is treated as a bivariate sample, which is denoted by $PD^{(m)}$. The total number of all bivariate samples is $m = \frac{1}{2} p(p - 1)$.

The observation matrix for the pair (j, k) , which forms the bivariate sample $PD^{(m)}$, is defined as

$$PD^{(m)} = \begin{bmatrix} x_{1j} & x_{1k} \\ x_{2j} & x_{2k} \\ \dots & \dots \\ x_{nj} & x_{nk} \end{bmatrix}, j, k = 1, 2, \dots, p, j \neq k,$$

where $x_i^{(m)} = [x_{ij}, x_{ik}]$ is the vector of the values of the j th and k th features corresponding to the object O_i .

Step 2. The values of the Mahalanobis depth measure $Mzan_2^{(m)}(x_i^{(m)}, PD^{(m)})$ are computed for each vector $x_i^{(m)}$ of the sample $PD^{(m)}$, $i = 1, 2, \dots, n$. Depth measure values ordered non-decreasingly enable ranking observations with respect to their distance from the central cluster, which is defined by the observations with the highest depth measure values. The centroid of the sample P_n^p is determined by the observation to which the highest depth measure value corresponds. It determines the median vector $WM = [Me_1, Me_2, \dots, Me_p]$ of the sample P_n^p . Lower depth measure values indicate a higher distance from a given observation to the sample centre, or the median vector. The observations to which the lowest depth measure values correspond are the most distant from the sample's central cluster. They can be treated as outlying observations with respect to the values of the studied variables.

Step 3. Classes containing the observations with the lowest depth measure values are created for each bivariate sample. They are denoted as $NMZan_2^{(m)}$.

Step 4. The observations belonging to the classes specified in step 3 are reviewed to establish for which diagnostic features observations are more distant from the central cluster of P_n^p .

Step 5. To determine which observations in the sample P_n^p assume typical numerical values for all studied variables, subsets containing the 50% of observations with the greatest depth are determined for each of the m $PD^{(m)}$ samples. A group of objects $NWZan_p = \{x_i^{(m)} : NWZan_2^{(1)} \cap NWZan_2^{(2)} \cap \dots \cap NWZan_2^{(m-1)} \cap NWZan_2^{(m)}\}$ is created. They define the class of observations of the sample P_n^p for which each of the studied features assumes typical values.

The presented classification method was described in detail by KOBYLINSKA and WARNER 2010. Discussion of observation depth in a sample can be found, among others, in the papers by DONOHO and GASKO (1992), HE and WANG (1997) and LIU et al. (1999).

Voivodeship classification with respect to selected features concerning the property market

The property market is one of the most dynamically-developing segments of the Polish economy. One of the main values used to characterize the property market is the housing stock in individual regions, which can be applied to determine the dwelling rate per 1000 residents. This allows the housing stock of the studied regions to be objectively compared. The demographic and economic situation of a given region influences the housing development rate. The housing stock in Poland consists mainly of flats in

multi-family houses located in larger towns and cities and single-family houses, which predominate in the countryside and in smaller towns. The dwelling saturation rates are more favourable in larger towns and cities. The main reason is the significant activity of developers, a lower unemployment rate, a higher pay level and a substantial number of settlers coming to academic centres. A measure for the dwelling purchase potential is the average monthly pay. Banks offer home loans, which constituted 36% of bank loan portfolios in 2011. It should be remembered that the property market is a local market and its activity depends on a given region.

The classification was carried out for 16 voivodeships in 2011 with respect to three features concerning the property market:

X_1 – mean dwelling unit purchase/sale transaction price (PLN for m^2),

X_2 – gross average monthly pay (PLN),

X_3 – number of new dwellings put into use per 1000 residents.

Table 1 contains the numerical values of the studied features in the voivodeships in the year. A statistical description of the features is provided in Table 2.

Table 1
Numerical values of the features X_1 , X_2 , X_3 in voivodeships in 2011

Voivodeship	X_1	X_2	X_3	Voivodeship	X_1	X_2	X_3
Lower Silesia	3,641	3,587.25	3.62	Subcarpathia	3,760	3,023.21	2.68
Kuyavia-Pomerania	3,087	3,062.32	3.06	Podlasie	3,764	3,178.15	3.69
Lublin	3,477	3,257.14	2.92	Pomerania	4,079	3,567.49	5.22
Lubusz	2,429	3,073.95	3.24	Silesia	2,572	3,794.62	2.00
Łódź	3,028	3,245.97	2.37	Świętokrzyskie	3,039	3,137.91	2.00
Lesser Poland	4,295	3,332.98	3.78	Warmia-Mazury	2,886	3,019.37	3.15
Masovia	6,701	4,504.66	4.76	Greater Poland	3,710	3,284.41	4.00
Opole	2,745	3,249.58	1.69	West Pomerania	3,451	3,289.56	3.46

Source: stat.gov.pl.

The computed high range values indicate a wide spread in the values of the studied features in voivodeships. The coefficients of variation are 28.19%, 11.23% and 30.03%, respectively. It can be assumed that the variation in gross average monthly pay is low and variation in the other features is moderate (WASILEWSKA 2009). 87.50% of the observations for the features X_1 and X_2 and 68.75% of observations for the feature X_3 fall within the range of one standard deviation for these features, i.e. (2543.12; 4539.88), (2974.43; 3726.64) and (2.26; 4.20). The first value differs considerably from 68%, which is assumed for symmetrical distributions. This is also indicated by high skewness values.

Mean dwelling unit purchase/sale transaction prices and gross average monthly pay levels below the mean value were recorded in most voivodeships in 2011.

Table 2

Numerical characteristics of the studied features

Statistics	X_1	X_2	X_3	Statistics	X_1	X_2	X_3
Lowest observation	2,429.00	3,019.37	1.69	Variance	996,762.53	141,458.10	0.95
Highest observation (max)	6,701.00	4,504.66	5.22	Standard deviation	998.38	376.11	0.97
Range	4,272.00	1,485.29	3.53	Median	3,464.00	3,253.36	3.20
Arithmetic mean	3,541.50	3,350.54	3.23	Skewness	2.20	2.17	0.34

Source: own work.

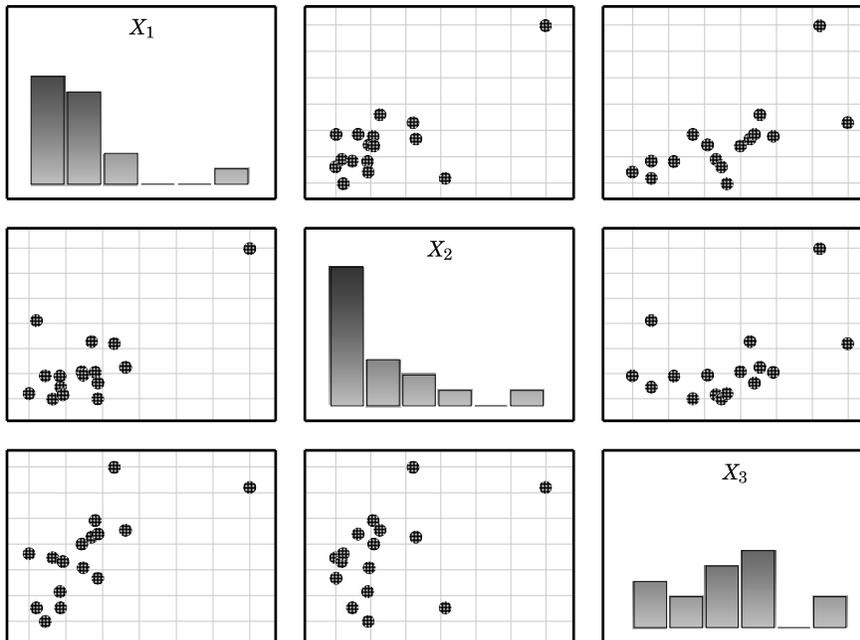


Fig. 1. Matrix diagram for the studied features

Source: own work.

The relationship between the analysed variables was illustrated in correlation diagrams arranged in the form of a matrix diagram. Considerable clustering of observations in the low and average value ranges can be observed along with the occurrence of observations much different from the others because of the high values of the analysed variables. The respective computed correlation

coefficients are $r_{X_1X_2} = 0,73$, $r_{X_1X_3} = 0,69$ and $r_{X_2X_3} = 0,43$. The mean dwelling unit purchase/sale transaction price is strongly correlated with the other variables. Higher gross monthly pay was recorded and more new dwellings were put into use in the voivodeships with higher mean transaction prices.

The set of features $\{X_1, X_2, X_3\}$, was divided into three two-element subsets $X^{(1)} = \{X_1, X_2\}$, $x^{(2)} = \{X_1, X_3\}$, $X^{(3)} = \{X_2, X_3\}$. Each of these subsets defines a bivariate sample with a size of 16. The Mahalanobis depth measures presented in Table 3 were computed for each of these samples. The number of observations according to Table 1 was placed in columns next to the non-decreasingly ordered depth measure values.

The observation number 16 (West Pomeranian voivodeship) reached the highest depth measure value in each bivariate sample. It is located centrally in the studied data set and defines the median vector of the sample P_{16}^3 , whose coordinates are $WM = (3451,00; 3289,56; 3,46)$.

Table 3

Mahalanobis observation depth measures for bivariate samples

Obs. no.	Mzan ₂ ⁽¹⁾ (X ₂ X ₂)	Obs. no.	Mzan ₂ ⁽²⁾ (X ₁ X ₃)	Obs. no.	Mzan ₃ ⁽³⁾ (X ₂ X ₃)
7	0.077	7	0.0803	7	0.090
12	0.097	11	0.1355	12	0.149
9	0.286	8	0.2395	11	0.173
6	0.410	4	0.2825	8	0.239
4	0.427	12	0.3650	13	0.485
10	0.514	9	0.4465	15	0.492
8	0.524	13	0.4748	5	0.513
14	0.547	15	0.5054	14	0.518
1	0.580	5	0.5086	9	0.534
2	0.605	14	0.5829	10	0.553
11	0.722	6	0.6211	4	0.587
13	0.736	10	0.7985	2	0.606
5	0.766	2	0.8008	6	0.691
15	0.808	1	0.8161	1	0.694
3	0.911	3	0.8350	3	0.875
16	0.971	16	0.8495	16	0.876

Source: own work.

Using the data contained in Table 3, it can be established which voivodeships are in the most central range of the sample PR_{16}^3 , with respect to all numerical values of the variables. Subsets containing the 50% of observations with the greatest depth were determined for this purpose for each bivariate sample. This is presented graphically in Figure 2. The triangle

contains the observations with the greatest depth in all bivariate feature subsets. Observations belonging to each of these subsets were placed inside the triangle. The Lower Silesia, Kuyavia-Pomerania, Lublin and West Pomerania voivodeships can be considered typical for all diagnostic features.

The values of the Mahalanobis observation depth measures in the sample presented in Table 3 determine which voivodeships are outliers due to their very low or very high values of the studied variables. The lowest depth measure values correspond to the Masovia voivodeship (observation 7), in which the highest values of the X_1 and X_2 variables were recorded in 2011. The Silesia voivodeship (observation 12) can be considered outlying because of the low values of both the dwelling purchase/sale transaction price and the number of new dwellings put into use. High values of gross average monthly pay and the number of new dwellings put into use per 1000 residents were recorded in the Pomerania voivodeship (observation 11) in 2011.

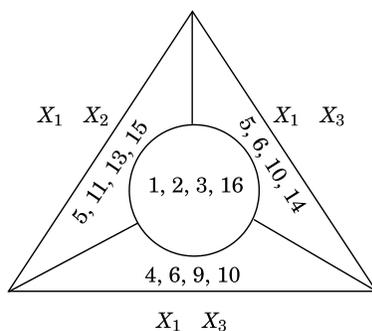


Fig. 2. Triangle containing the observations with the greatest depth in all bivariate feature subsets
Source: own work.

Mahalanobis observation depth measures in the sample PR_{16}^3 Table 4

Obs. no.	Mzan	Obs. no.	Mzan	Obs. no.	Mzan
7	0.095	14	0.530	6	0.700
12	0.159	9	0.556	1	0.706
11	0.188	5	0.558	16	0.874
8	0.269	10	0.565	3	0.897
13	0.386	4	0.597	–	–
15	0.509	2	0.618	–	–

Source: own work.

The values of Mahalanobis observation depth measures in the sample PR_{16}^3 (Table 4) were used to prepare a statistical map. Five depth measure intensity ranges were adopted on the map, for which corresponding grey scale shades were used. The presence of two coherent areas can be observed in the north-eastern and west-central parts of the country, which include the voivodships with depth measure values from 0.4 to 0.6.

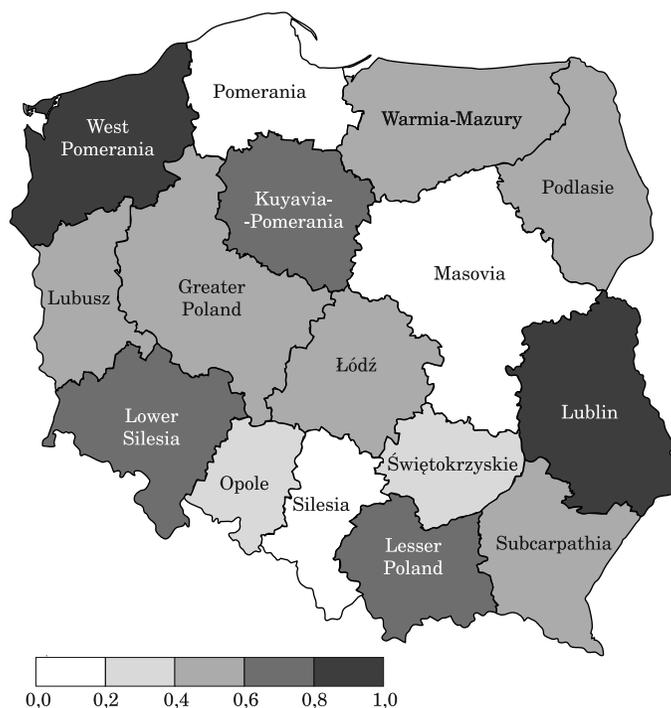


Fig. 3. Statistical map of the voivodships for the depth measures
Source: own work.

Summary

The study used an observation depth measure in a sample for multivariate object classification, based on the example of voivodships with respect to selected features concerning the property market in 2011. This allowed groups of objects similarly distant from the central cluster to be determined with respect to the studied diagnostic features. As a result of using the presented method, voivodships characterized by typical values of the mean dwelling unit purchase/sale transaction price, gross average monthly pay and the number of new dwellings put into use per 1000 residents were distinguished. These were the West Pomeranian (observation 16) and Lublin voivodships (observation

3), which make up 12.50% of the studied units. For each of these voivodeships, the depth measure values (Tables 3 and 4) reached the highest values (over 0.8). 18.75% are voivodeships outlying because of high or low values of the studied variables obtained in them. The largest group (37.5%) were the voivodeships in which the depth measure value was from 0.4 to 0.6 (observations 8, 13, 15, 14, 9, 5, 10, 4). No variables reached values which would classify a voivodeship in the outlying or most centrally-located observations in the set PR_{16}^3 in any of these voivodeships.

The year 2011 was a stable period in the sale of dwellings compared to the previous year. 29.7 thousand dwelling units were sold, over 7% more than in the previous year (*Property market in Poland in 2011*). As in the previous years, the highest level of sales of dwellings was observed in the largest housing markets in Poland, which include the cities of: Warsaw, Gdańsk, Gdynia, Sopot, Poznań and Cracow.

The proposed statistical methods based on observation depth measures in a sample can supplement more detailed analysis, which is of high importance in the study of socioeconomic phenomena. Using an observation depth measure in a sample, difficulties connected with ordering multivariate observations are overcome. Many multivariate statistical methods require the fulfilment of some assumptions, e.g. conformity of the analysed variables with normal distribution. The fulfilment of this assumption is not necessary in the presented classification method.

Translated by JOANNA JENSEN

Accepted for print 31.12.2013

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