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## **Status and trends of the employment in the financial institutions in Poland**

### INTRODUCTION

The situation of the labour market in the financial and insurance sectors is unsteady due to its characteristics [Banaszczak-Soroka, 2014]. Most organisations have suspended development projects related to employment growth until they note a clear upward trend in the Polish economy [Sopoćko, 2015]. Positive signals for employment in financial and insurance institutions include: improving macroeconomic indicators, i.e. an increase in GDP, declining unemployment and increasing average gross remuneration – all of these raise hope for a revival of the entire sector.

The maturity of the market economy is determined by the level of development of market institutions responsible for the efficiency of market processes [Czekaj, 2008]. Financial markets are one of the most important components of the socio-economic system of every country [Dębski, 2012; Smyczek, 2012]. Market institutions are organisations through which various market streams flow, from producers to end users and vice-versa. The nature of such streams is closely connected with the market type. The labour and the financial markets are closely interrelated. According to the human capital theory, the labour market is very receptive as long as salaries and wages do not begin to decline [Blaug, 1995]. Development of the financial sector and its determinants can be dependent on the market development level. A different role will be played by such development factors as good governance and quality of services, and a different role will be

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played by economic growth, trade openness [Thai-Ha Le, Jungsuk Kim, Minsoo Lee, 2016] and role of universities in the knowledge economy [Bejinaru, 2017].

The economic changes occurring in a society generate a number of sectoral adaptations [Baszyński, 2007]. The labour market in the sector of banking services in Poland after the period of growth in the nineties began to decrease. The introduction of technological changes in the provision of banking services contributed the most to reducing the demand for work in the financial sector. Banks carry out a reduction of employment resulting from the necessity to liquidate branches due to a change in the manner of customer service. The reason for changes in the level of employment in the financial sector is the restructuring of the costs of the operation of banking institutions and the increase in labour productivity. The rate of employment in financial institutions is unquestionably affected by advanced technologies and their increasing use in almost every aspect of our lives. New services based on IT solutions are also dynamically being introduced to financial institutions. An online banking is a system where financial settlements take place, excluding the circulation of hard-copy documents, and the bank communicates with its clients via data transmission [Chmielarz, 1999]. An online banking is perceived two-dimensionally; as a group of online banking service distribution channels and as the possibility to create completely new products that expand the bank's product range [Świecka, 2007].

The purpose of this research is to analyse the employment in the financial sector at a level of voivodeship in period from 2005 to 2014 and clustering voivodships in terms of entities numbers in the same period. This time period and moments are relevant in terms of economic comparison, considering that Poland has been a Member State of the EU for over ten years now. Multivariate statistical analysis methods were applied in the research, especially the non-hierarchical clustering method, the descriptive statistical method and linear regression. The article consists of three main parts. The first part discusses employment in general at financial and insurance companies operating in Poland, also divided by voivodeships. The second part is an overview of the changes in employment structure in the sector analysed for individual voivodeships and discusses the development trends in employment. The third part presents a division of voivodeships into clusters by the number of entities varied due to types of economic activity according to PKD.

## EMPLOYMENT IN THE POLISH FINANCIAL SECTOR

The analysis of employment in the financial and insurance sector was based on the total number of employees at financial and insurance companies presented in section K of the Polish Classification of Business (PKD). Descriptive statistics of the groups allowed for temporal distribution of employment under discussion. Table 1 illustrates a summary of the main measures of employment distribution in the financial sector in individual voivodeships and in Poland overall, compiled on the basis of data for the period from 2005 to 2014.

**Table 1. Spatial diversification of employment in the Polish financial and insurance sector in 2005–2014**

Voivodeship	Statistics	Average	Min.	Max.	Coefficient of variance	Coefficient of skewness
Poland		272284	244010	285751	5.46	-1.21
Dolnośląskie		24874	19560	28649	10.90	-0.68
Kujawsko-pomorskie		8507	7833	9683	6.68	0.93
Lubelskie		10326	8191	12142	14.33	-0.15
Lubuskie		3246	2970	3598	6.29	0.83
Łódzkie		12476	11746	13695	4.59	0.71
Małopolskie		17249	12750	20119	11.75	-1.10
Mazowieckie		110448	84183	125582	13.86	-0.81
Opolskie		3306	2790	3818	12.20	0.17
Podkarpackie		5547	5039	6480	8.48	1.01
Podlaskie		4403	3728	4940	10.52	-0.71
Pomorskie		17744	15767	21220	10.89	0.79
Śląskie		23421	21885	25499	5.12	0.12
Świętokrzyskie		3217	2906	3908	10.16	1.22
Warmińsko-mazurskie		4159	3323	4987	14.98	-0.37
Wielkopolskie		16294	15002	17287	4.94	-0.01
Zachodniopomorskie		7061	6163	8227	12.37	0.43

Source: own analysis based on data of the Central Statistical Office of Poland.

The average number of employees at financial, insurance and pension institutions and other entities facilitating financial activities in Poland over the period under analysis amounted to slightly more than 270,000 people. It was characterized by very low volatility ( $V_s=5.46\%$ ) and a strong negative asymmetry of the distribution of annual employment, which means that for most years of the period under analysis the employment was above average. The highest number of employees in the financial sector was observed in the Mazowieckie voivodeship. The employment level in this voivodeship exceeded employment in the remaining voivodeships a few or even several dozen times. The reason for this is the strong concentration of financial services units and supporting these companies in Warsaw as the country's financial center. A relatively high level of the discussed problem i.e. over 15,000 employees on average over the year the voivodeships Dolnośląskie, Śląskie, Pomorskie, Małopolskie and Wielkopolskie were characterized. The lowest average employment just over 3,000 owned voivodeships: Świętokrzyskie, Lubuskie and Opolskie. Analysis of average employment in individual voivodeships excluding Mazowieckie due to Warsaw indicates the division of the country into the south-western part with clearly higher average annual employment and the eastern part with a much lower level of this phenomenon.

## EMPLOYMENT TRENDS IN THE FINANCIAL SECTOR

An analysis of changes in employment is an extremely important aspect of every sector, including the financial sector as well. In the next part of the research, trends in employment in the financial sector among the voivodships were analysed as well as trends in the number of workers in that sector in individual voivodships. In 2005–2014, in all of the voivodships except for the Mazowieckie voivodship, employees of financial institutions constituted a small percentage (a few per cent) of total employment. Table 2 illustrates those changes.

**Table 2. Percentage share of financial and insurance sector employment in total employment in individual voivodships over 2005–2014**

Voivodeship \ Years	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Dolnośląskie	8.0	8.7	9.5	10.1	9.8	9.8	8.8	8.5	9.0	9.1
Kujawsko-pomorskie	3.5	3.3	3.2	3.0	2.8	2.8	2.8	3.1	3.2	3.5
Lubelskie	4.6	4.8	4.6	4.3	3.8	3.6	3.4	3.3	3.0	2.9
Lubuskie	1.5	1.3	1.2	1.3	1.1	1.2	1.1	1.1	1.1	1.1
Łódzkie	5.1	5.1	4.9	4.8	4.3	4.2	4.2	4.4	4.5	4.5
Małopolskie	7.3	6.8	6.4	5.5	6.1	7.1	6.6	6.5	6.6	4.6
Mazowieckie	34.4	35.7	36.7	38.6	40.7	42.4	44.1	43.9	43.3	44.0
Opolskie	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	1.0	1.0
Podkarpackie	2.7	2.3	2.2	2.2	1.8	1.9	1.9	1.9	1.9	1.8
Podlaskie	2.0	1.9	1.8	1.7	1.4	1.3	1.3	1.6	1.6	1.6
Pomorskie	6.5	6.6	6.8	7.1	7.1	5.6	5.8	6.1	6.1	7.6
Śląskie	9.0	8.7	8.5	8.3	9.1	8.3	8.5	8.6	8.7	8.4
Świętokrzyskie	1.5	1.3	1.3	1.4	1.1	1.1	1.1	1.1	1.0	1.0
Warmińsko-mazurskie	2.0	1.9	1.8	1.6	1.6	1.5	1.4	1.2	1.2	1.2
Wielkopolskie	7.0	6.8	6.6	6.1	5.7	5.7	5.6	5.5	5.6	5.4
Zachodniopomorskie	3.3	3.3	3.1	2.7	2.4	2.4	2.3	2.2	2.2	2.3

Source: own analysis based on data of the Central Statistical Office of Poland.

In 2014, when compared to 2005, an increase in the percentage of financial and insurance sector employees was noted in three voivodeships: the Dolnośląskie (+1.1pp, 13.7%), Mazowieckie (+9.6pp, 27.9%), and Pomorskie (+1.1pp, 16.9%) voivodeships. The rest of the voivodeships noted a relative decrease in employment in the sector analysed. An increase in employment in the Mazowieckie voivodeship concurred with a decrease in employment in the rest (the majority) of the voivodeships. In 2014, employees of financial, insurance or related companies located in the Mazowieckie voivodeship constituted around 44% of total employment in that sector in Poland. The lowest percentage of employees in the financial

sector was in the Lubuskie, Opolskie, Świętokrzyskie, and Warmińsko-Mazurskie voivodeships. The share of employment in the financial sector in those voivodeships when compared to employment in that sector in Poland overall fluctuated at around 1% and the trend was downward.

The time series for the number of employees employed in individual voivodeships, linear trend functions and the average rate of change were also estimated and are illustrated in Table 3.

**Table 3. Trends in employment in the Polish financial and insurance sector from 2005–2014**

Statistics Voivodeship	Average rate of change (%)	Trend function
1	2	3
Poland	1.50	$\hat{y}_t = 251073,02 + 3856,68t;$ $R^2 = 0,62;$ $V_{\xi} = 3,6\%$ <small>(<math>t=37,67^{***}</math>) (<math>t=3,59^{***}</math>)</small>
Dolnośląskie	2.94	$\hat{y}_t = 22806,30 + 379,08t;$ $R^2 = 0,17;$ $V_{\xi} = 10,4\%$ <small>(<math>t=12,80^{***}</math>) (<math>t=1,31</math>)</small>
Kujawsko-pomorskie	1.49	$\hat{y}_t = 7942 + 102,78t;$ $R^2 = 0,30;$ $V_{\xi} = 5,9\%$ <small>(<math>t=23,06^{***}</math>) (<math>t=1,86^*</math>)</small>
Lubelskie	-3.54	$\hat{y}_t = 12816,9 - 452,88 t;$ $R^2 = 0,86;$ $V_{\xi} = 5,7\%$ <small>(<math>t=31,86^{***}</math>) (<math>t=-6,98^{***}</math>)</small>
Lubuskie	-1.77	$\hat{y}_t = 3520,00 - 49,74 t;$ $R^2 = 0,54;$ $V_{\xi} = 4,5\%$ <small>(<math>t=35,24^{***}</math>) (<math>t=-3,09^{**}</math>)</small>
Łódzkie	-0.13	$\hat{y}_t = 12705,7 - 41,73 t;$ $R^2 = 0,05;$ $V_{\xi} = 4,7\%$ <small>(<math>t=31,39^{***}</math>) (<math>t=-0,64</math>)</small>
Małopolskie	-3.59	$\hat{y}_t = 17683,60 - 79,02 t;$ $R^2 = 0,01;$ $V_{\xi} = 12,4\%$ <small>(<math>t=12,13^{***}</math>) (<math>t=-0,33</math>)</small>
Mazowieckie	4.29	$\hat{y}_t = 84889,40 + 4647,15t;$ $R^2 = 0,85;$ $V_{\xi} = 5,8\%$ <small>(<math>t=19,46^{***}</math>) (<math>t=6,61^{***}</math>)</small>
Opolskie	-3.01	$\hat{y}_t = 4010,20 - 128,00 t;$ $R^2 = 0,92;$ $V_{\xi} = 3,5\%$ <small>(<math>t=49,68^{***}</math>) (<math>t=-9,84^{***}</math>)</small>
Podkarpackie	-2.76	$\hat{y}_t = 6264,20 - 127,03,11t;$ $R^2 = 0,67;$ $V_{\xi} = 5,1\%$ <small>(<math>t=31,87^{***}</math>) (<math>t=-4,02^{***}</math>)</small>
Podlaskie	-1.01	$\hat{y}_t = 4733,60 - 60,05 t;$ $R^2 = 0,15;$ $V_{\xi} = 10,2\%$ <small>(<math>t=15,34^{***}</math>) (<math>t=-1,21</math>)</small>
Pomorskie	3.36	$\hat{y}_t = 16554,7 + 216,35t;$ $R^2 = 0,11;$ $V_{\xi} = 10,8\%$ <small>(<math>t=12,57^{***}</math>) (<math>t=1,01</math>)</small>
Śląskie	0.72	$\hat{y}_t = 22061,1 + 247,37t;$ $R^2 = 0,39;$ $V_{\xi} = 4,2\%$ <small>(<math>t=32,50^{***}</math>) (<math>t=2,26^*</math>)</small>

1	2	3
Świętokrzyskie	-2.35	$\hat{y}_t = 3,661,80 - 80,81 t$ ; ( $t=23,30^{***}$ ) ( $t=-3,19^{**}$ ) $R^2 = 0,56$ ; $V_{\xi} = 7,1\%$
Warmińsko- -mazurskie	-4.41	$\hat{y}_t = 5256,40 - 199,52 t$ ; ( $t=47,55^{***}$ ) ( $t=-11,20^{***}$ ) $R^2 = 0,94$ ; $V_{\xi} = 3,9\%$
Wielkopolskie	-1.46	$\hat{y}_t = 17626,40 - 242,11 t$ ; ( $t=72,87^{***}$ ) ( $t=-6,21^{***}$ ) $R^2 = 0,83$ ; $V_{\xi} = 5,6\%$
Zachodnio- pomorskie	-2.98	$\hat{y}_t = 8558,40 - 272,11 t$ ; ( $t=40,68^{***}$ ) ( $t=-8,08^{***}$ ) $R^2 = 0,89$ ; $V_{\xi} = 4,3\%$

Note:  $R^2$ ,  $V_{\xi}$  correspond respectively to the coefficient of determination and coefficient of variation.

The average rate of change calculated as  $(\bar{t}_G - 1) * 100\%$ , where  $\bar{t}_G = \sqrt[n-1]{y_n/y_1}$ .

\*\*\*, \*\*, \* – statistically significant coefficient at the significance level of  $\alpha=0.01$ ; 0.05; 0.1 respectively.

Source: own analysis.

Data for the entire country show a statistically significant, growing trend in employment in the financial sector. However, its relatively high positive slope is determined by a very strong, growing trend for the Mazowieckie voivodeship, with a much slower trend for the Dolnośląskie, Pomorskie and Śląskie voivodeships. In the case of the majority of voivodships, models of the trend function indicate a negative statistically significant development tendency of the studied phenomenon or lack of a significant tendency indicating that the level of employment fluctuates around a fixed average value. The coefficients of determination ( $R^2$ ) of the statistically significant slopes of the linear trends show a good fit or an average fit between those functions and the empirical data. The average rates of change confirm the predicted directions of development trends and mean that for voivodships characterized by a downward trend in employment in the financial sector, the annual decline in employment is between 0.13% in the Łódzkie voivodeship and 4.41% in the Warmińsko-Mazurskie voivodeship.

#### GEOGRAPHICAL DIVERSITY OF ECONOMIC ENTITIES IN THE POLISH FINANCIAL SECTOR

The preliminary statistical analysis of employment revealed that its level is different in individual regions of Poland. To better describe this phenomenon, it seems advisable to spatially cluster regions consisting of voivodships with employment at a similar level and of similar structure in the financial and insurance sectors. However, those regions were clustered based on the number of registered entities in the sector, which is a direct determinant of employment. The voivodships were clustered and a comparison was made for 2009 and 2014.

In particular, diagnostic variables constituted the number of entities operating in three groups of the financial sector divided by the type of economic activity according to PKD. They include: group 64 – financial service activities except for insurance and pension funding (A); division 65 – insurance, reinsurance, and pension funding, except for compulsory social security (B); and group 66 – activities auxiliary to financial services, insurance, and pension funding (C). The first group comprises: monetary intermediation; activities of holding companies; activities of trusts, funds, and similar financial entities; as well as other financial service activities, except for insurance and pension funding. The second group comprises insurance and reinsurance. Group C consists of institutions engaged in financial management, activities ancillary to insurance and funding activities, and financial services. Table 4 presents the percentage structure of the number of entities in individual groups.

**Table 4. Share of financial and insurance sector entities in individual voivodships in 2009 and 2014**

Voivodeship	Years/PKD	2009			2014		
		A	B	C	A	B	C
Poland		15.5	0.8	83.7	20.3	1.0	78.8
Dolnośląskie		16.7	0.4	82.9	22.9	0.7	76.4
Kujawsko-pomorskie		18.3	1.0	80.7	20.4	1.1	78.5
Lubelskie		15.0	0.7	84.3	16.5	1.3	82.1
Lubuskie		16.5	1.2	82.3	19.2	1.6	79.2
Łódzkie		15.6	0.8	83.5	19.2	1.2	79.6
Małopolskie		13.6	0.6	85.8	18.2	0.9	80.9
Mazowieckie		19.0	1.3	79.7	26.2	1.3	72.5
Opolskie		9.2	1.3	89.5	12.4	1.4	86.2
Podkarpackie		10.1	0.4	89.5	13.7	1.0	85.3
Podlaskie		12.8	0.5	86.7	17.9	0.7	81.4
Pomorskie		11.8	0.4	87.7	16.0	0.6	83.4
Śląskie		15.5	0.5	84.0	21.0	0.6	78.4
Świętokrzyskie		13.4	0.9	85.7	16.1	1.2	82.7
Warmińsko-mazurskie		13.6	1.3	85.1	16.2	1.4	82.4
Wielkopolskie		16.1	1.0	82.9	21.2	0.8	78.0
Zachodnio-pomorskie		14.9	0.8	84.3	16.7	0.7	82.6
Mean		14.6	0.8	84.6	18.5	1.0	80.5

Note: PKD groups: A – financial service activities except for insurance and pension funding; B – insurance, reinsurance, and pension funding, except for compulsory social security; C – activities auxiliary to financial services, insurance and pension funding.

Source: own analysis based on data of the Central Statistical Office of Poland.

The data presented indicate the highest percentage of institutions operating activities ancillary to financial, insurance, and pension funding services (C), although it declined on average for all of Poland – from 84.6% to 80.5% of the total number of economic operators over the years under analysis. One should note that the highest percentages in that group were in the Opolskie and Podkarpackie voivodeships and the lowest was in the Mazowieckie voivodeship. The lowest percentage of the number of financial sector companies (around 1%) was noted in group (B) related to insurance, reinsurance and pension funding. In the case of that group, for the years compared, the highest percentages of economic operators were noted in the Lubuskie, Mazowieckie, Opolskie, and Warmińsko-Mazurskie voivodeships. On the other hand, the percentage of companies operating financial service activities (A) in 2009 in Poland was 14.6% and it increased to 18.5% of all such institutions by 2014. Relatively most entities in that group in the years compared were noted in the Mazowieckie voivodeship and the fewest were in the Opolskie voivodeship.

The voivodeships were clustered based on selected diagnostic features using cluster analysis algorithms. For clustering, the k-means method (a non-hierarchical clustering method) was applied. First of all, this method requires making an arbitrary decision about the number of clusters, into which the original set of objects are to be grouped [Dziechciarz, Walesiak, 2000; Walesiak, Gatnar, 2009]. Another problem is identification of initial centroid averages, i.e. the initial centres of clusters<sup>3</sup>. The fundamental idea behind this method is such allocation of taxonomic units to  $k$  groups that minimizes variability in the clusters created and maximizes the variability among them. The objects (voivodeships) should be moved among the clusters to achieve the greatest level of significance of the analysis of variance (variations) (ANOVA). High variability among the highlighted clusters and relatively low variability in the clusters testify to the adequate clustering of the voivodeships by the variables analysed. The results of  $F$ -statistics illustrated in Table 5 show that all the variables, both in 2009 and 2014, well discriminate the clusters at a level of significance of 0.05.

**Table 5. Results of the analysis of variations of discriminant variables in 2009 and 2014**

Variable	Analysis of variance for the variables for 2009					
	Intergroup variation	df	Intragroup variation	df	F-Statistic	p-Value
A	14152960	3	2161601	12	26.18	0.000
B	34023	3	27289	12	4.98	0.017
C	275692700	3	13003350	12	84.80	0.000

<sup>3</sup> When selecting initial centres of the clusters for the research, the distances between all the objects are sorted and objects with constant intervals are then chosen as initial centres of the clusters.



Variable	Analysis of variance for the variables for 2014					
	Intergroup variation	df	Intragroup variation	df	F-Statistic	p-Value
A	34877750	3	1336918	12	104.35	0.000
B	68623	3	2867	12	95.74	0.000
C	253004500	3	17269030	12	58.60	0.000

Source: own analysis.

In this way, it was possible to arbitrarily identify four clusters. Voivodeships grouped into four clusters include objects similar to each other in terms of the features under analysis (entities in groups 64, 65, and 66). The classification of voivodeships in the 2009 and 2014 are illustrated in Tables 6 and 7.

**Table 6. Clusters of the voivodeships and their descriptive statistics for 2009**

Cluster	Elements of the cluster in 2009	Variable	Descriptive statistics of entities belonging to the cluster		
			Average [entities]	Standard deviation [entities]	Coefficient of variation (%)
1	Kujawsko-Pomorskie, Lubelskie, Łódzkie, Zachodniopomorskie	A	1087.3	184.9	17.0
		B	57.3	11.3	19.8
		C	5650.5	646.6	11.4
2	Dolnośląskie, Małopolskie, Pomorskie, Wielkopolskie	A	1535.3	399.7	26.0
		B	65.5	35.6	54.3
		C	8797.8	811.3	9.2
3	Mazowieckie, Śląskie	A	3484.0	1243.1	35.7
		B	183.0	148.5	81.1
		C	16193.0	2944.4	18.2
4	Lubuskie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie, Warmińsko-Mazurskie	A	460.2	83.1	18.1
		B	33.5	14.6	43.5
		C	3194.3	470.1	14.7

Source: own research.

In 2009, the cluster with the greatest average number of economic operators inside three groups of the financial sector (cluster 3) included the Mazowieckie and Śląskie voivodeships. Those values exceed several times the corresponding values in the remaining clusters and can be interpreted as the main financial centres of Poland. Cluster 2 is a concentration of areas of the western and southern parts of Poland, specifically of the Dolnośląskie, Małopolskie, Pomorskie and Wielkopolskie

skie voivodeships. That cluster is characterised by a relatively high average number of financial companies, especially of those operating activities ancillary to financial services. Cluster 1 is a group of four voivodeships: Kujawsko-pomorskie, Lubelskie, Łódzkie and Zachodniopomorskie. The standard deviation values and the variance coefficient value for the number of financial companies for 2009 indicate a slight regional diversity among those voivodeships. On the other hand, cluster 4 is a group of voivodeships with the lowest average number of entities under analysis. It comprises such voivodeships of eastern Poland as the Podkarpackie, Podlaskie, Świętokrzyskie and Warmińsko-Mazurskie voivodeships as well as two smallest voivodeships of western Poland, i.e. the Lubuskie and Opolskie voivodeships. The average number of financial institutions operating financial service activities, excluding insurance and pension funding of activities, in that cluster is more than two or three times lower compared to the average number of entities calculated for clusters 1 and 2, and more than seven times lower when compared to cluster 3.

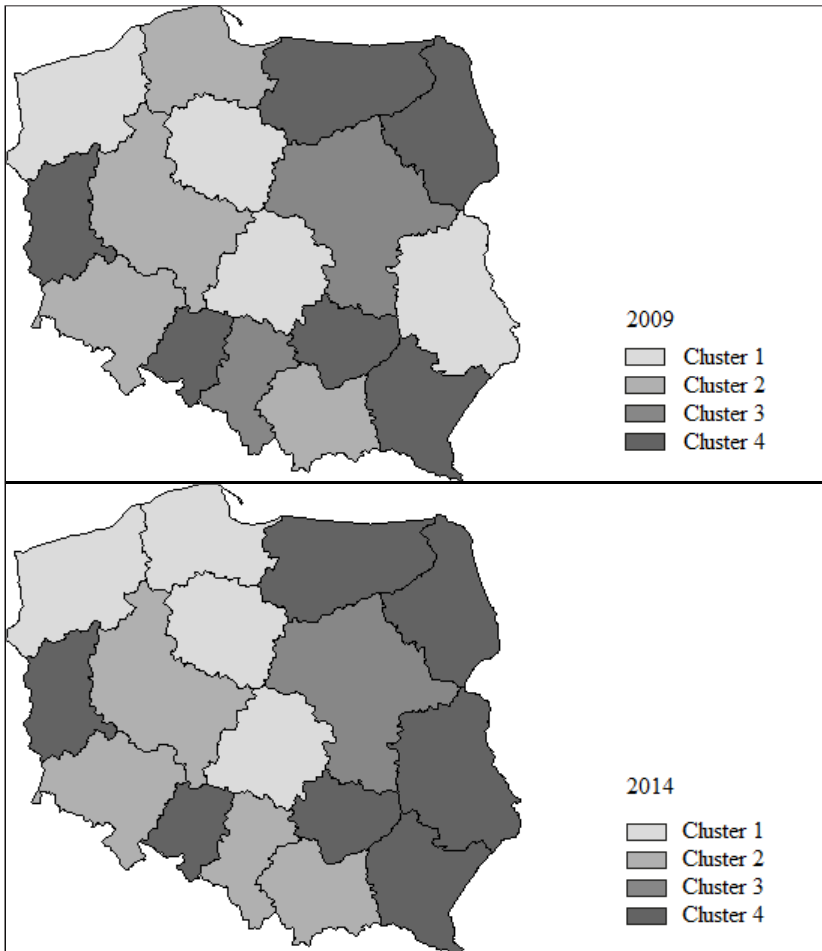
**Table 7. Clusters of the voivodeships and their descriptive statistics for 2014**

Cluster	Elements of the cluster in 2014	Variable	Descriptive statistics of entities belonging to the cluster		
			Average [entities]	Standard deviation [entities]	Coefficient of variation (%)
1	Kujawsko-Pomorskie, Łódzkie, Pomorskie, Zachodniopomorskie	A	1299.5	166.4	12.8
		B	64.3	20.4	31.7
		C	5876.8	1015.4	17.3
2	Dolnośląskie, Małopolskie, Śląskie, Wielkopolskie	A	2571.0	614.4	23.9
		B	89.8	9.9	11.0
		C	9620.5	1949.3	20.3
3	Mazowieckie	A	6456.0	0.0	0.0
		B	323.0	0.0	0.0
		C	17889.0	0.0	0.0
4	Lubelskie, Lubuskie, Opolskie, Podkarpackie, Podlaskie, Świętokrzyskie, Warmińsko-Mazurskie	A	587.4	142.3	24.2
		B	45.7	14.9	32.5
		C	3051.0	680.2	22.3

Source: own research.

The classification results achieved for 2014 show a similar geographical division of financial and insurance companies according to population noted in the analysis for 2009. Cluster 3 isolated the Mazowieckie voivodship as a stand-alone region, the biggest cluster of companies in the sector analysed in the country. The remaining clusters were formed by the following regions: south-western (cluster 2),

central (concentration 1) and the largest eastern (cluster 4). Elements of the separated clusters in 2009 and 2014 are presented in the maps of Fig. 1.



**Fig. 1.** The division of Poland into voivodeship clusters due to the number of entities from the finance and insurance sector in 2009 and 2014.

Source: own research.

The changed composition of clusters in the analysed years does not fully entitle to compare the average number of companies in these clusters. The most similar in its composition, cluster 4, recorded a decrease in the average number of entities in the most numerous section (66) of the financial sector and an increase in the sections (64 and 65) of this sector. The remaining clusters, whose elements were mainly voivodships of western and southern Poland, were characterized by an increase in the number of entities in all sectors of the financial and insurance sector.

## CONCLUSION

Employment related to the financial and insurance sector in Poland was mainly concentrated in companies with activities supporting financial services as well as insurance and pension funds. The share of this PKD section in 2005-2014 was over 80% of total employment in the entire sector. Over time, regional disparities in terms of the number of business entities in the financial sector are progressing. In the highest degree, this level increased in the Mazowieckie Voivodship, in which there was an increase in the percentage of companies related to financial activities by almost 10 pp. The main urban centers of southern and western Poland are also characterized by a high degree of concentration of the discussed companies, where there is a significant increase in the number of entities belonging to this sector. Changes in the number of operating financial entities translate into the employment level in these entities. In the case of the majority of voivodships, however, the determined employment trend models point to a statistically significant negative development tendency of the studied phenomenon. In voivodships with declining employment trends in the financial sector, the annual decline in the number of employees varies from 0.13% to 4.41%.

Decreasing employment, caused by fewer people being employed in the financial sector, triggered economic changes, the effect of which were regulations of the Polish Financial Supervision Authority resulting in slower evaluation of credit requests by banks. The lower employment level in the Polish financial sector could also be a result of the development of online banking or the broadly understood development of information technologies in the banking sector. In addition, of significance is increasingly higher social awareness of online banking as well as the introduction of new cashless payment solutions. Reductions in employment are also an effect of numerous changes in the ownership of financial entities. Consolidation of companies resulting in mergers of departments may lead to fewer jobs.

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### Summary

The financial sector is one of the most important elements of socio-economic system of each country. The research work is employment in this sector focusing financial activities insurance and other activities supporting these activities. The aim of the study was to examine the level of employment in the financial sector in spatial terms (voivodship) in the period 2005–2014 using methods of multivariate statistical analysis. The attention was also drawn to the trends in the structure of employment in the financial sector between the voivodships and the same size of the number of employees in individual voivodship. The classification results indicate the geographical division of the country in terms of number of firms in the sector of finance and insurance. Data for the country also show a significant growing trend of employees in the financial sector. However its high directional coefficient is conditioned by very strong growing trend occurring in Mazowieckie much slower trend in the provinces of Dolnośląskie, Pomorskie, and Śląskie. For most voivodships tendency models indicates a negative statistically significant trend of the studied phenomenon.

*Keywords:* the financial sector, employment, k-means classification, trends.

## Poziom i tendencje zmian w zatrudnieniu w instytucjach finansowych w Polsce

### Streszczenie

Sektor finansowy stanowi jeden z najważniejszych elementów systemu społeczno-ekonomicznego każdego kraju. Przedmiotem badań w pracy jest wielkość zatrudnienia w tym sektorze skupiającym działalność finansową, ubezpieczeniową oraz pozostałą działalność wspomagającą powyższe działalności. Celem pracy było zbadanie poziomu zatrudnienia w sektorze finansowym w ujęciu przestrzennym (województwa) w latach 2005–2014 przy użyciu metod wielowymiarowej analizy statystycznej. Zwrócono również uwagę na trendy w strukturze zatrudnienia w sektorze fi-

nansowym między województwami, jak i samej wielkości liczby zatrudnionych w poszczególnych województwach. Dane dla kraju pokazują również na istotny rosnący trend wielkości zatrudnienia w sektorze finansowym. Jednakże jego wysoki współczynnik kierunkowy warunkowany jest bardzo silnym trendem wzrostowym, mającym miejsce w województwie mazowieckim, znacznie wolniejszym trendem w województwach dolnośląskim, pomorskim i śląskim. W przypadku większości województw bowiem, modele funkcji trendu wskazują na ujemną, statystycznie istotną tendencję rozwojową badanego zjawiska. Wyniki klasyfikacji wskazują na geograficzny podział kraju pod względem liczby podmiotów w sektorze finansów i ubezpieczeń.

*Słowa kluczowe:* sektor finansowy, zatrudnienie, metoda k-średnich, modele trendu.

JEL: C38, E24, G20