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Spatial Diversity of the Network of Cooperative Banks in Poland in Relation to the Voivodships' Socio-Economic Development in the years 2010–2022

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Abstract

The purpose of the following study is to identify the most important socio-economic conditions of the distribution of cooperative bank branches in Poland in the years 2010–2022. The scope of the analysis shall include the identification of differences in the location of cooperative bank branches in individual voivodships and their determining factors. The selection criterion was based on the available temporal and spatial detailed data on cooperative bank establishments as well as variables referring to the socio-economic development published by the Statistics Poland (GUS), the Polish Financial Supervision Authority (KNF), and the Bank Guarantee Fund (BFG). The period under analysis included the years 2010, 2014, 2018, and 2022. The empirical basis for the issues addressed in the article is the review of the reference literature and the analysis of the findings of the research conducted by means of the following methods: structure and dynamics indicators and regression analysis using a selection of variables. Theoretical and empirical analyses indicate that, in the period in question, the network of cooperative bank branches decreased by 18.9%. The largest decrease was recorded in the Podkarpackie and Śląskie voivodships, while an increase was observed only in the Lubelskie Voivodship. The factors that shaped the spatial distribution of the cooperative bank branches to the largest extent were the total population number, GDP per capita and the level of nominal household income per capita. The higher the value of those variables could be observed, the more extensive the branch network was.

Key words: cooperative banks, branches, voivodship, socio-economic development

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Introduction

Over the years, the business model of cooperative banks in Poland has been changing in line with changes in their environment. New technologies, new banking services, strong competition from banking and non-banking entities, changes in the organizational structure of the sector and the legal conditions, as well as changes in customer preferences and expectations, are just some of the contemporary challenges to banking. Undoubtedly, the socio-economic development of the country is the determining factor regarding banking activities. It assumes particular importance in the context of the accessibility of banking services, which are still, to a considerable extent, provided by stationary branches. The issue of the spatial distribution of cooperative bank branches tends to remain a research area which is still little recognized. The review of the publications on this topic

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points to a few authors who address the issue in relation to the cooperative bank sector on the national basis. The issues undertaken in this article, particularly the presentation of the determinants of the spatial distribution of the branches on the basis of the author's selection of diagnostic features, can add value to the analyses in the field of the distribution of cooperative bank services.

1 Review of the literature

In the literature on the subject, "the banking branch Network" is related to the concept of branch banking, the idea of which originated in the United States in the early 20th century. It refers to banking activities conducted by means of banking branches. A. Szelągowska (2019, 18) notes that, in the light of the theory of branch banking, the crucial factors influencing these activities are the decisions on the size of the branches, their location, the pace at which they are established and closed down, and the introduction of innovations. These factors matter not only to the banks themselves but also to their competitive environment in the local market as well as to the economic entities and households (Ho and Ishii 2011; Jackowicz, Kowalewski, and Kozłowski 2014; Pastor et al. 2017).

Literature studies demonstrate that the determinants of bank branch network decisions include economic growth, access to bank credit, and the situation of consumers and depositors. J. Temesvery (2015) indicated the relationship between the price of banking products (interest rates) and branch location decisions, as exemplified by the Hungarian market. In contrast, M. Kim and B. Vale (2001) were of a different opinion and noted, drawing on the study conducted in Norway, that banks compete not only on deposit and credit rates but also on the structure of their branch network. The experience of Belgian researchers M. Huysentruyt, E. Lefevere and C. Menon (2013) shows that long-term changes in the banking network are proportional to the wealth of the population, whereas the density of the branch network decreases as the city districts become poorer. Similar conclusions were drawn by K. Jackowicz, O. Kowalewski and Ł. Kozłowski (2014) from the study conducted in Polish counties between 2007 and 2013. It was found that the branch network density was the highest in wealthy and urbanized areas. However, the rate of increase in the number of the branches was more intense in the regions where the network density had previously been lower (Jackowicz, Kowalewski, and Kozłowski 2014, 15).

In contrast, the study of the relationship between economic growth and the location and change in the number of the branches has yielded different and simultaneously divergent results. K.J. Mitchener and D. Wheelock (2013) argued on the basis of observations conducted in the United States that, for a given level of concentration, both a larger number of banks per capita and a larger number of the branches exerted a favorable influence on the growth of the output in industries requiring external financing. By contrast, D.G. Freeman (2002) questioned the existence of such relationship.

A.N. Berger, J.H. Leusner and J.J. Mingo (1997) demonstrated that banks tended to maintain more branches than required by the objective of minimizing costs. From the consumer's point of view, such an expanded network is highly beneficial as it can affect quality and guarantees convenience in terms of access to banking services.

In the recent years, the research on the change in the number of banking branches has been focused on the phenomenon of omnichannel distribution of banking services, which means access to banking services through stationary banking branches as well as electronic and mobile access channels. A. Alińska (Alińska 2019, 109–112) points out that omnichannelization is becoming both a challenge and a target model in the financial services market. Changes in the banking environment, the market conditions, and, above all, customer expectations force those institutions to adopt omnichannel strategies. The research conducted in the United States refers to the complementary nature of various distribution channels of banking products and the educational role of traditional banking. M. Zhou et al. (2020) indicate that there appears to be the so-called "learning effect" of more complex banking services in stationary branches which customers later apply in electronic distribution channels. This points to the need to maintain the branch network resulting from the complexity and the specificity of banking products.

The research on the location of cooperative bank branches in Poland was conducted by M. Golec and A. Kulig (2015), K. Jackowicz, O. Kowalewski and Ł. Kozłowski (2014) and A. Szelągowska (2019). Their insights were congruent and largely shaped by the specifics of the sector. Cooperative banks can be categorized as local financial institutions whose territorial coverage is primarily determined by the level of their initial capital. The smallest cooperative banks, with a capital of at least EUR 1 million, can operate through branches and subsidiaries usually in the territory of a few or a dozen counties, those slightly larger can operate in the territory of a given voivodship, while those with their own funds exceeding EUR 5 million (the minimum level of the initial capital for a bank in the form of a joint-stock company) can offer their services throughout the country (Nowacka 2022, 225).

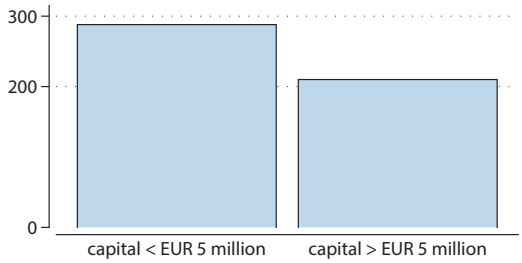

Figure 1. Division of cooperative banks in accordance with the initial capital (as at the end of 2022)

Source: Own compilation based on "Sytuacja banków spółdzielczych i zrzeszających po IV kwartale 2022 r." [Situation of cooperative and associative banks after Q4 2022]. UKNF Report, available at https://www.knf.gov.pl/knf/pl/komponenty/img/Sytuacja_bankow_spoldzielczych_i_zrzeszajacych_po_IV_kwartale_2022_82127.pdf.

Almost 43% of cooperative banks possessed equity capital of at least EUR 5 million; hence, those institutions could operate throughout the country. The limited area of the activities of cooperative banks can be considered in relation to the location of their head offices, which are most often situated in smaller towns, far from the centers and off the main transport routes. In terms of location, it is worth emphasizing the extensive network of the field branches, often situated in rural areas and functioning as the only institutions to provide financial services (table 1).

Table 1. Location of cooperative bank head offices in Poland in 2022

Cooperative banks	Urban commune	Urban-rural commune	Rural commune	Total
Associated in IPS BPS group	30	132	146	308
Associated in IPS SGB group	13	97	70	180
Not associated	5	1	4	10
Total	48	230	220	498

Source: Own compilation based on "Sytuacja banków spółdzielczych...," op. cit.

At the end of 2022, there were 498 cooperative banks operating in Poland. Out of this number 308 were the members of the Institutional Protection Scheme (IPS) of the Polish Cooperative Bank (BPS) and 180 were institutions affiliated to the IPS of the Cooperative Banking Group. There were 10 banks operating outside the protection scheme. Almost 44.0% of the cooperative banks had their head offices located in rural communes, while only 9.6% in urban communes. It is clear that cooperative banks dominate in small towns. There was a higher percentage of cooperative banks in rural communes recorded in the IPS of the Polish Cooperative Bank (47.4%) than in the IPS of the Cooperative Banking Group (38.8%). The urban communes are dominated by independent banks which are not associated.

This clearly contributes to the role of cooperative banks in local development, which was highlighted as early as in the 19th century. Such banks work for the benefit of local communities and their development as well as support local entrepreneurship. These institutions pool the local communities' savings used by local entities for their development.

Development is an ambiguous concept which, according to an encyclopedic definition,[1] is any long-term process of directional change in which one can distinguish consecutive stages of the ascertainable transformation (developmental phases) of a given object (system) in a specific respect. Development can be understood as an event representing a new stage in a changing situation or a process itself (Bellù 2011, 2; Litwiński 2017, 450). In the social sciences, particularly in economics, development is equated with economic development. It should, however, be emphasized that such a concept of development was popular with economists before the 1990s. More recently, new terms have been introduced into the discourse on development, such as the institutional environment of the economy or the social capital, which led to the popularization of the term *socio-economic development* (Kubiczek 2014, 42). D. Strahl (1998) notes that socio-economic development is an extremely broad concept which takes into account the impact on the living conditions of the citizens exerted by institutions providing social services (education, culture, upbringing, and social and health care), the residential environment (the housing situation, the labor market, and public safety), and general economic phenomena (shaping the level of the country's economy).

The issue of socio-economic development is of interest not only to economists but also to sociologists and geographers, including J. Hryniewicz, J. Turowski, J. Paris, and T. Czyż. However, their approach is less saturated with the quantitative-qualitative element and more focused on the continuity of change (Zimny 2017, 26). J. Parysek (2018, 39) interprets socio-economic development as changes in the specific properties of the individual components of the socio-economic system—i.e., its distinguished elements that determine the developed structures. It can also be assumed that not all changes taking place in the development process are irreversible. This is proved by collapses of regimes, economic fluctuations, crises, and the systemic changes the economies and societies undergo.

Development can be treated as the process of quantitative or qualitative changes following specific events that took place at a specific time. Such an approach is presented by L. Kupiec (1993, 14), who adds that economic development is the process of quantitative and qualitative changes consisting in the increase in and the improvement of the existing phenomena and the emergence and development of new phenomena in the sphere of all economic activities of a given society. The qualitative aspect refers to the transformation of socio-economic structures as a result of which they acquire new characteristics and properties. The quantitative aspect, on the other hand, includes economic growth, i.e. the expansion of the volume of production of goods and services along with an increase in the national income (Pawlik et al. 2021, 9).

The notion of regional and local development is a kind of mental abbreviation covering a broad spectrum of social, economic and spatial phenomena. D. Strahl (1998, 28) points out that regional development is the process of positive changes in the quantitative growth and qualitative progress taking place in a region. Definitions of local development differ from those of regional development in the degree of the generalization of economic categories. I. Pietrzyk (2006, 32–33) sees local development as the process of diversification and enrichment of economic and social activities of a given territory, originating in the mobilization and coordination of its resources and energies.

Regional and local development are related to changes in the co-existing and interdependent socio-economic systems of territorial units of regional and local scope, which should be considered by taking the following into account:

- the entities and various types of organizational units operating in the area,
- the tools and instruments they use,
- the conditions and mechanisms in place, and
- the physical and financial resources available (Alińska 2008, 57).

The group of entities playing an important role in the local environment undoubtedly includes cooperative banks, which significantly contribute to the local economic development.

1. According to Polish PWN on-line Encyclopedia, available at https://encyklopedia.pwn.pl/.

2 Methodological assumptions

The article attempts to determine which variables selected for analysis (pertaining to socio-economic development at the local level) most influenced the change in the number of cooperative bank branches in the 16 voivodships of Poland. The research period covered the years from 2010 to 2022 with the following years adopted for the analysis: 2010, 2014, 2018, and 2022. The set of diagnostic features characterizing the socio-economic development of the voivodships is presented in table 2.

Table 2. Diagnostic features selected to assess the socio-economic development of the voivodships

Variable	Description of the variable
X1	Area in thousands of km
X2	Total population in thousands
X3	Registered unemployment rate in %
X4	Individual farms of the area exceeding 1 hectare in thousands
X5	National economy entities (registered in the National Official Register of Economic Entities, REGON) per 10,000 inhabitants
X6	GDP per capita in PLN (current prices)
X7	Nominal available household income per capita
X8	Number of rural communes
X9	Number of urban-rural communes

The choice of the variables was determined by the availability of the statistical data and was made on the basis of a substantive criterion, taking into account the purpose and the object of the study as well as the units of time for which the study was conducted. Another important aspect for the analysis was the adoption of diagnostic variables which were characterized by reliability, accuracy, comparability, relevance, and completeness (Młodak 2006, 55; Paluch, Cymanow, and Cymanow-Sosin 2022, 52–53).

The verification of the independent variables significantly affecting the number of cooperative bank branches in all the voivodships in Poland was performed by means of regression analysis with variable selection. The extraction of the factors that significantly influenced the dependent variable (the number of cooperative bank branches) was performed using the Principal Component Analysis (PCA), in which new variables (as a linear combination of explanatory variables) are determined and then reduced according to a selected criterion, which, in that case, was the percentage of the variance explained (Stelmach 2015, 82). The results of the principal component analysis were recorded as the variables that were created by the regression method. The indicators of the model fit were the KMO (Kaiser-Meyer-Olkin) test and the Barlett test. The KMO test score should be as high as possible, at least exceeding 5, while the Barlett test score should be statistically significant (Poczta-Wajda 2010). All the principal component models obtained a good fit to the data (table 3).

Table 3. Adjustment of principal component models in the years 2010, 2014, 2018, and 2022

Specification	2010	2014	2018	2022
KMO test	0.646	0.648	0.655	0.631
Barlett test	138.729	138.87	142.339	151.828
Significance of Barlett test	< 0.001	< 0.001	< 0.001	< 0.001

The final step consisted in building a model (including variables after reduction) by means of regression analysis with backward elimination for individual years (Stelmach 2015, 81–82).

3 Presentation of results

The scale and scope of cooperative bank activities influence the range of the services provided and the opportunities for the institutions' further development, especially the introduction of new technologies. The sector is still quite diversified, which means that there are banks that can operate nationwide and those whose area is limited to one county. This results in limited opportunities to invest in and implement modern electronic and mobile solutions. On the other hand, the local character of cooperative banks and the customers' attachment to traditional service distribution channels encourage maintaining a large number of field branches, as indicated by the data presented in table 4.

Between 2010 and 2022, the number of cooperative banks (head offices) and their branches decreased by 13.5% and 19.7% respectively. This trend has continued for years and is caused, among others, by mergers of those banks which do not meet the requirements for the level of initial capital as well as the customers' use of electronic banking services.

A detailed analysis was carried out with regard to the spatial distribution of cooperative bank branches by voivodships (table 5).

Table 4. Basic information on the number of cooperative banks in Poland in the years 2010, 2014, 2018, and 2022

Cooperative banks	2010	2014	2018	2022
Total number of head offices	576	565	549	498
Total number of branches (excluding head offices)	3,586	3,897	3,672	2,879
Average number of branches per one cooperative bank	6.23	6.89	6.68	5.78

Source: Own compilation based on UKNF reports concerning situation of cooperative and associative banks after 4th quarter of the years 2010, 2014, 2018, and 2022, available at https://www.knf.gov.pl/dane_i_opracowania; database of Inteliace Research company; and (Szelągowska 2019).

Table 5. Spatial distribution of cooperative bank branches in Poland (including head offices) by voivodships in the years 2010, 2014, 2018, and 2022

	2010		2014		2018		2022	
Voivodship	*n*	%	*n*	%	*n*	%	*n*	%
Dolnośląskie	220	5.3	239	5.4	228	5.4	164	4.9
Kujawsko-pomorskie	247	5.9	249	5.6	239	5.7	189	5.6
Lubelskie	296	7.1	346	7.8	353	8.4	316	9.4
Lubuskie	119	2,8	126	2.8	121	2.9	95	2.8
Łódzkie	306	7.4	319	7.1	304	7.2	234	6.9
Małopolskie	346	8.3	428	9.6	422	10	346	10.2
Mazowieckie	599	14.4	623	13.9	582	13.8	475	14
Opolskie	153	3.7	165	3.7	157	3.7	115	3.4
Podkarpackie	331	7.9	354	7.9	322	7.6	222	6.6
Podlaskie	203	4.9	195	4.4	191	4.5	162	4.8
Pomorskie	167	4.0	191	4.3	193	4.6	162	4.8
Śląskie	321	7.7	371	8.3	310	7.3	222	6.6
Świętokrzyskie	168	4.0	166	3.7	132	3.1	123	3.6
Warmińsko-Mazurskie	161	3.9	162	3.6	156	3.7	126	3.7
Wielkopolskie	389	9.4	371	8.4	360	8.5	315	9.3
Zachodniopomorskie	136	3.3	157	3.5	151	3.6	111	3.4
Total	4,162	100.0	4,462	100.0	4,221	100.0	3,377	100.0

Source: Same as table 4.

The largest number of cooperative bank branches in 2010–2022 was recorded in the Mazowieckie Voivodship, with the percentage share in the total number ranging from 13.8% to 14.4%, and the smallest number was recorded in the Lubuskie Voivodship (from 2.8% to 2.9% of the total number of branches). Apart from the Mazowieckie Voivodship, the sequence of voivodships with a dense network of branches was the following: Łódzkie (from 6.9% to 7.4%), Małopolskie (from 8.3% to 10.2%), Podkarpackie (from 6.6% to 7.9%), Śląskie (from 6.6% to 8.3%), and Wielkopolskie (from 8.4% to 9.4%).

Table 6. Dynamics of changes in the number of cooperative banks branches in Poland (including head offices) by voivodships in the years 2010 (base year), 2014, 2018, and 2022

Voivodship	2010	2014/2010	2018/2010	2022/2010
Dolnośląskie	100.0	108.6	103.6	74.5
Kujawsko-pomorskie	100.0	100.8	96.7	76.5
Lubelskie	100.0	116.9	80.7	106.7
Lubuskie	100.0	105.8	101.7	79.8
Łódzkie	100.0	104.2	99.3	76.5
Małopolskie	100.0	123.7	121.9	100
Mazowieckie	100.0	104.0	97.1	79.3
Opolskie	100.0	107.8	102.6	75.1
Podkarpackie	100.0	106.9	97.3	67.1
Podlaskie	100.0	96.06	94.1	79.8
Pomorskie	100.0	114.4	115.6	97.0
Śląskie	100.0	115.6	96.6	69.2
Świętokrzyskie	100.0	98.8	78.6	73.2
Warmińsko-mazurskie	100.0	99.4	96.9	78.3
Wielkopolskie	100.0	95.4	92.5	80.9
Zachodniopomorskie	100.0	115.4	111.0	81.6
Total	100.0	107.2	101.4	81.1

Source: Same as table 4.

The analysis of the data presented in table 6 shows the highest dynamics of change having occurred in the Podkarpackie and Śląskie voivodships (a decrease by 32.9% and 30.8% respectively). By contrast, an increase was recorded only in the Lubuskie Voivodship (6.7%). Overall, between 2010 and 2022 the number of cooperative bank branches decreased by 18.9%.

The next stage of the study was the analysis of the determinants affecting the number of cooperative bank branches in the 16 voivodships. For that purpose, 4 regression models were constructed — one for each year — with the data from the 16 voivodships included in each case. The data from the voivodships were ordered by case (16 cases) and each socio-economic factor as a variable (9 variables). For the years 2010 and 2014, there were 3 factors (components) obtained, while for the years 2018 and 2022, there were 2 factors (components). The component models for 2010 and 2014 are presented in tables 7 and 8 (on next page).

The component model for 2010 explains the total of 87.611% of the overall variance; hence, 12.389% is left out of the model and belongs to the elements not included in the statistical study. The first component, which explains 56.026% of the variance of all the variables analyzed, consists of all the variables. However, part of the variance explained is also accounted for by the other components. As there is no factual basis to exclude them from the interpretation, it is assumed that they are also subject to interpretation. The factor loadings of all the variables (except for the unemployment rate) have a positive direction. It can be assigned the name *Positive aspects of socio-economic and demographic dimensions*. With regard to the second component, which accounts for 19.682% of the overall variability, it is necessary to focus on the following determinants:

Table 7. Matrix of components and their interpretation in 2010 and 2014

	Component in 2010			Component in 2014		
Specification	**1**	**2**	**3**	**1**	**2**	**3**
Total population number in thousands	0.910			0.907		
GDP per capita (current prices) in Polish zlotys	0.904			0.930		
Nominal available income in a household per capita	0.879	0.344		0.876	−0.316	
Number of rural communes	0.778	−0.594		0.758	0.636	
Rate of registered unemployment in %	−0.721		0.429	−0.700		0.371
Area in thousands of km	0.683		0.642	0.678	0.302	0.588
National economy entities (registered in REGON) per 10,000 inhabitants.	0.601	0.724		0.698	−0.603	
Individual farms of the area exceeding 1 hectare in thousands.	0.650	−0.717		0.624	0.738	
Number of urban-rural communes	0.499	0.362	0.576	0.539		0.644

Table 8. Percentage of variance explained by individual components in 2010 and 2014

	Sums of squares of loads after separation in 2010			Sums of squares of loads after separation in 2014		
Component	**Total**	**% of variance**	**% cumulated**	**Total**	**% of variance**	**% cumulated**
1	5.042	56.026	56.026	5.146	57.173	57.173
2	1.771	19.682	75.708	1.672	18.575	75.748
3	1.071	11.903	87.611	1.049	11.661	87.409

the number of rural communes, national economic entities and individual farms. Nominal household available income and the number of urban-rural communes can be disregarded as their factor loadings slightly exceed 0.30, meaning that most of the variance explained falls on the first factor. That component can be described as *Entrepreneurial strength and rural weakness*. The third component, which accounts for 11.903% of the total variance, covers the unemployment rate, the area of a givenvoivodship, and the number of urban-rural communes. The component can be called *Employment weakness in the urban-rural centers of large voivodships*.

The component model for 2014 explains the total of 87.409% of the overall variability, so 12.591% is left out of the model and belongs to the elements not included in the statistical survey. The first component for 2014 shall be interpreted in the same way as for 2010. For the second component, the number of rural communes, individual farms and national economy entities (with a negative sign) should be taken into account. The component can be called *Rural strength and entrepreneurial weakness*. The third component, which is formed by the area of a given voivodship and the number of urban-rural communes, can be named *Importance of the area*.

Meanwhile, the component models for 2018 and 2022 are presented in tables 9 and 10.

The analysis of the principal components in 2018 identified two components that account for 78.084% of the overall variance in the set of variables. Outside the explanation remains 21.160% of the variance. The first and second components of the variation account for over a half of 58.277% and 19.807% respectively. The first component can be interpreted analogously to the years 2010 and 2014. The second component, however, covers the number of rural communes, the unemployment rate, the area of a given voivodship, the number of individual farms, and the number of national economy entities (with a negative sign). This factor can be named as *Voivodships of large area with a significant share of rural infrastructure and a poor business sector combined with high unemployment*.

For 2022, on the other hand, there were two components identified, explaining 78.898% of the overall variability. The first of them accounts for 60.162% of the variance, which is the highest result for all the years analyzed. The first factor is subject to the same interpretation as in the

Table 9. Matrix of components and their interpretation in 2018 and 2022

	Component in 2018		Component in 2022	
Specification	**1**	**2**	**1**	**2**
GDP per capita (current prices) in Polish zlotys	0.944		0.946	
Total population number in thousands	0.902		0.897	
Nominal available household income per capita_	0.897		0.939	
National economy entities (registered in REGON) per 10 thousand inhabitants	0.779	−0.482	0.782	−0.481
Number of rural communes	0.735	0.647	0.750	0.615
Registered unemployment rate in %	−0.690	0.513	−0.639	0.578
Area in thousands of km	0.680	0.401	0.710	0.380
Number of urban-rural communes	0.556		0.573	
Individual farms of the area exceeding 1 hectare in thousands	0.585	0.749	0.648	0.701

Table 10. Percentage of variance explained by individual components in 2018 and 2022

	Sums of squares of loads after separation in 2018			Sums of squares of loads after separation in 2022		
Component	**Total**	**% of variance**	**% cumulated**	**Total**	**% of variance**	**% cumulated**
1	5.245	58.277	58.277	5.415	60.162	60.162
2	1.783	19.807	78.084	1.693	18.806	78.968

previous years. The second component covers individual farms, the number of rural communes, the unemployment rate, and national economic entities. This factor can be interpreted as *Voivodships with a significant share of rural infrastructure and a poor business sector combined with high unemployment.*

To recapitulate, it is the first component, which accounts for the highest percentage of variance in each model, that can be expected to exert a positive influence on the number of cooperative banks.

The next step consisted in building a regression model using the backward elimination method. In 2010, the model accounted for 90.745% of the variance in the dependent variable (the number of cooperative bank branches) and was statistically significant $F(3, 12) = 50.027$; $p < 0.001$. The significant variables in the model were as follows:

- Positive aspects of socio-economic and demographic dimensions: $\beta = 0.871$; $p < 0.001$
- Entrepreneurial strength and rural weakness: $\beta = -0.408$; $p < 0.001$

In 2014, the model accounted for 90.954% of the variance in the dependent variable and its statistical significance remained at $F(3, 12) = 40.271$; $p < 0.001$. The significant variables in the model were as follows:

- Positive aspects of socio-economic and demographic dimensions: $\beta = 0.838$; $p < 0.001$
- Rural strength and entrepreneurial weakness: $\beta = 0.425$; $p < 0.001$
- Importance of the area: $\beta = -0.086$; $p = 0.086$

In turn, in 2018 the model accounted for 85.541% of the variance in the dependent variable and was statistically significant $F(2, 13) = 45.371$; $p < 0.001$. The significant variables in the model were as follows:

- Positive aspects of socio-economic and demographic dimensions: $\beta = 0.815$; $p < 0.001$
- Large-area voivodships with a significant share of rural infrastructure and weakness of the business sector combined with high levels of unemployment: $\beta = 0.425$; $p < 0.001$

The highest level of explanation of the variance of the dependent variable was obtained in 2022: 86,367%. The model was statistically significant $F(2, 13) = 48.512$; $p < 0.001$, as were all its variables:

- Positive aspects of socio-economic and demographic dimensions: $\beta = 0.821$; $p < 0.001$
- Voivodships with significant rural infrastructure and weaknesses in the business sector combined with high unemployment: $\beta = 0.455$; $p < 0.001$

The determinants of the distribution and the number of cooperative bank branches in the following years were selected correctly. The reduction of the number of variables by the principal component method did not indicate the need to exclude any of them. Thus, 3 and 2 clear clusters were obtained. In each year, the favorable impact on the distribution of the branches was demonstrated by the level of GDP per capita and nominal available income per household, as well as the total population number in a given voivodship, national economy entities (registered in REGON) per 10,000 inhabitants, the number of rural and urban-rural communes, the area of the voivodship, and individual farms of the area exceeding 1 hectare.

Summary

There have been significant changes in the number of branches of cooperative banks in the recent years although not as substantial as in the case of commercial banks. The specific nature of those institutions, their local character and the customers' attachment to traditional distribution channels result in a dense network of stationary branches still maintained. Based on the author's research and the results obtained, the following conclusions can be drawn:

- The traditional branches of cooperative banks constitute an element of building their competitive advantage.
- The most extensive network of cooperative bank branches was recorded in voivodships with the largest area and population (Mazowieckie, Wielkopolskie, and Lubelskie), and the smallest network was recorded in the smallest voivodship (i.e., Lubuskie).
- The strongest predictors of the number of cooperative banks branches in all the years analyzed were the total population number, GDP per capita, and the level of nominal household income per capita in relation to voivodships (the higher the level of those variables, the larger the number of the branches).
- The number of rural communes and individual farms of the area exceeding 1 hectarewas negatively correlated with the number of the branches in 2010, which may indicate the focus on building the cooperative banking sector in rural areas. Furthermore, the negative effect of the number of urban-rural communes in 2014 suggests the trend indicated.
- In 2010 and 2014, the high unemployment rate correlated negatively with the number of the branches (voivodships with a high unemployment rate saw an increase in the number of branches, as opposed to voivodships with a low unemployment rate).

In conclusion, the determinants of socio-economic development influenced the spatial distribution of cooperative bank branches and their changes between 2010 and 2022 with varying intensity and direction. The increasing costs of maintaining the branch network, primarily resulting from the rising wage levels and energy costs, may contribute to more significant changes in the number of cooperative bank branches.

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