ECONOMICS
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DO CREDIT UNIONS CONTRIBUTE TO FINANCIAL INCLUSION AND LOCAL ECONOMIC DEVELOPMENT? EMPIRICAL EVIDENCE FROM POLAND

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ABSTRACT. Financial inclusion is currently on the political agenda of many governments and international institutions as an unavoidable objective of territorial cohesion and economic development programs. It is also central to the Sustainable Development Goals (SDGs). For their part, the role of credit unions as agents of local economic development and their commitment to the provision of financial services in regions subject to unfavorable demographic and economic stress has been verified by various studies. However, this article examines the contribution of credit unions to the processes of financial inclusion and economic development in Poland under a regional analysis approach. For this purpose, spatial analysis method is applied to a sample of 3,556 credit union bank branches representative of all Polish voivodeships to determine the distribution of these branches. Then, a model based on the research of Di Pietro (2016) and Coccorese and Shaffer (2018) is estimated to assess the impact of credit unions on the endogenous economic development of the territory. The obtained results suggest that credit unions have a significant influence on the local economic development of Polish voivodeships and contribute to the financial inclusion in these regions.

Introduction

The role of financial institutions in promoting the economic development of a territory is indisputable. Their impact on economic growth has been widely studied in the economic literature (Demetriades et al., 2006; Allen et al., 2018; Helhel, 2018; Altay et al., 2020; among others). The available studies cover various regions, for example, Europe (Wu et al., 2010; Bosma et al., 2018; Asteriou et al, 2019), underdeveloped countries (Patrick, 1996; Ibrahim, 2018), and Asia (Qamruzzaman et al., 2018).

On the other hand, financial inclusion has also aroused interest within academia in recent years. Many studies have addressed this phenomenon from different perspectives. For example, the work of Peterson (2010, p.457) identified a set of conditioning factors such as "the level of financial innovation, poverty levels, the stability of the financial sector, the state of the economy, financial education and regulatory frameworks". Other studies, on the contrary, have focused on quantifying financial inclusion, e.g., Girón et al. (2022) for the case of African and Asian countries. Some studies, such as Sulong et al. (2018) and Dahiya et al. (2020), have related financial inclusion to economic growth.

The cooperative banking sector is no stranger to both phenomena. Its role as a dynamizing agent of endogenous economic development and its contribution to financial inclusion are well known (Monteagudo, 1999; Lang et al., 2016; Córnea et al., 2018). Although some recent studies have addressed the impact of credit unions on economic development (Chandel et al., 2019; Coccorese et al., 2021), there are no works that have linked such analysis to the contribution of credit unions to the financial inclusion goals determined by the SDGs, much less for the Polish voivodeships. This article attempts to contribute new data to this emerging line of research.

In this context, the main objective of this paper aims to assess the contribution of credit unions to financial inclusion goals and their impact on local economic development in Poland, adopting an eminently regional analysis approach and under the framework of the SDGs defined in the 2030 Agenda adopted by the UN in 2015. In particular, this article aims to examine whether the presence of cooperative banks in the territory stimulates the local economic development of the various voivodeships in Poland (regions into which this country is divided). To this end, we have examined the relationship between the presence of cooperative banks in the voivodeships that make up Poland and their incidence and relationship with certain socioeconomic variables: per capita income, number of inhabitants, number of enterprises, average monthly salary, level of unemployment and number of enterprises.

To carry out this objective, this research uses a representative sample consisting of 3,556 credit union bank branches that make up the target population and are representative of all Polish voivodeships. The analysis covers the period from 2004 to 2020 (sixteen years). A methodological approach combining spatial analysis is applied to determine the distribution of bank branches under study and statistical modelling techniques are applied to analyze the contribution of credit unions to the local economic development of the territory in which they operate. In particular, the ease of access to this type of credit institutions (measured in km needed to reach them) from the most remote areas of each voivodeship is analyzed. All of this is related to SDG number 8, which aims to: "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all"; and financial inclusion is configured as a key to this.

This research is a pioneering study in the field of financial inclusion and local economic development. This is the first in-depth analysis conducted at the voivodship level in Poland. At the local level, in Podlaskie voivodeship a study was already conducted by (Korzeb et al., 2019) and also on the same voivodeship, but focused on the social economy there is a study conducted by (Ryszkowska et al., 2018). Also, another study by (Łukaszuk, 2020) focused on loans

granted by credit cooperatives to farmers in that voivodeship. This correlational and spatial study can serve Polish regions to expand their knowledge about the importance of cooperative banks in their area and guide public policies to promote financial inclusion and economic and social cohesion in the territory. Miklaszewska (2007) also conducts a study on economic growth and financial inclusion in Poland. The manuscript is organized as follows: First, after the introduction, the theoretical framework section discusses the concept of financial inflation, and a literature review is conducted to lay the groundwork for the formulation of the research hypotheses. Secondly, a section is dedicated to the material and method, where the main phases and characteristics of the methodological approach adopted are described. Next, the empirical model and the description of the selected variables are presented. Finally, it concludes with the analysis and discussion of the results and conclusions of the study.

1. Contextual framework and working hypothesis

Financial inclusion refers to "individuals and businesses having access to useful and affordable financial products and services (transactions, payments, savings, savings, credit, and insurance) that meet their needs delivered in a responsible and sustainable way" (World Bank, 2014). Therefore, it can be concluded that financial inclusion entails making an offer of fundamental financial services under non-discriminatory conditions available to all economic agents.

Promoting an inclusive financial sector is one of the main objectives of different governments and international organizations (Chibba, 2009; Prasad, 2010; Sachs et al., 2019; Parkhouse, 2020). Indeed, in 2015, the new UN Agenda 2030 highlighted expanded access to financial services in five of its seventeen new SDGs (Klapper et al., 2017; Demirguc-Kunt et al., 2017). However, financial inclusion is a multidimensional concept. This characteristic makes it difficult to diagram a single, clear map of causal relationships between financial inclusion and sustainable development, although several authors have demonstrated the existence of such a relationship (Sethi & Acharya, 2018; Kim et al., 2018; Obayori & Chidinma, 2020; among others). Empirical evidence shows that access to financial services under favourable conditions facilitates planning expenditures, controlling consumption patterns, attending to health-related risks, and making investments not only in productive ventures but also in training and education Van et al. (2019).

Several authors have focused on assessing the benefits of financial inclusion. In general terms, most authors have based their analyses on the specific dimensions of cases and evaluations of particular programs implemented around the world (Nayak, 2012; De Olloqui, et al., 2015; Dabla-Norris, et al., 2015). Other authors, such as Klapper et al. (2017), have highlighted the contribution of financial inclusion to the fulfilment of the SDGs. The analyzed case studies argue that some goals are promoted directly (goals 1, 2, 3, 4, and 5) while others (6, 7, 8, 9, 10, and 16) are promoted indirectly. Demirguc-Kunt et al. (2017) performed a similar analysis differentiated by categories of financial products. The sustainable development goal with the strongest link to financial inclusion is number 8: "Decent work and economic growth". In particular, point 8.10 expressly states the following as an objective: "Strengthen the capacity of national financial institutions to promote and expand access to banking, financial and insurance services for all". As noted by various studies, such as that of Fernández-Olit (2020), even in times of crisis, "cooperative banking sustained rural and ageing areas" in Spain, helping to guarantee financial inclusion. Similar results were obtained by Almeida Guzmán (2017) in Ecuador, who reported that "Savings and Credit Cooperatives (CAC), allow to dynamize and consolidate financial inclusion". Similar arguments were presented by Martínez-Carrasco Pleite et al. (2016), for Mexico, and Roa (2013), for the whole of Latin America and the Caribbean region. Such arguments led us to formulate the following hypothesis:

Hypothesis 1 (H1). Credit unions contribute positively to favouring the process of financial inclusion in Poland.

The favourable impact of credit unions on the local development of their territories in which they are located has been studied by several authors. Many studies have identified the capacity of credit unions to create employment in the territories where they operate. Carrasco Monteagudo (1999), for example, noted that the differential features of credit unions and their strong presence in the territory contribute to improving the endogenous growth conditions of the regions in which they operate. This positive impact is achieved through the retention of financial resources; the promotion of entrepreneurship and the creation of new cooperative societies; and, finally, through concrete projects such as research centers or the creation of investment companies. Along the same lines, Lang et al. (2016) stated that credit unions play a primary role in fostering social capital and local economic development due to their ability to mobilize savings and grant credit. The authors further highlighted the commitment of credit unions to maximizing the welfare of the members of the local communities where they operate. As Fairbairn et al., (1997, p.3) note, "credit unions have an interest in becoming more involved in community economic development because their future is linked to that of their communities". Other authors such as Córnea et al. (2018) also agreed that cooperative banks improve local economic development, highlighting their anti-cyclical attitudes. Coccorese et al. (2021) obtained evidence for the positive contributions of Italian cooperative banks to local economic performance in Italy. Based on these precedents, the following hypothesis is put forward:

Hypothesis 2 (H2). The presence of cooperative banks stimulates regional development in Polish voivodeships.

In Europe, two different types of cooperative banks can be identified at present. The first type is international corporations, loosely founded on cooperative principles. The others are smaller banks operating locally (Karafolas, 2016; Cornée et al., 2018; Miklaszewska & Pys, 2018; and Groeneveld, 2021). The latter type of bank dominates in Central and Eastern Europe. Only in Hungary and Poland do cooperative banks play important roles in the banking sector. Poland is the largest country in the region in terms of cooperative bank assets, number of outlets, number of members, and number of staff employed (Bülbül et al., 2013; Karafolas, 2016). these factors justify the choice of Poland as the territorial unit of analysis for this study. The following table shows a characterization of the Polish cooperative banking sector based on various economic and financial indicators (see Table 1).

In Poland, the first banking institution operating as a lending foundation was "Fundacja Ostrołęcka TaniegoKredytu" ("*Ostrołęka Credit Foundation*"), established in 1577 by Wawrzyniec Białobrzeski (Rafacz, 2012). The first cooperative institutions in the banking sector in the modern era were the "*Towarzystwo Pożyczkowedla Przemysłowców Miasta Poznania*" (Loan Society for Industrialists of the City of Poznań), created in 1861 (Mateusz, 2019), and the Brodnica and Golub loan societies, created in 1862. All three are still operating as cooperative banks, making them the oldest Polish banks (Mateusz, 2019). The most important specific characteristics of these banks are as follows: I) member ownership, where the owners of the bank are the cooperative members; II) democratic governance based on the principle of "one person, one vote"; III) most cooperative banks are local, meaning that their presence supports the local community and regional development; IV) their operation is based on relational banking and concentrated in rural areas and small towns, offering products and services mainly to farmers and small and medium-sized enterprises; V) profit generation is necessary for the development of the banks, but maximizing profits is not their main objective. In addition, a large part of the net profits must be retained, and VI) cooperative banks have a long tradition of commitment to sustainability and social values.

Table 1. Characterization of the cooperative banking sector in Poland (2020)

Economic indicators	Total, assets (EUROmio)	48.019
	Total deposits from customers (EUROmio)	33.913
	Total loans to customers (EUROmio)	18.895
	Net profit after taxes (EUROmio)	112
	Total, equity (EUROmio)	3.294
	Leverage Ratio (%)	8.6
Capital solidity indicators	ROA (%)	0.30
	ROE after taxes (%)	3.8
	Cost/Income Ratio (%)	74.8
	Total, capital ratio (%)	18.9
Other indicators	Nb Employees Full-time equivalent	28500
	Nb of legally independent local OR regional co-operative banks	530
	Nb of branches (in home country)	3.954
	Nb members	916.564
	Nb of domestic ATMs	3.604
Market share	Domestic market share deposits (%)	9.8
	Domestic market share loans (%)	6.6
	Mortgage market share (%)	5,3
	Market share SMEs (%)	9.0

Source: own elaboration based on data from the European Association of Cooperative Banks (2020).

A portion of the banks' profits is invested in local economic initiatives that also benefit the local community in the field of culture, sport, and education (Cornée et al., 2018; Mateusz, 2019; Bierecki, 2020). According to current regulations, only natural persons can be founders of a cooperative bank. In addition, the number of founders cannot be less than ten, and the initial capital cannot be less than the equivalent of €1,000,000 in Zlotys (PLN) (Bierecki, 2020). Depending on their assets, cooperative banks are subject to limitations on the territorial and material scope of their activities.

2. Materials and methods

As noted above, this study focuses on the credit union sector in Poland as the country of reference for this research. To define the study population, data extraction was performed from the Central Bank of Poland (Narodowy Bank Polski) through its website with an advanced data search engine (Narodowy Bank Polski-Central Bank of Poland, 2022). After collecting data on credit union bank offices by voivodeship, municipality, city, and postal code, a dataset with 3,556 records on credit union bank offices was generated (provided at the end of the manuscript as Annex 1). Table 2 presents the technical specifications of the study.

Table 2. Technical specifications of the study

Study population	Banking offices of credit unions
Geographical area	Poland (regional analysis by voivodeship)
Data undertaken	January 2022 - May 2022
Population record	Narodowy Bank Polski
Size of population	3557 bank branches
Sample	3557 bank branches

Source: own elaboration

The next step was to develop an analysis of the spatial distribution of cooperative credit bureaus in Polish voivodeships to test the first hypothesis (H1). To fulfil this objective, we

adopted the methodology originally proposed by Stix (2020a, 2020b) in his study of an Austrian case. This methodology has been generalized and applied to different areas and from different approaches. For example, Beckmann et al. (2018) employed this method in their study on Central, Eastern and Southeastern Europe, and Banque de France (2019) for the specific case of France. Outside Europe, similar studies have been conducted, including in Canada (Chen & Strathearn, 2020), Australia (Delaney et al., 2019) or (Caddy & Zhang, 2021), and Poland (Náñez Alonso et al., 2022a). These studies have also focused on a regional analysis perspective. Among these studies, evidence has been found for the British region of Wales (Evans et al., 2020) and for the Spanish region of Castilla y León (Náñez Alonso et al., 2022b). At the local level, a previous study analyzed the city of Bristol (United Kingdom) by Tischer et al. (2019). At the provincial level, the province of Avila (Spain) was studied by Náñez Alonso et al. (2020). However, no evidence has been found in the literature on the application of this methodology to study credit unions in Poland using a regional analysis approach.

To test the second hypothesis (H2), a statistical modelling is used. The acceptance of this hypothesis is plausible when our model shows that the evolution of the number of credit union branches has a positive impact on wages, income, unemployment rate, number of enterprises, or population. The following model is estimated based on the method proposed by Palacín-Sánchez & di Pietro (2015), Coccorese & Shaffer (2018), Korzeb et al. (2019), and Jorge Vázquez & Náñez Alonso (2023).

Data collection was carried out using the Statistical Portal of Poland (GUS) as the main source of information for all variables being studied, including population, number of enterprises, unemployment rate, wages, and income (GUS, 2022). This collection of information was used to generate a second dataset with 1,957 records (see Annex 2).

The initial model for Poland as a whole and at the regional level individually for each voivodship is as follows:

$$POLAND\_COOPBB$$
$$= \beta_0 + \beta_1 * POLSKA\_INC + \beta_2 * POLAND\_POP + \beta_3$$
$$* POLSKA\_NCOM + \beta_4 * POLAND\_UNEM + \beta_5 * POLAND\_SAL + \varphi_i$$
$$+ \varepsilon_i.$$

Here, ordinary least squares (OLS) or linear least squares are used. The dependent variable (COOPBB) represents the number of banking cooperatives present in each voivodeship in the period under study i (i= 1, ..., n) from 2010 to 2020. φ_i represents unobservable individual effects, and $⟦\varepsilon⟧\_i$ is an-error term.

As dependent variables, six regional performance measures are used: the population and its evolution during the period for each voivodeship (_POP); the number of enterprises for each voivodeship and their evolution during the period (_NCOM); the evolution of the unemployment rate (%) in each voivodeship during the period (_UNEMP); the evolution of wages (expressed in Zlotys) in each voivodeship during the period (_SAL); and the evolution of income (expressed in Zlotys) in each voivodeship during the period (_INC).

Table A1 in the appendix presents descriptive statistics of the aforementioned variables: minimum, maximum, mean, standard deviation, skewness, and kurtosis. Appendix 3 at the end of the manuscript presents the correlations of the above variables.

3. Results

The following provides an analysis of the results obtained from the two methodological approaches adopted based on our two objectives: the contribution of credit unions to financial inclusion through an analysis of spatial distribution and the impact on local economic development based on the estimated model.

3.1. Results derived from the spatial distribution analysis

First, we extracted and analyzed the data published by the Central Bank of Poland on the number of cooperative bank branches. Then, the number of bank credit offices currently operating in each voivodship was organized and distributed by voivodship. These data are shown in Figure 1.
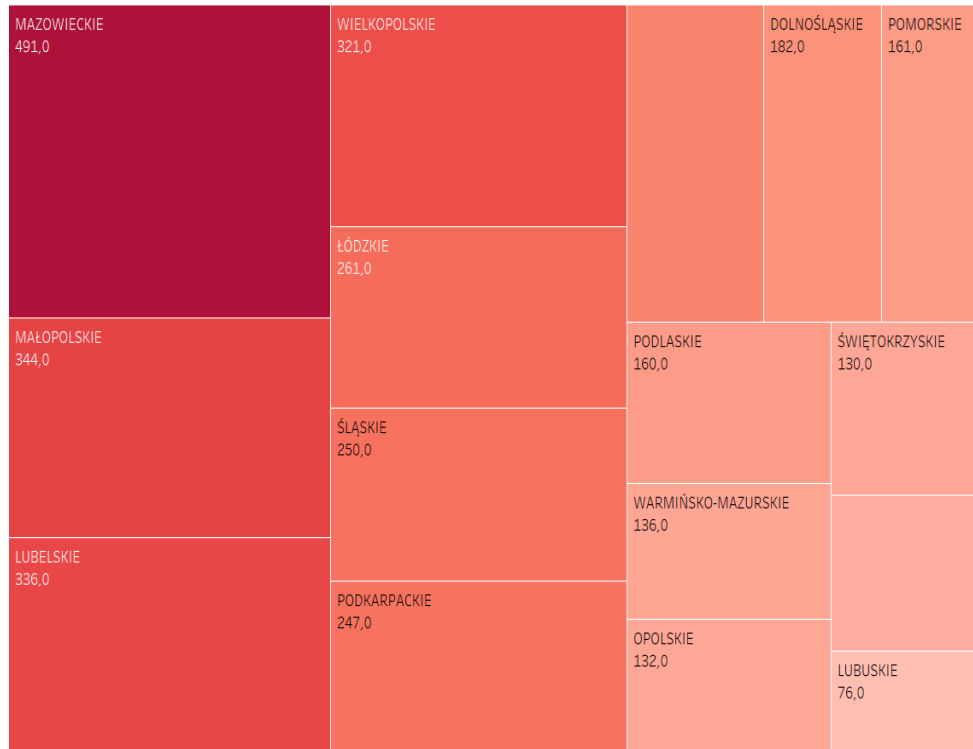

Figure 1. Number of credit union branches per voivodeship
Source: Own elaboration based on data from the Narodowy Bank Polski-Central Bank of Poland (2022) and Tableau Desktop Professional Edition v.2023.2.

In the figure above, the voivodeship with the largest number of branches of cooperative banks is located in Mazowieckie, the region in which Warsaw, the country's economic engine, is situated. The capital effect is thus observed. In second place, we find Małopolskie, whose capital, Krakow, is the second most populated city in the country. Lubelskie ranks third place with 336 branches. Lubelskie is a region of eastern Poland that is not very densely populated and predominantly rural, so we can intuit that banking credit unions in this area have great importance for, and impacts on, financing the agricultural and livestock sector. In last place is Lubuskie (76 branches), a rural voivodship in the western part of Poland where the agricultural and livestock sectors are important; this result also holds for Zachodniopomorskie (with 117).

Analyzing the concentration of bank branches in these cities, we find that the city of Rzeszów has the largest number of cooperative banks in operation, with 26 branches. Rzeszów is the capital of the Podkarpackie Voivodeship, an industrial region in southeastern Poland. In second and third place we find the cities of Warsaw and Krakow (capital and second most populated city of the country) with 21 and 19 bank branches, respectively. In fourth place comes the city of Nowy Sacz, a city in southeastern Poland, currently located in the Małopolskie Voivodeship (like Krakow), with 17 branches. In fifth place is the city of Byalistok, located in the northeast of the country near the border with Belarus, in the Podlaskie Voivodeship. The average for Poland is 1.5 branches per city.

Our preliminary analysis, shown graphically in Figure 1, indicates that the territorial distribution of credit union bank branches in Poland is fairly uniform throughout the country, particularly in all its voivodships. However, there are four areas where access to these services remains more difficult. On the map in Figure 2, areas are marked with the letters A to D. The first zone is located in the north of Poland, between the Zachodniopomorskie and Pomorskie voivodships. This is an area where the agricultural industry is the primary sector (Rakowska, 2015). The second area falls within the Lubuskie voivodeship, located in the west. Lubuskie is the voivodeship with the smallest number of branches and also presents an uneven distribution. In Lubuskie, the primary sector is wine, making the area popularly known as the "*Polish Tuscany*" (Jeziorska-Biel et al., 2021). The third zone, marked with the letter C, corresponds to the entire southern part of the Podkarpackie voivodeship, whose capital, Rzeszów, has the largest number of branches (26) and is an industrial region (Adamowicz, 2021). The last area where it is most difficult to access cooperative credit services is marked with the letter D and is located in eastern Poland. This region encompasses the Podlaskie Voivodeship, bordering both Ukraine and Belarus, and is an agricultural area (Korzeb et al., 2019).
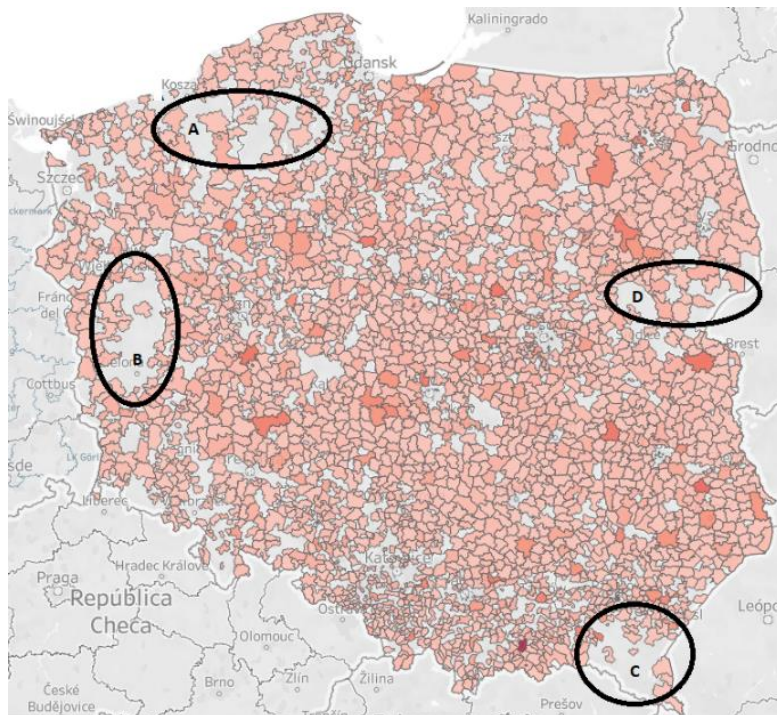

Figure 2. Branches of credit union banks in Poland. Spatial distribution by voivodeship and municipality
Source: Own elaboration based on data from the Narodowy Bank Polski-Central Bank of Poland (2022) and Tableau Desktop Professional Edition v.2023.2.

Secondly, we collected and analyzed data on the number of institutions engaged in banking activities and the number of bank branches corresponding to credit unions and the commercial banking sector over the period of 2007-2020. This information comes from official statistics published by the Polish Komisja Nadzoru Finansowego (KNF).

Despite the process of bank restructuring observed throughout Europe, an analysis of these data shows that credit unions have performed more favorably than other commercial banks. Although the number of credit union institutions and branches during the period under analysis decreased, this reduction was significantly smaller than that observed among commercial banks (see Figure 3).

commercial banks (banki komercyjne)   cooperative banks (banki spółdzielcze)
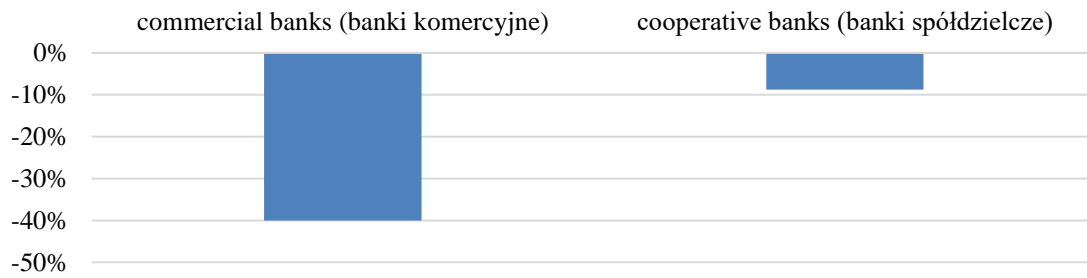

Figure 3. Evolution of the number of entities engaged in banking activities. Comparison between the commercial and cooperative banking sectors (2008-2020)
Source: own elaboration based on data from (KNF, 2022).

For the number of bank branches and workers employed in the cooperative banking sector, we used data published by the European Association of Cooperative Banks (various years). As shown in Figure 4, the number of bank branches remained fairly constant, with an average of 4,423 branches opened during the period of 2008-2020. In terms of cumulative changes in 2008-2020, branches declined by about 5.8%. In terms of employment, the sector employed an average of 31,556 workers over the period, with cumulative variation of 8.8% throughout.
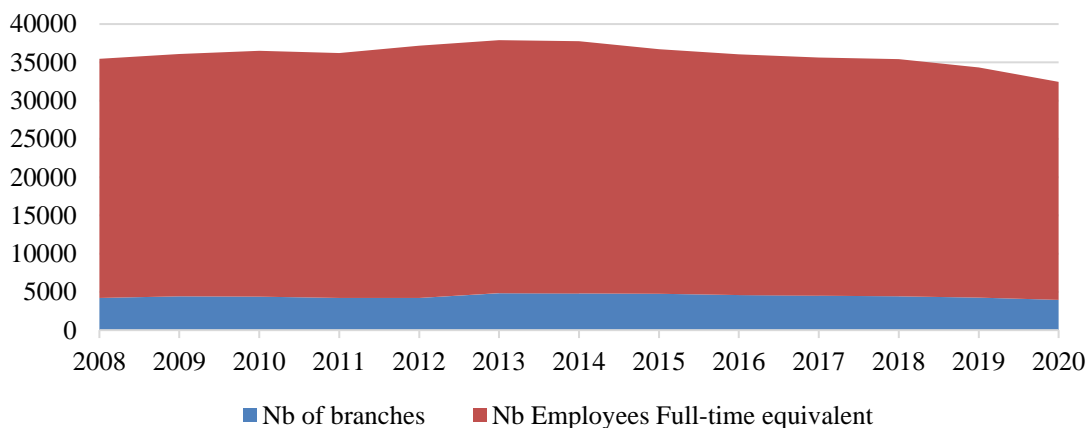

Figure 4. Evolution of the number of branches and employees linked to the cooperative credit sector (2008-2020)
Source: Own elaboration based on data from the European Association of Cooperative Banks (various years).

3.2 Results derived from the statistical model.

After the ordinary least squares (OLS) model was applied, it was possible to estimate the relationship between the number of cooperative banks and their evolution in Poland with the variables under study, both at the level of Poland and at the level of each of its voivodeships. For this purpose, the best results from OLS were selected.

All presented models are homoscedastic, have normal residuals, and do not show symptoms of autocorrelation. Apart from the general model for Poland, the other models also show no symptoms of multicollinearity. The 17 presented models have fairly high coefficients of determination (close to 1), which indicates a good linear fit to the available data.

At the voivodship level, the results obtained individually by the OLS model are shown in Table 3.

Table 3. Results from the ordinary least squares per voivodeship. Source: Own elaboration based on data from the Narodowy Bank Polski-Central Bank of Poland (2022) analyzed using the OLS model and SPSS

Country/voivodeship	Results from ordinary least squares
Polska	$COOPBBB = (61866'39) + (-0'001466) * \_POP + (-0'000497) * \_NCOM + (16'1654) * \_UNEM + e_i$
Dolnośląski	$COOPBB = (220'9715) + (-0'006763) * \_SAL + e_i$
Kujawsko-Pomorskie	$COOPBB = (258'3508) + (-0'009566) * \_SAL + e_i$
Lubelskie	$COOPBB = (415'9256) + (-0'01626) * \_SAL + e_i$
Lubuskie	$COOPBB = (92'3442) + (-0'00333) * \_SAL + e_i$
Łódzkie	$COOPBB = (317'1384) + (-0'010835) * \_SAL + e_i$
Małopolskie	$COOPBB = (412'5689) + (-0'01237) * \_SAL + e_i$
Mazowieckie	$COOPBB = (611'7599) + (-0'0181) * \_SAL + e_i$
Opolskie	$COOPBB = (161'5132) + (-0'00579) * \_SAL + e_i$
Podkarpackie	$COOPBB = (302'4350) + (-0'01169) * \_SAL + e_i$
Podlaskie	$COOPBB = (195'9879) + (-0'007281) * \_SAL + e_i$
Pomorskie	$COOPBB = (197'5848) + (-0'006605) * \_SAL + e_i$
Śląskie	$COOPBB = (292'4855) + (-0'006593) * \_INC + e_i$
Świętokrzyskie	$COOPBB = (159'5503) + (-0'006129) * \_SAL + e_i$
Warmińsko–Mazurskie	$COOPBB = (194'8135) + (-0'000449) * \_NCOM + (0'273769) * \_UNEM + e_i$
Wielkopolskie	$COOPBB = (394'7597) + (-0'014647) * \_SAL + e_i$

The wage variable is the most representative in almost all voivodships analyzed, always having an indirect or negative relationship with credit unions. Wage is also the only variable in the final model in the vast majority of the regions. Notably, in Śląskie, the most significant variable for explaining credit unions is income, which also has an indirect relationship with the dependent variable. In the Warmińsko–Mazurskie area, the variables that best explain bank credit unions are the number of enterprises and the unemployment rate; these variables have inverse and direct relationships, respectively, with the endogenous variable. In the case of the country in general, the model is affected by the population, the number of enterprises, and the unemployment rate, with the relationships between the cooperatives and the population or the number of enterprises having an indirect relationship and the unemployment rate having a direct relationship. Thus, as the population increases, the number of cooperatives decreases if the number of enterprises and the unemployment rate remain constant. If the number of enterprises increases and the population and unemployment remain the same, the number of credit unions will also decrease. In Poland, if the population and the number of enterprises remain constant but unemployment increases, the number of credit unions will also increase.
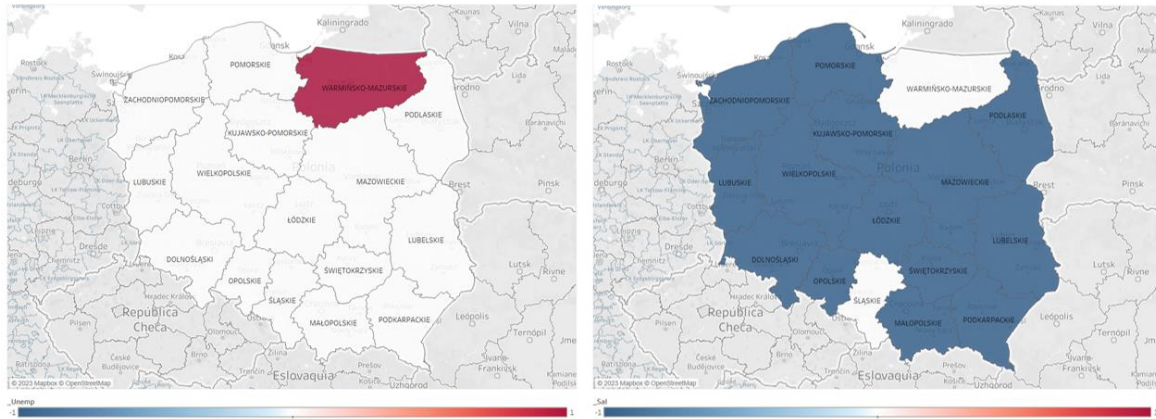
Figure 5. MCO results for bank credit unions, unemployment, and wages. Source: Own elaboration based on data from the Narodowy Bank Polski-Central Bank of Poland (2022), the applied OLS model, and Tableau Desktop Professional Edition v.2023.2

Figure 5 shows the results for the wage (_SAL) and unemployment (_UNEMP) variables. First, we analyze the results for unemployment (left map). The evolution of banking cooperatives and their distribution in Warminsko Mazurskie Voivodeship are directly related to unemployment, i.e., the higher the unemployment, the higher the number of banking cooperatives. Secondly, the map on the right in Figure 5 shows the relationship with the evolution of wages. In all voivodeships, except for Śląskie and Warminsko Mazurskie, the evolution of banking cooperatives and their distribution have an inverse relationship with wages. Thus, banking credit cooperatives are located in places where wages are significantly lower, serving as a dynamizing element of the economy.
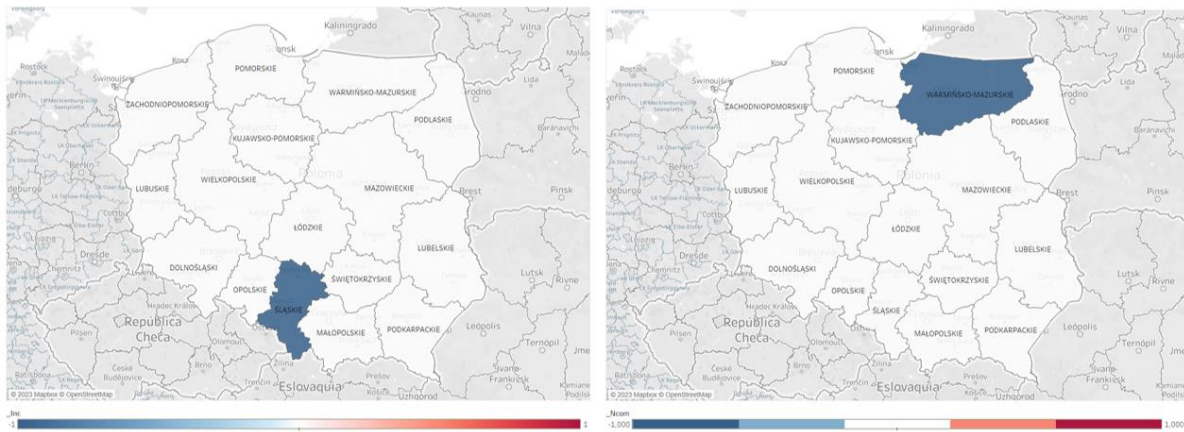

Figure 6. MCO results for bank credit unions, revenues, and number of companies. Source: Own elaboration based on data from the Narodowy Bank Polski-Central Bank of Poland (2022), the applied OLS model, and Tableau Desktop Professional Edition v.2023.2

Figure 6 shows the results of the OLS model in the relationship between bank credit unions, revenues (_INC), and number of companies (_NCOM). For the income represented in the left map, only Śląskie (blue color) appears in the models as representative of banking cooperatives. Moreover, Śląskie's distribution has an inverse relationship with income. Accordingly, this voivodeship is located in an area where the salary is significantly lower. In the other areas, there is no significant influence. The number of enterprises variable is

represented in the map on the right. In the voivodeship, the development of cooperative banks and their distribution in Warminsko Mazurskie have an inverse linear relationship with the number of enterprises. Thus, banking credit cooperatives are located in areas of the voivodeships where economic activity is lower, as there are fewer enterprises. Thus, credit cooperatives act as a dynamizing element.
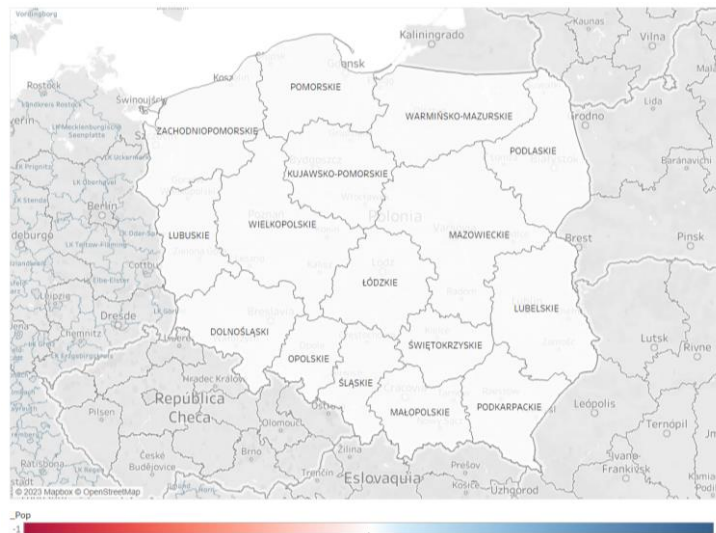

Figure 7. MCO results for bank credit unions and population. Source: Own elaboration based on data from the Narodowy Bank Polski-Central Bank of Poland (2022), the applied OLS model, and Tableau Desktop Professional Edition v.2023.2

As shown by the map in Figure 7, the results of the OLS model relate bank credit unions with population. Notably, as a variable, population is not considered significant under any of the applied models, indicating that bank credit unions are not related to the populations of the voivodeships.

Therefore, the presence of bank credit unions in the various voivodeships has a positive impact on several variables. In the case of the Kuyavian and Pomeranian Voivodeships, there is a high level of development in the manufacturing industry and agriculture, two key sectors in the financing of cooperative banking, especially in the rural and agricultural sectors. Cooperative banking has positively affected Lubelskie (Lublin). In this case, the results are also directly related to the main sectors of the economy, which have traditionally financed these cooperatives: the agriculture and agri-food industry; the chemical industry (especially fertilizers); the manufacturing industry (furniture, clothing, footwear); and, in the case of energy, coal. In Lubuskie (Lubus), cooperative banks may have positively affected this territory and the main sectors of the economy, agriculture and industry, and partially affected tourism. In the Lodzkie Voivodeship (Lodz), bank credit cooperatives may help the main sectors in this voivodeship: the textile industry and the agro-food sector, as well as the glass, chemical, and electromechanical industries. In the Maloposkie (Lesser Poland) Voivodeship, tourism is a major source of development for the economy, and the country's second largest city, Krakow, is an important center of business and entrepreneurship. In the Mazowieckie Voivodeship (Masuria), as in Lesser Poland, tourism is a major source of development for the economy. This region, where the capital of Warsaw is located, features great development in various industries, in addition to being a financial and business center. Moreover, this region features intensive development of agriculture to grow rye, potatoes, and vegetables, as well as intensive pig and

cattle breeding. In Opolskie (Opole), bank credit cooperatives can help the main sectors in this voivodeship through mining derived from its marble, basalt, and limestone deposits.

4. Discussion of results

In recent years, especially since the 2008 crisis, a strong process of bank restructuring has taken place in Europe. The cooperative banking sector is also familiar with this phenomenon. Some authors such as Groeneveld (2015) argued that increased competition, efficiency, and development under digital banking could explain this restructuring process. The reduction of international activities or integration processes in the cooperative banking sector were other conditioning factors (Groeneveld, 2016). The effects of this banking integration process are threatening the maintenance of open bank branches and employment in the sector. This process is also placing certain disadvantaged territories at risk of financial exclusion due to a lack of accessibility and proximity to basic financial services. Nevertheless, the results obtained in this study reveal that the impact of this restructuring process on the cooperative banking sector has been relatively low due to its roots in the territory and the particular characteristics of credit cooperatives. In Poland, the presence of credit unions has remained relatively stable. Moreover, the number of bank branches has only decreased by 5.8% since the 2008 financial crisis, and the number of employees has contracted by 8.8%. These results are in line with those obtained in other studies. A previous study by Lang et al. (2016) concluded that since the 2008 financial crisis, cooperative banks have suffered employment losses of around 4.6% compared to the 10.3% reduction suffered by the entire banking sector. The process of bank branch closures was also more moderate than that in the banking sector overall. In particular, 10.3% of bank branches were closed in the banking sector compared to 3.3% of credit cooperatives. This result demonstrates the active participation of credit unions in the process of financial inclusion. Along the same lines, other studies (Nayak, 2012; Lakshmi et al., 2013; Dabla-Norris et al., 2015; Lat, 2018) have noted that access to basic financial services through cooperative banks favors financial inclusion and contributes to alleviating poverty and promoting inclusive growth. Our results in Poland corroborate those obtained by Albert Moreno and Chaves Ávila (2021) in Spain, who argued that "The presence of cooperative banks plays a determining role in the reduction of income inequality". In the regions of Valencia in Spain and Emilia Romagna in Italy, such banks were reported to create social value for the society and territory (Catala et al., 2023).

On the other hand, our results after analysis show a significant influence of cooperative banks on the development of Polish voivodeships, after estimating the correlation between the selected socio-economic variables (income, wages, the number of enterprises, population, and unemployment) and the independent variable (the number of cooperative branches in each voivodeship). The prognostic value of the constructed model was high, with significant parameters, especially wages. The coefficient of determination R^2 indicated a high explanatory capacity of the models. In all cases, the R^2 value was above 0.99, as shown in table 3 of the appendix.

It was possible to identify the significant variables with a high coefficient of determination R^2 for the selected socio-economic parameters in the Polish voivodeships for the time series (2010-2020) (See Table 3 in the Annex). The values of the t-distribution (at a significance level of 0.05) indicate that banking cooperatives in Polish voivodeships are influenced by wages. However, depending on the voivodship, other variables also presented high significance in the study (unemployment, number of enterprises, income, etc.). Notably, the location of cooperative banks depends on the selected socio-economic factors, not vice versa. A similar conclusion was reached by Jorge Vázquez and Náñez Alonso (2023) and Korzeb et al. (2019) in their research.

Conclusion

The main objective of this study was to assess the contribution of credit unions to the process of financial inclusion and the local economic development of the territory where they operate. In particular, this study focused on Poland, one of the countries with the longest tradition of cooperative banking in Central Europe, using a regional analysis approach.

The analysis developed in this research revealed the capacity of credit cooperatives to offer financial services to the most isolated populations under conditions of accessibility and proximity. The results indicate that the widespread presence of credit unions in the territory, especially at the local level, and their strong ties with the local communities where they operate, allow cooperative banks to contribute to the process of financial inclusion and promote inclusive growth. As this study shows, credit unions have a counter-cyclical attitude. This factor allows cooperative banks to better withstand periods of economic recession and, consequently, retain a larger number of open bank branches compared to the commercial banking sector. Employment stability is also higher in the credit union sector. Both indicators suggest a greater commitment by cooperative banks to ensure that the population has greater access to their financial services. Nevertheless, the results derived from the analysis of the spatial distribution of bank branches indicate that four areas in Poland may be at risk of financial exclusion as credit unions in such areas are not able to offer their services in a sufficient quantity to ensure full financial inclusion of the population. Consequently, hypothesis 1 is accepted but only partially.

On the other hand, the statistical modelling corroborates the significant influence of cooperative banking on local economic development in the Polish voivodeships under study. The constructed model allowed us to identify the correlation between socioeconomic variables such as income, wages, number of enterprises, population, and unemployment and the number of cooperative branches operating in each voivodeship, ultimately obtaining a high model predictive value with significant parameters, especially wages. However, heterogeneous behavior was observed in the regions under study. Thus, depending on the voivodship, other variables such as unemployment, income, and the number of enterprises, among others, also achieved high significance in the study. All these results suggest that cooperative banking favors better economic performance at the local level. This evidence is consistent with the results obtained in other studies that confirmed the role of credit cooperatives as agents of local economic growth. Most of the studies found in the economic literature highlight the contribution of cooperative banks to the endogenous growth of the territory in which they operate due to their exceptional capacity to mobilize savings, grant credit, and support local entrepreneurial projects. Based on these results, the second hypothesis (H2) is accepted.

Several limitations of this study should be considered when interpreting the results. First, the possible impact of the overlap between the effects generated by commercial banks and the effects linked to cooperative banks must be considered. This overlap represents a certain limitation for analyzing the influence of cooperative banks on regional development, especially considering that cooperative banks operate within the traditional deposit and credit model. This factor indicates that banks can only improve their profits by competing within the same customer segments and in the same sectors of the economy as commercial banks (Ennew & Binks, 2002; Hakenes et al. 2014; Nguyen & Barth, 2020). On the other hand, the general model adopted in this study, despite being common in this type of research, may not gather, in every case, all relevant socioeconomic variables. Nevertheless, the reliability of the model was demonstrated in the literature. Therefore, the results obtained show a fairly reliable approximation of the phenomenon studied. As a future line of research, it would be convenient to develop a study of greater territorial amplitude to generalize the results with greater precision.

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Annex

Annex 1: List of institutions: Cooperative banks https://cutt.ly/ENLCPCL
Annex 2: Dataset https://cutt.ly/0NLCbhX
Annex 3: Descriptive statistics of the sample https://cutt.ly/5NLNkxX