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ON CREDIT DISTRIBUTION
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ABSTRACT

Banks and cooperatives operating in the financial market can offer rural credit to their customers, either from their own resources or from federal revenues arising from specific programs. However, there is a limit to the installment plan, due to the scarcity of resources and the restrictive characteristics of the union, such as the spending ceiling. In this context, cooperativism can figure as an alternative for expanding the monetary amount allocated to rural credit. This research aims to examine the interaction of credit unions with total loans made available to the agricultural sector in Paraná, between 2013 and 2018, comparing them with other financial institutions. To this end, data from the Monthly Banking Statistics by municipality (ESTBAN) and IF.Data, both provided by the Central Bank of Brazil and used through exploratory analysis of spatial data and the formulation of the Rural Credit Concentration Index (ICCR) were analyzed, aiming to analyze local interactions and identify patterns or particularities. It was found that rural credit in the interior of the state is mostly provided by credit unions. Thus, the important function of cooperatives is exposed in bringing to the farmer, especially the small one, resources for his activity.

Keywords: Regional Development. Rural credit. Paraná.
Exploratory Analysis of Spatial Data. Credit Unions.

RESUMO

Bancos e cooperativas atuantes do mercado financeiro podem oferecer crédito rural a seus clientes, seja a partir de recursos próprios, ou de receitas federais advindas de programas específicos. Porém, existe limite ao crediário, por conta da escassez de recursos e das características restritivas da união, como o teto de gastos. Neste contexto, o cooperativismo pode figurar como alternativa para expansão do montante monetário destinado ao crédito rural. A presente pesquisa objetiva examinar a interação das cooperativas de crédito com o total de empréstimos disponibilizados ao setor agropecuário no Paraná, entre 2013 e 2018, comparando-as com as demais instituições financeiras. Para tanto, foram analisados os dados da Estatística Bancária Mensal por município (ESTBAN) e do IF.Data, ambos, disponibilizados pelo Banco Central do Brasil e aproveitados mediante análise exploratória de dados espaciais e da formulação do Índice de Concentração de Crédito Rural (ICCR), objetivando analisar as interações locais e identificar padrões ou particularidades. Foi encontrado que o crédito rural no interior do estado é, majoritariamente, disponibilizado pelas cooperativas de crédito. Assim, expõem-se a importante função das cooperativas em levar para o agropecuarista, principalmente o pequeno, recursos para sua atividade.

Palavras-chave: Desenvolvimento Regional. Crédito Rural. Paraná.

Análise Exploratória de Dados Espaciais. Cooperativas de Crédito.

INTRODUCTION

Being a historically important sector to Paraná economy, the agricultural industry is diversified and the basket of items produced changes according to the characteristics of each region. In the livestock industry, the cattle and the poultry farming generate riches, once there are internal and external demands to the meat consumption. Likewise, the agriculture provides – contemporaneously – soya and corn planting in large scale. The agricultural, as a whole industry, generates production surplus, which is destined to other locations, thus contributing to the increase of producer's income and, consequently, to the whole area where the producer is inserted.

Imperfections in the agricultural industry – as the lack of funding for investments, costing and commercialization – hinder the development of the sector, therefore the credit unions emerge to assist by offering rural funding lines. The collaboration of associated partners strengthens the regional market, providing resources to the agricultural sector, with families and companies of those regions being benefited by the collective initiative.



The inclusivity characteristic is identified in the credit unions, for contributing with the agricultural credit division. These unions are closer to the plaintiffs of rural credit than other institutions, enabling advantages over the competition, such as: reduction in the transaction costs and privileged information about the contractors, which contribute to decrease the loan risks.

The presence of cooperativism is found all over Brazil; however, it is more common in smaller cities of the country. Thus, distributed in a fragmented way over the national territory, the presence of credit unions compensates the absence of bank branches in some cities, in a way that resources are enabled to the rural producers, as emphasizes INPUT (2020).

The cooperatives present in Paraná, including the credit ones, contribute to the agricultural sector modernization, stimulating the industry and retaining the financial resources regionally, to be reinvested in the many production chains promoted by the cooperativism. With that, the transmission of technology to the agriculturalists, together with the integration of financial resources, increase the life quality of producer families by the economic growth. Although there is inefficiency on the allocation of rural credit among all the participants, the interaction between cooperative members demonstrates the potential to develop underprivileged regions in terms of technological, financial and structural resources. Essentially, the rural credit provided by the credit unions increases the income circulation and promotes the social capital of small rural producers (Alves e Lima, 2018).

From this consideration and from the observation that there is heterogeneity in the rural credit distribution in different regions of Paraná, it is aimed to answer the questions: do the credit unions present any differentiated behavior compared to the other financial institutions existing in Paraná? Could the possible behavioral difference of these corporations explain the heterogeneous results in the allocation of rural credit in the state of Paraná?

The purpose of this investigation is to analyze the allocation of relative credit operation from credit unions which handled with rural credit from 2013 to 2018. The data is provided by the Central Bank of Brazil (BCB¹) through the Monthly Banking Statistics (ESTBAN²), as well as by

1 Banco Central do Brasil (N.T.).

2 Estatística Bancária Mensal (N.T.).



the quarterly report, exposed on IF.data portal of BCB, in which are included the headquarters of different financial institutions. The methodology applied also corresponds to an Exploratory Analysis of Spatial Data (AEDE³), making use of the construction of a credit concentration index.

The article is organized in five parts. After this introduction, it follows the historical and empirical references, forming an informational timeline about the credit unions, with emphasis on Paraná context. Methodology, materials and methods used compose section three, in which are presented the data that explain the specificities of each spatial component. With sufficient information allowance, the results are shown and measured in section four. In sequence, the outcome is done including the results, comments and recommendations.

THE CREDIT UNIONS AND THE RURAL CREDIT

It is presented, on this stage, a brief exposition concerning the performance of the credit unions in the availability of rural credit through empiric literature about the subject. An inference of the information obtained from BCB (2022) complements the section.

The credit unions emerge to arrange credit lines and financial services to the associated members. These unions can be constituted by groups of employees of the same company, agglomerate of companies, professionals of the same performance group and entrepreneurs. The resources are captured from demand deposit and term deposit, loans, transfers and refinancing from other financial institutions, as well as can be received by donations. Loans, securities discounts and financing are the channels for credit availability (vide Assaf Neto, 2018).

Some singular characteristics of the credit unions are the non-subjection to bankruptcy; nonexistence of profit motive; efforts destined to the associated members (offering better fees and charges); the non-requirement to collect the compulsory deposits stipulated by BCB; receiving deposits only from associated; raising loans and transferring lines in national and international financial institutions. Considering these attributes, even if the credit unions have the ability to create book currency, as a commercial bank can do, they classify themselves as non-bank financial institutions.

3 Análise exploratória dos dados espaciais (N.T.).



The law number 5.764/1971 indicates the guidelines of the Cooperativism National Policy, defining three kinds of institutions. First, the singular ones are composed by, at least, twenty people, allowing the inclusion of legal entity as long as they execute not-for-profit tasks or related to natural people. Second, the central or federations of credit unions, which are conceived following the same rules as the singular ones, although, differently from them, can contemplate thirty legal entities or natural people. Lastly, there are the confederations of central credit unions that are constituted of – at least – three central or cooperatives federations, which can be of distinct modalities (BCB, 2022).

Research in the economic field investigate the performance of credit unions about the offer of rural resources and use these unions as study object. Several answers are obtained by different analytical perspectives, though many studies highlight the importance of the credit unions for the access to financial services in Paraná and Brazil region, as pointed out by Alves and Lima (2018) and Fonseca, Antoniazzi and Novak (2019). On these approaches, it was highlighted the relevance of credit unions in the state of Paraná, emphasizing how the social interaction between the cooperated members eases the development of regions initially underprivileged. These institutions promote the insertion of Family Farming in a wider context of Paraná agricultural industry, through the access to rural credit, savings generation and knowledge spreading.

A more comprehensive interaction is identified when considering the relation between the regional development and the territory. According to Gumiero et al. (2022), the resources and assets accumulated over the years can be classified as territorial heritage. This aggregation improves the institutions, the administration and the planning of public policies for the region. By these means, the development is boosted by the combination of these factors and by the social interaction of the residents.

On the other hand, Santos and Batalha (2023) discuss how the technology can push the development regionally. The authors state that the technological advancement in a specific area does not depend only on the entrepreneurial activity and its agents, but also on the pre-existing conditions before the implementation of a new technology. This condition is known as territorial technological capacity. In view of this, understanding the technological capacity of each area can



ease the implementation of public and private policies that elevate the innovation level focused on the territorial development.

Another regional approach is proposed by Brito, Theis and Santos (2019). In this analysis, the factors that contributed to the uneven development of some regions compared to others, resulting in social inequality, are highlighted. Thus, the regional distancing is due to the past territorial occupation and to the consequent economic concentration on Brazilian Southwest. Therefore, it is necessary to implement adjusted policies to the context of each location, considering its specificities. In conclusion, the historical factors generated regional disparities, demanding specific strategies for the social problems resolution.

Relating the performance of Gross Domestic Product (GDP) and the rural credit from 1999 to 2018, Borges and Parré (2022) use Autoregressive Vectors, Granger's analysis of causality and the ordinary and generalized least squares method. In the defined temporal space, it was identified real addition to the credit line of agricultural industry, but with distributive agglomeration in a few establishments of contracts with elevated values. They finish the analysis pointing out the one-sided precedence – the rural credit causes, in the sense of Granger, the agricultural GDP.

The solvency of credit unions from Minas Gerais indicates the relevance and effectiveness of offering the service to the producers. The financial indexes and the Logit model were applied to obtain such conclusion by the authors Bressan, Braga and Lima (2004). The rural credit evolution in Brazil was also investigated by Gimenes, Gimenes and Gozer (2008) who confirmed the performance of agricultural cooperatives in the formal and informal system. The review about the topic provided support to highlight that there is more demand for rural credit than relative supply. This argument exposed the difficulty of resources capturing by the cooperatives because of the imperfections on the agricultural sector. The authors emphasize, however, that the credit unions are important – mostly – to specific lines, such as the rural one.

Returning to the efficiency topic, the Data Envelopment Analysis (DEA) was used to evaluate the performance of rural credit unions in the state of Sao Paulo by the authors Vilela, Nagano and Merlo (2007). The institutions which had the higher volume of monetary resource obtained higher efficiency score. In an investigation focused on the city of Laranjeiras do Sul in Paraná, the



objective was to verify the participation of cooperatives in rural line operations in 2013, 2014 and 2015. The agricultural funding and investment group was selected and used upon data provided by BCB and The Brazilian Institute of Geography and Statistics (IBGE⁴). In the selected period, an increase in the share of rural credit offered by non-cooperatives compared to cooperatives was identified. Regarding this, in areas where the cooperativism happens in a structured way, it can effectively contribute to the region development, as state Presa and Christoffoli (2018). This study is finished indicating loan agglomeration in the section of commodities.

Another investigation, destined to a single specific municipality, Cascavel, was performed by Zago and Garcia (2008). Focusing on the operation of a rural credit cooperative and its effects to the minor producers, the field research was applied to praise the magnitude about the sustainable human development. Costa et al. (2019) expose a study related to the contribution of credit unions in rural financing operations of descriptive and exploratory nature, confirming that the cooperatives influence, positively, the public policy based on the rural credit.

The fact that in Brazil there are still municipalities without bank branches makes the credit unions an option to the credit supply. The work of Schuntzemberger et al. (2015) aimed to measure the impact of solidarity rural credit in cities of Brazil on the added value of agricultural industry upon the difference-in-difference methods with propensity score pairing and Ordinary Least Squares (OLS); it was verified that the rural credit cooperatives contribute to the local growing.

As a literature summary, the papers explored are related to the effects of credit unions and infer on topics such as income distribution, economic development, power decentralization and financial aid. Generally, the results are close to each other, highlighting the importance of the cooperatives to the rural activity, although various methodologies were applied.

4 Instituto Brasileiro de Geografia e Estatística (N.T.).



MATERIALS, METHODS E METHODOLOGY

The literature emphasizes the contribution of rural credit to regions development, but the disaggregated transmission of these resources by the cooperatives is explored in a smaller proportion. Therefore, the quantitative methodology was chosen to confirm the relevance of the cooperativist performance in regions of Brazil, especially in Paraná. By these means, it was possible to determinate, based on the collected data, the proportion of credit unions participation compared to other financial institutions in the disposal of financial resources destined to the rural environment. Thus, this research is of exploratory nature due to the lack of empirical studies about the theme, being original and contributing to the scientific progress.

In this investigation, which examines the performance of credit unions in municipalities and regions, the AEDE was used, and a credit concentration index was formulated. The data come from two basis of BCB: ESTBAN and IF.data. Despite both coming from the same source, the method of collection and data presentation are different. The spatial analysis was made by the software Geoda, which assisted, similarly, the formation of cartographies presented as figures throughout this research. The values from the information sources were adjusted to December 2018, allowing a comparison in real amounts, using the inflation index IGP-M of Getúlio Vargas Foundation as reference.

SOURCES E APPLICATIONS

The analysis conducted in this research are based on the municipal scope and, subsequently, wider areas are taken, by the concept of immediate and intermediate regions. Since one of the research objectives is studying the presence of credit unions on rural line supply, the ESTBAN basis is used only in the first stage, because it does not display detailed information. In this way, the IF.data basis was preferred to provide the necessary disaggregation between the performance of cooperative and non-cooperative institutions in the years 2015 and 2018, once there were not disaggregated data before this period.



Initially, it was intended to apply the materials provided by ESTBAN to identify a presumed spatial correlation of cooperative and non-cooperative municipal institutions, however, considering the characteristics that composes this BCB reference, this was not possible. The reporting of data collection in ESTBAN portal does not disaggregate information as the cooperative and non-cooperative registers, legal entity and natural person. Therefore, the data from IF.data were used, which is also managed by BCB and provides the particular categories required. Although some information asymmetry has been solved, the way that the materials are reunited – as in ESTBAN – makes unfeasible the spatial inference by municipality.

Being monthly generated with banking statistics, ESTBAN contemplates the monthly municipal balance position of the main balance sheet items from commercial banks and multiple banks with commercial portfolio. On the other hand, the IF.data shows the quarterly release of institutions which BCB authorizes to operate, being an access portal to the reports according to the classification criteria defined.

Regarding the immediate and intermediate spatial organizations, these ones were defined by IBGE (2017), because the heterogeneity of Brazilian territory demanded a review of sub-state units. Meso-regional and micro-regional started being associated with the concepts of intermediate and immediate regions, offering more detailed information about Brazilian territory and its attributes. This partition instrumentalizes and integrates observations and expectations of planning agencies of the state. The identification and publishing of regional clippings is made jointly to the National Association of Planning, Research and Statistics Institutions (ANIPES⁵).

Aiming to verify the concentration, per region, of the rural credit offered by authorized institutions, the monetary values were collected in reais from Paraná areas in an index which indicates values from 0 to 1, and the closer the unity, the greater the credit accumulation. The Rural Credit Concentration Index (ICCR⁶) aims to show the accumulation level of a minor region *i* considering another one bigger *j*. On this approach, the municipalities, immediate and intermediate from Paraná, were selected as minor areas. The equation (1) is exposed:

5 Associação Nacional das Instituições de Planejamento, Pesquisa e Estatística (N.T.).

6 Índice de Concentração de Crédito Rural (N.T.).



$$ICCR_{i,j} = \frac{\left(\frac{(CR_i - \overline{CR}_j)}{s_j^{CR}}\right) - CR_j^{min}}{CR_j^{max} - CR_j^{min}} \quad (1)$$

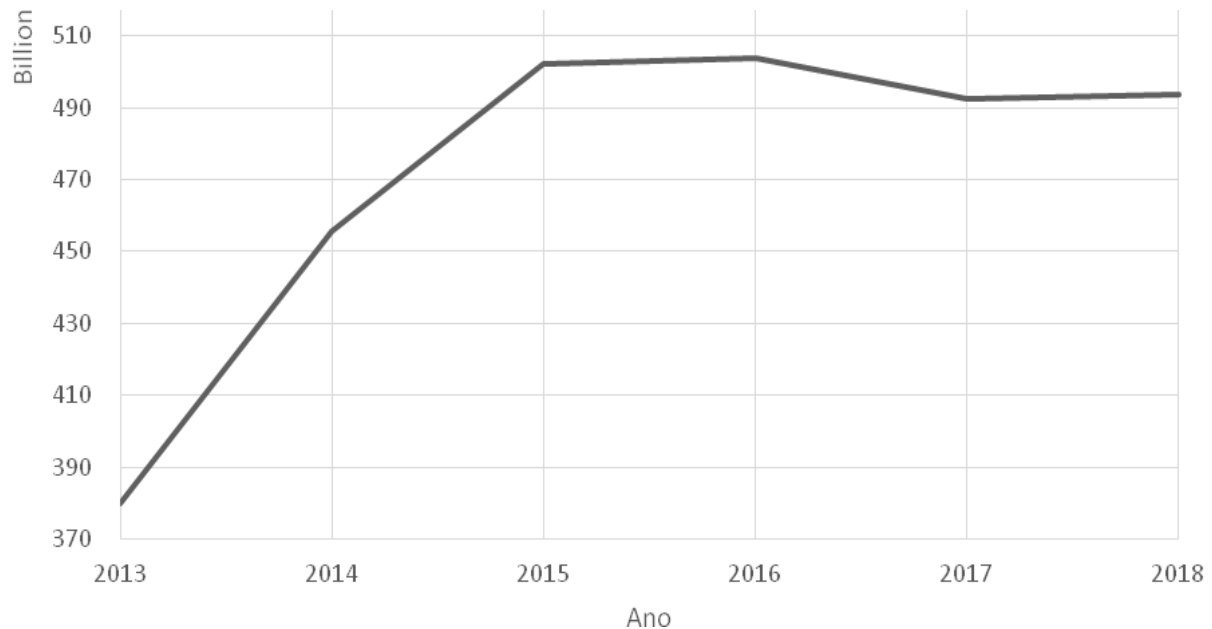
in which CR indicates the total number of hired rural credit in reais, \overline{CR} points out the average, besides the value of j aggregated, it is also used the minimum, min , and the maximum, max .

The institutions that offer rural credit were divided into two groups, cooperatives and other financial institutions. From the grouping, there was the claimants classification in natural people and legal entities. All of them compose the characteristics of rural credit distribution through Paraná territory, with that, enabling the inference about different conditions considering the attributes of each location in the state of Paraná. Summarily, it was made the ICCR calculation in the regions, dividing the credit unions and the other financial institutions by natural person and legal entity.

STYLIZED FACTS: AN ANALYSIS OF THE RURAL CREDIT IN PARANÁ

The joint exhibition of the monetary value of agricultural investment and costing lines among financial institutions of Paraná is presented in Figure 1. From the beginning of the series, in 2013, until 2018 the credit hiring grew; however, the value has remained relatively constant until the end in 2018. The financial instability identified in Brazil, with GDP stagnation and retraction, grounds the constancy after 2015. It started from the minimum of about 380 billion reais in 2013 reaching, approximately, 500 billion in 2015 and 2016; in 2018 it was obtained a monetary value close to the past years, although slightly lower, about 490 million reais.

Figure 1 | Hired credit variation in reais to investment and costing of agriculture and farming industry in Paraná in 2013-2018



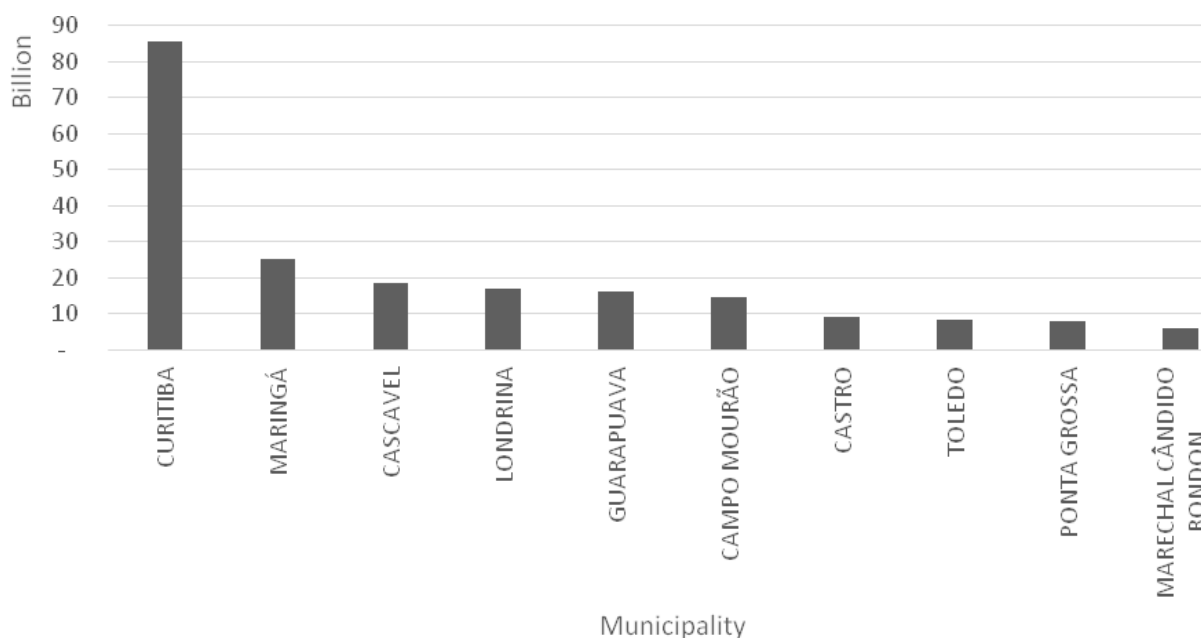
Source: Own elaboration based on the data from ESTBAN of BCB (2022).

Note: Updated values to 2018 by IGP-M.

Among the cities which most hired loans related to the agricultural funding in Paraná, Curitiba displays a financial agglutination above the triple demanded by the second city – e.g., Maringá. The capital of Paraná is located near the Campos Gerais region, a highly participative area in the state rural segment, by this way making accessible to the spatial close producers to reach the metropolitan centers for hire loans. Furthermore, the economic development of Curitiba generates favorable conditions to the availability of robust bank services, as well as other structured points.

Municipalities as Maringá, Cascavel and Londrina also presents a reference positioning; in other words, the agents of neighboring cities access them searching for credit in higher quantity and lower fees. Figure 2 shows the average financial record of these places, around 20 billion reais. Guarapuava is on the ranking mostly because of its malt production. Marechal Candido Rondon, although it is not a populous location – almost 60 thousand inhabitants – acts generating animal nutrition products, what can explain its relative participation.

Figure 2 | Average value in reais from top ten credit claimants to costing and investment of agriculture and farming in Paraná in 2013-2018

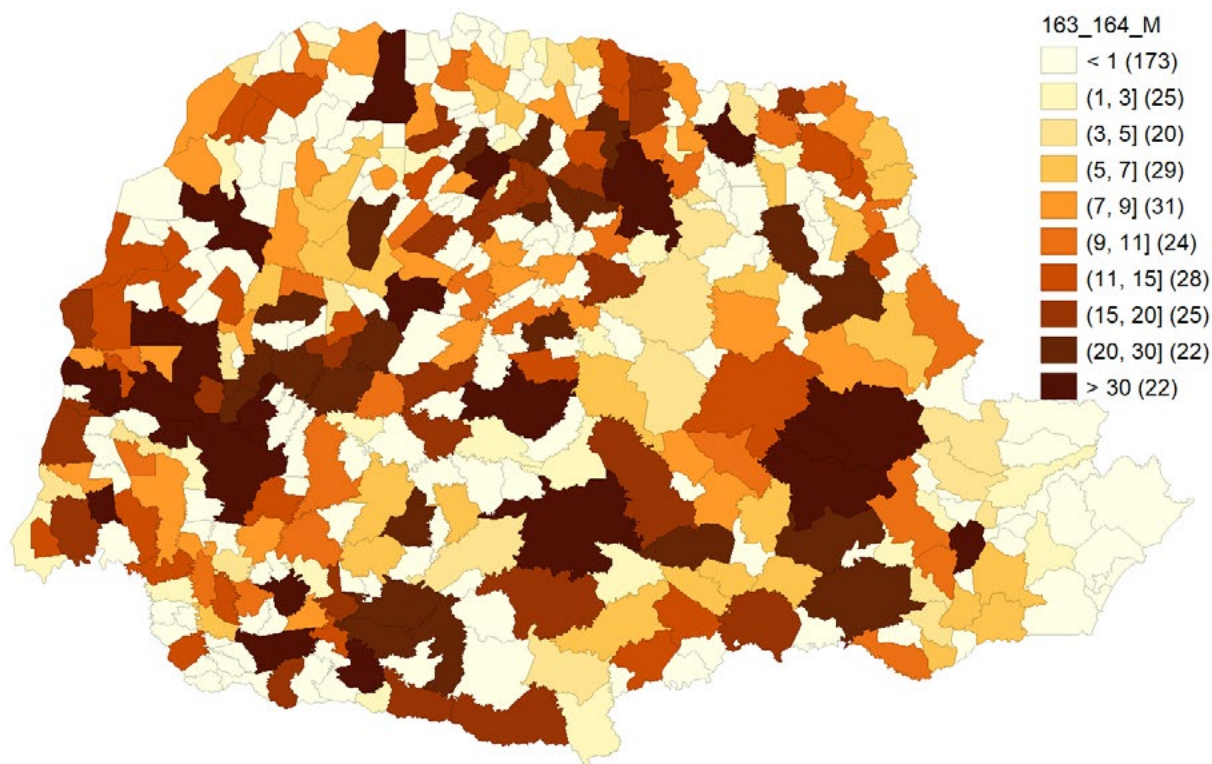


Source: Own elaboration based on the data from ESTBAN of BCB (2022).

Note: Updated values to 2018 by IGP-M.

Only Curitiba presented a record above 30 billion reais in hired rural credit. As shown in Figure 3, there are rural credit concentration points. In Campos Gerais area, municipalities as Castro and Ponta Grossa allocates between 5 and 10 billion reais each, for production costing or investments. In North-central, Londrina and Maringá register an accumulation of values, though some of their neighbors also consume a reasonable credit quantity. Campo Mourão, in Central west, is the reference for the region. Cascavel, in West, and Guarapuava, in Center-south, complete the composition of accumulation central locations.

Figure 3 | Municipalities average value between 2013-2018 in billion reais to costing and investment of agriculture and farming in Paraná

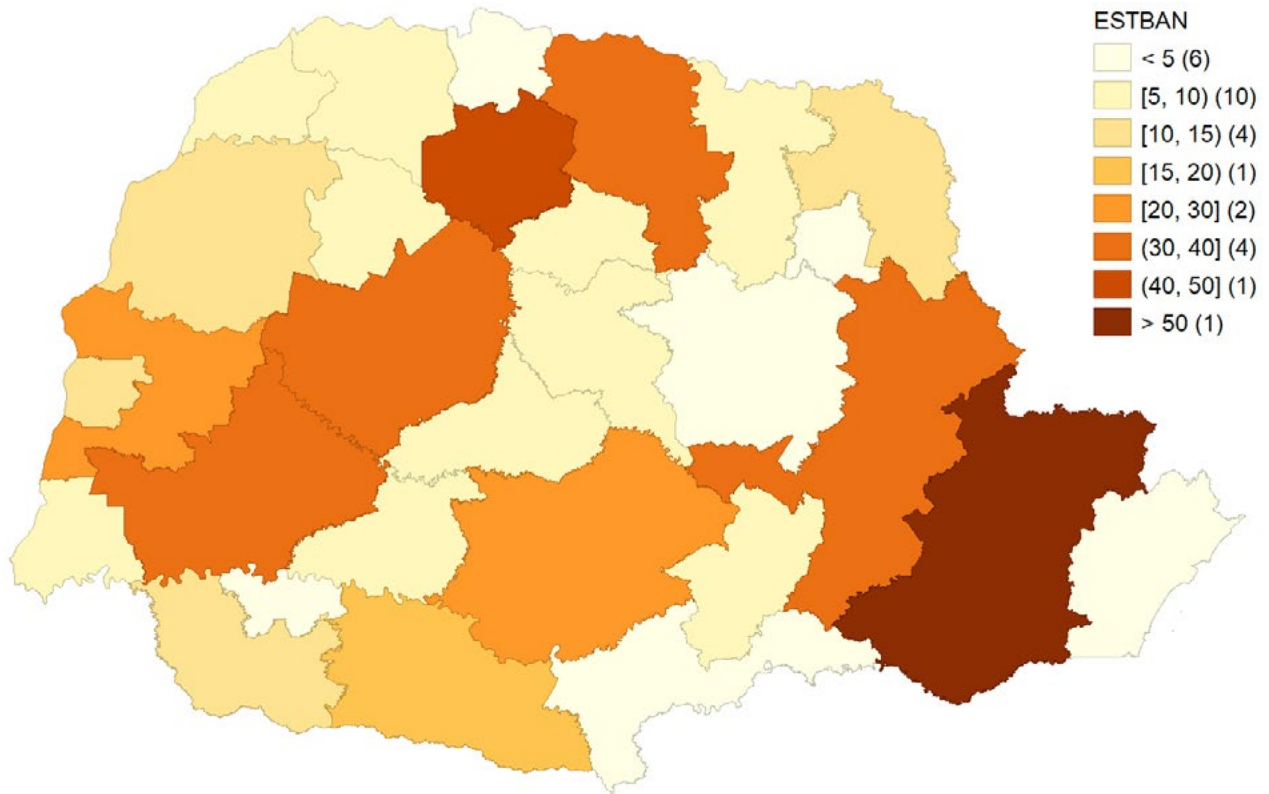


Source: Own elaboration based on the data from ESTBAN of BCB (2022).

Note: Updated values to 2018 by IGP-M.

Considering the regional clipping of immediate regions, more than double of the credit hiring to investment and costing for the agricultural sector was registered in the immediate region of Curitiba – above 90 billion reais – when compared to the Maringá immediate region – slightly above 40 billion reais – as shown in Figure 4. A discrepancy in rural credit allocation is found when calculating the difference of values between extreme points (around 95 billion reais) and the coastal location of Paranaguá, where there is a lower quantity demand of credit line due to its economic attributes. Being a grain producer, specifically soya, the belt that is shaped in the North-central up to West exposes the necessity and, consequently, the high demand for loans related to the agricultural industry, also due to the fertile and iron-rich ground.

Figure 4 | Average value of immediate regions between 2013-2018 in billion reais to costing and investment of agriculture and farming in Paraná

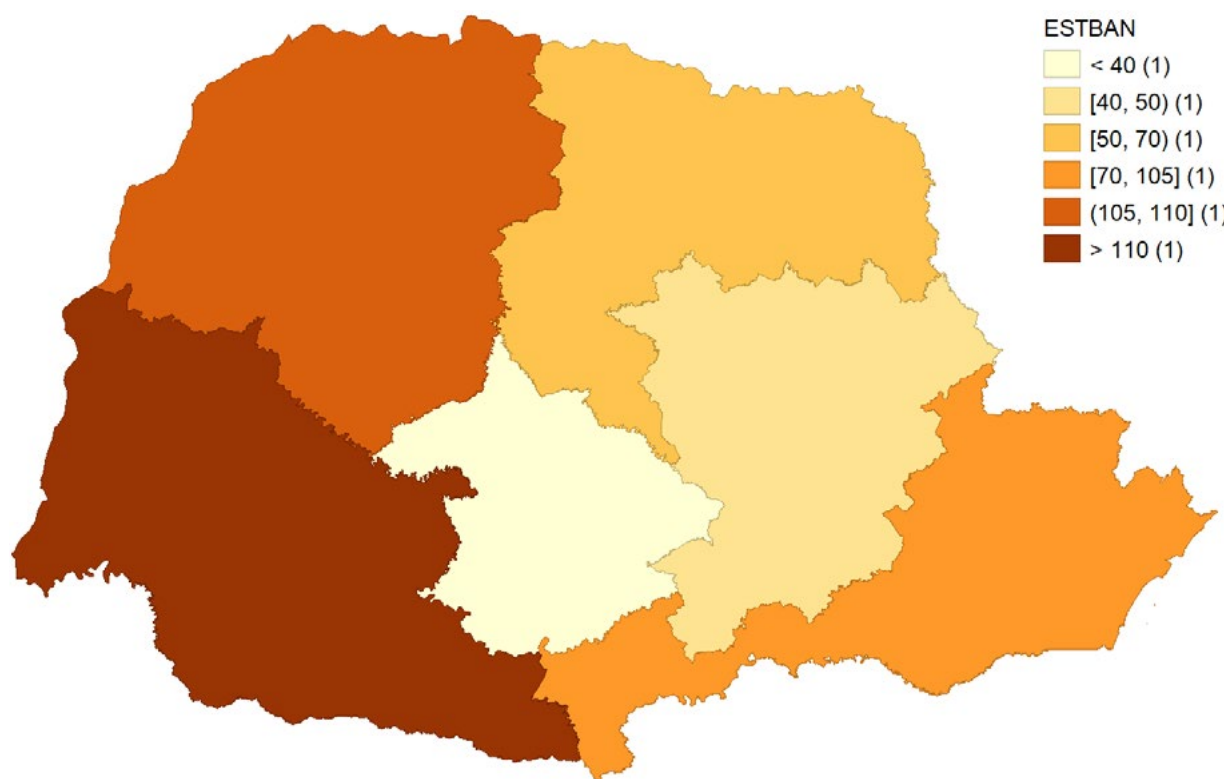


Source: Own elaboration based on the data from ESTBAN of BCB (2022).

Note: Updated values to 2018 by IGP-M.

Grouping the immediate locations to form the intermediate regions, as displayed in Figure 5, the leadership composition in the allocation diverges. Curitiba loses the leadership to Cascavel and Maringá, all aggregating, individually, above 100 billion reais according to BCB. A quantity lower than 30 billion reais was demanded in the central area of Guarapuava. By distributing the data in a less grouped form, various results according to the spatial composition of the locations were identified.

Figure 5 – Average value of intermediate regions between 2013-2018 in billion reais to costing and investment of agriculture and farming in Paraná



Source: Own elaboration based on the data from ESTBAN of BCB (2022).

Note: Updated values to 2018 by IGP-M.

The aggregation of minor areas – cities – made possible the identification of divergences among the regions of Paraná in the rural credit capture. The agricultural performance inhomogeneity of Paraná is displayed in the immediate locations, although Curitiba concentrates large part of financial transactions even though it is not inserted in the category of more productive municipalities in rural scope of the state.

RESULTS ANALYSIS

The total ICCR, composed by an analysis of the rural credit allocated by all financial institutions, points out Curitiba as the largest municipality with rural credit allocation. This is justified considering that the capital disposes of an economic conjuncture better structured than other locations of Paraná state. Campo Mourão, located in the agricultural active region, presents ICCR close to the unit (0,9977), holding a good credit rural proportion. In sequence, there is Maringá (0,9670) – central reference of neighbor cities – thus capturing its demands. Medianeira, Ampére and Palotina, small-sized cities, under 100 thousand inhabitants, display an index above 0,8. Such municipalities have agro-industrial cooperatives headquarters, what can explain the region credit accumulation. Analyzing Figure 6 and Table 1, besides the main economic centers of the state, as Ponta Grossa and Cascavel, there are also cities less centralized which highlight themselves according to the total index. A possible explainer relation could be the presence of cooperatives performance in their territories.

Table 1 | Average ICCR from Paraná municipalities to natural person and legal entity of cooperatives, non-cooperatives and total from 2015 to 2018

Municipality	Natural person			Legal entity			Total		
	Coop	Ncoop	Total	Coop	Ncoop	Total	Coop	Ncoop	Total
Alto Paraná	0,9192	0,4569	0,5993	0,3779	0,4573	0,4486	0,9071	0,4570	0,5667
Ampére	0,9991	0,4569	0,7559	0,3778	0,4573	0,4486	0,9986	0,4570	0,6962
Apucarana	0,3216	0,4569	0,4119	0,4746	0,4573	0,4556	0,3262	0,4570	0,4211
Arapongas	0,6192	0,4569	0,4890	0,3774	0,4573	0,4486	0,6057	0,4570	0,4799
Arapoti	0,6167	0,4569	0,4883	0,3920	0,4573	0,4497	0,6044	0,4570	0,4797
Araucária	0,2843	0,4876	0,4304	0,3774	0,4573	0,4486	0,2835	0,4807	0,4341
Assis Chateaubriand	0,4491	0,4569	0,4453	0,4416	0,4573	0,4533	0,4465	0,4570	0,4468
Bela Vista Da Caroba	0,2869	0,4569	0,4021	0,3776	0,4573	0,4486	0,2861	0,4570	0,4119
Boa Ventura de São Roque	0,3425	0,4569	0,4176	0,3777	0,4573	0,4486	0,3394	0,4570	0,4241
Cafelândia	0,5572	0,4569	0,4728	0,4353	0,4573	0,4528	0,5501	0,4570	0,4682
Cambará	0,4564	0,4569	0,4472	0,3779	0,4573	0,4486	0,4487	0,4570	0,4473
Campo Mourão	1,0000	0,4569	0,9376	0,6943	0,4573	0,4718	1,0000	0,4570	0,8820
Cândido De Abreu	0,3728	0,4569	0,4256	0,3790	0,4573	0,4487	0,3685	0,4570	0,4304
Candói	0,3591	0,4569	0,4220	0,3783	0,4573	0,4487	0,3554	0,4570	0,4276
Capanema	0,7672	0,4569	0,5323	0,7885	0,4573	0,4801	0,7774	0,4570	0,5208
Cascavel	0,7813	0,4569	0,5370	0,8658	0,4573	0,4887	0,7972	0,4570	0,5264
Castro	0,2969	0,4569	0,4049	0,3774	0,4573	0,4486	0,2957	0,4570	0,4141
Cerro Azul	0,3678	0,4569	0,4243	0,3810	0,4573	0,4489	0,3639	0,4570	0,4294



Chopinzinho	0,4196	0,4569	0,4378	0,3774	0,4573	0,4486	0,4133	0,4570	0,4399
Clelândia	0,3125	0,4569	0,4093	0,3775	0,4573	0,4486	0,3106	0,4570	0,4176
Colorado	0,2996	0,4569	0,4057	0,3774	0,4573	0,4486	0,2982	0,4570	0,4147
Coronel Vivida	0,5219	0,4569	0,4638	0,3856	0,4573	0,4492	0,5122	0,4570	0,4604
Cruz Machado	0,4644	0,4569	0,4492	0,3843	0,4573	0,4491	0,4568	0,4570	0,4490
Curitiba	0,4761	1,0000	1,0000	0,4808	1,0000	1,0000	0,4755	1,0000	1,0000
Dois Vizinhos	0,5896	0,4569	0,4812	0,3781	0,4573	0,4487	0,5770	0,4570	0,4738
Douradina	0,2843	0,4583	0,4026	0,3774	0,4573	0,4486	0,2835	0,4580	0,4123
Enéas Marques	0,3261	0,4569	0,4131	0,3778	0,4573	0,4486	0,3237	0,4570	0,4205
Foz Do Iguaçu	0,3138	0,4569	0,4097	0,4602	0,4573	0,4546	0,3176	0,4570	0,4192
Francisco Beltrão	0,7838	0,4569	0,5378	0,7048	0,4573	0,4726	0,7871	0,4570	0,5235
Grandes Rios	0,4006	0,4569	0,4329	0,3854	0,4573	0,4492	0,3957	0,4570	0,4362
Guaraniaçu	0,3485	0,4569	0,4192	0,3777	0,4573	0,4486	0,3451	0,4570	0,4253
Guarapuava	0,5222	0,4569	0,4639	0,5549	0,4573	0,4613	0,5256	0,4570	0,4631
Guaratuba	0,2962	0,4569	0,4047	0,4909	0,4573	0,4568	0,3026	0,4570	0,4157
Honório Serpa	0,3072	0,4569	0,4078	0,3783	0,4573	0,4487	0,3056	0,4570	0,4164
Ibaiti	0,2979	0,4569	0,4052	0,3780	0,4573	0,4486	0,2966	0,4570	0,4143
Ibema	0,3190	0,4569	0,4111	0,3774	0,4573	0,4486	0,3169	0,4570	0,4190
Itapejara D' oeste	0,4430	0,4569	0,4438	0,3793	0,4573	0,4487	0,4358	0,4570	0,4446
Itaperuçu	0,2913	0,4569	0,4033	0,3790	0,4573	0,4487	0,2903	0,4570	0,4129
Ivaiporã	0,3943	0,4569	0,4313	0,3780	0,4573	0,4486	0,3890	0,4570	0,4348
Jandaia Do Sul	0,3619	0,4569	0,4228	0,4053	0,4573	0,4506	0,3600	0,4570	0,4286
Lapa	0,4747	0,4569	0,4518	0,4821	0,4573	0,4561	0,4743	0,4570	0,4526
Laranjeiras Do Sul	0,6045	0,4569	0,4851	0,4414	0,4573	0,4532	0,5963	0,4570	0,4779
Londrina	0,4084	0,4590	0,4370	1,0000	0,4573	0,5701	0,5326	0,4586	0,4662
Mandaguari	0,5165	0,4569	0,4624	0,3969	0,4573	0,4500	0,5079	0,4570	0,4595
Mangueirinha	0,3573	0,4569	0,4215	0,3774	0,4573	0,4486	0,3535	0,4570	0,4272
Marechal Cândido Rondon	0,5817	0,4569	0,4791	0,5414	0,4573	0,4603	0,5817	0,4570	0,4748
Marilena	0,2906	0,4569	0,4031	0,3774	0,4573	0,4486	0,2896	0,4570	0,4127
Maringá	0,9998	0,4582	0,7856	1,0000	0,4573	0,6515	1,0000	0,4580	0,7597
Mariópolis	0,5553	0,4569	0,4723	0,8148	0,4573	0,4827	0,5801	0,4570	0,4745
Marmeleiro	0,3519	0,4569	0,4201	0,3775	0,4573	0,4486	0,3484	0,4570	0,4260
Medianeira	0,9507	0,4569	0,6239	0,9999	0,4573	0,5603	0,9691	0,4570	0,6105
Nova Esperança	0,2878	0,4569	0,4023	0,3775	0,4573	0,4486	0,2869	0,4570	0,4121
Nova Esperança Do Sudoeste	0,3110	0,4569	0,4089	0,3776	0,4573	0,4486	0,3092	0,4570	0,4173
Nova Londrina	0,4230	0,4569	0,4387	0,3777	0,4573	0,4486	0,4166	0,4570	0,4406
Nova Prata Do Iguaçu	0,3414	0,4569	0,4173	0,3777	0,4573	0,4486	0,3383	0,4570	0,4238
Palotina	0,9781	0,4569	0,6585	0,4603	0,4573	0,4546	0,9733	0,4570	0,6156
Paranacity	0,2848	0,4569	0,4014	0,3775	0,4573	0,4486	0,2840	0,4570	0,4114
Paranavaí	0,3593	0,4569	0,4221	0,5933	0,4573	0,4641	0,3712	0,4570	0,4310
Pato Branco	0,3689	0,4569	0,4246	0,5818	0,4573	0,4632	0,3797	0,4570	0,4328
Pérola D' oeste	0,3402	0,4569	0,4169	0,3785	0,4573	0,4487	0,3372	0,4570	0,4236



Pinhão	0,3069	0,4569	0,4078	0,3781	0,4573	0,4487	0,3053	0,4570	0,4164
Pitanga	0,3215	0,4569	0,4118	0,3791	0,4573	0,4487	0,3193	0,4570	0,4196
Planalto	0,3108	0,4569	0,4089	0,3788	0,4573	0,4487	0,3091	0,4570	0,4172
Ponta Grossa	0,9435	0,4569	0,6174	0,8067	0,4573	0,4819	0,9442	0,4570	0,5884
Pranchita	0,3253	0,4569	0,4129	0,3786	0,4573	0,4487	0,3230	0,4570	0,4204
Prudentópolis	0,6528	0,4569	0,4981	0,5211	0,4573	0,4589	0,6488	0,4570	0,4893
Realeza	0,3590	0,4569	0,4220	0,3783	0,4573	0,4487	0,3552	0,4570	0,4275
Renascença	0,3631	0,4569	0,4231	0,3776	0,4573	0,4486	0,3591	0,4570	0,4284
Rio Branco Do Sul	0,2969	0,4569	0,4049	0,3783	0,4573	0,4487	0,2957	0,4570	0,4141
Rolândia	0,3809	0,4569	0,4278	0,3774	0,4573	0,4486	0,3761	0,4570	0,4321
Salgado Filho	0,2968	0,4569	0,4049	0,3776	0,4573	0,4486	0,2955	0,4570	0,4141
Salto Do Lontra	0,3712	0,4569	0,4252	0,3774	0,4573	0,4486	0,3669	0,4570	0,4301
Santa Izabel Do Oeste	0,3544	0,4569	0,4208	0,3780	0,4573	0,4486	0,3508	0,4570	0,4266
Santa Lúcia	0,3994	0,4569	0,4326	0,3776	0,4573	0,4486	0,3939	0,4570	0,4358
Santo Antônio Da Platina	0,4570	0,4569	0,4473	0,3828	0,4573	0,4490	0,4496	0,4570	0,4475
Santo Antônio Do Sudoeste	0,3091	0,4569	0,4084	0,3782	0,4573	0,4487	0,3074	0,4570	0,4168
São João	0,6275	0,4569	0,4912	0,4117	0,4573	0,4511	0,6163	0,4570	0,4822
São João Do Triunfo	0,4139	0,4569	0,4363	0,3776	0,4573	0,4486	0,4078	0,4570	0,4388
São Jorge D'oeste	0,4535	0,4569	0,4465	0,3775	0,4573	0,4486	0,4458	0,4570	0,4467
São Miguel Do Iguaçu	0,3677	0,4569	0,4243	0,3778	0,4573	0,4486	0,3635	0,4570	0,4293
Tamboara	0,2882	0,4569	0,4024	0,3778	0,4573	0,4486	0,2873	0,4570	0,4122
Toledo	0,5447	0,4569	0,4696	0,6102	0,4573	0,4653	0,5515	0,4570	0,4685
Três Barras Do Paraná	0,3947	0,4569	0,4314	0,3784	0,4573	0,4487	0,3895	0,4570	0,4349
Turvo	0,3796	0,4569	0,4274	0,3868	0,4573	0,4493	0,3756	0,4570	0,4319
Umuarama	0,3280	0,4569	0,4136	0,3832	0,4573	0,4490	0,3259	0,4570	0,4211
Vera Cruz Do Oeste	0,2860	0,4569	0,4018	0,3775	0,4573	0,4486	0,2852	0,4570	0,4117
Verê	0,4051	0,4569	0,4341	0,3929	0,4573	0,4497	0,4005	0,4570	0,4372
Virmond	0,3498	0,4569	0,4195	0,3821	0,4573	0,4489	0,3467	0,4570	0,4257

Subtitle: Coop: cooperatives; NCoop: non-cooperatives.

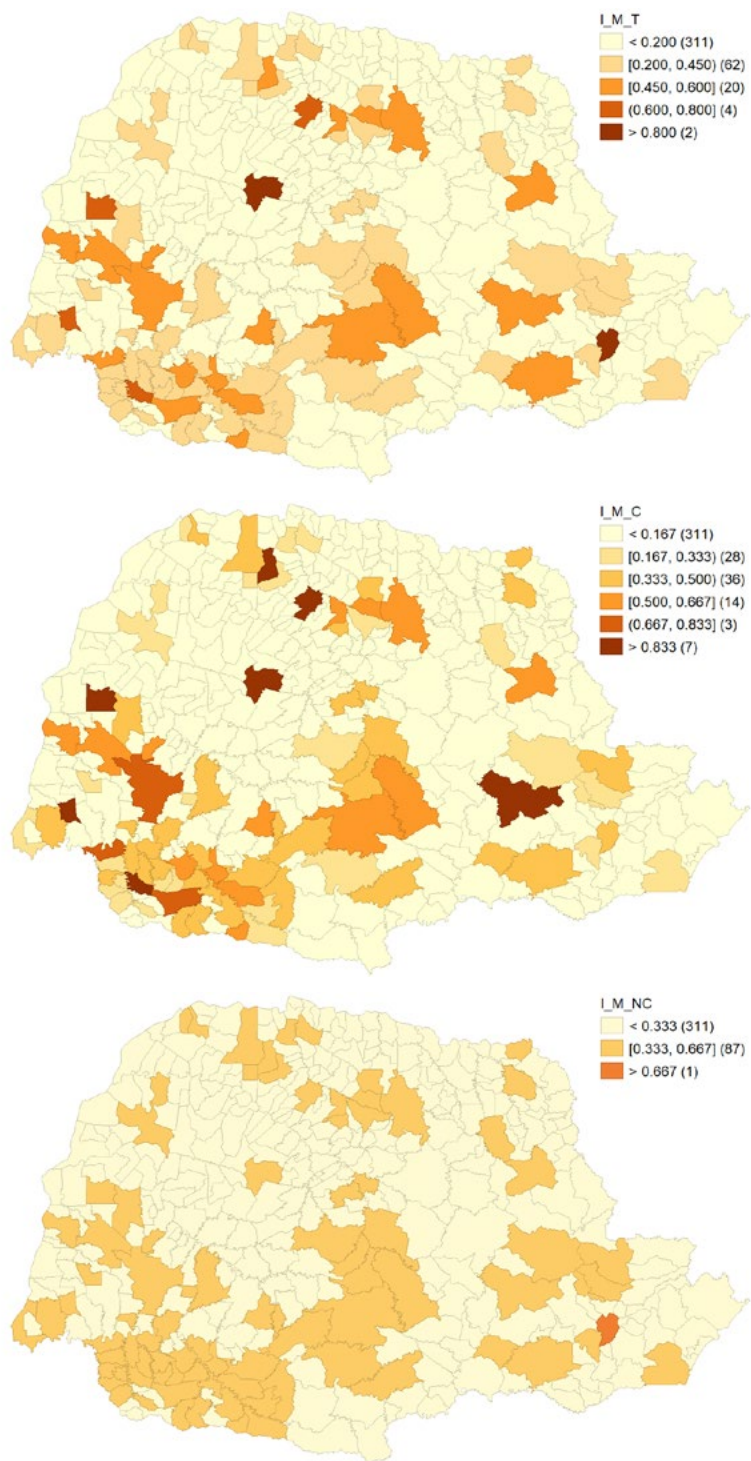
Source: Own elaboration based on the data from IF.data of BCB (2022).

Note: Updated values to 2018 by IGP-M.

The temporal space selected on Table 1 was from 2015 to 2018 due to unavailability of non-associated information before 2015, when there was not a division among cooperatives, non-cooperatives, natural person and legal entity. Still on Table 1, there are not included all Paraná municipalities, only those which are listed in the database, since not all of them hired any kind of rural credit line.



Figure 6 | Total ICCR, from cooperatives and non-cooperatives of Paraná municipalities with credit unions headquarters in 2015-2018



Note: IMT = Índice Médio Total (Total Average Index), embraces cooperatives and non-cooperatives. IMC = Índice Médio das Cooperativas (Cooperatives Average Index). IMNC = Índice Médio das Não-cooperativas (Non-cooperatives Average Index), that is other institutions of financial system.

Source: Own elaboration based on the data from IF.data of BCB (2022).

Dividing the rural credit distribution between cooperative and non-cooperative institutions, as displayed on Table 1, it is possible to obtain divergent information of general indicator. Curitiba, main provider of rural line, is the 25th participant, with index in 0,7677, when considering the values allocated by financial cooperatives. On the other hand, Ampére, Palotina and Medianeira express index number above the total analysis. The participation of smaller cities, in the case of cooperatives, is more expressive than the total index. Arapongas surpassed from (0,6026) to (0,9127); Laranjeiras do Sul from (0,5983) to (0,9051); São João also indicated a growth, from (0,6072) to (0,9207); ratifying the favorable performance of credit unions in smaller cities region of Paraná.

Analyzing the hired credit by non-cooperatives, there is a difference of almost 0,5 points if comparing Curitiba, first placed in the ranking, to Araucária, the second placed. On the legal entity total, the highest result on the index is from Curitiba, once the capital hires more non-cooperative credit focused on legal entities, whereas, in smaller cities, it can be identified larger presence of credit unions, especially for natural people. The cooperatives performance in rural credit distribution to families, active in agricultural sector, in smaller cities is more effective than other rural credit providers.

Again, the cooperatives performance in smaller cities is evident when the index between loans of cooperatives and non-cooperatives is disaggregated. Curitiba indicator passes from (0,9999) to (0,4165) when only the cooperatives aggregation is analyzed. The regions that already presented an elevated position in the regions board of Paraná had they index values increased, it is the case of Francisco Beltrão (0,9987), Campo Mourão (0,9927), Maringá (0,9463) and Toledo (0,8207).

When aggregating the indexes considering the intermediate regions of Paraná, it was not identified any discrepant observations, in other words, values too distant from the average. The location that most registers rural loans have a distance, related to the others, of approximately (0,2); linking with the municipality and immediate inferences, it is closer to the average, what indicates less divergence among the selected areas. Curitiba remains as reference in financial services providing (0,5726), followed by Cascavel (0,4875) and Maringá (0,4442).

The disaggregation of rural credit revealed the significative presence of credit unions in smaller cities of Paraná, indicating that most of the resources destined to the agriculturalist is captured, predominantly, by these cooperatives. Furthermore, it was verified that the performance of these



financial institutions contributes to the regional development of Paraná, once eases the resources transmission to less centered and less favored areas. By these means, the continuous collaboration among the agents stimulates the local growth, confirming the results of Alves and Lima (2018). In conclusion, the results highlight the necessity to explore in greater proportion the rural credit sources and their dynamics.

Corroborating the study of Borges and Parré (2022), distributive agglomeration was found in the large economic centers, as in the capital Curitiba and other financial reference regions, Cascavel and Maringá. As well as Bressan, Braga and Lima (2004), Gimenes, Gimenes and Gozer (2008), Schuntzemberger et al. (2015), Andrade et al. (2017) and Nepomoceno and Ferreira (2021), the performance of credit unions in offering agricultural funding to families and companies was highlighted. However, the separation of family and companies registers, as the natural person and legal entity one, included in this paper, are unprecedented factors to contribute to the theme. It was also highlighted the merit of credit unions in making available the rural credit line to families and companies in smaller cities, a more extensive performance than from other financial institutions.

FINAL CONSIDERATIONS

This study presented as scope the performance of credit unions in the disaggregation of rural credit in Paraná territory between 2013 and 2018. For this purpose, it was used the Rural Credit Concentration Index (ICCR), general and discriminated to cooperatives and non-cooperatives, natural person and legal entity, and the exploratory analysis of spatial data (AEDE).

The verified regions – immediate and intermediate – of Paraná display elevated ICCR in Curitiba and adjacent municipalities, when considering all the rural credit. However, when specifying the variants, diversified results were notable. The accumulation in Curitiba region – to the immediate and intermediate regions – occurs, mainly, to legal entities, once the credit comes from non-cooperatives mostly. Focusing on smaller cities of the state, the indexes revealed effective performance of cooperatives for the access of families, natural people, to the rural credit, which happens – practically – only by credit unions; the execution of this exercise by non-cooperatives in smaller cities is low.



By the analysis of locations in which the credit unions are installed in smaller cities of the state, it is possible to notice the association between number of operating units and credit concentration. More participative regions in the composition of agricultural GDP are the ones which dispose of larger financial amount of rural credit. The fact that there is a productive culture influences the establishment and operation of cooperatives, making available offers once there is demand. Confirming the cultural aspect, there are, in some of the selected areas, unfavorable conditions to the agricultural industry; natural characteristics such as weather and ground, besides the economic positioning, define the participation level of the cooperatives in the different locations of Paraná.

Lastly, the non-inclusion of statistic inference in the selected information induces future research, related to the theme, to apply other empirical methods. The importance of cooperativism functional activities was stated in Paraná state, especially in smaller cities, as well as its differentiated performance when compared to other financial institutions which grant rural credit. The omission of information per municipality instead of cooperatives headquarters in the BCB report makes the punctual evaluations unfeasible, demanding the use of larger areas – immediate and intermediate – to obtain answers. Thus, it is enabled the research extension about the topic to fulfill such gaps, still, to future projects, it is recommended the comparison of Paraná locations with other states ones, making possible a more extensive exam of the credit unions performance, especially for the rural credit.



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