

METHODOLOGY AND MAIN RESULTS ON THE WORKING PAPER SERIES “THE ECONOMIC BENEFITS OF CREDIT UNIONS”, PROMOTED BY SICREDI.

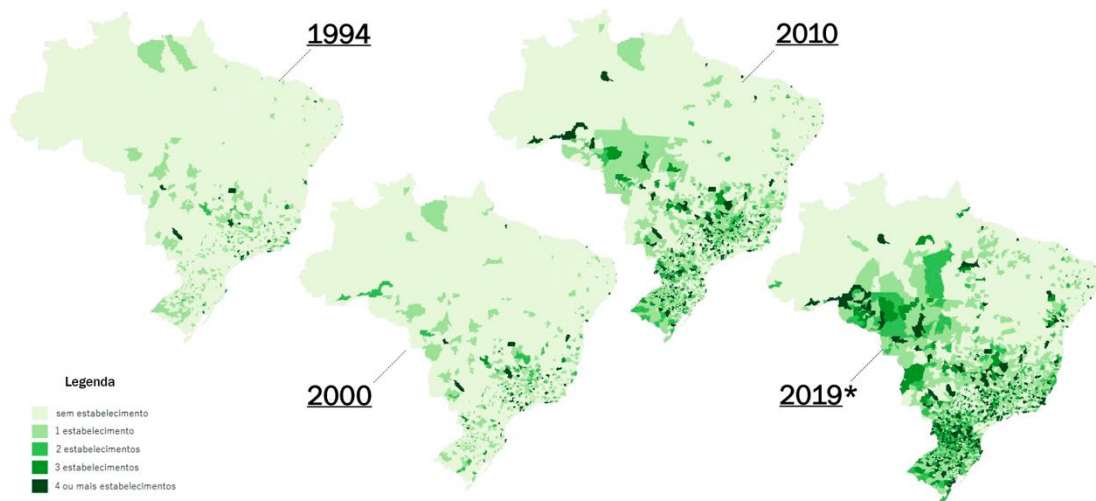
WP 1 – “Economic Benefits of Credit Unions on the Brazilian Economy”, published in 2019.

The research was conducted by FIPE, a foundation linked to the prestigious Economics Department of the *Universidade de São Paulo (FEA-USP)*. The institution is responsible for the maintenance of various economic indicators of national importance, teaching and researching on economic-related themes.

The work has three main sections (i) a descriptive analysis of cooperativism history and characteristics in Brazil, (ii) a comparative analysis between the credit balances between the aggregate of Brazilian credit unions (CU) and banks and (iii) econometrical exercises on the impact. The results go up to 2019.

(i) Cooperativism in Brazil

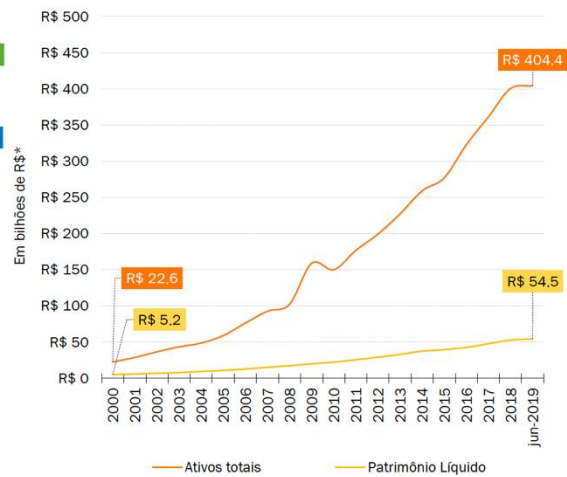
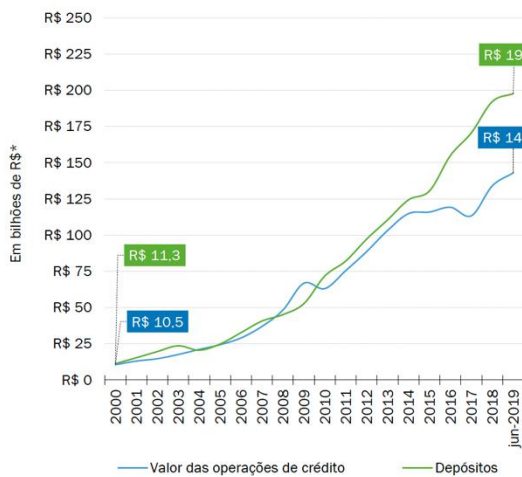
- The first Brazilian CU was established in 1891. It is still active and part of our system, the Sistema Sicredi.
- There have been many institutional improvements since then, most of them expanding the possibilities of business. An important advance takes place in 2003, where Brazilian CU were allowed to have “free association”, removing geographical and professional restriction. It means that CU can grow geographically, and any person can associate to it just as easily as in a commercial bank.
- Brazil has a three-tier organization, which means that a CU can act alone, associate to a single cooperative central (2º tier) or associate to a cooperative central which is part of a confederation (3º tier). Up to 2018, there were 4 confederations, 5 singular credit central and 975 CUs in Brazil. Two confederations have “cooperative banks” (Sicredi and Sicoob), which serves exclusively the CUs and have a similar regulation to commercial banks, expanding the products and services offered by the CUs associated to them.
- Up to 2018, there were 5.384 CU branches covering 47% of the 5570 Brazilian municipalities, with +70 thousand workers serving +10 million associates. The aggregate credit balance corresponded to 3,8% of the Brazilian financial system, and the deposits to 5,6%.
- Below, there are the CU’s branches distribution over the territory. The lighter shade means 0, the darker means 4+. It is notorious the impact of the “free association” model over the expansion.



- In 06/2019, among the +11 million associates, 86% were natural persons and 13,5% legal person.
- Natural person profile: 42,1% were female; concentration in 30-50 (43,4%) and 50-70 (28,1%) years old; 40,9% were borrowers and 24,4% were savers.
- Legal person profile: 44,8% were borrowers and 23,8% were savers.

(ii) Comparative analysis

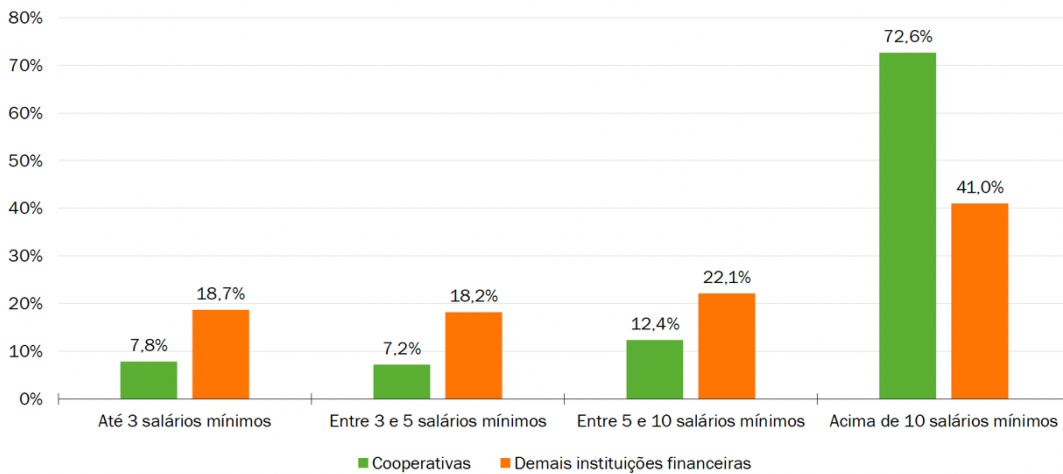
- Below, the evolution of credit balance (blue), deposits (green), assets (orange) and equity (yellow).



- The Brazilian CU's credit balance (green) for natural people concentrates on higher income people, when compared to the commercial banks (orange).

■ Composição da carteira de crédito ativa por perfil de renda do tomador - pessoa física

Alocação das carteiras de crédito ativas de cooperativas de crédito e demais instituições financeiras por perfil de renda do tomador - PF



- CU's credit balance (green) is concentrated in rural credit (Rural e Agroindustrial, 41,2%) and uncollateralized (Empréstimos sem Consignação em Folha, 24,9%) while the commercial banks (orange) concentrate in housing (Habitação, 33,3%), collateralized (Empréstimos com consignação em folha, 18,9%) and credit card (Cartão de Crédito, 12,7%)

■ Composição da carteira de crédito ativa por modalidade - pessoa física (junho/2019)

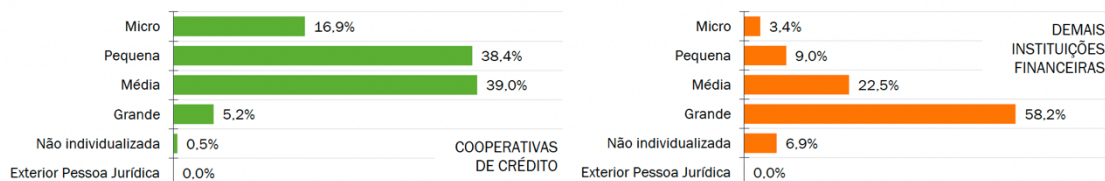
Alocação das carteiras de crédito ativas de cooperativas de crédito e demais instituições financeiras por modalidade - PF



- For the legal persons, most of CU's credit balance is financing working capital (52,2%) and is concentrated (green) in micro, small (Pequena) and medium (Média) business, while commercial banks concentrates in large companies (Grande).

■ Composição da carteira de crédito ativa por porte do tomador - pessoa jurídica (jun/2019)

Alocação das carteiras de crédito ativas de cooperativas de crédito e demais instituições financeiras por porte do tomador - PJ



- Credit unions (green) also takes more risks than commercial banks (orange). H represents the higher risks while AA represents the lowest.

■ Composição da carteira de crédito ativa por nível de risco da operação (junho de 2019)

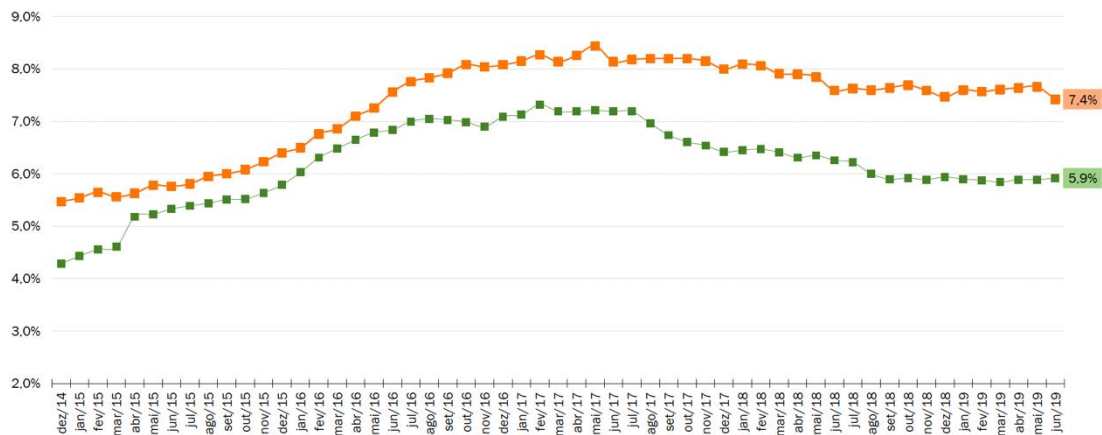
Alocação das carteiras de crédito ativas de cooperativas de crédito e demais instituições financeiras (por nível de risco da operação)



- But it doesn't reflect in higher percentage of problematic assets. Below, the CU's (green) and commercial banks (orange) percentage compared to its total balance.

■ Evolução mensal do percentual de ativos problemáticos na carteira de crédito

Comparativo do grau de exposição da carteira de crédito das cooperativas e demais instituições financeiras ao longo do tempo



(iii) Econometric Analysis

Exercise 1 – Measuring the impact of the establishment of a credit union branch on the local economical dynamic, using a DiD set.

Methodology: Two groups were classified, the treatment group were the ones where branches were established and the control group didn't have a branch over the evaluation period, that goes from 1994 up to 2017. The study variables were all municipal, containing employment (formal employment and average salaries), municipal GDP, number of business companies, high education, health and other human development indicators. The method applied was a DiD with fixed effects and variations in treatment timing (*Goodman-Bacon, A. Difference-in-Difference with Variation in Treatment Timing. NBER Working Paper N. 25018. 2018*).

Main results:

Variable	Average	Estimated variation	Estimated difference
GDP per capita (annual)	R\$19,196.10	+5.6%	+R\$1,108.4

Formal employment	17.7%	+6.2%	+1.1p.p.
Average salary (monthly)	R\$1,446.4	+1.0%	+R\$14.2
Business companies for 1.000 habitants	12.7	+15.7%	+2.0 companies
Export value per capita	US\$378.1	+19.6%	+US\$74.0
Import value per capita	US\$176.8	-9.5%	-US\$16.7
Net export per capita	US\$201.3	+45.1%	+US\$90.7

Exercise 2 – Measuring the impact of new credit on the production chains.

Methodology: The data of CU's credit granted to each sector of businesses and natural people were used to apply a shock on the input-output model of the Brazilian economy and the direct, indirect, and induced impact were measured in terms of GDP and payroll. The data used corresponds to the time period of 2012-2018, annually.

Main results

Credit granted (average)	Estimated impact (total)	Multiplier
R\$8.585 million /year	R\$20.997 million /year	2.45
R\$8.585 million /year	240.1 thousand jobs /year	-

WP 2 – “Impact over the national bancarization”, published in 2020.

The research was conducted by Juliano Assunção, PhD, an associated professor at PUC-Rio. He is the director of CPI Brasil, member of the Consortium on Financial Systems and Poverty (Chicago University) and conducts research mainly on public policy, microeconometrics, development and climate.

The work has two main sections, (i) examines the profile of CU's branches over the Brazilian territory and (ii) estimates the minimum threshold for branch establishment of banks and CU's.

(i) The CU's branches profile over the territory

- Brazil has 5.570 municipalities, and it's amplitude implies that, on average, those municipalities are distant from one another. The number of places covered by at least 1 bank branch was about 60% up to 2018. The table shows the number of municipalities with 0, 1, 2 or 3+ bank branches. The first column represents all banks, the second only private banks and the third the public ones.

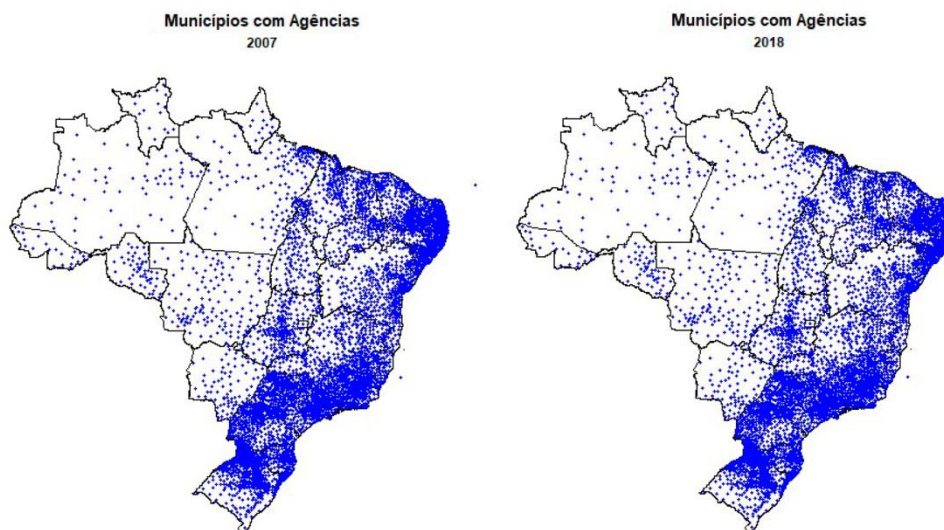
Tabela 1: Distribuição dos Municípios Segundo Número de Agências Bancárias (Total, Privadas e Públicas)

	Número de Agências Bancárias				Número de Agências Privadas				Número de Agências Públicas			
	0	1	2	+3	0	1	2	+3	0	1	2	+3
2007	2145	1460	699	1266	3495	1128	380	567	2634	1515	764	657
2008	2139	1456	701	1274	3487	1124	377	582	2620	1525	765	660
2009	2121	1464	697	1288	3486	1114	374	596	2599	1538	765	668
2010	2111	1517	663	1279	3493	1116	378	583	2583	1605	717	665
2011	1989	1264	768	1549	2921	1460	536	653	2510	1618	750	692
2012	1920	1248	700	1702	2920	1447	546	657	2377	1531	891	771
2013	1901	1242	659	1768	2928	1440	544	658	2343	1452	929	846
2014	1924	1217	655	1774	2964	1420	536	650	2336	1435	896	903
2015	1988	1203	616	1763	2976	1413	530	651	2438	1339	881	912
2016	2005	1193	627	1745	3024	1387	502	657	2426	1346	881	917
2017	2181	1128	580	1681	3208	1282	517	563	2592	1205	971	802
2018	2221	1123	573	1653	3232	1283	496	559	2643	1179	981	767

Fonte: Dados do Banco Central do Brasil. Tabela de elaboração própria.

- We also see a strong concentration of the presence on the shore and richer parts of the country

Mapa 1: Municípios com Agências Bancárias (2007-2018)

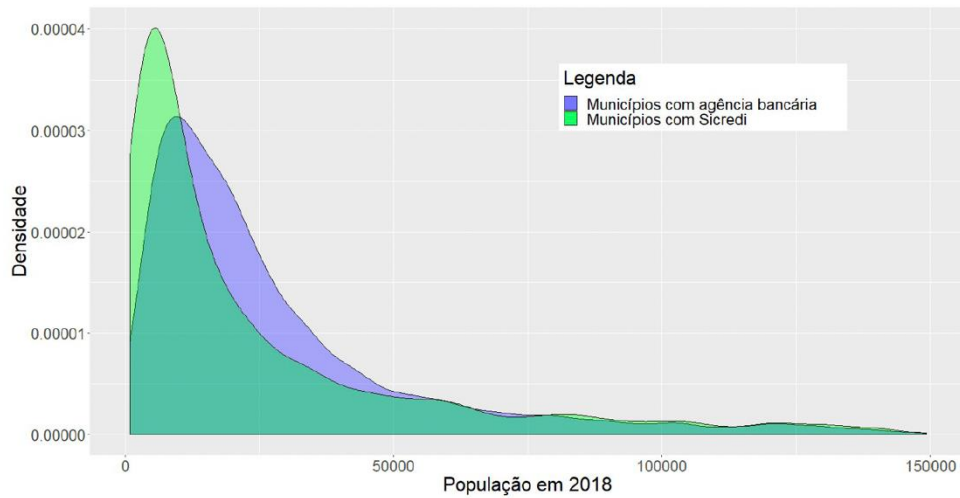


Fonte: Dados do Banco Central do Brasil. Mapa de elaboração própria.

- When we evaluate only Sicredi branches (green, one of the biggest CU system in Brasil), we see a predominance in less populated places when compared to banks

(blue).

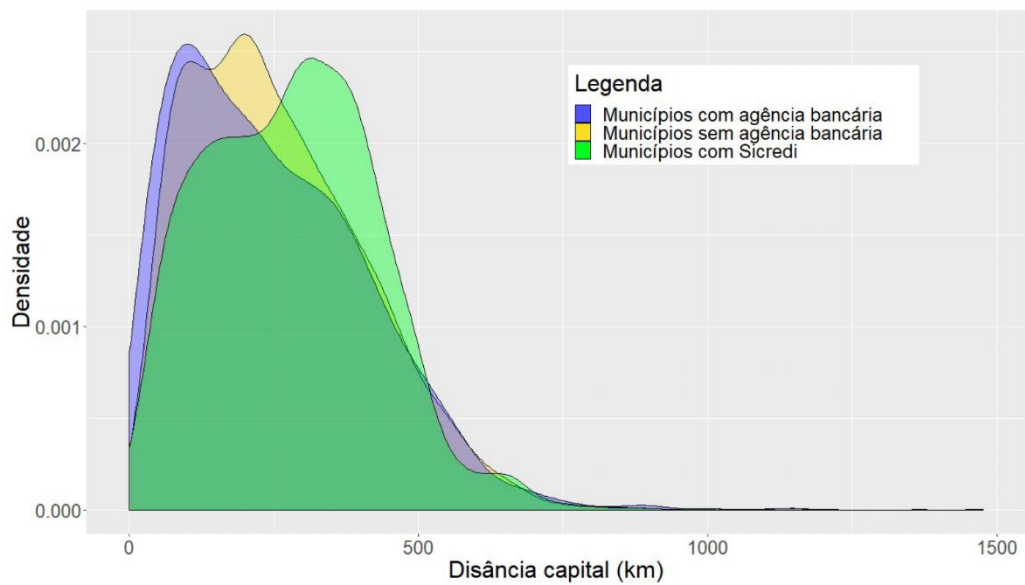
Figura 5: Distribuição segundo população (agências bancárias x Sicredi)



Fonte: Dados do Banco Central do Brasil e IBGE. Figura de elaboração própria.

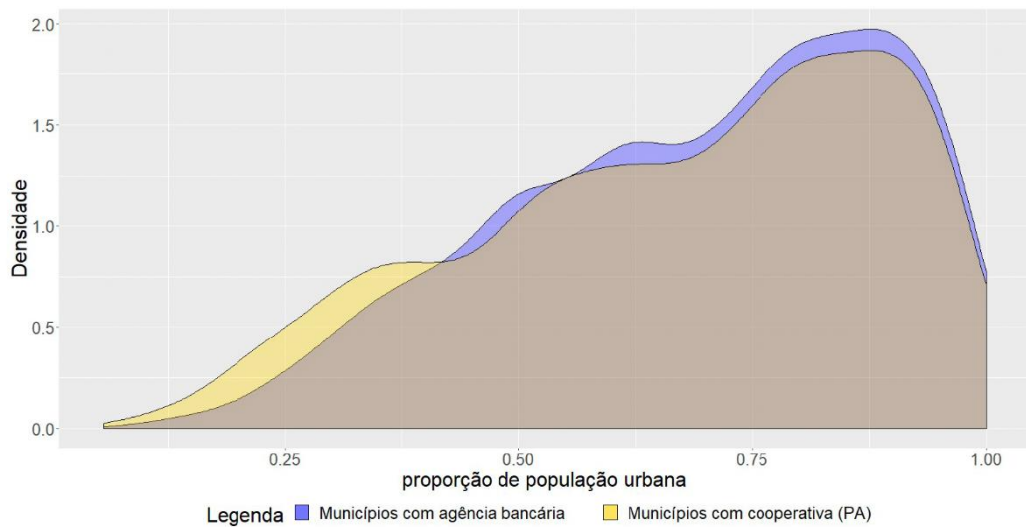
- We also see a concentration of Sicredi branches (green) on places more distant to the state capital, what means more interiorized. Blue means that there is at least one bank branch and yellow means no branches.

Figura 9: Distribuição segundo distância à capital (agências bancárias x sem agências x Sicredi)



- By urban population, we note a higher density of CU's branches (in general, yellow) on less urbanized places when compared to banks (blue)

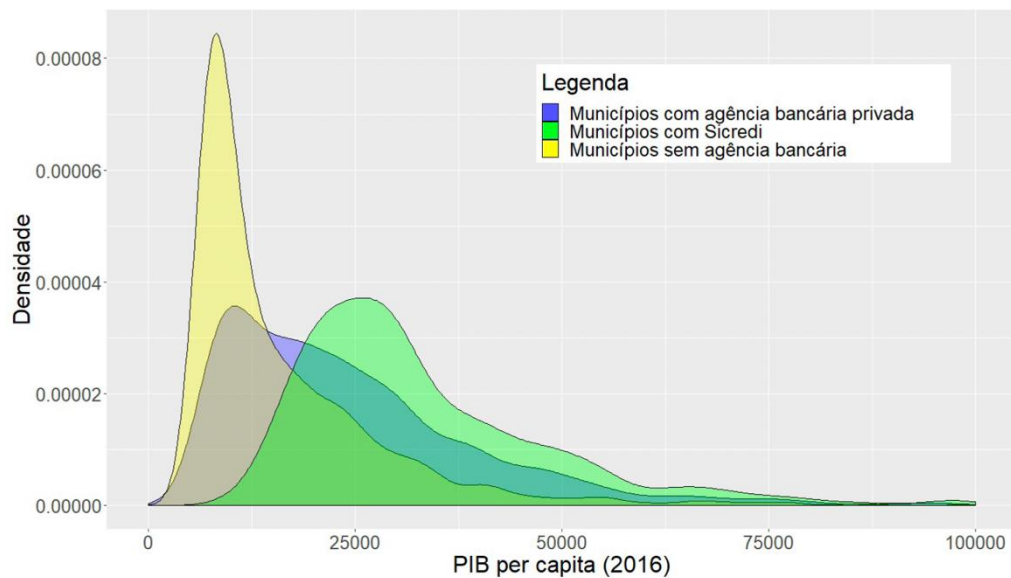
Figura 12: Distribuição segundo grau de urbanização (agência bancárias x cooperativas)



Fonte: Dados do Banco Central do Brasil e IBGE. Figura de elaboração própria.

- In terms of GDP per capita, we see a predominance of Sicredi (green) on higher ones, and that there is no branches in lower ones (yellow). Private banks are represented in blue.

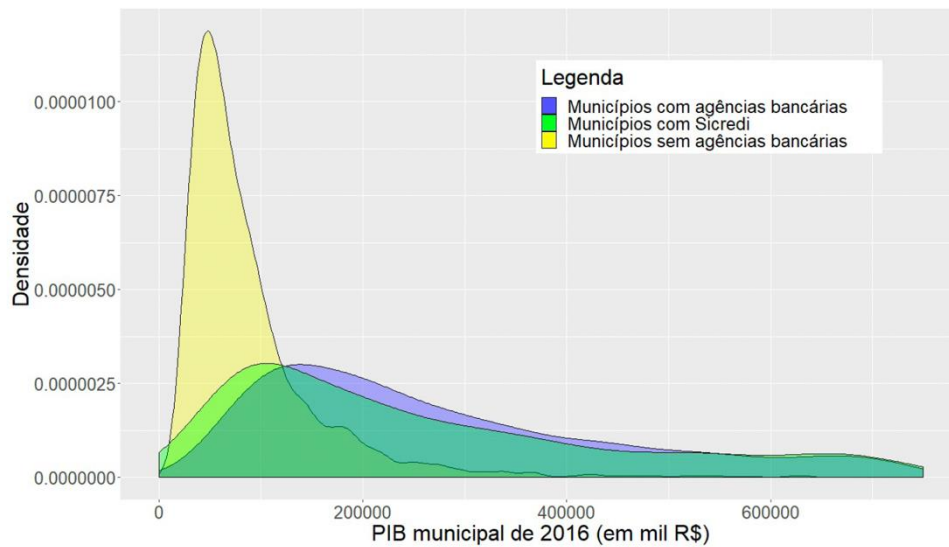
Figura 20: Distribuição segundo PIB *per capita* (bancos privados e Sicredi)



Fonte: Dados do Banco Central do Brasil e IBGE. Figura de elaboração própria.

- But the total municipal GDP, the relation inverts to Sicredi branches predominance on lower levels (municipalities are richer on average, but have smaller population).

Figura 21: Distribuição segundo PIB municipal (com e sem bancos, e Sicredi)



Fonte: Dados do Banco Central do Brasil e IBGE. Figura de elaboração própria.

(ii) Estimating the bancarization potencial

Exercise – Measuring the lower population and GDP threshold for the establishment of a CU’s or a bank’s branch.

Methodology: Based on industrial models of entry, adapted for the purpose of banking on Assunção, J. (2013) “Eliminating entry barriers for the provision of banking services”, Journal of Banking and Finance, 37:2806-2811.

Main results (for 2018):

Variable	Region	Institution	Minimum threshold
Population	National	Banks (general)	8.000
Population	South states	Banks (general)	4.400
Population	South states	Private banks	12.200
Population	South states	Public banks	3.300
Population	South states	Sicredi	2.300

Population	South states	CU (general)	550
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- The choice for regional analysis comes from the fact the Sicredi was originated, and was limited by regulation up to 2003, in the south. Therefore, the data was unfit for a national analysis since the expansion process is still taking place.
- The regional analysis shows that the threshold for Sicredi and other CU branches is considerably lower, especially when compared to private endeavors.
- Dynamically, we also observe a lowering tendency for Sicredi and other CU's, while threshold of the banks in general is getting higher.
- If the fundamental is unchanged, the estimations for Sicredi (2.307) and nationwide banks (8.053) implies a potential of covering a total of 1.918 municipalities that are below the bank's threshold (35% of Brazilian municipalities). It could impact more than 9,5 million people.

WP 3 – “Territorial financial covering amplification”, published in 2021.

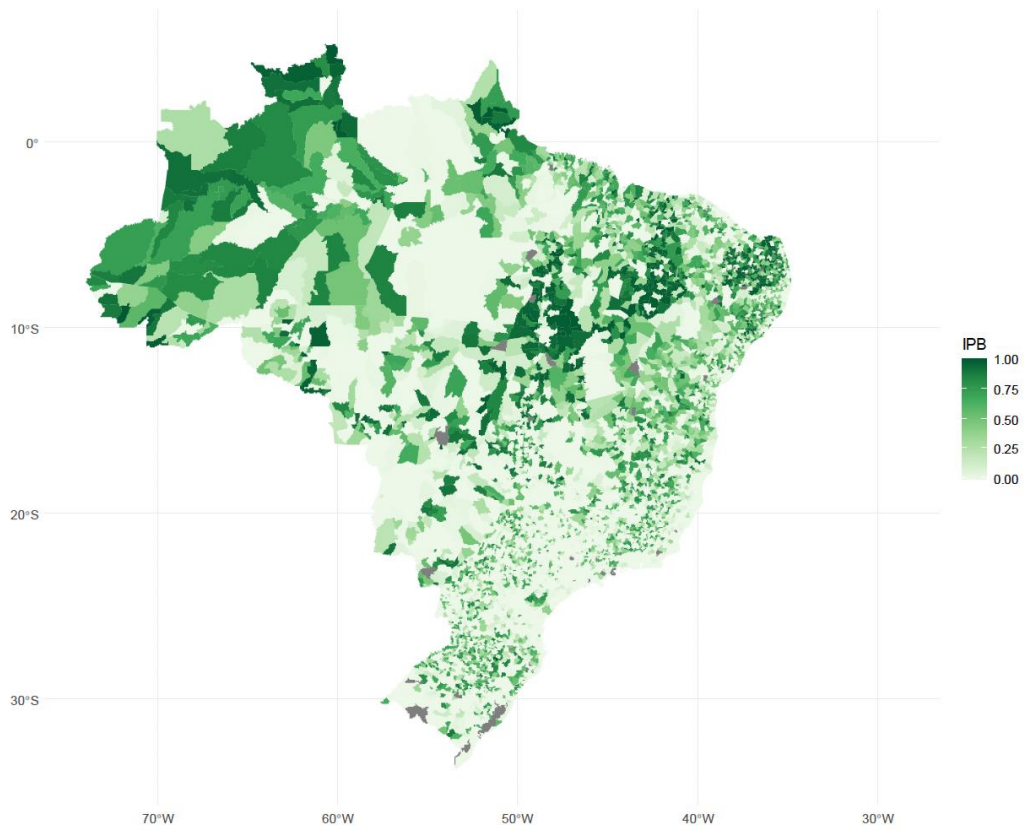
The research was conducted by the economics team of Sicredi. The work has two main sections, (i) creates an indicator that ranks Brazilian municipalities by the unattractiveness to the bank sector and (ii) evaluates the branches chain of public banks, private banks and CU.

(i) The “bancarization difficulty indicator”

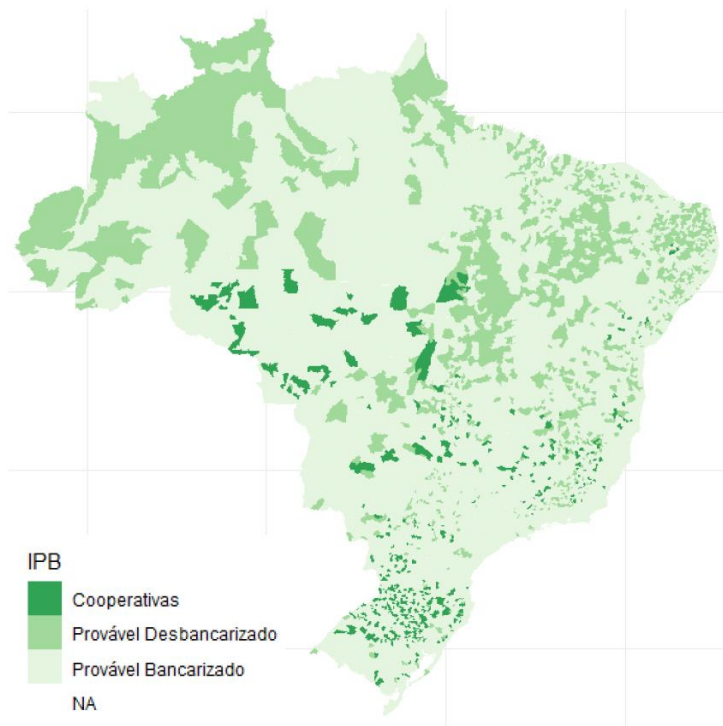
Methodology: we used a range of municipal social-economic indicator to evaluate what characteristics makes a municipality undesired for public and private banks through a PROBIT method. Other methods were tested and leads to the same results. The modelling involved testing the variables that better explained the absence (dummy 1) of a bank branch. The outputs were used as a indicator of “banking difficulty” that ranks all municipalities by their risk of being unserved.

Main results:

The graphic below shows the distribution of the indicator over the territory. The darker the shade, the higher is the probability that it is not served physically by any bank. As we can notice, there is a higher concentration of unserved places on Brazil's north and northwest regions, where GDP and population tends to be lower. In fact, a dummy of south and southwest were significant in our model, revealing this preference. It is important to notice that the unserved regions are precisely the ones where the municipal territory is bigger and the urban regions are more far apart from one another, making it relatively costlier to the unserved people reach the financial services on cities nearby. By the characteristics of the model, any > 0.5 place is a probable unserved place, while places in the range 0.4-0.5 are vulnerable to become unserved in a nearby future, since the banks are in a process of closing branches.



- Lastly, we can see that the most vulnerable regions (> 0.5), that comprehends a universe of 1876 municipalities, is mostly unserved (medium shade of green). Credit unions have reached 486 of them up to 2018 (darker shade of green).
 Presença de Cooperativas de Crédito em Locais Adversos - 2018

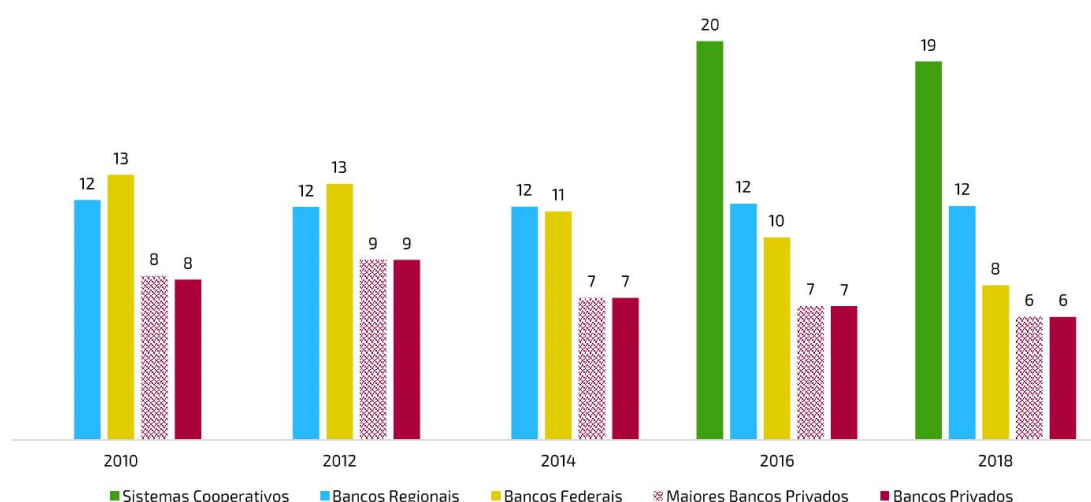


(ii) The evaluation of financial institutions branch chains.

Methodology: we constructed two simple metrics to evaluate the chains. The first one, that we call relative, is built as the average indicator of all the municipalities served by the type of institution under analysis. It goes from a range of 0 to 1, where higher indications implies that the chain is concentrated in less attractive places. It can be interpreted both as an indicator of how that institution must make a higher effort to be viable and as a social impact measure of how important it's work is to expand the financial services chain farther. The second metric is a sum of the scores associated to the places where the institution is present. It shows the aggregate importance of that chain in the effort to expand the financial frontier nationwide.

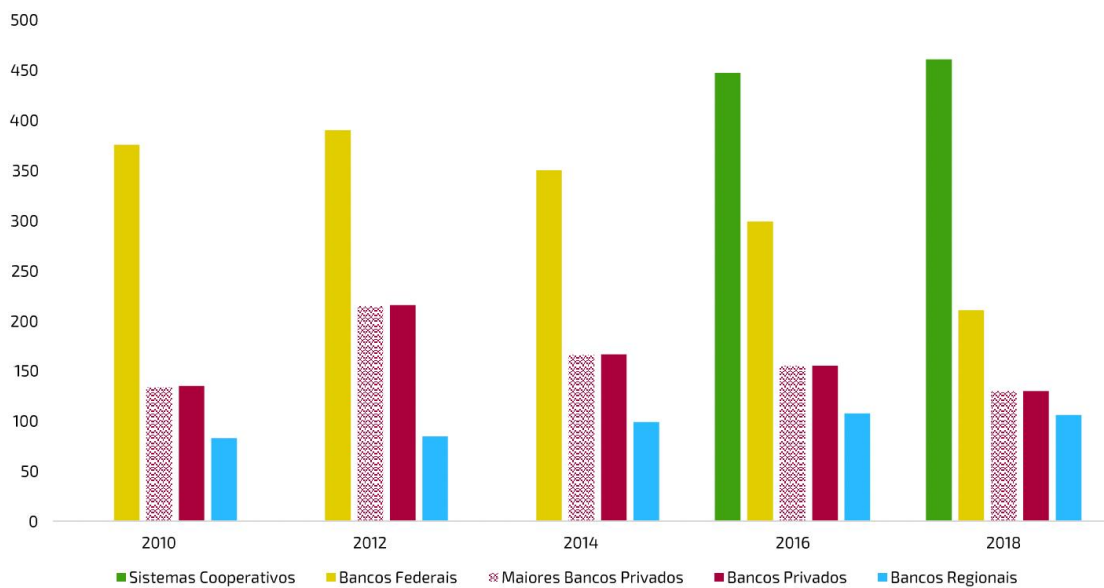
- The relative measure, as shown below, indicates that on average CU's branches (green) concentrates a higher number of vulnerable places, and that it's social inclusive profile is much higher than the second best (regional public banks) and the third (nationwide public banks). Private banks (red), on the other hand, is highly concentrated on the most lucrative places. The index here is multiplied by 100 for better visualization.

Índice Municipal de Bancarização Relativo – IMB-R
(índice x 100*)



- The absolute measure show that the CU's branches compose, undoubtedly, the most important chain expanding the financial services nationwide – both for it's concentration on difficult places, as shown above, and for its huge quantity of branches. It is also important to notice that it's importance is getting higher dynamically, while nationwide public banks (yellow) have retracted it's social impact. The regional public banks (blue) have a limited impact since its chain is geographically restricted to just a few states.

Índice Municipal de Bancarização Absoluto (IMB-A)



WP 4 – “Effectiveness of the credit cooperativism”, published in 2022.

The research was conducted by Juliano Assunção, PhD. The work has two main sections, (i) the use profile in places where CU’s physical branch is solo, (ii) the effect on credit access of a CU’s branch and (iii) the proximity as a condition to a deeper financial inclusion.

General methodology: We have use semestral internal data (end of period) between 2018-2021 about personal characteristic and products usage for an average of 230 thousand associates that live in places where Sicredi is the only financial branch available. We have also used a national database that indicates the total volume of credit that those associates had in all Brazilian institutions. With this information, we used nonparametric statistics with fixed effects to emulate the evolution of usage of products (experiment 1 and 2) over the time of association. On experiment 3, we used a subset of this associates who already had a relation with Sicredi before the establishment of a branch on its home-municipality to investigate how the relation would change over time.

Main results:

After 5 years of association

- The average number of products used is increased by 32.4%. For the legal persons, it is 41%.
- The percentage of associates with deposits increase 46% for a popular product in Brazil, called poupança, and 169% for general deposits.
- The percentage of associates that access rural credit increases almost 4x.
- The percentage of legal persons with commercial credit increases 177%, reaching 50% of the public.

- The average volume of credit of the associate increases 27.5% in all Brazilian financial system, meaning they had a more restricted credit scenario before the establishment.
- The impact on credit is higher on uncollateralized credit. The average amount possessed by the associate increases 46%, evidence that this public were facing an even greater restriction.

For the experiment 3, where the associates had all our products available beforehand, 5 years after the establishment of a branch in its hometown.

- The usage of products, that were already higher than new associates on average, increases 61%.
- The percentage of associates using “poupança” increases 59%, and general deposits go up 49%. Both were higher than a new associate, on average, beforehand.
- The percentage that uses “cheque especial”, a very expensive form of emergencial credit which is always available, drops 47%. This is evidence of a better financial management.