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Municipalities' rural development index: a study based on the 2006 Agricultural Census

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Abstract
Rural aspects have been emphasized due to new attributes and interrelationships with the development of different regions. Based on this finding, the article aims to present a new index of rural development. For this purpose, the selected analytical method was factor analysis with data from the 2006 Agricultural Census. Despite the time lag in the data, the results indicated consistent references to explain rural development, as explained below. The contribution and differentials stem from the set of variables that make up the proposed index, which represents the particularities of the economic development dimensions (economic, environmental, social, and demographic) related to rurality. Secondly, they derive from producing the rurality economic development index, based on all Brazilian municipalities and composed of a set of 9 factors, capable of measuring and categorizing the level of economic development of rural areas in municipalities and large Brazilian regions.
Keywords: Economic Development. Rural Development. Rurality. Factor analysis. Index.

Índice de desenvolvimento da rural das municipalidades: um estudo a partir do Censo Agropecuário de 2006

Resumo
Os aspectos rurais têm apresentado ênfase em decorrência dos novos atributos e inter-relações com o desenvolvimento das regiões. A partir dessa constatação, o artigo objetiva apresentar um novo índice de desenvolvimento rural. Para tanto, o método analítico selecionado foi a análise fatorial com dados oriundos do Censo Agropecuário de 2006, apesar da defasagem temporal nos dados, os resultados indicaram referências consistentes para explicar o desenvolvimento rural. Isso porque a contribuição e os diferenciais decorrem, em primeiro, do conjunto de variáveis que compõe o proposto índice as quais representam as particularidades das dimensões do desenvolvimento econômico (econômica, ambiental, social e demográfica) relacionadas à ruralidade e, em segundo, decorreu do fato de produzir o índice de desenvolvimento econômico da ruralidade, com base na totalidade dos municípios brasileiros e composto por um conjunto de 9 fatores, capaz de aferir e categorizar o nível de desenvolvimento econômico da rural dos municípios e grandes Regiões brasileiras.

Palavras–chave: Desenvolvimento Econômico. Desenvolvimento Rural. Ruralidade. Análise Fatorial. Índice.

Índice de desarrollo rural de los municipios: estudio basado en el Censo Agrario de 2006

Resumen
Los aspectos rurales se han enfatizado como resultado de nuevos atributos e interrelaciones con el desarrollo de las regiones. Con base en esta observación, el objetivo del trabajo es presentar un nuevo índice de desarrollo rural. Para eso, el método analítico seleccionado fue el análisis factorial con datos del Censo Agropecuario 2006, a pesar del desfase en los datos, los resultados indicaron referencias consistentes para explicar el desarrollo rural. Esto se debe a la contribución y los diferenciales surgen, en primer lugar, del conjunto de variables que conforman el índice propuesto que representan las particularidades de las dimensiones del desarrollo económico (económico, ambiental, social y demográfico) relacionados con la ruralidad y, en segundo lugar, es en producir un índice basado en la totalidad de los municipios brasileños (RDI) y compuesto por un conjunto de 9 factores para categorizar el nivel de desarrollo económico rural de los municipios brasileños y las grandes regiones.
Palabras clave: Desarrollo económico. Desarrollo Rural. Ruralidad. Análisis factorial. Índice.

Introduction

The importance of rural aspects for localities' economic development has been emphasized as the result of new attributes and interrelationships between rural areas and regional economic development. Under this perspective, several academic works used a similar methodology and database to produce indexes to measure rural and economic development. However, the problem is that none of the analyzed works created an index capable of identifying the aspects of rurality related to the dimensions of economic development for the 5560 Brazilian municipalities.

In this context and based on the identified problem, this article aims to present a new rural development index, called the rurality economic development index (REDI), capable of measuring with greater reliability the characteristics of Brazilian municipalities in terms of the level of rural economic development[1].

From a practical perspective, the motivation for the research is justified and contributes to improving the process of selection of variables that more effectively represent the level of rural economic development of a region and enhance knowledge regarding how these variables interact to explain the level and evolution of municipal, regional, and national economic growth.

The article contributed by providing answers to two guiding questions. Firstly, how and what are the variables, or factors, to be selected to represent the aspects of rurality interrelated to the dimensions of economic development? Secondly, resulting from the first, does this index allow for a deeper comparison and categorization of geographic areas?

The answer to the first question stems from the conceptual framework listed to define the idea of rurality, based on Veiga (2006), Carneiro (2008), Bosworth and Somerville (2013), and Torre and Wallet (2016), which referenced the selection of variables for the database to be analyzed. Subsequently, using the factor analysis method, select the set of variables to compose the generated index (REDI). These

[1] The name rurality economic development index (REDI) was chosen to differentiate it from other rural development indices produced by several authors in numerous articles.

variables represent aspects of rurality and, even partially and indirectly, the complexities and conceptual particularities present in the dimensions of economic development (economic, demographic, environmental, and social). As a result, the abovementioned index is a more precise instrument with greater explanatory power to assess the rural specificities in regional economic development.

The second question is answered by the fact that several studies have used indexes to measure rural development, such as Kageyama (2004; 2008), Parré and Melo (2007), Stege and Parré (2011), Prieto-Lara and Ocaña-Riola (2010), Michalek and Zarnekow (2012), and Pagliacci (2017) among others. However, among national works, no index, such as the one proposed, evaluates, with greater accuracy, the aspects of rurality on the economic development of municipalities based on a broad set of variables (42). The index produced can assess the level of rural economic development of all Brazilian municipalities (5560), allowing the classification and comparison of Brazilian states and regions and, therefore, generating a useful analytical instrument to guide the creators of public and private regional policies.

Thus, in addition to this introductory section, the article is subdivided into the following sections, a presentation of the theoretical and practical foundations, a section describing the methodology to be employed, an indication of results and discussions, and, finally, the conclusions.

Theoretical Foundation

In Europe, there is a new suggested paradigm regarding rural development, which includes other characteristics with new objectives, such as the establishment of synergies with local ecosystems, the tendency to value economies of scope more than those of scale, the pluriactivity of rural residents, and, finally, production of public goods (PRIETO-LARA; OCAÑA-RIOLA, 2010; TORRE; WALLET, 2016).

According to Kageyama (2008), rural development is characterized by being multilevel, multi-actor, and multifaceted. The multilevel refers to considering rural development, at the first level, inserted in a local context, based on the links between agriculture and society. At the intermediate level, synergistic relationships between local and regional ecosystems are considered and, finally, at the last level, reference is made to the micro level, that is, in particular, to the pluriactivity in which the individual firm stands out when considering new relationships and allocations of family work.

Regarding the multi-actor concept, the complexity of the institutions (actors) integrated into the rural development process is highlighted, considering the local, regional, and global societal involvements. Finally, new environmental services and agroecological activities, such as direct sales, regional specialty products, organic agriculture, agrotourism, nature conservation, and landscape management, are some of the new products and services related to the multifaceted character of recent rural development (KAGEYAMA, 2004, 2008).

In summary, rural development brings together the following characteristics and objectives: i) the establishment of synergies with local ecosystems; ii) inherent tendencies to value economies of scope over economies of scale; iii) prioritize the pluriactivity of inhabitants located in rural areas; iv) produce public goods such as natural landscapes to encourage eco-tourism. In addition to the characteristics of rural development, there are still dimensions circumscribed in it, namely: economic

(family income, stability in terms of distribution, pluriactivity); social (socially adequate standards of living, related to education and health characteristics); environmental (preserving natural resources and minimizing environmental degradation), and structural (physical conditions related to production factors to carry out agricultural activities) (ANJOS, 2003; KAGEYAMA, 2008).

From the conceptualization and particularities inherent to rural development, the complexity lies in assessing its level for the geographic areas. This complexity stems from the very definition of rural, which cannot be treated as a synonym for agrarian. Agrarian refers to processes of the metamorphosis of rural social life, in which production activities play a crucial role, mainly through the factors of production, land, and work. Regarding rural, there is no consensus on a methodology, nor is there a single definition of rural, because occupation patterns are determined by divergent historical and cultural factors and are divergent in different regions of the world (GOMES, 2011; BOSWORTH; SOMERVILLE, 2013; TORRE; WALLET, 2016; SOUZA, 2018; CARNEIRO; SANDRONI, 2019; PEDROSO; NAVARRO, 2019).

Given this difficulty in defining the rural space, Gomes (2011, p. 160-1), referenced in the Leibnizian concept, argues that such space is constituted from abstractions. Therefore, the consent for this space will only occur if there is approval that there are different spaces and relationships which can be studied from different perspectives. The author argues that rural spaces are neither opposite nor continuous with urban ones. These rural spaces have intrinsic social, economic, and cultural characteristics; however, these are not necessarily exclusive.

This idea of rural space is in line with Veiga (2006), because the rural category cannot be defined by criteria related to the lack of anthropic pressure or by criteria linked to the degree of artificialization, or unnatural, of ecosystems, which would be measured through a scale produced by different levels between the natural and artificial extremes.

From the difficulties in defining rural spaces, the possibility to represent them comes from their manifested characteristics. They are i) agriculture is a central mechanism to provide sustainable rural development; ii) the rural is multifunctional and can act multisectoral; that is, the traditional rural economic profile has undergone significant changes resulting from agricultural production promoting an execution process seeking to ensure high quality, nature conservation, landscape management, agrotourism, part-time farming, short food supply chains, and corporate management; iii) there is a relatively low population density in rural areas; iv) modern rural spaces are not necessarily isolated from each other. They are differentiated and heterogeneous, and agricultural companies are increasingly installed with complex sets of institutional, regulatory, and market relationships (KAGEYAMA, 2008; VAN LEEUWEN, 2009, SOUZA, 2018).

The literature has highlighted several aspects that characterize significant changes in productive, social, and demographic activities in Brazilian rural areas, among which the following can be highlighted: loss of participation in GDP by agricultural activities, demographic changes related to emptying, masculinization, and aging of individuals who inhabit these rural areas (CAMARANO; ABRAMOVAY, 1999; STADUTO; ALVES NASCIMENTO; SOUZA, 2017; PEDROSO; NAVARRO, 2019).

In this sense, the geographic clippings related to indicators arising from the rural concept, empirically, cannot be rigorously demarcated as intended by the

dichotomous rural-urban perspective, nor are they adequately supported by the idea of "complete urbanization" developed by Henri Lefebvre or in the conception that a "rural renaissance" took place, elaborated by Bernard Kayser[2]. In contrast, the "new rurality" is based on three fundamental aspects: 1) activities related to tourism and the benefits arising from the activities generated by the use of natural amenities; 2) commitment to the conservation of biodiversity and its landscape consequences and, 3) the imperative and inevitable search for accessible renewable energy sources in rural environments (Veiga, 2006, p. 333.)[3].

In this context, according to Sarraceno (1994), this new concept of rurality allows a more adherent theoretical construction to the conception of regional or local economy and, thus, enables the analysis of phenomena related to spatial characterization. This work will use as a conceptual reference the idea suggested and coined by Veiga (2006) of a "new rurality," and will use only the term rurality. In the words of Carneiro (2008), corroborating the idea of Sarraceno (1994), this concept is defined

> as a dynamic process in the constant restructuring of the elements of the local culture, through the incorporation of new values, habits, and techniques. This process implies a movement in two directions, which identify, on the one hand, the reappropriation of elements of local culture from a rereading made possible by the emergence of new codes and, on the other hand, the appropriation by the urban culture of cultural goods and the nature of the rural world, thus producing a situation that can contribute to fostering sociability and strengthening ties with the locality. (Carneiro, 2008, p. 35).

In line with and in addition to Veiga (2006), the approach of Bosworth and Somerville (2013) and Torre and Wallet (2016) synthesize the theoretical construction defining the concept of rurality based on three interconnected factors. The first is functional and serves as a concept identifier, for example, extensive or intensive use of land, environmental qualities, and behaviors associated with lifestyle in rural areas. The second refers to a more political-economic perspective. It is based on structural characteristics that affect the populations of some rural regions, such as tourist attractions and attractions for retired people. Finally, the third factor relates rurality to a social construction that emphasizes the importance of cultural and moral values associated with rural life.

Based on this generic conceptual demarcation, in complementarity, based on Graziano da Silva (2002) and on the argument of Pedroso and Navarro (2019) about the process of transition to the rural agricultural Brazil, the importance of rurality at the national level is interrelated to a sectoral composition of economic activities, which are described as: 1st) modern agriculture based on commodities and closely connected to the agroindustry, a connection that tends to make rural development more dynamic; 2nd) a range of agricultural activities related to new specific market niches; 3rd) a range of non-agricultural occupational activities associated with leisure, housing, various industrial activities, and the provision of services; 4th) a set of subsistence activities through, in general, primitive agriculture and the raising of

[2] For a discussion of the arguments and concepts proposed by the authors on rurality, see Veiga (2006).

[3] The aim of the article is not to delimit rural spaces but to capture the importance of the rural area for the economic development of municipalities. Thus, for a more in-depth discussion on the delimitations of rural and urban spaces in different countries, see Bosworth and Somerville (2013).

small animals with a view to maintaining a portion of the population in rural areas characterized by, in general, not owning land, be devoid or with low technical qualification, be unemployed (not be pluriactive), that is, individuals on the margins of agribusiness .

In summary, it is not the objective of the article to define the rural borders, but from the municipal boundaries to use the conception of rurality to capture in the analyzed variables the influences on the level of rural economic development of the municipalities. Thus, based on Veiga (2006), Carneiro (2008), and Bosworth and Somerville (2013), the idea of rurality is considered as an analytical category characterized by some degree of homogeneity of territories which identified a progressive heterogeneity in rural aeas. As a result, this concept can be used to demarcate the possible rural particularities in variables to be selected and used to measure the rural characteristics present in the geographic area under analysis. In other words, referring to the proposal by Torre and Wallet (2016), a statistical approach is used to capture as fully as possible the importance of economic, social, environmental, and spatial dimensions to produce an interpretation of the importance of rurality in Brazilian municipalities.

Recent rural economic development indices

From the particularities of the rural habitat and its influence on the development of the regions, several works aimed to measure the importance of the rural for different geographic cuts, and that involved the construction of indices in analyzing the determinants, levels, and the classification in terms of the level of rural development. A considerable portion employed multivariate analysis methodologies.

Some authors used factor analysis to elaborate their studies; among them, Parré and Melo (2007) conducted a study creating a rural development index for municipalities in Paraná. Subsequently, to analyze the multidimensional context of rural development, Stege and Parré (2011) studied the Brazilian micro-regions, and Vidigal, Castro Amaral, and Silveira (2012) evaluated the Paraná micro-regions regarding discrepancies in the level of socioeconomic development and also hierarchized and grouped the microregions into clusters. Finally, and following the same guideline, Melo and Silva (2014) created a rural sector development index to categorize municipalities in the southwest region of Paraná.

Regarding international references, the authors Michalek and Zarnekow (2012) produced a composite index from a set of multidimensional variables aiming to measure the general level of rural development and quality of life in rural regions of Poland and Slovakia in the period of 2002 to 2005. The level of rural development of the territories is captured by several variables originating from secondary regional statistics in the demographic, environmental, socioeconomic, infrastructural, and administrative dimensions. An essential point of this work concerns demographic characteristics. The authors estimated an econometric model to observe intra-regional and inter-regional migration; this model considers the preferences of migrants in decision-making about staying in the territory.

In another recent contribution, Pagliacci (2017) employs Fuzzy logic to analyze 27 European regions via a continuous and multidimensional rurality indicator. The factors employed in this analysis were: population density, land use characteristics, and agriculture attributions. This author argues that the degree of rurality can be an

essential factor in explaining the differences in Europe regarding socioeconomic development.

After defining the established theoretical limits and the empirical studies carried out, the next section will present the methodology used in this article. The database corresponding to the aspects of rurality representing the environmental, demographic, economic, and social dimensions utilized and their respective relationships with the level of rural and, therefore, economic development of a region are described, as well as the method used to construct the index and, subsequently, to categorize Brazilian municipalities.

Methodology

The adopted research strategy proposes to produce a rurality economic development index (REDI) capable of representing and classifying the local economic development level of 5560 Brazilian municipalities through a database initially composed of 97 rural variables from the Census Agriculture (IBGE, 2006).

Factor analysis (FA) is used to select the correlated variables and, through the obtained latent factors, compose the index (REDI) and, subsequently, perform analysis through the categorization of municipalities. The FA was chosen as the method of analysis due to the multidimensional characteristics of economic development. The factor analysis technique allows for identifying the dimensions of common variability existing in a set of phenomena. The objective is to verify existing structures, but not directly observable (FÁVERO; BELFIORE, 2017).

For this purpose, principal component analysis (PCA) is used, which is quite robust concerning the violation of the normality hypothesis (PARRÉ; MELO, 2007; STEGE; PARRÉ, 2011). Additionally, the variables used were linearized using the Neperian logarithm to meet the linearity criterion.

After conducting the factor analysis, the next step was to produce the rurality economic development index (REDI) to rank Brazilian municipalities. Thus, a classification methodology similar to that used by Parré and Melo (2007) and Stege and Parré (2011) is described in the following **Frame 1**. For its estimation, the value of each factor is used, weighting each one by its variance. The REDI for the i_th municipality will thus be given by equation 1,

$$\boldsymbol{REDI_i} = \frac{\sum_{j=1}^{\rho} \boldsymbol{\theta_i F_i}}{\sum \boldsymbol{\theta_i}} \qquad (1),$$

where $\boldsymbol{REDI}_i$ refers to the economic rurality development index in municipality i; θ_i are the proportions of the variance explained by each factor (*Fi*) of the REDI; ρ is the number of factors used in the analysis of the i_th municipality; and $\sum \theta_i$ represents the sum of the proportions of the explained variances referring to the ρ factors extracted from the set of variable components of the REDI.

Frame 1 – Classification of Brazilian municipalities in relation to the rurality economic development index (REDI), Brazil, 2022.

Position	Classification	Relationship with the REDI
1	Extremely High (EH)	Greater than 2.5 standard deviations above the mean
2	Very High (VH)	Between 1.5 and 2.5 standard deviations above the mean
3	High (H)	Between 1 and 1.5 standard deviations above the mean
4	Medium High (MH)	Between the mean and 1 standard deviation above the mean
5	Medium Low (RL)	Between the mean and 1 standard deviation below the mean
6	Low (L)	Between 1 and 1.5 standard deviations below the mean
7	Very Low (VL)	Less than 1.5 standard deviations below the mean

Source: Prepared by the author based on Parré and Melo (2007)[4].

After preparing the REDI, it will be submitted to an interpolation process, thus allowing the classification of municipalities, which, in turn, will vary between 0 and 1 and be hierarchized according to the methodology described above in **Frame 1**.

The sequence of the research carried out added the variables identified in this article to others from the 2010 Population Census to compose another index capable of measuring, in addition to rural development, municipalities' local development level. The justification for using a lagged database stems from the fact that there still needs to be data available from the 2020 Population Census to correlate with data from the 2017 Agricultural Census, and no index similar to that proposed for Brazilian municipalities in the analyzed period was found. Finally, the results obtained for Brazilian municipalities were discussed based on the REDI categorization.

Results Analysis

From the 97 variables collected (see Appendix 1) and after factor analysis, the Bartlett test should be preferred to the KMO statistic to decide on the overall adequacy of the factor analysis. In this case, the Bartlett test (*p-value* = 0.00) demonstrates that the factor analysis is adequate, as well as the KMO statistic (0.912) in **Table 1**, below (FÁVERO; BELFIORI, 2017).

Table 1 – Kaiser, Meyer, and Olkin Test (KMO) and Bartlett Test

Kaiser-Meyer-Olkin Sampling Adequacy Measure.		0.912
Bartlett's Test of Sphericity	Approx.χ2	199,529.092
	df.	861
	Sig.	0.000

Source: Own elaboration using SPSS software and data from the IBGE (2006).

In the present study, the tests indicate as favorable the global suitability to perform the factor analysis. Another point to highlight to check the good adherence to the model is informed by the reproduction matrix of the correlations in which the residues can be verified. In this model, 9% (82) of the non-redundant residues have absolute values greater than 0.05%; the criterion for selecting a good model would be values below 50% (SARSTEDT; MOOI, 2019).

[4] The asymmetry carried out in the first two levels is deliberate in evaluating with greater precision the municipalities that presented the best levels of the rurality economic development index (REDI). Only the two levels greater than 1.5 standard deviations were divided into two categories.

According to Kaiser's criterion, nine latent factors were extracted to express the complete set of indicators that represent the categorization of municipalities in terms of economic development of rurality. In this sense, they are presented in **Table 2**, these nine factors with the eigenvectors and variances used for weighting in the classification of municipalities.

Table 2 – Variance explained and accumulated by the factors with normal and rotated characteristic roots for the 9 established factors

LATENT FACTORS	INITIAL EIGENVALUES			VARIMAX ROTATION		
	Total	% Variance	% Cumulative	Total	% Variance	% Cumulative
1st	11.951	28.454	28.454	8.092	19.266	19.266
2nd	5.390	12.833	41.287	6.158	14.661	33.927
3rd	3.670	8.739	50.026	3.862	9.195	43.122
4th	2.905	6.916	56.942	3.205	7.631	50.754
5th	2.188	5.208	62.150	2.311	5.503	56.257
6th	1.707	4.063	66.213	2.270	5.404	61.661
7th	1.580	3.762	69.975	2.009	4.784	66.445
8th	1.210	2.881	72.856	1.900	4.524	70.968
9th	1.087	2.589	75.445	1.880	4.476	75.445

Source: Own elaboration using SPSS software and data from the IBGE (2006).

From **Table 2**, it is observed that the extracted factors represent 75.45% of the total accumulated variance of the 42 economic development indicators of rurality in Brazilian municipalities. In the analysis, the varimax rotation method is used, a type of orthogonal rotation, which minimizes the number of variables that present high loads in a given latent factor through the redistribution of factor loadings and maximization of shared variance in factors corresponding to lower eigenvalues (FÁVERO; BELFIORI, 2017).

After observing the criteria used to select the nine factors in which 42 indicators are contained, the **Frame 2** results are presented below. The first column shows the codes of the listed variables. Then, in the second column, the factorial loads are presented, representing the Pearson correlations between the initial variables and each of the latent factors produced; all of them showed positive correlation and, therefore, are shaded with gray. After rotation by the varimax method, the factor loadings of the nine common factors produced allow inferring the correlations between each factor and the indicators. In this analysis, the indicators inserted in each factor with a factorial load equal to or greater than 0.5 were considered suitable for use in the factorial analysis model (HAIR, et al., 2009).

Frame 2 – Latent factors, factor loadings, indicators used, and their respective dimensions of the economic development of rurality in Brazilian municipalities

CODE	FACTOR LOAD	COMMUNALITY	VARIABLE NAME
FACTOR 1: PHYSICAL CAPITAL AND TECHNICAL ORIENTATION (α= 0.942)			
ER39	0.896	0.912	Average number of tractors per establishment.
ER45	0.849	0.851	Average number of sprayers and/or atomizers per establishment.
ER46	0.873	0.813	Average number of fertilizer machines and/or limestone distributors per establishment.
ER41	0.822	0.768	Average number of harrows and/or rotary hoes per establishment.
ER52	0.589	0.767	Average amount of fuel consumed (alcohol, gasoline, diesel oil, and kerosene) in liters per establishment.
SR123	0.574	0.689	Participation of establishments that received technical guidance.
ER42	0.769	0.666	Average number of brush cutters per establishment.
ER49	0.784	0.644	Average number of trucks per establishment.
ER26	0.702	0.636	Participation of establishments with computer and internet access over the total number of establishments.
ER51	0.610	0.634	Average number of cars per establishment.
ER50	0.741	0.614	Average number of utility vehicles per establishment.
FACTOR 2: LIVESTOCK, SOIL MANAGEMENT AND INVESTMENT (α= 0.916)			
ER67	0.905	0.896	Average number of cattle heads per establishment.
ER63	0.725	0.851	Average value (R$) of animal production at the establishments.
ER56	0.702	0.814	Participation in the area of livestock and creation of others.
ER17	0,780	0.768	Control of diseases and/or parasites in animals per establishment.
ER79	0.793	0.767	Average value (R$) with revenue from cattle per establishment.
ER60	0.588	0.55	Average value (R$) of investments made by establishments.
ER69	0.757	0.751	Average number of horses per establishment.
AR10	0.683	0.671	Share of the area (ha) of planted pastures in good condition.
ER78	0.701	0.641	Average value (R$) of milk produced per establishment.
AR18	0.729	0.614	Rotation of pastures by establishment.
FACTOR 3: SOIL, SOY, AND PESTICIDES MANAGEMENT (α= 0.835)			
ER32	0.831	0.780	Participation of establishments that use direct planting in straw.
AR5	0.643	0.661	Participation of establishments that used pesticides.
ER82	0.679	0.655	Average value of soybean production (R$) by the total number of establishments.
AR27	0.761	0.640	Crop rotation by establishment.
FACTOR 4: RURAL EDUCATION AND DEMOGRAPHY (α = 0.858)			
SR121	0.847	0.854	Participation of people with complete secondary education in the rural population.
DR24	0.880	0.844	Participation of the number of people who run the establishment residing in a municipality in the urban area of the municipality itself or another over the rural population.
ER98	0.728	0.829	Participation of people employed in establishments with a kinship tie with the producer (including the producer) in the rural population.
SR120	0.727	0.792	Participation of people with complete higher education in the rural population.
DR23	0.655	0.773	Participation of the number of people who manage an establishment residing in the establishment itself or in a municipality in the rural area.
FACTOR 5: GOAT, SHEEP, AND DONKEY PRODUCTION (α = 0.770)			
ER72	0.865	0.817	Average number of goats per establishment.
ER73	0.803	0.758	Average number of heads of sheep per establishment.
ER70	0.762	0.699	Average number of donkeys per establishment.
FACTOR 6: PRODUCTION INTEGRATED TO THE INDUSTRY (α = 0.777)			
ER75	0.759	0.731	Average number of poultry heads (hens, roosters, pullets, broilers, and chicks) per establishment.
ER107	0.800	0.713	Participation of establishments with animal production integrated into the industry.
ER74	0.524	0.621	Average number of pigs per establishment.
FACTOR 7: PRIMARY PRODUCTION AND ECONOMIC RESULT (α = 0.875)			
ER85	0.727	0.794	Average value (R$) of primary production per establishment.
ER66	0.682	0.714	Balance (Income and other income - Expenses) average (R$) per establishment.
FACTOR 8: AGROINDUSTRIAL PRODUCTION (α = 0.863)			
ER86	0.917	0.878	Average value (R$) of agro-industrial production per establishment.
ER65	0.920	0.869	Average added value (R$) of agroindustry by establishment.
FACTOR 9: FOREST PRODUCTION (α = 0.794)			
ER30	0.919	0.879	Share of forest area (ha) planted with forest essences[5].
AR16	0.924	0.864	Participation of the forestry production area.

Source: Own elaboration using SPSS software and data from the IBGE (2006).

[5] Forests planted with forest essences (native or exotic) – comprise areas covered by woods and forests planted with forest essences, native or exotic, used for the production of wood and its derivatives, for environmental protection or biological purpose (IBGE, 2006).

Regarding commonality (3rd column of **Frame 2**), the value of 0.6 was used as a benchmark, demonstrating that the selected indicators have solid correlations and, therefore, are highly relevant to determine the categorization of the level of economic development of the rurality of the municipalities. The commonality is used to express the variance of each indicator because the greater the value of this commonality, the greater the relationship between the indicator and the factor, expressing greater sensitivity and explanation within that factor (HAIR et al., 2009; FÁVERO; BELFIORI, 2017).

After selecting the variables, using the criteria related to the magnitude of the factor loadings and commonality, the Cronbach's alpha test (α) was performed separately for each factor obtained. Based on the results presented on alpha in **Frame 2**, and based on the definition of the degree of reliability resulting from the behavior of the correlations between the original or standardized variables, α allowed evaluating the reliability of extracting a factor concerning the variables. Therefore, α is defined as a measure capable of evaluating the intensity with which a given factor is present in the original variables, and, thus, a database with variables that share a single factor tends to present a high α, as observed in the results obtained by the alphas (α) of the nine factors, which showed values greater than 0.7 and, therefore, have a considerable degree of reliability (SARSTEDT; MOOI, 2019).

In **Frame 2**, all indicators have positive factor loadings, as expected (see Annex 1). Therefore, they indicate how each of these factors influences the level of the rurality economic development in Brazilian municipalities. It is essential to observe that, among the 42 indicators, 14 variables are contained in the interval between 0.813 and 0.912; that is, commonality values greater than 0.8 are considered extremely high and, therefore, are the indicators with the most significant degree of influence on the factors contained therein. As a result, it is identified in which dimensions of economic development these variables are contained in each of the nine factors.

Factor 1 (***F***$_1$), called ***Physical Capital and Technical Orientation***, corresponds to 19.27% of the total accumulated variance and integrates the correlation of 11 variables, ordered by the magnitude of commonality. They are: ER39, ER45, ER46, ER41, ER52, SR123, ER42, ER49, ER26, ER51, and ER50. Of these 11 variables, ten are included in the economic dimension and demonstrate a direct relationship with the rurality economic development; substantially, they are related to the use of physical capital and inputs used in the production process in primary activities. Among these ten variables, the first three (average numbers of tractors, sprayers and/or atomizers, and fertilizer spreaders and/or limestone distributors) present extremely high commonalities, greater than 0.8, and, therefore, indicate their greater power of influence on this first factor. The positive correlation between physical capital and economic development has already been empirically proven since it is incorporated into technology and, therefore, the fundamental ingredient to leverage labor productivity (FREITAS; BACHA; FOSSATT, 2009; GASQUES et al., 2014).

Furthermore, regarding the ER26 variable, it is essential to highlight its interconnection with the social dimension, more precisely with the education sub-dimension, and the capacity represented by this type of physical capital (computers and internet access) to expand access to information and communication and, consequently, boost the business of rural establishments. Still, on the first factor, only variable SR123 is classified in the social dimension and is directly related to education. This variable is closely related to learning to use and manage the physical

infrastructure of rural establishments since technical guidance optimizes the use of productive physical resources of rural establishments, an argument supported by Freitas, Bacha, and Fossatt (2009).

Factor 2 **(F_2)**, entitled ***Livestock, Land Management, and Investment,*** represents 14.66% of the total accumulated variance and is formed by ten variables arranged like this, considering the greatest commonality: ER67, ER63, ER56, ER17, ER79, ER60, ER69, AR10, ER78, and AR18. As in F_1, all these variables have positive factor loadings, and the first three variables (average number of cattle heads, average value of animal production per establishment, and participation of the area (ha) destined to cattle and other livestock) have a strong power of influence on this factor since their commonalities are greater than 0.8.

Factor 2 is composed of variables representing the economic and environmental dimensions. Concerning economics, in addition to the first three variables mentioned in the previous paragraph, the other variables that make up this factor (control of parasites and/or diseases (ER17), the average values of revenue earned from cattle (ER79), investments made (ER60), and milk produced (ER78), in addition to equine production (ER69)) are also representative of the economic dimension. These results corroborate the results obtained by Stege and Parré (2011), for which there is a positive correlation between variables related to animal production on the categorization of Brazilian micro-regions. In addition, Crespolini dos Santos et al. (2014), when evaluating the period between 2002 and 2014, concluded that there were significant gains in productivity indicators in beef cattle, such as capacity per area, age at slaughter, and mortality rate. However, such gains did not significantly affect this activity's profitability.

Still, in ***Factor 2***, the environmental dimension is represented by the participation of the area (ha) of pastures planted in good conditions (AR10) and by pasture rotation (AR18). Both indicate good practices in soil management to ensure productivity and preserve soil sustainability. The positive correlation between these two variables is supported by Macedo (2009) and Macedo et al. (2013). These authors argue that the degradation of pastures has, as one of its leading causes, the inadequate management of the herd. This degradation is determined by the evolution of the natural recovery capacity of the pastures, which is crucial to sustaining the levels of productivity and quality for animal production.

In Brazil, Macedo et al. (2013) argue that more than 70% of cultivated pasture areas are at some stage of degradation. Among these, a considerable portion is at advanced levels of degradation. In general, the degradation results from inadequate handling of the animals (excessive capacity of animals per area) and/or lack of nutritional replenishment of the soil. One of the most alarming consequences of pasture degradation corresponds to the impacts in terms of the intensification of greenhouse gas emissions and the effects on water resources. Technologies such as the no-tillage system have been used to combat such deterioration and its accelerating effects and expand production sustainability. Adequate soil preparation, crop rotation, and the crop-livestock integration system are also essential (ER32), a variable identified as relevant for ***Factor 3*** (F_3). Thus, the relationship between these variables explains the correlation between soil management, livestock, and productivity as relevant factors to explain municipalities' economic development level.

Regarding the environmental dimension, Stege and Parré (2011) found results through variables directly related to environmental damage; in contrast, the variables used in this article captured practices that aim to expand or at least preserve good environmental conditions. In addition, these same authors found a positive correlation between some of the variables used in this work related to livestock and the level of economic development, however, for the Brazilian micro-regions.

Factor 3 (***F_3***), called ***Soil, Soybean, and Pesticide Management,*** represents 9.20% of the total accumulated variance and is composed of four indicators, ordered by a more significant commonality: ER32, AR5, ER82, and AR27. When observing the component indicators of the third factor, it is verified that they are inserted in the economic and environmental dimensions, which are interrelated. The variables related to direct planting in straw (ER32) and the average value of soybean production (ER82) are directly linked to the economic dimension. This is because, according to Franchini et al. (2007), direct planting in straw has generated higher productivity and better results in production sustainability and environmental preservation than conventional planting techniques.

The variables use of pesticides (AR5), and crop rotation (AR27) are related to environmental and economic issues because the use of pesticides is directly associated with crop productivity, in this case, soybeans, and, if misused, it can lead to soil, river, and spring contamination. Crop rotation is related to the preservation of conditions related to soil fertility and, therefore, also related to land productivity (HIRAKURI et al., 2014).

However, regarding the use of pesticides, it should be mentioned that the variable used in this article was the number of establishments that used pesticides divided by the total number of establishments in the municipality. That is, this variable indicates that in municipalities where there is a greater number of establishments using pesticides, there is a probable positive correlation with soy productivity and, as a result, with the development of rurality. But this variable does not mention the quantity, as Staduto, Orlandi, and Chioveto (2018) did and found a negative relationship between the use of pesticides (kg/ha) and the economic development of municipalities.

Factor 4 (***F_4***) was named ***Rural Education*** and ***Demography*** and constituted 7.63% of the total accumulated variance. It is formed by five indicators (SR121, DR24, ER98, SR120, and DR23). This factor emphasizes the importance of the social dimension in the rural population, conferred by variables representing the educational level (middle and higher) and, therefore, currently used as a representation of the idea of human capital (SR121 and SR120), a relationship that is closely linked to economic development and proven by several authors (CUNHA; HECKMAN; SCHENNACH, 2010; RENZI et al., 2022). Furthermore, Freitas, Bacha, and Fossett, (2009) emphasize the variables related to formal education that are important in explaining regional inequalities.

The demographic dimension is represented by the characteristics of the people involved in rural activities. The weight of variable DR24, the importance of the managing directors of rural establishments residing in the urban area, in terms of commonality, gives the economic development of rurality a demographic factor. This result is theoretically supported by Van Leeuwen (2009), who emphasizes this characteristic related to the dynamics of the movement of people between rural and urban areas as a relevant element in determining local economic development.

However, the traditional configuration of the characteristics of the employees of the establishments still has some critical influence on the management of Brazilian rural establishments. Some of these leaders still reside in the rural establishment itself (DR23), and the variable ER98 concerns the employment of people with some kinship ties in the agricultural enterprise, a relevant variable in terms of conducting the activities carried out in the establishments. In this sense, intending to expand the explanation of this movement of people between rural and urban areas, Graziano da Silva (2002) argues that a portion of people residing in rural areas is engaged in activities in other sectors (industrial or services), or that they are pluriactive people, and the direction of agricultural establishments, in general, can be composed by one or some of the components of the family, no longer, necessarily, the family as a whole. The division of capitalist labor acts as in other sectors. That is, there is hiring, mainly of third-party services.

These demographic variables suggest an important household characterization of the rural economic development process. However, based on it, one cannot refute the argument that there has been a tenuous relationship between population growth and economic growth, an argument that seems to be strengthened in the rurality sphere since there is empirical evidence that the portion corresponding to agricultural production has increased concomitantly with the reduction of rural demographic density (CAMARANO; ABRAMOVAY, 1999; CAMARANO, 2014). Another factor that corroborates the results comes from the argument from Alves and Souza, (2015), for whom, in the semi-arid and southern regions, the labor and land factors had their respective shares reduced while the technology factor increased its participation in agricultural production among the 1995/6 and 2006 censuses.

Factor 5 (***F_5***) corresponds to the ***Production of Goats, Sheep, and Donkeys***, and three variables make up this factor, corresponding to 5.50% of the accumulated variance, classified by greater commonality; they are ER72, ER73, and ER70. This factor deals with the importance of the productivity of goats (ER72), highlighting their commonality being more significant than 0.8, sheep (ER73), and donkeys (ER70). Again, the economic dimension presents a positive relationship to categorize municipalities regarding the level of economic development of rurality. This correlation finds empirical support in the results obtained by the authors Ramos, and Garagorry (2019), when they identified the production of goats, sheep, and donkeys, included in the livestock products, as relevant activities to explain the changes in agricultural output in MATOPIBA.

Factor 6 (***F_6***) was called ***Integrated Production to Industry*** it is composed of three indicators and represents 5.40% of the accumulated variance, arranged in order of commonality; they are ER75, ER107, and ER74. This factor highlights the significance of poultry and pork production (ER75 and ER74) integrated into the industry (ER107). In other words, the municipalities that present a greater integration between animal production (poultry and pork) with the industry absorb more positive results in relation to those devoid of such integration. This fact had already been pointed out by Graziano da Silva (2002) when characterizing the new rurality through the sectoral rearrangement of economic activities, in which he argued that the critical feature of modern agriculture is the production of commodities closely associated with agro-industrial transformation. In the specific case of **Factor 6**, there is positivity resulting from animal production and the connections inherent to the

productive chains involved for a better categorization of the municipality in the level of the rurality economic development, that is, the highest degree of integration with the industry tends to make the rurality development process more dynamic through drag effects (backward linkages) and propulsion effects (forward linkages) (BRANDÃO, 2012).

Regarding ***Factor 7*** (***F_7***), entitled ***Primary Production and Economic Result***, it represents 4.78% of the total accumulated variance and comprises two indicators presented in order of commonality: ER85 and ER66. This factor represents the direct influence of productivity on primary products (ER85) and the economic result (ER66) in terms of income minus expenses of rural establishments. In other words, it expresses the positive aspect generated by productivity and financial sustainability in rural establishments to classify municipalities concerning the rurality economic development. These results corroborate those of Stege and Parré (2011), who found a positive influence of variables related to agricultural, plant, and animal productivity on categorizing Brazilian microregions. The results obtained by Almeida Mendes et al. (2018) indicated, in turn, that the evolution of the agricultural sector contributes to the human development of municipalities, especially small ones. On the same theme, Staduto, Orlandi, and Chioveto (2018) observed the positive correlation between a representative factor of the primary GDP and the rural development of the municipalities of Mato Grosso.

Factor 8 (***F_8***) is named ***Agroindustrial Production*** and represents 4.52% of the total accumulated variance, and is composed of two indicators: ER86 and ER65. This factor captures the positive aspects of productivity in the agroindustry (ER86) and the process of adding value throughout the agroindustrial activity (ER65) to categorize municipalities in terms of the economic development of rurality. These results corroborate the notes made by Graziano da Silva (2002) and Pedroso and Navarro (2019).

Factor 9 (***F_9***) was called ***Forest Production*** and concerns 4.48% of the total accumulated variance, composed of two variables: ER30 and AR16. This factor has two variables interrelated to the economic and environmental dimensions. The first variable highlights the importance of areas (ha) of forests planted with forest essences (ER30), and the other the importance of areas (ha) intended for forest production (AR16). Both positively influence the classification of municipalities in reference to the level of economic development of rurality. These results support the argument by Gurgel et al. (2009), for whom protected areas, such as conservation units and forest production or reforestation areas, are elements that provide more adequate socio-environmental conditions and, therefore, capable of promoting an economic development process with fundamentals endowed with the ability to make such a process last for a more extended period.

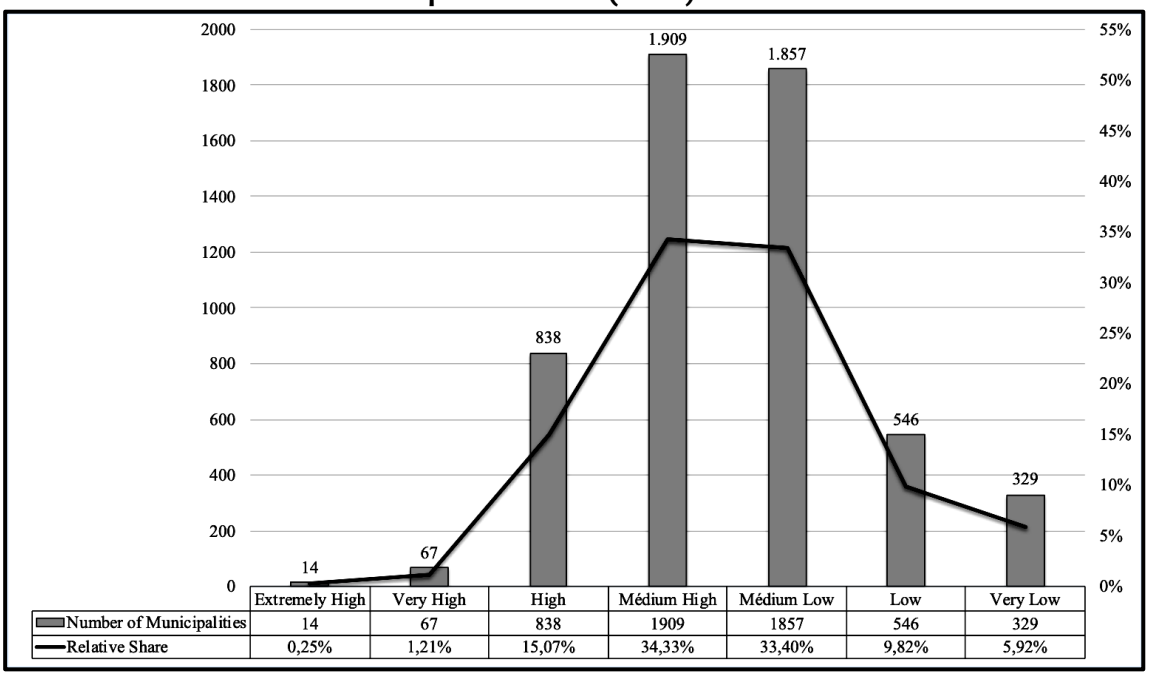
After interpreting the results regarding the latent factors obtained, the following section analyzes the REDI categorization for the 5560 Brazilian municipalities.

1. Categorization of Brazilian municipalities

In the previous section, the nine resulting common factors were analyzed, allowing the classification of 5560 Brazilian municipalities using the REDI.

Graphic 1 shows the results obtained and the classification of municipalities in seven categories, duly supported by the methodology presented in Frame 1 (p.8) and related to the level of the rurality economic development in each municipality.

Graphic 1– Classification of Brazilian municipalities using the rurality economic development index (REDI) in 2006



	Extremely High	Very High	High	Médium High	Médium Low	Low	Very Low
Number of Municipalities	14	67	838	1909	1857	546	329
Relative Share	0,25%	1,21%	15,07%	34,33%	33,40%	9,82%	5,92%

Source: Own elaboration based on data from the Agricultural Census (2006).

After the index interpolation process, an average REDI value of 0.5389 was obtained, which, in a regional analysis, allows to highlight the presence of 50.86% (2828) municipalities with a REDI greater than or equal to the national average. However, the REDI results presented a standard error of 0.0018, extremely low, indicating a low dispersion among municipalities in terms of the level of the rurality economic development. Furthermore, with a standard deviation of 0.1339, the distribution of Brazilian municipalities is close to a normal distribution, with 96.56% of the municipalities included in the range of two standard deviations with reference to the mean. In addition, the coefficient of variation presented a value of 24.85%, indicating that the mean is a good measure of data representation. That is since this value is less than 30%, the data are reasonably homogeneous. In terms of shape measurements, there is a Fischer skewness coefficient of -0.2211, that is, a negatively skewed distribution, and a Fischer kurtosis coefficient of 0.2709, meaning the curve is leptokurtic (FÁVERO; BELFIORE, 2017).

From the analyzed case, it is inferred that the rurality economic development of Brazilian municipalities is expressed by two sets of municipalities characterized by extremes. In other words, when looking at **Graphic 1** (p. 16) and **Frame 1** (p. 8)**,** it appears that the largest share of municipalities is concentrated in the medium-high (MH) and medium-low (ML) categories: (67.73%). Thus, from **Graphic 1**, it is inferred that the significant differences in terms of economic development of rurality; therefore, the analysis of the categorization of municipalities focused on these extremes, that is, the categories extremely high (EH), very high (VH) and high (H) correspond to 16.53%, while the very low (VL) and low (L) categories account for

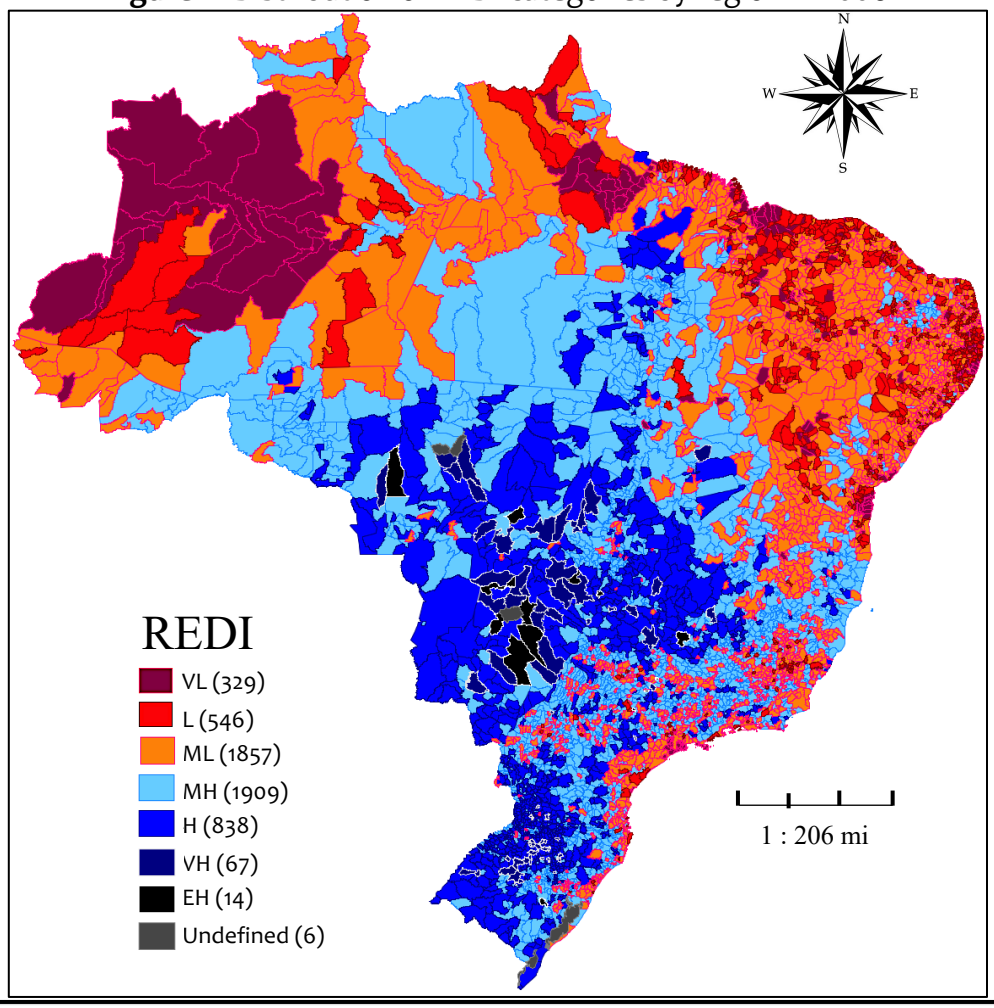
another 15.74%[6]. The analyzes of these REDI categories identify where the best and worst results are located and provide indications of and for public actions and policies.

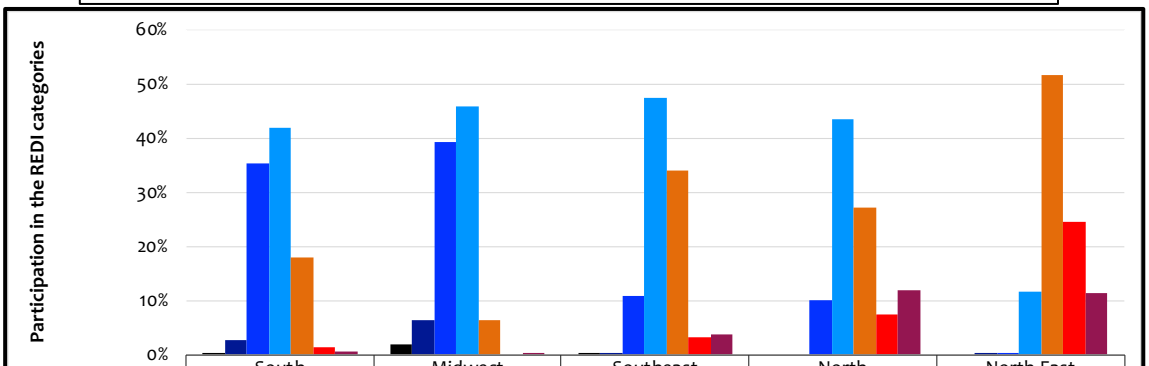
2. Main notes about the REDI

After the classification analysis based on the seven categories of the rurality economic development index (REDI), this section will present the factors that explain the divergences between regions and municipalities and the main resulting conclusions. Therefore, initially, in **Figure 1**, the municipalities that stood out positively or negatively by region are located below. The order presented (right to left) used as a criterion the sum of the results obtained in the three superior levels, namely: high (H), very high (VH), and extremely high (EH) levels of rurality development in their respective municipalities compared to the other Regions.

[6] Regarding the performed asymmetry, see footnote 4.

Figure 1– Distribution of REDI categories by region in 2006





	South	Midwest	Southeast	North	North East
Extremely High	0,08%	1,94%	0,24%	0,00%	0,00%
Very High	2,61%	6,48%	0,30%	0,00%	0,06%
High	35,44%	39,31%	10,91%	10,02%	0,45%
Médium High	41,92%	45,79%	47,60%	43,43%	11,72%
Médium Low	17,93%	6,26%	33,99%	27,17%	51,67%
Low	1,43%	0,00%	3,18%	7,57%	24,67%
Very Low	0,59%	0,22%	3,78%	11,80%	11,44%

Source: Own elaboration based on data from the Agricultural Census (2006).

When analyzing **Figure 1**, considering the national REDI average of 0.5389 as a reference, the South Region had the best performance and contained 80.05% of the municipalities above this average. Among the municipalities located in this Region, 35.34% (421) had a high level (H), 2.61% (31) a very high level (VH), and one (0.08%)

municipality was categorized at an extremely high level (EH) by the index. The second Region with the best results presented was the Midwest Region. It contained 433 municipalities (93.52%) with a REDI above the national average. Considering all the municipalities, the Midwest Region concentrates 39.31% (182) in the high level, 6.48% (30) in the very high level, and nine municipalities in the extremely high level (1.94%) of REDI. At the opposite extreme, it had only one municipality with a very low level (VL) and none with a low level (L).

Still, in **Figure 1,** above, in an intermediate situation is the Southeast Region, with only 59.05% (985) of its municipalities with a REDI above the average of Brazilian municipalities. On the one hand, based on all the municipalities present in this Region, only 10.91% (182) had a high level (H), 0.30% (5) a very high level, and 0.24% (4) an extremely high level (EH). On the other hand, 3.18% (53) had a low level (L), and 3.78% (63) had a very low level (VL) of REDI. The prevailing categories for this Region were intermediate, with 81.59% (MH and ML). Therefore, it is concluded that activities related to rurality have a lower power of determination in the present region. Such a conclusion does not necessarily mean that the aspects of economic development of rurality are not relevant for this Region but that, relatively, they are less influential in comparison with the other Regions of the nation.

The North and Northeast Regions, in contrast, when observing **Figure 1**, stand out negatively for having the highest participation in the low (L) and very low (VL) levels of economic development of rurality. The North Region has 53.45% (240) municipalities below the national average of the REDI. Among all the municipalities in this Region, 7.57% (34) were classified at the low level (L) and 11.80% (53) at the very low level (VL); concerning the other extreme, only 10.02% (45) municipalities have a high level (H), and no municipality was categorized in the very high (VH) or extremely high (EH) categories. Finally, the last Region to be analyzed in Figure 1 and which presents the worst result of the concentration of municipalities below the national average of the REDI, is the Northeast Region. In it, 87.78% of the municipalities are below the national average, and among the municipalities, 24.67% (442) presented a low level, and 11.44% (205) a very low level. At the other extreme, 0.45% (8) of the municipalities were classified at the high level (H), and at the very high level (VH), only one (0.06%) municipality.

Compared to the North and Northeast Regions, the superiority presented by the REDI of the South, Midwest, and Southeast Regions can be, in part, explained by the greater concentration of stocks of physical and human capital existing in these Regions, in addition to their likely more efficient interaction between such capitals and the resulting higher economic result, in terms of productivity, soil use conditions, referring to environmental aspects, and the results of the primary productive crops considered, such as livestock (beef and dairy), soy, and forestry production. The importance of industrial integration and the economic result of agroindustry is also observed to be relevant and differential factors between the Brazilian Regions.

The results found in this article are academically supported. This is because Freitas, Bacha, and Fossatt (2009) found a capital-labor ratio even lower than unity when analyzing the period between 1980 and 1996 for the states belonging to the North and Northeast Regions, while for the other Regions (Southeast, South, and Midwest), obtained values greater than unity. This fact helps to explain the differences between the Regions through the divergent process of technification and mechanization of the agricultural sector, which tended to be concentrated in the

Southeast, South, and Midwest Regions to the detriment of the North and Northeast Regions. Additionally, another point highlighted by these authors to explain the differences between the Regions is that the average level of education of workers in the agricultural sector in the states of the Northeast Region was relatively lower compared to the entire nation in that period, a fact also supported by the results obtained in this article.

Another essential element to explain in part the regional divergences is that the lack of physical and human capital tends to maintain and prolong the permanence time of these localities in lower levels of rurality economic development, mainly in areas where there is a predominance of agriculture characterized by activities, for the most part, of subsistence and whose population, for the most part, is in conditions of vulnerability to poverty (NAVARRO; 2001, 2019; LAURENTI, 2014).

Finally, concerning the Northeast Region, **Figure 1** illustrates the high concentration of municipalities classified at lower levels of rural economic development. Compared to the results of Stege and Parré (2011), the results obtained in this work by the REDI contribute to providing a more precise identification capacity in terms of geographic units and a more extensive set of variables to support the interpretation of regional divergences.

Conclusion

The objective proposed in this article was reached by constituting the economic development index of rurality and, through it, categorizing the 5560 municipalities in 2006. Despite the data time lag, the main contribution, and differential, of this article stems from the fact that the REDI was produced from a database composed of 97 variables, of which 42 variables composed the 9 latent factors, and therefore, endow the REDI with a set of particularities capable of capturing more precisely and deeply the aspects of rurality to assess the level of rural development of the municipalities and the great Brazilian Regions.

The results obtained make it possible to produce new research observing whether the characteristics of the rurality of the Brazilian municipalities remain the same as presented in 2006 and also contribute to help other research works that need references to evaluate the success of public policies carried out a *posteriori* because the nine factors can be considered as relevant guidelines to obtain better results in policies aimed at accelerating the rural and economic development of Brazilian municipalities.

These guidelines correspond to the following factors: 1st) incentive to invest in physical capital and technical education in agricultural activities; 2) improvement of agricultural activities; 3rd) environmental care and activities related to soybean productivity (soil management, crop rotation, and use of pesticides); 4th) improve the formal educational training of rural managers and consider the new demographic conditions for the constitution of policy proposals; 5th) increase productivity in activities related to goats, sheep, and donkeys, mainly because they are characteristic activities of less developed Brazilian regions and because they enhance the catching-up of these Regions; 6) intensify the integration of primary and industrial production; 7) encourage primary output and focus on the economic results of rural establishments; 8th) enhance the result adding value along the production chains

and, finally, 9th) encourage the increase in forestry production both in area and in productive diversity.

Therefore, public policies constructed along the lines mentioned above, after 2006, would tend to make success in reducing the socioeconomic backwardness gap between Brazilian municipalities and regions more feasible. As a result, it is proposed as a future research agenda to analyze rural development policies and their interrelationship with the guidelines listed in this work.

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