



PRODUCTIVE STRUCTURE, COMPLEXITY, AND REGIONAL DEVELOPMENT: EVIDENCE FROM THE SALVADOR-CAMAÇARI-FEIRA DE SANTANA CORRIDOR

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Abstract: This article analyzes how economic complexity and productive specialization are associated with the territorial hierarchy of 28 municipalities in the Salvador-Camaçari-Feira de Santana corridor, the main area of economic and industrial concentration in Bahia. Using data from the 2024 Annual Social Information Report (RAIS) regarding the extractive and manufacturing industries, the study combines the Economic Complexity Index (ECI) – based on Revealed Comparative Advantage adapted to employment and the municipality-activity structure – and the normalized Concentration Index (ICn), applied to five competitive factors. The analyzed municipalities have an average ECI of 1.021 and an average diversity of 34.4 activities – results higher than those observed for Bahia as a whole, which are -0.319 and 24.79, respectively. The distribution of these indicators reveals, however, significant internal heterogeneity. Camaçari, Simões Filho, Salvador, and Feira de Santana occupy prominent positions in the regional productive structure, although they exhibit distinct combinations of complexity, diversity, industrial employment, and specialization. In terms of competitive factors, scale-intensive and natural-resource-based activities predominate, while science-based activities remain more geographically restricted. The results indicate that complexity and specialization constitute complementary dimensions of the productive structure. It is concluded that the region exhibits a concentrated, functionally differentiated configuration marked by territorial asymmetries in productive capacities and specializations among the analyzed municipalities.

Keywords: Economic complexity; Regional development; Productive specialization; Productive structure.

ESTRUTURA PRODUTIVA, COMPLEXIDADE E DESENVOLVIMENTO REGIONAL: EVIDÊNCIAS DO EIXO SALVADOR-CAMAÇARI-FEIRA DE SANTANA

Resumo: O artigo analisa como complexidade econômica e especialização produtiva se associam à hierarquia territorial de 28 municípios do eixo Salvador-Camaçari-Feira de Santana, principal área de concentração econômica e industrial da Bahia. Com dados da Relação Anual de Informações Sociais (RAIS) de 2024, referentes às indústrias extrativa e de transformação, combinam-se o Índice de Complexidade Econômica (ECI), baseado na Vantagem Comparativa Revelada adaptada ao emprego e na estrutura município-atividade, e o Índice de Concentração normalizado (ICn), aplicado a cinco fatores competitivos. Os municípios analisados apresentam ECI médio de 1,021 e diversidade média de 34,4 atividades, resultados superiores aos valores observados para a Bahia, de -0,319 e 24,79, respectivamente. A distribuição desses indicadores revela, contudo, expressiva heterogeneidade interna. Camaçari, Simões Filho, Salvador e Feira de Santana ocupam posições relevantes na estrutura produtiva regional, embora apresentem combinações distintas de complexidade, diversidade, emprego industrial e especialização. Nos fatores competitivos, predominam atividades intensivas em escala e baseadas em recursos naturais, enquanto as atividades baseadas em ciência permanecem mais restritas territorialmente. Os resultados indicam que complexidade e especialização constituem dimensões complementares da estrutura produtiva. Conclui-se que o eixo apresenta configuração concentrada, funcionalmente diferenciada e marcada por assimetrias territoriais de capacidades produtivas e especializações entre os municípios analisados.

Palavras-chave: Complexidade econômica; Desenvolvimento regional; Especialização produtiva; Estrutura produtiva.

1 Introduction

Bahia's productive structure is marked by strong territorial heterogeneity. Alongside

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municipalities that concentrate diversified industrial activities and relatively sophisticated productive capabilities, local economies persist with poorly diversified structures and peripheral integration into the state's main productive circuits. This configuration reflects a historical process of economic and industrial concentration in the metropolitan area surrounding Salvador and in specific regional centers in the interior, resulting in persistent asymmetries in the territorial distribution of productive activities (Diniz, 1993; Diniz & Crocco, 1996).

Identifying these differences requires going beyond conventional scale indicators, such as industrial employment or sectoral share. Municipalities with similar levels of employment may have distinct productive structures in terms of diversity, specialization, and the capabilities required by the activities they carry out. The literature on economic complexity offers an approach to capturing these differences by jointly considering the productive diversity of territories and the ubiquity of the activities in which they specialize, thereby allowing for the identification of productive hierarchies that isolated measures of concentration do not reveal (Hidalgo *et al.*, 2007; Hidalgo; Hausmann, 2009; Hidalgo, 2021; Boschma and Martin, 2010; Foray, 2014; Iammarino, Rodriguez-Pose, and Storper, 2019).

In Brazil, studies have employed this approach at different territorial scales, showing that the configuration of productive capacities shapes the possibilities for diversification and structural transformation in regions (Freitas, 2019; Fagundes *et al.*, 2019; Monteiro Neto; Silva; Severian, 2021; Mota, 2022). However, there remains scope to better understand how economic complexity and patterns of productive specialization combine at the municipal level, especially in internally heterogeneous territories linked by major industrial hubs. This issue is particularly relevant in Bahia, where geographically close municipalities exhibit quite distinct productive structures.

In this context, the article analyzes 28 municipalities organized around the Salvador-Camaçari-Feira de Santana axis, a territory that brings together important economic and industrial hubs in Bahia and, at the same time, municipalities with lower productive density. The spatial proximity between such distinct economic structures provides an appropriate framework for investigating how diversity, complexity, and specialization are distributed across the territory.

The research question guiding this study is: How are economic complexity and the predominant competitive factor associated with the productive hierarchy of the municipalities along the Salvador-Camaçari-Feira de Santana axis? The hypothesis is that productive capacities are distributed in a selectively concentrated manner, forming a hierarchical territorial system in which a few municipalities combine high levels of diversity and complexity, along with significant industrial specializations, while the others exhibit more limited productive structures.

To test this hypothesis, we use formal employment data from the Annual Social Information Report (RAIS) for 2024, covering the extractive and manufacturing industries. The



analysis combines two dimensions. The first measures economic complexity using the Economic Complexity Index (ECI), constructed from Revealed Comparative Advantage adapted to employment and the municipality-activity structure (Hidalgo *et al.*, 2007; Hidalgo and Hausmann, 2009). The second examines productive specialization using the normalized Concentration Index (ICn), which combines the Location Quotient, the modified Hirschman-Herfindahl Index, and Relative Share, with weights obtained through Principal Component Analysis (Crocco *et al.*, 2006).

The main contribution of this article is to link economic complexity and productive specialization at the municipal level to identify the functional architecture and internal asymmetries of one of Bahia's main economic corridors. This approach makes it possible to distinguish municipalities whose centrality stems from a combination of diversity and complexity from those characterized by more concentrated productive specializations, thereby providing evidence for the discussion on territorial heterogeneity and regional development.

In addition to this introduction, the article is organized into five sections. Section 2 presents the theoretical framework on territorial externalities, complexity, variety, and regional development. Section 3 describes the methodological procedures. Sections 4 and 5 present, respectively, the results regarding economic complexity and the predominant competitive factor. Finally, Section 6 summarizes the main results, limitations, and implications of the study.

2 Economic Complexity, Productive Specialization, and Regional Development

Differences in development among territories are linked to the way economic activities, productive capacities, and knowledge are distributed across space. Since Marshall (1920), the geographic concentration of production has been associated with the formation of specialized labor markets, supplier networks, and knowledge spillovers – mechanisms that favor the localized accumulation of capabilities. The regional economics literature subsequently demonstrated that location, concentration, and specialization are relevant dimensions for understanding the spatial organization of economic activities (Isard, 1960; Hoover, 1971; Ellison and Glaeser, 1997; Duranton and Overman, 2005).

These structures are not independent of their historical trajectory. Evolutionary economic geography emphasizes that accumulated skills, knowledge, and routines condition future possibilities for productive transformation, shaping path-dependent processes (Boschma; Martin, 2010). The excessive persistence of certain specializations can also lead to lock-in situations, restricting the incorporation of new technological and productive trajectories (Grabher, 1993; Zhao *et al.*, 2021). Thus, territories subject to similar macroeconomic conditions may develop distinct



productive structures depending on their accumulated capabilities and historically established activities.

The theory of economic complexity provides an approach for identifying these differences based on the observed productive structure. Hidalgo *et al.* (2007) and Hidalgo and Hausmann (2009) argue that the capacity to produce different goods and engage in different activities indirectly reveals the set of knowledge and skills available in an economy. From this perspective, complexity results from the combination of diversity – expressed by the number of activities in which a territory exhibits a revealed advantage – and ubiquity, corresponding to the number of territories capable of carrying out these activities. More complex structures therefore tend to combine greater diversity with relatively less widespread activities (Hidalgo; Hausmann, 2009; Hidalgo, 2021).

This approach allows us to distinguish diversity from complexity. A territory may exhibit a wide range of activities without necessarily possessing high complexity if these activities are widely disseminated and require relatively common capabilities. Economic complexity constitutes, in this sense, a relational property of the productive structure, allowing for the comparison of territories based on the combination of the activities they perform and the distribution of these activities within the analyzed economic system (Hidalgo, 2021).

Applying this perspective at the subnational level is particularly relevant in countries characterized by marked regional inequalities. Fagundes *et al.* (2019) demonstrate the possibility of measuring regional economic complexity using employment data, while Freitas (2019) links complexity, industrial structure, and opportunities for diversification in Brazilian microregions. Romero and Silveira (2019) link complexity and structural change to the development potential of Brazilian states. Mota (2022) and Mascarini *et al.* (2023), in turn, show that technological and diversification trajectories are shaped by regional heterogeneity and previously established capabilities.

This discussion links economic complexity to the notion of related variety. Activities that share knowledge and skills offer greater opportunities for the exchange of capabilities and learning, favoring diversification trajectories closely aligned with the existing productive structure (Frenken; Van Oort; Verburg, 2007). However, in this study, related variety serves as a theoretical framework for interpreting the possibilities for productive transformation, rather than a directly measured dimension. The empirical analysis focuses on the diversity, complexity, and observed patterns of specialization among municipalities.

Specialization adds another dimension to the characterization of local economic structures. Sectors differ in terms of their requirements for scale, labor, knowledge, technology, and productive organization, such that seemingly similar territorial structures may reflect distinct



competitive bases (Pavitt, 1984; Porter, 1990). In this article, this heterogeneity is examined through five competitive factors – natural-resource-based activities, labor-intensive activities, scale-intensive activities, differentiated goods production, and science-based activities – allowing us to observe which types of activities exhibit the highest relative concentration in each municipality. The normalized Concentration Index proposed by Crocco *et al.* (2006) contributes to this analysis by combining measures of specialization, concentration, and relative share, thereby reducing the limitations of using the Location Quotient in isolation.

Complexity and specialization thus represent distinct and complementary dimensions of the productive structure. Complexity indicates a territory's relative position based on the diversity and ubiquity of its activities, while competitive factors allow us to characterize the productive bases in which its specializations are concentrated. Interpreting these factors together enables us to assess whether more complex municipalities exhibit specialization structures that differ from those characterized by lower diversity and complexity.

This perspective is particularly relevant in Brazil, where the territorial distribution of industry remains marked by concentration and heterogeneity. Diniz (1993) and Diniz and Crocco (1996) demonstrated the spatially selective nature of Brazilian industrial deconcentration. Saboia (2013) identifies the continuation of this trend in the 2000s, while Monteiro Neto, Silva, and Severian (2021) show that the territorial reconfiguration of industry in the 21st century continues to be accompanied by significant regional differences. These inequalities indicate that deconcentration on a national scale does not necessarily imply the homogenization of productive structures at the state and local levels.

In Bahia, this issue can be observed along the Salvador-Camaçari-Feira de Santana corridor, which comprises municipalities located within the same area of economic integration but characterized by heterogeneous productive structures. The territory brings together industrial, logistical, and urban hubs, as well as municipalities with varying degrees of diversification and specialization, making it a relevant case study for examining how productive capacities are distributed across space and shape different positions within the regional economic organization. The coexistence of these structures allows us to investigate whether territorial proximity actually corresponds to similar productive structures or whether a regional organization marked by hierarchies and differentiated specializations prevails.

The existence of productive capacities, however, does not automatically imply their diffusion across the territory. Cassiolato, Szapiro, and Lastres (2004) emphasize the importance of relationships among firms, institutions, and local actors for learning processes and the formation of productive systems. Foray (2014) argues that development policies should take into account the existing capacities and possibilities for transformation in each territory, while Iammarino,



Rodriguez-Pose, and Storper (2019) highlight the need to consider territorial heterogeneity in the formulation of regional policies.

In the context of Bahia, differences in the institutional and fiscal conditions of municipalities constitute an additional element of this heterogeneity (Pacheco *et al.*, 2026). In this sense, fiscal fragility can deepen lock-in by restricting municipalities' ability to finance infrastructure, skills development, and instruments to support productive diversification, while a more robust tax base expands the scope for public action to incorporate new capabilities and foster alternative productive trajectories.

This discussion becomes even more relevant in light of the recent renewed emphasis on industrial and productive policies observed following the COVID-19 pandemic. The renewed debate on neo-industrialization, digital transformation, the energy transition, and the strengthening of production chains has heightened the importance of regional productive capacities as determinants of economic diversification opportunities. In this context, differences in the productive structure and in the capacities accumulated by municipalities tend to influence their ability to respond to new opportunities for industrial development in different ways.

Thus, the regional productive structure can be understood as the result of the unequal distribution of productive capacities, diversity, complexity, and specializations. The Salvador-Camaçari-Feira de Santana corridor provides a suitable setting for observing these relationships, as it brings together economically interconnected municipalities with distinct productive structures. In this context, the interplay between the Economic Complexity Index and competitive factors allows us to identify how these differences are organized territorially and whether they form a hierarchical regional structure – an issue that guides the empirical analysis developed in the following sections.

3 Methodology

This study adopts a quantitative, territory-based approach to analyze the economic complexity, diversity, and patterns of productive specialization of 28 municipalities in the Salvador-Camaçari-Feira de Santana corridor. The empirical strategy combines two dimensions: economic complexity, estimated based on the municipality-activity structure, and productive specialization, measured by the normalized Concentration Index (ICn) according to competitive factors.

3.1 Territorial Scope and Database

The study area includes 28 municipalities: Alagoinhas, Amélia Rodrigues, Cachoeira,



Camaçari, Candeias, Catu, Conceição da Feira, Conceição do Jacuípe, Coração de Maria, Dias d'Ávila, Feira de Santana, Itaparica, Lauro de Freitas, Madre de Deus, Maragogipe, Mata de São João, Pojuca, Salvador, Salinas da Margarida, Santo Amaro, Saubara, São Francisco do Conde, São Gonçalo dos Campos, São Sebastião do Passé, Simões Filho, Teodoro Sampaio, Terra Nova, and Vera Cruz.

The empirical basis consists of formal employment relationships recorded in the Annual Social Information Report (RAIS) for the base year 2024, with data extracted in 2025. The time frame corresponds to the status of formal employment relationships as of December 31, 2024. The sectoral scope covers the extractive and manufacturing industries, classified according to the National Classification of Economic Activities (CNAE). The reference variable is the number of formal employment relationships by municipality and economic activity.

The analysis considers two territorial scales. The first corresponds to the 28 selected municipalities, which are the primary focus of the study. The second comprises all municipalities in Bahia, used as a reference for comparing productive complexity and diversity. This distinction allows for an assessment of the relative position of the analyzed region within the state context.

3.2 Economic Complexity and Productive Diversity

The measurement of economic complexity follows the approach of Balassa (1965), Hidalgo *et al.* (2007), and Hidalgo and Hausmann (2009), adapting Revealed Comparative Advantage (RCA) – originally applied to international trade – to the municipal structure of formal employment.

For each municipality c and activity p , RCA is defined by the activity's share of the municipality's industrial employment relative to that same activity's share of industrial employment across the entire state:

$$VCR_{cp} = \frac{E_{cp}/\sum_p E_{cp}}{\sum_c E_{cp}/\sum_c \sum_p E_{cp}} \quad (1)$$

where E_{cp} corresponds to formal employment in municipality c in activity p .

Values of $VCR_{cp} \geq 1$ indicate that the municipality exhibits relative specialization in that activity. Based on this criterion, the municipality-activity binary matrix M_{cp} is constructed:

$$M_{cp} = \begin{cases} 1, & \text{if } VCR_{cp} \geq 1 \\ 0, & \text{if } VCR_{cp} < 1 \end{cases} \quad (2)$$

The matrix allows us to calculate two fundamental properties of the productive structure: diversity and ubiquity. Diversity $k_{c,0}$ corresponds to the number of activities in which the

municipality exhibits a revealed comparative advantage:

$$k_{c,0} = \sum_p M_{cp} \quad (3)$$

Ubiquity $k_{p,0}$, in turn, corresponds to the number of municipalities that exhibit a revealed comparative advantage in activity p :

$$k_{p,0} = \sum_c M_{cp} \quad (4)$$

The combined interpretation of these dimensions forms the basis of economic complexity. Diversified municipalities exhibit revealed advantages in a greater number of activities, while less ubiquitous activities are present in a relatively smaller number of municipalities. Thus, complexity is not simply equivalent to diversity, as it also depends on the characteristics of the activities that make up the territorial productive structure.

The interaction between diversity and ubiquity is incorporated by the Method of Reflections (Hidalgo *et al.*, 2007; Hidalgo and Hausmann, 2009):

$$k_{c,N} = \frac{1}{k_{c,0}} \sum_p M_{cp} k_{p,N-1} \quad (5)$$

$$k_{p,N} = \frac{1}{k_{p,0}} \sum_c M_{cp} k_{c,N-1} \quad (6)$$

This formulation allows for the successive incorporation of information on the activities carried out by municipalities and on the municipalities in which these activities are present. The Economic Complexity Index (ECI) is obtained from the relational structure resulting from the municipality-activity matrix, considering the eigenvector associated with the second-largest eigenvalue of the transition matrix, as described by Hidalgo and Hausmann (2009).

3.3 Productive Specialization and Competitive Factors

The second analytical axis identifies patterns of productive specialization using the normalized Concentration Index (ICn), based on Crocco *et al.* (2006). The indicator combines three complementary measures: the Location Quotient (LQ), the modified Hirschman-Herfindahl Index (HHm), and Relative Share (RS).

The Location Quotient compares the relative importance of a given activity in the municipality with its importance across the entire study area, making it possible to identify activities that are proportionally more concentrated within the local economic structure.

The modified Hirschman-Herfindahl index considers the difference between the municipality's share of employment in a given activity and its share of total employment in the analyzed region, incorporating the economic concentration of the activity into the analysis.

Relative Share expresses the municipality's contribution to total employment in the activity under consideration, making it possible to distinguish relevant specializations at the regional level from those resulting exclusively from the small size of the municipal economy.

The three indicators are combined in the normalized Concentration Index:

$$ICn_{cp} = \theta_1 QL_{cp} + \theta_2 HHm_{cp} + \theta_3 PR_{cp} \quad (7)$$

where θ_1 , θ_2 , and θ_3 represent the weights associated with the respective components. According to Crocco *et al.* (2006), the weights are obtained through Principal Component Analysis (PCA), thereby avoiding arbitrary determination and incorporating the existing correlation structure among the indicators.

To refine the sectoral analysis based on the ICn, each CNAE division is associated with a predominant competitive factor, according to the correspondence proposed by Silva (2019) based on the technological and economic criteria of the OECD (1987). The classification comprises five groups: natural-resource-based activities, labor-intensive activities, scale-intensive activities, differentiated goods production, and science-based activities.

Inspired by Pavitt (1984), the OECD (1987) typology organizes industrial activities according to the primary mechanism of competitiveness. These groups reflect, respectively, advantages associated with the availability of natural resources, labor costs, economies of scale, product differentiation, and the incorporation of scientific and technological advances (OECD, 1987, as cited in BORBÉLY, 2004; MONTEIRO NETO; SILVA; SEVERIAN, 2021).

This approach allows the sectoral structure to be linked to the factors that shape the productive and commercial specialization of countries and regions. The classification incorporates aspects such as factor endowments, economies of scale, differentiation, innovation, and the diffusion of research and development, facilitating comparative analyses of patterns of specialization and structural changes across regions (BORBÉLY, 2004; MONTEIRO NETO; SILVA; SEVERIAN, 2021).

The literature presents different applications of this typology. Borbély (2004) combines the OECD classification with Revealed Comparative Advantage indicators to analyze the export specialization of European countries and identify competitive advantages and technological gaps. In Brazil, Monteiro Neto and Silva (2018) regroup the Value of Industrial Transformation according to competitive factors to examine the territorial decentralization of industry and processes of regressive restructuring. Nakabashi, Cruz, and Scatolin (2008), in turn, distribute Brazilian exports across the five groups to assess the effects of exchange rates and interest rates on the level and composition of foreign sales.



For the analysis of productive and commercial specialization, classification by competitive factor proves particularly suitable because it organizes sectors according to the mechanisms that underpin their competitiveness. Unlike classifications by technological intensity, which use technological content as the primary reference, this approach allows activities dependent on natural resources and labor to be distinguished from those supported by scale, differentiation, knowledge, and innovation. Thus, it makes it possible to relate patterns of specialization more directly to the structural characteristics and competitive advantages of each territory (BORBÉLY, 2004; MONTEIRO NETO; SILVA; SEVERIAN, 2021).

3.4 Integration of Indicators and Territorial Analysis

In the final stage, the indicators of complexity, diversity, industrial employment, and productive specialization are examined jointly using descriptive statistics, municipal *rankings*, thematic maps, correlations, and comparative matrices. The objective is to identify patterns of concentration, differences among municipalities, and relative positions within the regional productive structure.

Correlations between complexity, diversity, and employment are interpreted as descriptive associations, without implying causality. Similarly, the indicators of complexity and specialization allow us to characterize structural differences among municipalities but do not directly identify mechanisms of knowledge transmission, cognitive proximity, or related variety.

The combination of the two axes therefore provides complementary dimensions of the productive structure: the ECI characterizes the relative position of municipalities according to diversity and ubiquity, while the ICn identifies the intensity and nature of existing specializations. A joint analysis allows us to examine how different productive configurations are distributed along the Salvador-Camaçari-Feira de Santana axis and to what extent they constitute a heterogeneous and hierarchical regional structure.

4 Territorial Characterization of Economic Complexity and the Regional Development Profile

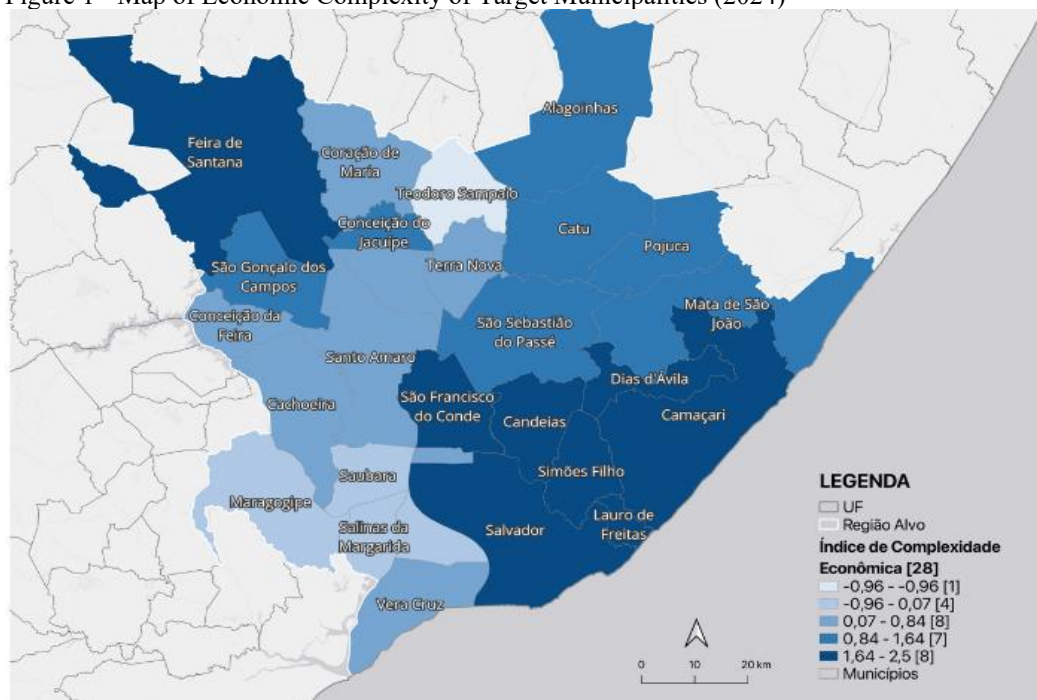
The analysis of economic complexity reveals significant differences between the municipalities along the Salvador-Camaçari-Feira de Santana axis and the rest of Bahia. In 2024, the 28 selected municipalities had an average ECI of 1.021 and an average diversity of 34.4 activities, compared to -0.319 and 24.79, respectively, for the state as a whole. Among the non-prioritized municipalities, the average diversity was 24.10 activities. These results indicate a



higher concentration of diversity and productive complexity in the analyzed territory.

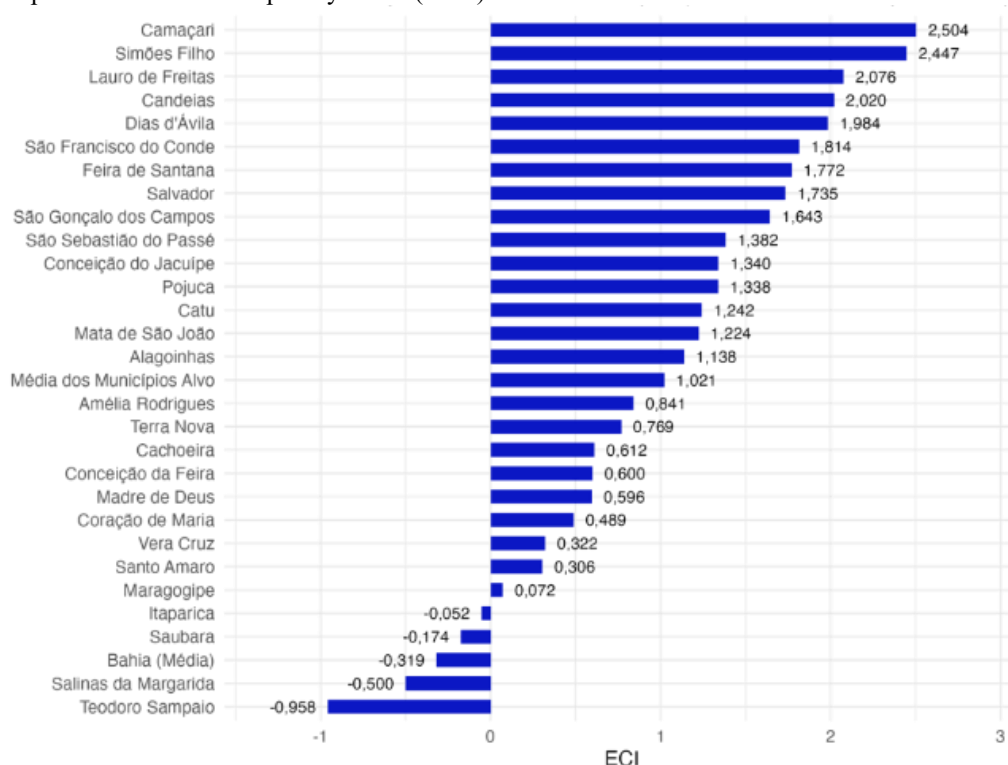
The relationship between the two indicators is also positive. In the selected municipalities, the correlation between complexity and diversity reached 0.619, while for all municipalities in Bahia, it was 0.644. This association suggests that more diversified productive structures tend to exhibit greater complexity. However, diversity and complexity are not equivalent, since the ECI also incorporates the ubiquity of activities present in each territory. The correlations are interpreted as descriptive associations, without implying causality.

Figure 1 - Map of Economic Complexity of Target Municipalities (2024)



Source: Authors' own work based on raw RAIS data (base year 2024), extracted in 2025.

Graph 1 - Economic Complexity Index (2024)



Source: Authors' own analysis based on raw RAIS data (base year 2024), extracted in 2025.

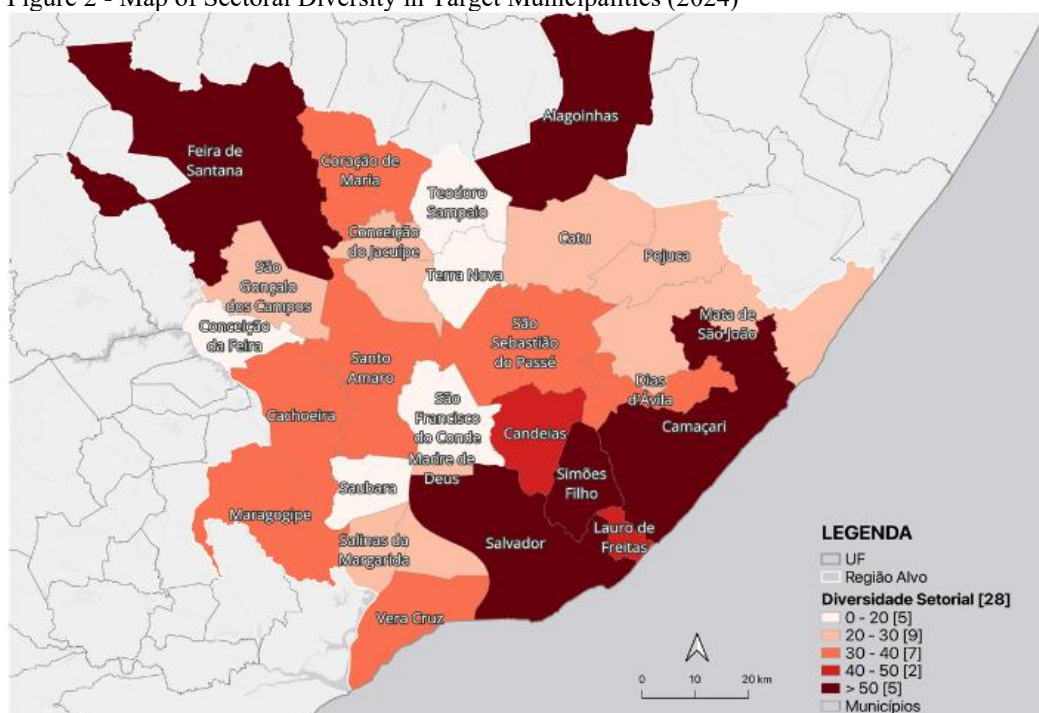
The results reveal, however, that the higher complexity of the region is not evenly distributed among its municipalities. Of the 28 municipalities analyzed, 15 recorded an ECI above 1.0, while only 10 of the remaining 389 municipalities in Bahia reached this level. This distribution points to a concentrated territorial structure, in which highly complex municipalities coexist with

local economies characterized by lower diversity and lower levels of productive sophistication.

Among the most complex municipalities, the following stand out: Camaçari (ECI of 2.504 and diversity of 61 activities), Simões Filho (2.447 and 60), Lauro de Freitas (2.076 and 43), Candeias (2.020 and 47), and Dias d'Ávila (1.984 and 40). The spatial pattern of these results highlights the concentration of more complex productive structures in the metropolitan-industrial area surrounding Salvador, marked by the historical presence of industrial activities, infrastructure, and services associated with production.

At the lower end of the distribution are Teodoro Sampaio, with an ECI of -0.958 and a diversity of 13 activities; Salinas da Margarida (-0.500 and 23); Saubara (-0.174 and 20); Itaparica (-0.052 and 24); and Maragogipe (0.072 and 32). The coexistence of municipalities with such distinct positions within the same territorial area reinforces the hypothesis of a hierarchical regional structure, in which geographic proximity to the main economic centers does not necessarily correspond to similar productive structures.

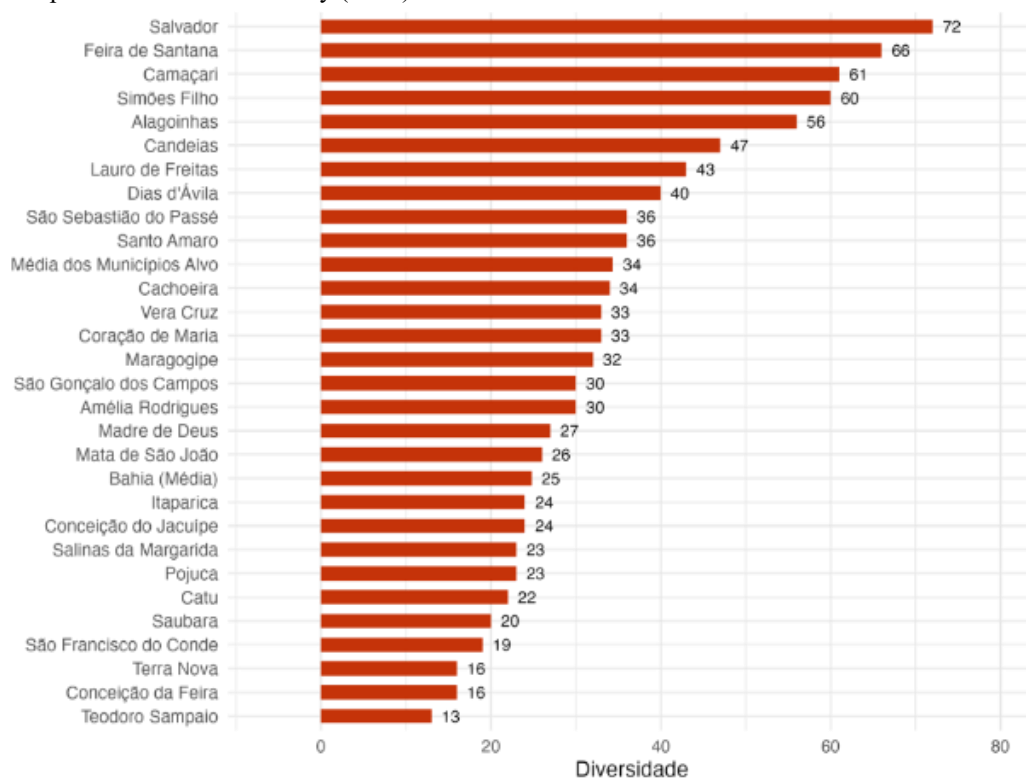
Figure 2 - Map of Sectoral Diversity in Target Municipalities (2024)



Source: Authors' own analysis based on raw RAIS data (base year 2024), extracted in 2025.

The diversity pattern is somewhat distinct. Salvador has 72 activities with a revealed advantage, followed by Feira de Santana (66), Camaçari (61), Simões Filho (60), and Alagoinhas (56). Their respective ECI values are 1.735, 1.772, 2.504, 2.447, and 1.138. This comparison is relevant because it empirically demonstrates that greater diversity does not necessarily correspond to greater complexity. Salvador and Feira de Santana have the most diversified portfolios in the group, while Camaçari and Simões Filho achieve higher levels of complexity with slightly less diversity.

Graph 2 - Economic Diversity (2024)



Source: Authors' own analysis based on raw RAIS data (base year 2024), extracted in 2025.

This distinction between diversity and complexity is consistent with the approach of Hidalgo *et al.* (2007) and Hidalgo and Hausmann (2009): complexity depends on the combination of the breadth of the productive structure and the ubiquity of the activities that comprise it. Thus, municipalities with similar levels of diversity may occupy different positions in the ECI ranking depending on the characteristics of the activities in which they hold a revealed comparative advantage.

The relationship between complexity and industrial scale adds another dimension to territorial heterogeneity. The 28 municipalities analyzed account for 127,552 formal jobs in industry, and the correlation between the ECI and industrial employment is 0.611. The result indicates a positive association between complexity and the scale of industrial employment, although there are significant differences among the municipalities.

Camaçari, Simões Filho, Salvador, and Feira de Santana combine high levels of complexity with a greater presence of industrial employment, consolidating their central positions within the analyzed productive structure. Conversely, Teodoro Sampaio, Salinas da Margarida, and Saubara combine lower complexity with more limited industrial structures. Between these extremes lie municipalities with intermediate configurations, demonstrating that industrial complexity, diversity, and scale are not distributed uniformly along the axis.



The results thus allow us to identify three central characteristics of the regional productive organization. First, the set of 28 municipalities exhibits complexity and diversity that exceed the state averages. Second, this relative advantage is internally concentrated, particularly in municipalities associated with the main metropolitan and industrial centers. Third, diversity, complexity, and industrial employment are positively associated but represent distinct dimensions of the productive structure.

Taken together, the evidence characterizes the Salvador-Camaçari-Feira de Santana axis as a heterogeneous and hierarchical productive structure, in which municipalities with high complexity coexist with local economies that are less diverse and more narrowly specialized. This result reinforces the importance of incorporating, in the next stage, the nature of municipal productive specializations, thereby allowing us to assess whether different levels of complexity are associated with distinct competitive factors.

5 Territorial Characterization of the Predominant Competitive Factor and the Regional Development Profile

The analysis of competitive factors complements the findings on economic complexity by identifying the productive bases in which municipal specializations are concentrated. The normalized Concentration Index (IC_n), calculated based on formal employment in 2024, reveals a heterogeneous territorial structure, in which natural-resource-based and scale-intensive activities are more prevalent, alongside specializations in labor-intensive activities, differentiated goods, and, to a lesser extent, science-based activities.

Table 1 shows that competitive factors are not evenly distributed among the municipalities. Camaçari exhibits greater specialization in scale-intensive activities (IC_n of 1.000), while Conceição do Jacuípe stands out in differentiated goods (1.000). Salvador records the highest IC_n in natural-resource-based activities (1.000). Feira de Santana and Simões Filho, in turn, exhibit specializations distributed across different factors, indicating relatively more diversified structures in terms of their productive bases.

Table 1 - Specialization Index of Prioritized Municipalities by Predominant Competitive Factor

Municipalities	Natural-Resource-Based	Labor-Intensive	Differentiated	Scale-Intensive	Science-Based	Mean
Teodoro Sampaio (BA)	0.559					0.559
Camaçari (BA)	0.372	0.339	0.108	1.000		0.455
Salvador (BA)	1.000	0.517	0.089	0.181	0.019	0.361
Feira de Santana (BA)	0.562	0.314	0.136	0.601	0.134	0.350
Conceição do Jacuípe (BA)	0.031	0.092	1.000	0.205		0.332
Terra Nova (BA)	0.151	0.549		0.185		0.295
São Gonçalo dos Campos (BA)	0.903	0.090	0.002	0.152		0.287
Simões Filho (BA)	0.534	0.226	0.037	0.551	0.002	0.270
Dias d'Ávila (BA)	0.364	0.195	0.008	0.316		0.221
São Francisco do Conde (BA)	0.511	0.121		0.029		0.221
Madre de Deus (BA)		0.310		0.110		0.210
Pojuca (BA)	0.522	0.068		0.032		0.208
Amélia Rodrigues (BA)	0.194	0.099	0.002	0.478		0.193
Santo Amaro (BA)	0.031	0.009		0.505		0.182
Catu (BA)	0.476	0.194	0.001	0.015		0.171
Candeias (BA)	0.080	0.069	0.008	0.523		0.170
Alagoinhas (BA)	0.492	0.151	0.014	0.021		0.169
Conceição da Feira (BA)	0.501	0.007	0.008	0.036		0.138
São Sebastião do Passé (BA)	0.412	0.047	0.009	0.055		0.131
Cachoeira (BA)	0.373	0.001		0.005		0.126
Mata de São João (BA)	0.183	0.143		0.016		0.114
Coração de Maria (BA)	0.093	0.199		0.030		0.107
Lauro de Freitas (BA)	0.152	0.139	0.033	0.136	0.015	0.095
Maragogipe (BA)	0.061	0.008		0.216		0.095
Saubara (BA)	0.040					0.040
Salinas da Margarida (BA)	0.006			0.038		0.022
Vera Cruz (BA)	0.049	0.013	0.000			0.020
Itaparica (BA)	0.014	0.004				0.009

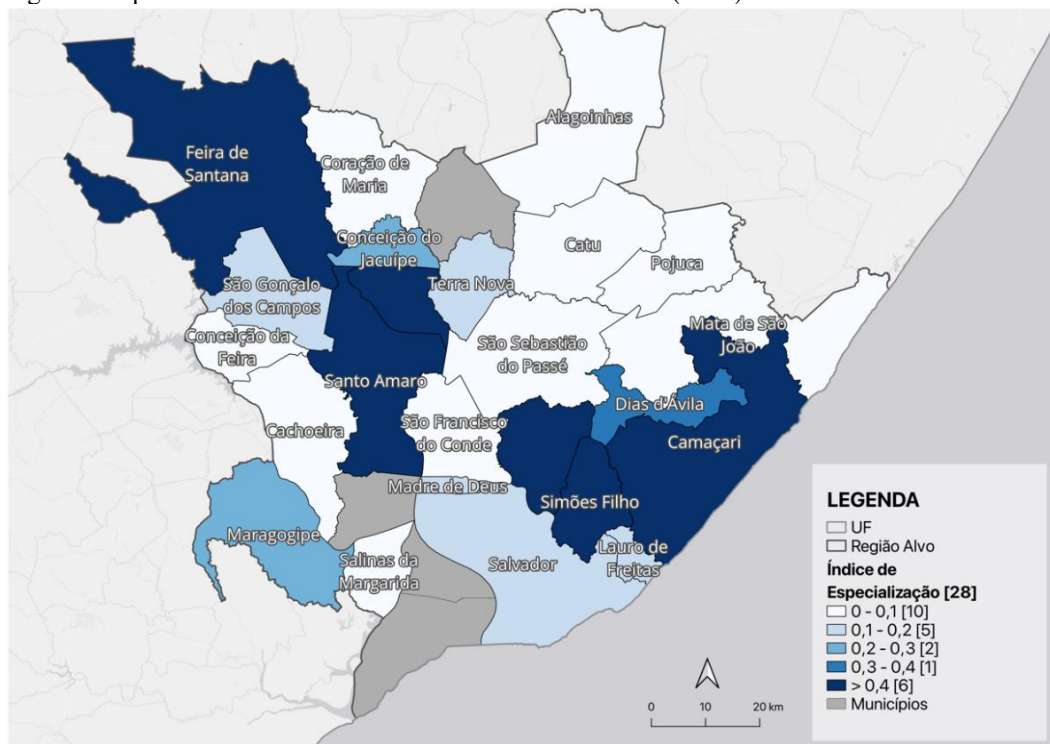
Source: Authors' own calculations based on raw RAIS data (base year 2024), extracted in 2025.

Note: Competitive factors were defined using the sectoral classification proposed by Silva (2019), based on the OECD/Pavitt taxonomy adapted to the Brazilian industrial structure. Activities are grouped into five categories: natural-resource-based, labor-intensive, scale-intensive, differentiated, and science-based.

5.1 Scale-Intensive and Natural-Resource-Based Activities

Among scale-intensive activities, Camaçari, Feira de Santana, Simões Filho, Candeias, and Santo Amaro stand out. Camaçari has an ICn of 1.000 and 12,055 jobs; Feira de Santana, 0.601 and 9,457; Simões Filho, 0.551 and 4,797; Candeias, 0.523 and 1,914; and Santo Amaro, 0.505 and 755 jobs. This distribution highlights the importance of this factor in the industrial structure of the region, particularly in municipalities associated with chemical, metalworking, and paper industries, as well as other sectors characterized by larger-scale production.

Figure 3 - Specialization Indicator for Scale-Intensive Sectors (2024)



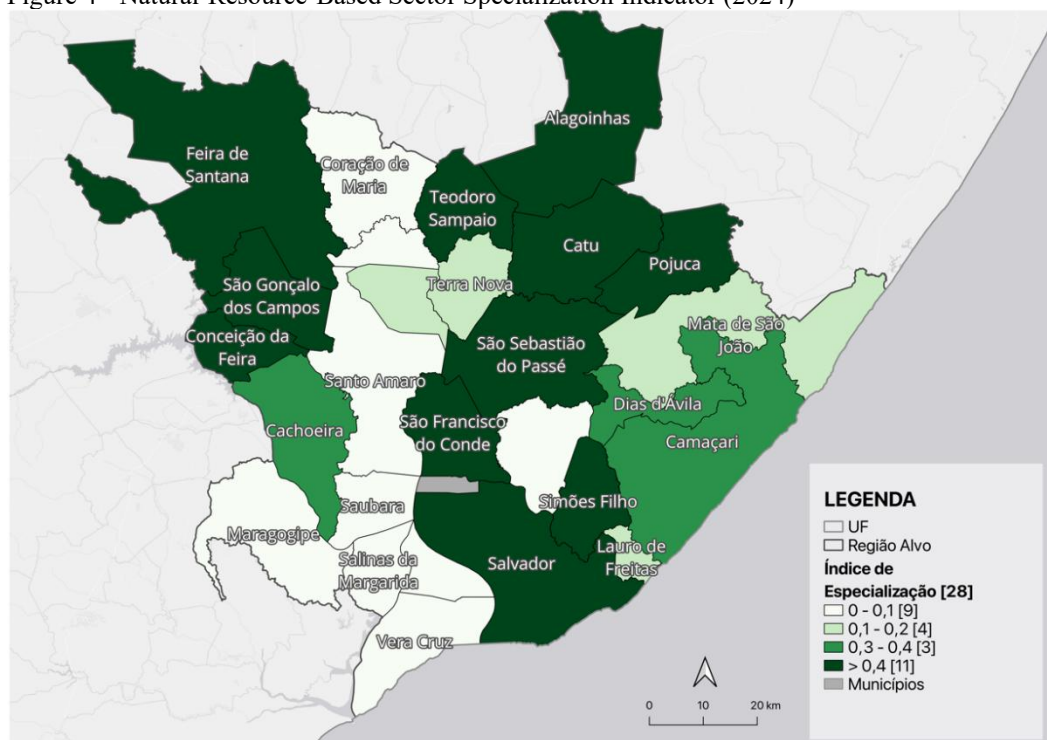
Source: Authors' own analysis based on raw RAIS data (base year 2024), extracted in 2025.

The sector-by-sector breakdown reinforces these differences. Feira de Santana specializes in steelmaking, paper and cardboard, corrugated cardboard, and auto parts; Simões Filho stands out in segments such as hygiene and perfumery, paints and enamels, and shipbuilding; and Candeias is concentrated in chemical activities. These results show that the scale-intensive factor encompasses distinct sectoral structures, although they share characteristics related to the scale of production and industrial organization.

In activities based on natural resources, Salvador, São Gonçalo dos Campos, Feira de Santana, Teodoro Sampaio, and Simões Filho stand out. Salvador records an ICn of 1.000, while São Gonçalo dos Campos reaches 0.903. In the other municipalities, the indicator shows varying intensities, demonstrating the presence of this factor in various parts of the analyzed territory.

The sectoral composition is also heterogeneous. In Salvador, the sector includes the manufacturing of food products and animal feed, as well as activities associated with oil and natural gas extraction. São Gonçalo dos Campos combines meat products and industrial tobacco processing, while Feira de Santana and Simões Filho feature activities linked, among other segments, to food and beverages. Thus, the classification based on natural resources encompasses processing activities with distinct production structures, and not merely directly extractive activities.

Figure 4 - Natural-Resource-Based Sector Specialization Indicator (2024)



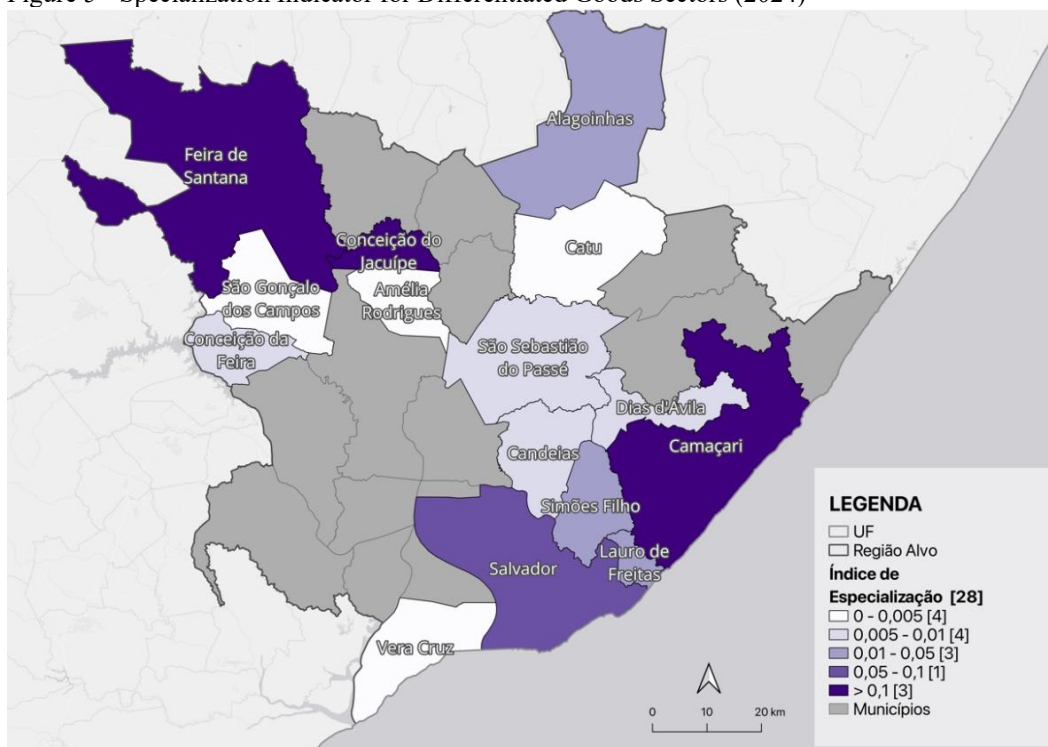
Source: Authors' own analysis based on raw RAIS data (base year 2024), extracted in 2025.

5.2 Differentiated Goods and Labor-Intensive Activities

In the production of differentiated goods, Conceição do Jacuípe shows the highest specialization, with an ICn of 1.000 and 4,921 jobs, followed by Feira de Santana, Camaçari, Salvador, and Simões Filho. In Conceição do Jacuípe, this result is strongly linked to the manufacture of household appliances, which accounts for the municipality's primary specialization in this factor. Feira de Santana also exhibits specializations in lighting equipment and medical, dental, and optical equipment.

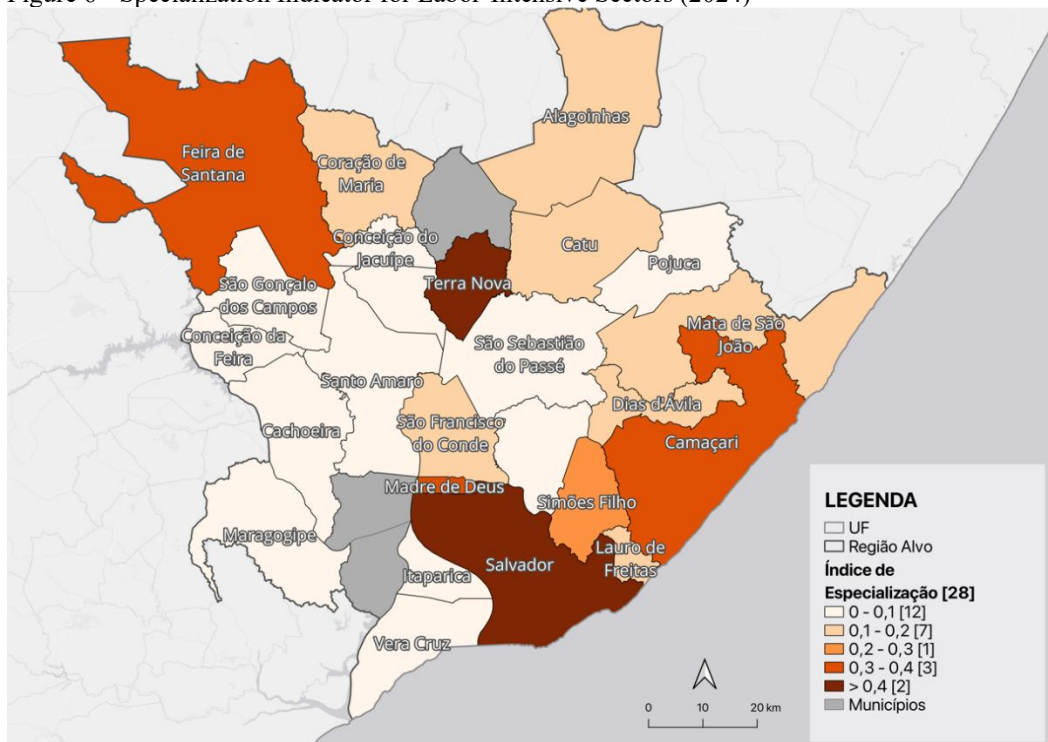
The distribution of labor-intensive sectors reveals a different pattern. Terra Nova has an ICn of 0.549, while Salvador registers 0.517. However, the similarity of the indicators masks significant differences in scale: Salvador accounts for 8,563 jobs in this sector, compared to 466 in Terra Nova. This result illustrates the importance of interpreting relative specialization in conjunction with employment volume, avoiding the automatic association of a high ICn with a larger municipal productive structure.

Figure 5 - Specialization Indicator for Differentiated Goods Sectors (2024)



Source: Authors' own analysis based on raw RAIS data (base year 2024), extracted in 2025.

Figure 6 - Specialization Indicator for Labor-Intensive Sectors (2024)

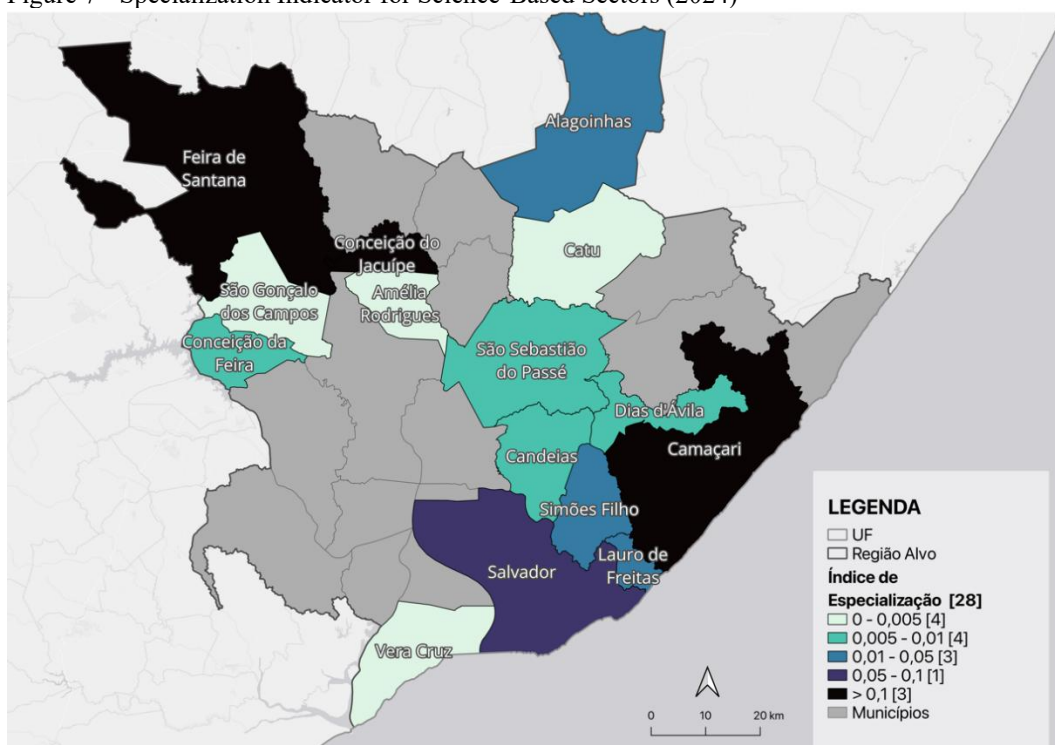


Source: Authors' own analysis based on raw data from RAIS (base year 2024), extracted in 2025.

5.3 Science-Based Activities

Activities classified as science-based are less prevalent in the analyzed set. Feira de Santana accounts for the largest share, particularly in electronic components, where the ICn reaches 0.957, in addition to pharmaceutical activities. Salvador also has activities associated with the electronics sector, but with lower relative intensity.

Figure 7 - Specialization Indicator for Science-Based Sectors (2024)



Source: Authors' own analysis based on raw RAIS data (base year 2024), extracted in 2025.

The limited presence of this factor contrasts with the more widespread presence of scale-intensive and natural-resource-based activities. The results allow us to identify the existence of sectors with higher technological content in specific areas of the territory, but do not, on their own, allow us to conclude that new technology hubs are forming or that future paths of diversification are emerging.

5.4 Specialization and Regional Production Hierarchy

Taken together, the indicators show that the territory's productive structure is organized predominantly around scale-intensive and natural-resource-based activities, complemented by localized specializations in differentiated goods and labor-intensive activities. Science-based activities remain spatially more restricted.

This configuration also highlights that complexity and specialization represent distinct



dimensions. Municipalities with high complexity may exhibit different predominant factors, while high ICn values can occur both in large production centers and in smaller, highly specialized municipalities. Thus, a high ECI does not imply specialization in a particular competitive factor, just as a high ICn does not necessarily imply greater economic complexity.

Camaçari exemplifies the combination of high complexity and strong specialization in scale-intensive activities. Simões Filho combines high complexity with a significant presence of both scale-intensive and natural-resource-based activities. Feira de Santana exhibits high diversity and complexity associated with specializations distributed across different factors. Conceição do Jacuípe, on the other hand, stands out for the intensity of its specialization in differentiated goods, demonstrating that specific specializations can be significant even outside the municipalities that lead the ECI ranking.

This differentiation reinforces the functionally heterogeneous character of the Salvador-Camaçari-Feira de Santana axis. The regional structure is not composed of municipalities that replicate the same production pattern at different scales, but rather of local economies that occupy distinct positions according to complexity, diversity, industrial scale, and the nature of their specializations.

The results are consistent with the interpretation by Diniz (1993), Diniz and Crocco (1996), Saboia (2013), and Monteiro Neto, Silva, and Severian (2021) regarding the spatially selective nature of the distribution of Brazilian industrial activity. In the case analyzed, there is a concentration of productive capacities within the region itself, accompanied by a differentiation in the functions performed by the municipalities.

In summary, the joint analysis of Sections 4 and 5 identifies a regional structure that is both concentrated and functionally differentiated. Camaçari, Simões Filho, Salvador, and Feira de Santana occupy prominent positions due to their combination of industrial complexity, diversity, or scale, but they exhibit distinct bases of specialization. In their surrounding areas, municipalities with lower levels of complexity or more concentrated specializations complete a territorial configuration marked by strong internal differences.

6 Concluding Remarks

This article analyzed the productive structure of 28 municipalities in the Salvador-Camaçari-Feira de Santana corridor, seeking to understand how economic complexity and competitive factors are associated with the regional productive hierarchy. The results confirm the existence of a heterogeneous and hierarchical structure, in which geographically close



municipalities exhibit significant differences in terms of complexity, diversity, industrial scale, and the nature of their productive specializations.

The analyzed group had an average ECI of 1.021 and an average diversity of 34.4 activities in 2024, higher than the values observed for Bahia, which were -0.319 and 24.79, respectively. This relative position, however, is internally unequal. Camaçari, Simões Filho, Salvador, and Feira de Santana occupy prominent positions in the regional productive structure, although they exhibit distinct combinations of complexity, diversity, industrial employment, and specialization.

An analysis of competitive factors adds an important dimension to this assessment. The regional productive structure features a greater presence of scale-intensive and natural-resource-based activities, accompanied by localized specializations in differentiated goods and labor-intensive activities. Science-based activities remain more geographically restricted. The results thus show that complexity and specialization capture complementary dimensions: municipalities with high complexity do not necessarily exhibit the same pattern of specialization, while high concentration indices can occur in productive structures of different scales and levels of complexity.

This pattern highlights that the municipalities along the axis occupy distinct positions within the regional productive structure, combining diverse capabilities, levels of complexity, and specializations. In this regard, regional development policies must take into account the specific productive characteristics of each territory, avoiding one-size-fits-all approaches for structurally distinct realities. This differentiation becomes even more relevant in the recent context of strengthened industrial policies, digital transformation, the energy transition, and productive diversification initiatives, whose effects tend to manifest unevenly across different regions.

The interpretation of these results, however, must take certain limitations into account. The correlations presented are descriptive in nature and, therefore, do not allow for the establishment of causal relationships; furthermore, the RAIS survey covers only formal employment, limiting the observation of activities characterized by higher levels of informality. The study also does not directly measure dimensions such as cognitive proximity and related variety among activities. These limitations point to possibilities for future research, especially through the incorporation of sectoral proximity matrices, time series, and spatial analysis methods capable of examining in greater depth the evolution of productive structures and their territorial interdependencies.

In conclusion, the Salvador-Camaçari-Feira de Santana axis does not constitute a homogeneous productive axis, but rather a territorial configuration with differentiated functions, in which municipalities play distinct roles according to their accumulated capacities and bases of



specialization. Recognizing this territorial architecture is essential for guiding regional development policies capable of combining the strengthening of existing centralities with differentiated strategies for diversification, productive densification, the diffusion of capabilities, and the expansion of possibilities for structural transformation in the municipalities that occupy more peripheral positions in the axis's productive hierarchy.

Referências

- BALASSA, B. Trade liberalisation and “revealed” comparative advantage. *The Manchester School*, v. 33, n. 2, p. 99-123, 1965.
- BORBÉLY, Dora. **EU Export Specialization Patterns of Selected Accession and Cohesion Countries: Tough Competition on the EU15 Market?** Wuppertal: European Institute for International Economic Relations (EIIW), University of Wuppertal, 2004.
- BOSCHMA, R.; MARTIN, R. (Ed.). **The handbook of evolutionary economic geography**. Cheltenham: Edward Elgar, 2010.
- CASSIOLATO, J. E.; SZAPIRO, M.; LASTRES, H. M. M. **Arranjos e sistemas produtivos e inovativos locais: conceitos, políticas e casos no Brasil**. Rio de Janeiro: IE/UFRJ, 2004.
- CROCCO, M. A. et al. Metodologia de identificação de aglomerações produtivas locais. *Nova Economia*, v. 16, n. 2, 2006.
- DINIZ, C. C. Desenvolvimento poligonal no Brasil: nem desconcentração, nem contínua polarização. *Nova Economia*, v. 3, n. 1, p. 35-64, 1993.
- DINIZ, C. C.; CROCCO, M. A. Reestruturação econômica e impacto regional: o novo mapa da indústria brasileira. *Nova Economia*, v. 6, n. 1, p. 77-103, 1996.
- DURANTON, G.; OVERMAN, H. G. Testing for localization using micro-geographic data. *Review of Economic Studies*, v. 72, n. 4, p. 1077-1106, 2005.
- ELLISON, G.; GLAESER, E. L. Geographic concentration in U.S. manufacturing. *Journal of Political Economy*, v. 105, n. 5, p. 889-927, 1997.
- FAGUNDES, M. B. B.; SILVA JÚNIOR, E. de A.; FIGUEIREDO, A. M. R.; MACHADO, J. V. Complexidade econômica regional: uma abordagem a partir de dados de emprego. *Revista de Desenvolvimento Econômico*, v. 2, n. 43, p. 161-181, 2019.
- FORAY, D. **Smart specialisation: opportunities and challenges for regional innovation policy**. Abingdon: Routledge, 2014.
- FREITAS, E. E. **Indústrias relacionadas, complexidade econômica e diversificação regional: uma aplicação para microrregiões brasileiras**. 2019. Tese (Doutorado em Economia) - Universidade Federal de Minas Gerais, Belo Horizonte, 2019.
- GRABHER, G. **The weakness of strong ties: the lock-in of regional development in the Ruhr area**. In: GRABHER, G. (Ed.). *The embedded firm: on the socioeconomics of industrial networks*. London: Routledge, 1993. p. 255-277.
- HIDALGO, C. A. Economic complexity theory and applications. *Nature Reviews Physics*, v. 3, n. 2, p. 92-113, 2021.
- HIDALGO, C. A.; HAUSMANN, R. The building blocks of economic complexity. *Proceedings of the National Academy of Sciences of the United States of America*, v. 106, n. 26, p. 10570-10575, 2009.
- HIDALGO, C. A.; KLINGER, B.; BARABÁSI, A.-L.; HAUSMANN, R. The product space conditions the development of nations. *Science*, v. 317, n. 5837, p. 482-487, 2007.
- HOOVER, E. M. **An introduction to regional economics**. 3. ed. New York: Knopf, 1971.
- ISARD, W. **Methods of regional analysis**. Cambridge: MIT Press, 1960.
- MARSHALL, A. **Principles of economics**. 8. ed. London: Macmillan, 1920.



MASCARINI, Suelene et al. Regional heterogeneity and the effects of the related and unrelated varieties on innovation. **Regional Science Policy & Practice**, v. 15, n. 9, p. 2026-2046, 2023.

MONTEIRO NETO, A.; SILVA, R. O.; SEVERIAN, D. **Brasil, Brasis: reconfigurações territoriais da indústria no século XXI**. Brasília: IPEA, 2021.

MOTA, Mabel Diz Marques. **DINÂMICA ESPACIAL DA ATIVIDADE TECNOLÓGICA NO BRASIL**. 2022. 209 f. Tese (Doutorado em Economia) - Faculdade de Ciências Econômicas, Universidade Federal da Bahia, Salvador, 2022.

NAKABASHI, Luciano; CRUZ, Marcio José Vargas da; SCATOLIN, Fábio Dória. Efeitos do câmbio e juros sobre as exportações da indústria brasileira. **Revista de Economia Contemporânea**, Rio de Janeiro, v. 12, n. 3, set./dez. 2008.

OECD – ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT. **Structural Adjustment and Economic Performance**. Paris: OECD, 1987.

PACHECO, Rubens Mario Ribeiro; DANTAS, Gabriel Jesus dos Santos; MOREIRA, Romilson do Carmo; AZEVEDO, Andréa Silva. Os determinantes do desempenho fiscal dos municípios do estado da Bahia: um estudo econométrico nos períodos de 2018 a 2021. **Colóquio - Revista do Desenvolvimento Regional**, Bento Gonçalves, v. 23, n. 1, 2026.

PAVITT, K. Sectoral patterns of technical change: towards a taxonomy and a theory. **Research Policy**, v. 13, n. 6, p. 343-373, dez. 1984.

PORTER, M. E. The competitive advantage of nations. **Harvard Business Review**, v. 68, n. 2, p. 73-93, 1990.

ROMERO, J. P.; SILVEIRA, F. **Mudança estrutural e complexidade econômica: identificando setores promissores para o desenvolvimento dos estados brasileiros**. Santiago: CEPAL, 2019.

SABOIA, J. A continuidade do processo de desconcentração regional da indústria brasileira nos anos 2000. **Nova Economia**, v. 23, n. 2, p. 219-278, 2013.

SILVA, Raphael de Oliveira. **Transformações recentes da indústria no Sudeste: Evidências da dinâmica produtiva e territorial entre 1996 e 2015**. Brasília: Ipea, 2019 (Texto para Discussão nº 2490)

ZHAO, L.; SUN, J.; ZHANG, L.; HE, P.; YI, Q. Effects of technology lock-in on enterprise innovation performance. **European Journal of Innovation Management**, v. 24, n. 5, p. 1782-1805, 2021.