

BIBLIOGRAPHIC PRODUCTION IN GEOGRAPHY OF INDUSTRY AND PRODUCTIVE SYSTEMS

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Abstract

Productive processes and their relationships with geographic space underwent profound changes in the last decades of the twentieth century, which substantially altered the dynamics of the spatial economy, making them less predictable and more open to thematic and theoretical-methodological changes in studies in the Geography of Industries. Given those transformations, this paper represents an effort to outline the recent bibliographic production in the Geography of Industries in Brazil, within the context of the greater dissemination of knowledge through information technologies, the consolidation of traditional study centers and the expansion of postgraduate programs in Geography. The database was created using the Google Scholar Platform, including the publications of 60 postgraduate Geography programs from the period between 2005 and 2016. We attempted to capture and analyze subthemes, lines of interpretation, authors, published papers, citations, and research centers on the Geography of Industries and productive systems. The results point to the increased diversity of the research lines and thematic cuts, the consolidation of new theoretical influences and the greater participation of the Brazilian regions in the bibliographic production on the theme.

Keywords: H index, Graduate programs in Geography, Geography of Industries, Brazil.

Resumo / Resumen

PRODUÇÃO BIBLIOGRÁFICA EM GEOGRAFIA DA INDÚSTRIA E DOS SISTEMAS PRODUTIVOS

Os processos produtivos e suas relações com o espaço geográfico passaram por profundas alterações nas últimas décadas do século XX, que alteraram substancialmente as dinâmicas da economia espacial, tornando-as menos previsíveis e cada vez mais abertas a mudanças temáticas e teórico-metodológicas nos estudos sobre Geografia das Indústrias. Ao considerar essas transformações, este artigo se constitui num esforço para delinear a produção bibliográfica recente da Geografia das Indústrias no Brasil, no bojo da maior disseminação do conhecimento graças às tecnologias da informação, consolidação de centros de estudos tradicionais e expansão de programas de pós-graduação em Geografia. O banco de dados foi montado a partir da Plataforma Google Acadêmico, sendo levantadas publicações dos 60 programas de pós-graduação em Geografia, entre 2005 e 2016. Buscamos capturar e analisar subtemas, linhas de interpretação, autores, trabalhos publicados, citações e centros de pesquisa sobre Geografia das Indústrias e sistemas produtivos. Os resultados mostram a maior diversidade das linhas de investigação e recortes temáticos, a consolidação de novas influências teóricas e a maior participação das muitas regiões do país na produção bibliográfica sobre o tema.

Palavras-chave: Índice H, Pós-Graduação em Geografia, Geografia das Indústrias, Brasil.

PRODUCCIÓN BIBLIOGRÁFICA EN GEOGRAFIA DE LA INDUSTRIA Y SISTEMAS DE PRODUCCIÓN

Los procesos productivos y sus relaciones con el espacio geográfico han venido experimentando cambios profundos desde finales del siglo XX, los cuales han modificado de forma significativa las dinámicas de la economía espacial, haciéndolas menos previsibles y cada vez más abiertas a nuevas temáticas y perspectivas teórico-metodológicas en los estudios sobre Geografía de las Industrias. Este estudio tiene en cuenta tales modificaciones y busca delinear la reciente producción bibliográfica sobre la Geografía de las Industrias brasileñas, en el seno de la mayor diseminación del conocimiento gracias a las tecnologías de la información, consolidación de los centros de estudios tradicionales y expansión de los programas de posgrado en Geografía. La base de datos fue creada a partir de la Plataforma Google Académico, seleccionando las publicaciones de los sesenta programas de posgrado en Geografía entre 2005 y 2016. Al revisar los trabajos, buscamos capturar y analizar subtemas, líneas de interpretación, autores, citas y centros de estudios sobre Geografía de las Industrias y sistemas productivos. Los resultados permiten observar una mayor diversidad de las líneas y temáticas de investigación, la consolidación de nuevas perspectivas teóricas y una mayor participación de regiones más periféricas en la producción sobre el tema.

Palabras-clave: Índice H, Posgrado en Geografía, Geografía de las industrias, Brasil.

INTRODUCTION

In recent decades, the dynamics surrounding industrial production have undergone significant transformations. Among other factors, this was due to the need companies have to overcome the instabilities of productive markets, resulting in attempts to reduce costs through technological innovations, the reengineering of production, and economic deregulation. These modifications are linked to territorial and productive restructuring, whose impacts stimulated the flexibilization of production, the increase of subcontracting in labor relations, the functional disjunction in industry and the amplification of productive and consumption spatial circuits.

All these changes have shaped the bases of the current bibliographic production on the Geography of Industries and productive systems, reinforcing the elaboration of diverse questions about the operation of manufacturing activities and their spatial logic.

This study is an attempt to apprehend and systematize the bibliographical production on the subject in Brazil, in the scope of the consolidation of traditional study centers and the creation of new postgraduate programs in Geography. Our objective is to understand the geographic reach and the development of the research on the Geography of Industries, as well as its thematic subdivision, the authors and postgraduate programs that publish on the subject and the main lines of interpretation and theoretical-methodological tendencies used.

Between 1930 and 1990, much of the geographic knowledge produced in Brazil was concentrated in institutions such as USP, IBGE, UFRJ, UFPE, and UNESP Rio Claro, which circulated their work in renowned publications in the period, such as the *Revista Brasileira de Geografia* - RBG, the *Boletim Paulista de Geografia* - BPG and the *Boletim de Geografia Teorética*. Nowadays, times are different because information technologies have contributed to greater dissemination of knowledge. In addition to having expanded significantly, periodicals and books are available in digital format, facilitating the propagation and exchange of information between different postgraduation centers. Technology has also allowed the formation of networks and research partnerships.

The organization of this text respects this division; hence, our study of the bibliographic production of industrial production processes considers two periods. The first, when most authors and published works gravitated around a few spatially centralized institutions; and subsequently the period from the beginning of the twenty-first century, when the broad opening of postgraduate programs in the Brazilian territory dispersed the "place of speech," and the distribution of research and researchers extrapolated geographical limits.

Considering this systematization, we initially carried out a bibliographical survey of the period from 1930 to 1990, with an emphasis on identifying authors, themes and the theoretical-methodological linkage of industrial studies in their relationship with space. Works published in the *Revista Brasileira de Geografia* - RBG were analyzed, as it is the main source for the dissemination of texts on the subject, as well as classical works that contributed to the consolidation of the Geography of Industries in Brazil.

Then, using a database and information assembled from the Google Scholar Platform¹, the period between 2005 and 2016 was selected to identify and analyze subtopics, lines of interpretation, authors, published works, citations and research centers on the Geography of Industries and productive systems². The result is a substantial set of indicators organized in the form of tables and maps, which permit a reading of the current production of industrial geography in Brazil, its permanence and modifications, scope, and institutional limitations. From the large volume of information provided by the database, authors who have published one to three texts have been selected, who work in some way on themes related to industrial production processes or their production and circulation circuits³.

The analysis includes a total of 59 authors, 94 texts and 1,284 citations, all linked in some way to the theme of the Geography of Industries and productive systems. It indicates the participation of 34 of the 60 postgraduate Geography programs in Brazil, where there were researchers or references related to industrial studies, together with their respective citations.

The treatment of these data helped develop some interpretations of the changes or permanence of the bibliographic production on the subject under analysis, as well as the authors' profiles, the characteristics of the texts and the geographical concentration / deconcentration of the published and cited works. The results aim to assist in the many possible interpretations of the Geography of Industries

and productive systems in the Brazil of the twenty-first century, in an attempt to stimulate the production of more research to add other perspectives to those disclosed here.

INDUSTRIAL STUDIES IN ECONOMIC GEOGRAPHY: THE TRADITIONAL BIBLIOGRAPHIC PRODUCTION

Understanding the academic production within the Geography of Industries in Brazil requires, first, an understanding of the systematization of this sub-area in Economic Geography and the evolution of its theoretical-methodological tendencies. With this in mind, below, there is an outline of the main theoretical tendencies in this disciplinary field to then comprehend their role in the bibliographical production of Brazilian Geography.

The Evolution of Approaches in Economic Geography

The origin of the studies in Geography of Industries is confused with studies in Economic Geography, whose systematization goes back to the turn of the nineteenth to the twentieth century. It began as a subarea concerned with the investigations of location factors in space. According to Méndez (1997, p. 13), the first works were characterized by "a strong descriptive and enumerative character, priority was given to activities more related to natural resources, the influence of environmental determinism and historicism in their explanations, as well as an explicit departure from economic theories."

Capel (1984, p. 86) emphasizes that these studies, influenced by natural sciences and historicism, presupposed that "physical and biogeographic factors, as well as historical ones, were generally used to explain the problems of location and development of economic activity." The author also points out that economic issues were addressed within the framework of country descriptions, especially in the manuals published at the time, bringing Geography closer to statistics. It was not uncommon for Economic Geography conferences to be associated with geomorphology, geology or hydrology, demonstrating the interest in understanding the impact of these geographic elements on circulation and trade.

Interest in the flow of production and trade led to the development of Commercial Geography, which comprised what is currently called Economic Geography. Claval (2012, p. 8) states that "this economic geography established relationships with geology and agronomy but completely ignored spatial economics." However, Capel (1984) asserts that the contact between Geography and spatial economy existed, even if sparsely, mainly in the works of English and German researchers, notably Halford Mackinder and Wilhelm Götz. Thanks to this contact, the emerging Economic Geography started to use terms such as "nodality" and "distance factor."

The first renewal of these studies occurred around the 1920s with the introduction of regional and landscape concepts, concerned with understanding human problems through the introduction of social and economic science methods. As Capel (1984) points out, these studies sought to highlight the influences of the economic spirit of each people on the types of work and economy on spatial organization; the contributions of the Germans Alfred Rühl and Leo Waibel are noteworthy. Thus, "economic geography was placing an increasing emphasis on economic landscapes while affirming the importance of economic forces in the modeling of these landscapes." This was especially the case when dealing with "the reciprocal relations between two elements: nature and the physical environment on the one hand, and on the other, the economic activity directed to the production and consumption of the material means that are directed to the satisfaction of human needs." (CAPEL, 1984, p. 91).

Geography's preoccupation with economic phenomena has been resisted, especially in France. Capel (1984, p. 93) affirms that "the weight of Vidal de la Blache's teaching, which gave special attention to cultural facts and 'civilization,' led to a devaluation of economic aspects and considered this branch as secondary or merely as non-geographical." Nevertheless, as early as the mid-1940s, Human Geography began to emphasize issues related to agricultural and industrial production, also highlighting urban, trade, and distribution themes. The primacy of economics occurred with the entry of Marxists into the academic environment, such as Pierre George, who proposed analyzing man as a producer and consumer, differing from the historicist bias.

Capel (1984, p. 97) points out that Pierre George's disciples, among them Bernard Kayser, Michel Rochefort, and Yves Lacoste, contributed to the consolidation of the primacy of the economic, accompanied by "great attention to social phenomena, the study of man as a producer and his action in the organization of space." These authors carried out studies that helped to understand the urban organization of regional spaces, spatial planning, the organization of industrial regions, and the role of economic relations in the structure of the agricultural landscape. For Capel (1984, p. 98), "little by little, in the 1960s, the primacy of the economic in the organization of space was accepted from very different theoretical and ideological positions."

The post-war economic boom in Europe and the United States, provided by the Fordist society of consumption and mass production, was accompanied by the deepening of spatial disparities. For Scott (2003, p. 21), "problems of location, spatial development, transportation, and so on had now become of major significance in the sense that they were raised to a new scale of intensity in Fordist economic systems, and were important objectives of governmental action." The author highlights the role of William Garrison, who developed research related to spatial analysis, including land use patterns, industrial location, central place systems and urbanization, and transport networks, among others. Similarly, Walter Isard sought to contribute to the construction of a hybrid discipline, containing economic and geographic elements, in reconstructing the theory of economic equilibrium in spatial terms.

Mendez (1997, p. 14) states that Economic Geography "claimed as its own those contents related to the theory of location, regional growth and urban economics [...] from a practical concern closely related to its use as a foundation for regional planning." The same is true of Scott (2003, p. 22), when he reports that "spatial analysis and regional science tended to merge together to form an intellectual amalgam focused on identifying the regularities of the neoclassic economy." At this time researchers of spatial and regional analysis emphasized ideas from Germany and France, especially those influenced by localization theory (Christaller, Hoover, Palander, Von Thünen, and Weber) and the analysis of the poles of growth and development (Perroux, Ponsard, and Boudeville).

Thus, "the 1960s represented a substantive change in the relationship between economics and geography, marked by an approximation that began with the development of the regional economy." (MENDEZ, 1997, p. 14) According to Claval (2005, p. 17), "economics and geography dealt with the same problems, and geographers took much of their inspiration from models developed by spatial economics and macroeconomics." This closer attention to economic theories resulted from several factors, including the uncertainties regarding empirical descriptions, the excess of naturalistic explanations and the importance of regional development (CAPEL, 1984). This resulted in Economic Geography achieving a substantial role in the elaboration and implementation of public policies; these new approaches predominated in the 1960s.

The influence of economics in Geography was so significant that many works were labeled as economics, and there was a call for a more geographic Economic Geography. Manzagol (1985) was one of the authors who wrote about the prevalence of the assumptions of spatial economics (atomized society, rational man, perfect information and isotropic space) and was harshly criticized by the behavioral and Marxist approaches of the 1960s and 1970s. For these lines, it was necessary to guide research to analyze agents' decision-making and the logic of capital and its spatial development.

Geographers from a behavioral perspective (Alan Pred, John Rees) stressed the incapacity of spatial economics to describe the locational behavior of modern industries and the perspective of undifferentiated space. Behavioralists proposed the study of agents' decision making, influenced by the context (preference, external environment, and experiences), in a scenario of uncertainty and imperfect information (AZZONI, 1982). Scott (2003, p. 24) draws attention to the new theoretical-methodological arsenal of Behavioral Geography, whose emphasis is on limited rationality and the forms of satisfaction of decision-making. Economic agents make decisions in a concrete geographical situation, in a condition close to two continuums, firstly, the quantity and quality of information available and, secondly, the capacity to make use of the information.

In the late 1960s and early 1970s, the crisis of Fordism in central countries, accompanied by rising unemployment and inflation, and the civil rights movements, among other factors, led to a critique of capitalism in various disciplines. Scott (2003, p. 25) states that "the insistent methodological

individualism of the dominant forms of economic geography was clearly inadequate to the task of dealing with the grand structural forces that seemed to lie behind these developments."

From this moment on, research has tried to show that the processes of accumulation and related social structures have created and recreated geographic realities, indicating that space is not only organized, but it is also the product of social relations and class interests. According to Méndez (1997), there was a quest for the geographic reconstruction of the capitalist mode of production, and studies attempted to read the spatial organization of economic systems over time in the light of systems theories and structuralism.

Within this new analytical framework, work proliferated on the urban organization of regional spaces, the different aspects of industrial regions, the territorial division of labor, the role of corporations, and territorial management. Analyses of capital segments showed the different location strategies, in the various scales, in light of the workforce and the circuits inside the area. This period studied the relationship of industrial complexes with the urban and with the center-periphery approaches, to show a territorial division of labor in several levels.

Scott (2003) identifies three notable groups: (1) Anglophone geographers and French Marxist urbanists, who sought to understand the logic of urban space under capitalism, by analyzing land income, housing supply, and urban planning; 2) researchers concerned with poverty, job loss, de-industrialization, and productive restructuring; and 3) scholars of unequal development on various geographical scales, intersecting with earlier studies of circular and cumulative causation and approaches to unequal exchange.

According to Claval (2005), not only was there widespread acceptance of the supremacy of economic phenomenon, but also the contemplation of themes related to social phenomena and the study of man as a producer and organizer of space. In the late 1970s, criticisms of the prevalence of economic language under the structuralist bias increased. Scott (2003, p. 26) points out that "deep concern was expressed by many geographers about what was felt to be the structuralist and economic turn of the discipline." Criticism revolved around the understanding of spatial forms as an immediate result of macroeconomic structures. The background to this criticism lay in the inability of Marxist political economics to treat human subjects, with their intentionality and sensitivity, to be open to a variety of political experiences and forms of action.

This critique of Marxist political economics found support in the agency-structure theory, which advocated the need to maintain certain structural determinations simultaneously with a more significant role of human agency. It is within this context that studies of localities in England in the 1980s emerge, of which Doreen Massey's studies of gender and social class are a high point. They sought to show the variation of the political and concrete meanings of an area depending on the historical and geographical circumstances. According to Scott (2003), spatial-economics studies, influenced by a realistic epistemology, drew attention to the contingent circumstances and the unique and varied responses of localities to the economic crisis.

The study of the restructuring of the capitalist system and its geographical implications was echoed not only in local studies in England but also in the United States, Italy, and France. In the late 1970s and early 1980s, amid the crisis of Fordism, there was a resurgence of investigations into regional economies peripheral to the Fordist regime. These regions exhibited high levels of spatial agglomeration, local networks, and innovation, among others. Allen Scott outlined four resulting research groups in Economic Geography: 1) the Italian School, with the resumption of studies of industrial districts, marked by a neo-craft production; 2) the California School, with its concerns about vertical disintegration, transaction costs, local labor markets, and so on; 3) the European Research Group on Innovative Environments (GREMI) and its concern about innovation embedded in local economic and social relations; and 4) ideas about Flexible Specialization, with its paradigm of the organizational renewal of production.

According to Méndez; Caravaca (1996), Economic Geography underwent a reconversion marked by the renewal and recovery of research themes, with some notable lines of investigation such as Marshallian industrial districts, innovative means, productive restructuring, economic globalization, urban changes and regional levels of industry and labor market developments. Scott (2003, p. 33) states that the studies show, on the one hand, the interest in economic globalization (international division of

labor, multinational corporations) and, on the other hand, the role of regions as a source of competitive advantage in the globalized world. The new studies also reveal the importance of culture, conventions, regulatory institutions, learning processes, and innovation, among others, positioning the approach in an institutionalist and evolutionist epistemological perspective.

THE TRADITION OF BRAZILIAN BIBLIOGRAPHIC PRODUCTION IN THE GEOGRAPHY OF INDUSTRIES

The first identified studies of the Geography of Industries in Brazil (MELO, 1954; CAMPOS, 1955) date back to the 1950s and were concerned with the geographical causes of industrial development. Despite the emphasis on the natural elements (climate, soil, geographic position) and their impact on companies' location, the works analyzed the reciprocal influences between the physical elements and economic activity destined to the production and the consumption of material resources to satisfy human needs. They are descriptive and historicist studies that enumerate the natural and socioeconomic factors responsible for the existence and location of productive activity, without major causal relations. These works are part of the movement renewing traditional industrial geography when the naturalist approach lost ground to socioeconomic approaches of landscapes and spatial organization.

Also, in the 1950s, two other works were concerned with understanding this phenomenon. The first dealt with the evolution of industrial activity (dispersion and concentration) according to the expansion of the city of Salvador (SANTOS, 1958), distinguishing the size and genus of the industry. It ended by proposing some areas of factory production that could be considered in the municipal zoning laws of urban space. Although there was an interest in understanding the interrelationships between the economic and the urban, the study's approach was still descriptive in nature. The second work (GEIGER, 1956), in turn, was a transition from classical studies addressing industry and spatial organization, due to a concern with both classical locational factors (physical and socioeconomic) and productive manufacturing activity and the more general processes of urbanization and industrialization.

Until the end of the 1950s, the Geography of Industries studied productive genres (ceramics, sugar mills) or the evolution of the sector, having a spatial cut at the national, regional and local scale. The link with the processes of industrialization and urbanization was present in the works from the end of the decade, at the time when industrialization started, with the installation of intermediate goods and capital goods production units, and the deepening of Brazilian urbanization. At the heart of this process, industry became more complex and exhibited a spatially differentiated aspect, as it was unevenly distributed and played an increasing role in the organization of urban and regional space.

In the 1960s, studies (GEIGER, 1963; DAVIDOVICH, 1966; MAGALHÃES, 1966) emphasized the importance of industry in organizing urban and regional space, by prioritizing the unequal distribution of investments and technology in space. They also sought to understand the role of this economic sector in the integration of the different regions of the country. The studies showed the importance of physical factors, but economic factors prevailed as explanations of the organization of space, especially the idea of a territorial division of labor that portrayed relationships of complementarity and subordination between areas; the use of terms such as a satellite city became common. On the urban scale, the studies emphasized the logic of the location of factories according to branches and the origin of the capital.

This predominance of the importance of the economic dimension in the organization of space did not eclipse other approaches, including traditional ones. Studies exist on the spatial location of industries in the state of Goiás (STEFFAN, 1967) and the sectoral concentration patterns and main problems faced by companies, as well as the industries of Blumenau (MAMIGONIAN, 1965), showing their structure, the size of companies, and the control of capital and material and immaterial flows at different scales. The latter brought together the contributions of the traditional Geography of Industries and the behavioral approach (the role of the immigrant and *savoir-faire* in the implantation of industrial activity and locational choices). A similar concern with the role of immigrant business people was present in the study of the installation of the textile and clothing industry in Petrópolis (MAGALHÃES, 1966).

During the 1970s, there was a remarkable increase in the number of papers on the subject and a broader theoretical-methodological spectrum, which included analyses of the spatial organization of production, regional science (Walter Isard), technological poles, and State and industrial policies. Some studies have reviewed these perspectives (BECKER; BERNARDES, 1979), showing their use in explaining the processes of urbanization and industrialization, as well as the different approaches in industrial geography and the problem of selecting appropriate variables for interpretation (SAMPAIO, 1975). This quantitative and qualitative range of studies has to do with the growth of industrialization in the country, with greater State participation in the development of productive forces and the concern about the uneven distribution of industrial production.

In the same decade, some papers addressed the complexity of the country's spatial structure (BECKER, 1972; GEIGER, DAVIDOVICH, 1974; GEIGER, 1976), sharing the idea that industrialization led to the formation of a center-periphery type spatial structure, with hierarchically interconnected spaces, according to existing productive activities and their variations (size, technology, capital). These studies showed the role of drainage of resources exerted by the main urban centers and their capacity to act as knots in the system in the generation of innovation. Industrialization and urbanization have resulted in problems of regional inequality present at the macro, intermediate, and micro scales. This process was uneven and combined (GEIGER; DAVIDOVICH, 1974), because the spatial structures were reworked and, at the same time, they demonstrated the force of their permanence. The focus was not guided by the organization of space, but by the production and reproduction of spatial structures.

Other works followed the orientation of regional science (TOLOSA, 1974; OLIVEIRA, 1976; MOLD, 1977), elaborating and testing localization models in the manufacturing industry associated to the characteristics of cities, models of optimal company location (minimization of transport costs), diversification models and urban-regional specialization and development of public policies, and standards and measures to define the size of industrial plants. These studies used mathematical language and highly questionable assumptions, such as the rationality of economic agents, perfect information, isotropic space, utility value, and balance, among others. Only one paper emphasized the importance of culture in industrial decisions (CHANG, 1978), while others dealt with industrial structure, flows, production / consumption, and the value of industrial transformation (JATOBÁ, 1977). Studies with similar characteristics, but linked to the perspective of regional development, developed a methodology for the identification of development poles, including locational strategies and consolidation patterns of large centers and concentrated dispersion (FAISSOL, 1972; ROCHA, 1975; PORCARO, 1977). They analyzed the implantation of districts and studied disaggregated industrial employment data, indicating that economic growth was concentrated in growth poles (urban centers), from where it spread to the rest of the economy.

In the 1980s and 1990s, the number of papers on industrial geography declined, perhaps due to the economic crisis and the dismantling of state planning. The texts sought to understand the logic of deconcentration of industrial activities between the main metropolitan urban centers and the intra-metropolitan spatial distribution (ROCHA, 1980; RIBEIRO, ALMEIDA, 1980; GEIGER, 1982; RIBEIRO, 1982; RAMIRES, 1989). They showed that internal differentiations were detectable in each macro-region and that there were sectoral and spatial changes in industry, with capital movements tending to produce a hierarchical spatial organization with a complex division of labor. Other works dealt with the requirements demanded by companies for the admission of labor or the reversal of the polarization of urban population growth rates and productive spatial changes.

In sum, the traditional production of knowledge in the Brazilian Geography of Industries has two distinct subperiods. There were few studies before the mid-1950s, most of them characterized by descriptive methodologies and an analysis of the main factors of location. From the mid-1960s, the approaches understood industry as a factor of organization of geographical space and regional development, with studies dealing with the relationships between industry and the city (industrial complexes, macro-region), the role of industry in spatial planning, industry and regional development, and others. From a theoretical and methodological point of view, two approaches have emerged, namely: 1) regional science, under the perspective of polarization (Perroux) and drivers (Walter Isard); and 2) the systemic and structuralist perspectives, with their studies on the center-periphery relationship and uneven and combined development.

RECENT BIBLIOGRAPHIC PRODUCTION: THE GEOGRAPHY OF INDUSTRIES IN TWENTY-FIRST CENTURY BRAZIL

Many changes marked the production of space and defined the organization of the Brazilian territory at the beginning of the twenty-first century. The territorial division of labor in the country has gained complexity, and the movements of productive deconcentration and centralization of capital (LENCIONI, 2005) imply a greater dynamism of material and immaterial flows, resulting in urban-regional restructuring and the reorganization of the roles of regions and cities.

The opening of the frontiers of productive expansion in various parts of the country and the new regional reach of industrialization, coupled with the expansion of modern agriculture in the Northeast and Centre-West and the construction of large technical structures (such as the hydroelectric power plants in the Amazon) have impacted on the spatial distribution of objects and actions in the territory. Also, the redefinitions imposed on the traditional production processes, which have permitted functional disjunctions, or the importance given to numerous non-industrial activities have deepened the complexity of the interpretation of economic processes.

Given this context, have there been changes in the bibliographic production on the topic of the Geography of Industries in Brazil? Is there a thematic diversity in this production, accompanying the multiplicity of phenomena incorporated into traditional production processes? Moreover, have the theoretical perspectives of this interpretation changed, or do the standards outlined in the previous item still apply? Also, do the authors and works cited continue to respect the classic environments or working groups that provided the rich traditional interpretation? Has the expansion of the frontiers of productive dynamism led to a spatial expansion of intellectual production on the subject, considering, above all, the growth of postgraduate programs in states or municipalities where they did not exist until the beginning of the twenty-first century?

The subitems below seek to interpret the unfolding of the relationship between industry, territory, and production systems in Brazil and try to answer these questions, always taking into consideration the methodological option of the publications cited by authors of postgraduate programs in Geography between 2005 and 2016.

An analysis of the bibliographic production by themes and the evolution of the approaches to the relationship between space and industrial activity

As detailed above, traditionally, working on industrial activity in Geography meant drawing up long descriptions of the impacts of manufacturing establishments on the landscape, or developing interpretations of the locational factors responsible for making a company's installation more effective in one area or another. Despite the exacerbated empiricism of the first approach, often from a naturalistic perspective, the inertia of studies based on a paradigm of the equilibrium of market forces did nothing more than design isotropic productive spaces in a world of perfect competition.

One of the first differences of the bibliographical production on the Geography of Industries between the end of the twentieth century and the beginning of the twenty-first century was the overcoming of these limitations. As a result of the incorporation of new theoretical influences in Geography in general, and in Economic Geography in particular, methods and themes linked to a Marxist, Schumpeterian, Keynesian and humanist / culturalist tradition have emerged (MARTIN, 1994; BENKO, 2008; BARNES, 2009). This movement was forged in the 1980s, just as the reading of industrial spaces began to materialize new phenomena, such as new productive strategies, information flows, networked competitive interactions, and flexibility in labor relationships.

In Brazil, many authors pioneered these changes (SPOSITO, 1996, 1999; BACELAR, 2000; LENCIONI, 1994, 2003, 2004; LIMA, 1994; SAMPAIO, 2009), especially when working in more detail on these transformations in their research. The fact is that they were initiating studies that would expand in the late 1990s, in particular by considerably broadening the range of geographical interpretation of the industrial phenomenon. Topics such as productive and territorial restructuring, technological and

information poles, and localized industrial systems, among others, have gained strength, mainly from research in postgraduate programs, in full expansion. Table 1⁴ portrays some of the introduction of this movement, from the earlier publications of authors whose works were subsequently repeatedly cited from 2005 to 2016 (Sandra Lencioni, Tânia Bacelar, Zenilde Baima Amora, Luiz Cruz Lima, Mónica Arroyo, Denise Elias, Olga Firkowsky, and others).

However, the most relevant result presented in Table 1 is the unfolding of studies incorporating these new sub-themes, revealed by the significant number of researchers, published works and citations on a variety of issues involving the most recent productive spatial relationships (in total, as already stated, 59 authors, 94 papers and 1,284 citations were considered). The selected sub-themes were: "Territorial and productive restructuring", "Technological poles, innovation, and information flows", "Productive agglomerates and localized systems", "Industrial policies", "Productive activities, regionalization and urbanization", "Agroindustrial complexes and networks", "Extractive, naval and construction industries and impacts on the territory" and "Other possibilities of intersection".

Themes	Number of Authors	Number of papers published	Number of citations
Territorial and productive restructuring	11	15	224
Technological poles, innovation, and information flows	3	3	20
Productive clusters and localized systems	4	7	75
Industrial policies	2	4	148
Productive activities, regionalization and urbanization	9	11	195
Agroindustrial complexes and networks	16	28	410
Extractive, naval and construction industry and impacts on the territory	14	19	132
Other possibilities of intersection	4	7	80
Total	63 ¹	94	1,284

Table 1 - Number of authors, published papers and citations by sub-themes in the Geography of Industries (2005/2016)

Source: Google Scholar. Database assembled with citations between 2005 and 2016 of authors linked to Postgraduate Programs in Geography.

Even traditional sub-themes in the interpretation of productive spaces, such as the discussion of industrial policies, especially in the Northeast of Brazil (Tânia Bacelar and Zenilde Baima Amora), and the relationship between industrialization and urbanization, common in works published in universities in the Southeast (Sandra Lencioni, Amélia Damiani and Márcio Piñon), gained new contours. They could no longer be addressed without considering the role of networks of productive relationships in the conformation between public and private, the strength of the new metropolitan mobilities or the dialectic pair of the centralization of capital / productive deconcentration.

Similarly, a significant contribution to the renewal of the geographical reading of the productive spaces was the progress involving studies of the intersection between the industrial sub-themes and other sub-themes. This is the most significant revelation regarding publications on productive systems and their relation to space. In addition to being a new experience, the intersection between sub-themes such as industry and agriculture (by the expansion of agribusiness and agribusiness in the Midwest, Northeast and North of Brazil), industry and mineral exploration (the role of iron ore exploration in Pará and the production of oil and gas in Sergipe and Rio de Janeiro), industry and construction of large projects (hydroelectric plants in the Amazon) and financialization and production activities (mainly studies carried out in São Paulo), delineates the new geographic production on industrial reality.

For this reason, as indicated by Table 1, among the most recurrent sub-themes in the literature on geography and industrial production, the one that deals with "agroindustrial complexes and networks" has the most citations (410) and concentrates the highest number of authors (16) and published works (28). Next are four fundamental sub-themes in the understanding of the new spatial productive systems,

namely, "Territorial and productive restructuring" (224 citations from 15 works, published by 11 authors), "Productive activities, regionalization and urbanization" (195 citations from 11 studies published by 9 authors), "Industrial policies" (148 citations from 4 papers, published by 2 authors) and "Extractive, naval and construction industry and impacts on the territory" (132 citations from 19 papers, published by 14 authors).

New territorial experiences with deconcentration of production and information technologies are represented by the subtopics "Productive clusters and localized systems" (75 citations from 7 papers, published by 4 authors) and "Technological poles, innovation and information flows" (20 citations from 3 papers, published by 3 authors). Finally, Table 1 also points to a set of published and cited works highlighting intersections between industry and diverse activities, especially those involving the financial system, companies' corporate strategies and the movement of goods, all grouped in the sub-theme "Other possibilities of intersection", which had 80 citations from 7 papers, published by 4 authors.

From this set it is possible to select the authors that have the highest citations among the mentioned sub-themes, confirming the prominence of some subjects that are recurrently cited in the relationship between productive systems and territory in Brazil.

The systemization in Table 25, confirms the emphasis given to the sub-theme "Agroindustrial complexes and networks." The most cited author among the works analyzed is Denise Elias / UECE, with 109 citations of the texts "Agribusiness and socio-spatial inequalities - diffusion of agribusiness and new socio-spatial dynamics" and "Globalization and fragmentation of agricultural space in Brazil." Other authors who have published on this subtopic are also frequently cited, such as Samuel Frederico / UNESP / Rio Claro (84 citations for the texts "Geographic space, production and movement: a reflection on the concept of productive space circuit" and "Regional dynamics and globalization: competitive agricultural spaces in the Brazilian territory). Sergio Fajardo / UNICENTRO has 30 citations of the texts "Corporate Territorialities in rural Paraná" and "Strategies and territoriality in the action of agricultural cooperatives and global companies of the agroindustrial sector in Paraná." Also, Roseli Alves dos Santos / UNIOESTE (29 citations for the text "The process of modernization of agriculture in the Southwest of Paraná") and Júlia Adão / UFRJ (28 citations for the text "Spatial circuits of production in the modern agricultural frontier: BR-163 in Mato Grosso"). They confirm the relevance of the theme to the shaping of networks and productive processes in Brazil, especially in the intersection with the discussion on agribusiness.

The work of Tânia Bacelar / UFPE is also noteworthy (108 citations for the texts "Brazil in the nineties: strategic options and regional dynamics," "Brazilian regional dynamics and competitive integration" and "Brazil: challenges of a national policy of contemporary regional development"). She writes about a traditional sub-theme, that is, industrial policy and regional planning, but in the context of major transformations in the Brazilian economy, mainly from the new entrepreneurial competitiveness created with globalization and economic openness in the 1990s.

Besides Tânia Bacelar, only Zenilde Baima Amora / UECE has published and cited works on industrial policies, (40 citations for the text "Industry and space in Ceará"), which demonstrates the importance of these authors' texts in the debate on the sub-theme, mainly in the Northeast of Brazil.

The questions on "Territorial and productive restructuring" and the published authors in this sub-theme are also among the most cited from the data presented in Table 2. As it is a sub-theme with a greater diversity of theoretical interpretation and broad possibilities of methodological treatment, in line with the forms of circulation and the modifications engendered in object systems, the restructuring of industrial production systems is only less cited than studies on agroindustrial complexes and networks.

Several authors, in their own way, and respecting particular lines of approach and spatial cuts, have disseminated significant papers, as is the case of Márcio Rogério da Silveira / UFSC (55 citations for the texts "Five logistical and revolutions and evolutions and their impact on the Brazilian territory" and "Circulation transport and logistics: different perspectives"), and Mónica Arroyo/USP (54 citations for the text "Territorial dynamics, circulation and medium-sized cities"). Also, Floriano Godinho / UERJ (34 citations for the text "Productive restructuring, territory and power in the state of Rio de Janeiro"), Olga Firkowsky / UFPR (24 citations for the text "Industry, spatial planning and transport: André Fischer's contribution"), Edilson Pereira Júnior / UECE (13 citations for the texts "Territory and

political economy: an approach based on the new industrialization process in Ceará" and "Space, industrialization and capitalist accumulation"), Denise Bomtempo/UECE (11 citations for the texts "Territorial dynamics, industrial activity and the medium-sized city" and "Spatial production circuits and new dynamics of the territory"), and Luiz Cruz Lima / UECE (10 citations for the text "Socio-spatial restructuring: from the banal space to the space of technical rationality"). These texts construct a differentiated relationship between the classic bibliographical production on industrial spaces and the current publications in Geography on processes and productive flows.

Authors	Authors and citations of papers published by sub-themes in the Geography of Industries							
	Territorial and productive restructuring	Technological poles, innovation, and information flows	Productive clusters and localized systems	Industrial policies	Productive activities, regionalization, and urbanization	Agroindustrial complexes and networks	Extractive, naval and construction industry and impacts on the territory	Other possibilities of intersection
Denise de Souza Elias (UECE)						109 citations		
Tania Bacelar de Araujo (UFPE)				108 citations				
Samuel Frederico (UNESP / RC)						84 citations		
Maria Mônica Arroyo (USP)	54 citations							29 citations
Solismar Fraga Martins (FURG)					63 citations			
Marcio Rogério Silveira (UFSC)	55 citations							
Alcides dos Santos Caldas (UFBA)			52 citations					
Sandra Lencioni (USP)					44 citations			
Zenilde Baima Amora (UECE)				40 citations				
Leandro Bruno Santos (UFF Campos)								35 citations
Florianio Jose Godinho de Oliveira (UERJ)	34 citations							
Lisandra Pereira Lamoso (UFGD)						8 citations	26 citations	
Sergio Fajardo UNICENTRO						30 citations		
Roseli Alves dos Santos (UNIOESTE)						29 citations		
Julia Adão Bernardes (UFRJ)						28 citations		
Amélia Luisa Damiani (USP)					27 citations			
Edilson Alves Pereira Junior (UECE)	13 citations				14 citations			
Maria Madalena de Aguiar (UNIR)							26 citations	
Luiz Cruz Lima (UECE)	10 citations	15 citations						
Olga Lucia Castreghini de Freitas Firkowski (UFPR)	24 citations							
Marcio Roberto Toledo (UFSJ)						19 citations		
Ricardo Abid Castillo (UNICAMP)						19 citations		
Sonia de Souza Mendonca Menezes (UFS)			19 citations					
Carlos Jose Espindola (UFSC)						18 citations		
Ricardo Gilson da Costa (UNIR)						7 citations	10 citations	
Cristovão Trindade de Brito (UFBA)							15 citations	
Marcos Aurélio da Silva (UFSC)					15 papers			
Luiz Andrei Goncalves Pereira (UNIMONTES)								14 citations
Catherine Prost (UFBA)							13 citations	
Silvana Cristina da Silva (UFF Campos)					13 citations			
Denise Cristina Bomtempo (UECE)	11 citations							
João Batista de Deus (UFG / Goiânia)						11 citations		
Marlon Clovis Medeiros (UNIOESTE)						11 citations		

Table 2 - Number of citations of papers by authors and sub-themes in the Geography of Industries (2005/2016)

Source: Google Scholar. Database assembled with citations between 2005 and 2016 of authors linked to postgraduate programs in Geography who published one to three texts, cited at least ten times in the period.

In the case of Mónica Arroyo, Luiz Cruz Lima, and Edilson Pereira Júnior, other texts on different themes were also cited. Edilson Pereira Júnior has publications and citations on the theme "Productive activities, regionalization and urbanization", a subject with a decades-long tradition in Brazilian Geography, but which has an important contribution with a renewed analytical perspective from authors such as Solismar Fraga Martins / FURGS (63 citations for the texts "Rio Grande City: industrialization and urbanity 1873-1990", "The role of the city of Rio Grande-RS in the economy of Rio Grande do Sul state during the dispersed industrialization of 1873/1930" and "The spatial constitution of a port city through the productive industrial cycles: the case of the municipality of Rio Grande 1874-1970"). Also, Sandra Lencioni / USP (44 citations for the text "Changes in the metropolis of São Paulo / Brazil and industrial transformations") and Amélia Luisa Damiani / USP (27 citations for the text "The metropolis and industry: reflections on critical urbanization"). These authors have incorporated more complex approaches into the traditional industry / city / urbanization / regionalization relationship, especially when dealing with the new centrality and deconcentration of capital, the reproduction of daily life in the metropolis and the historical relationship between industry and city.

Luiz Cruz Lima also publishes in the theme "Technological poles, innovation and information flows", with 15 citations for the text "Technopoly: a way of producing in contemporary modernity", together with João Francisco de Abreu / PUC Minas and Giovana Mendes de Oliveira / UPEL in the discussion about new technologies and the production centers of information and technological research.

Meanwhile, Mónica Arroyo, addressing the issue of finance in its relationship with the productive restructuring of industry (in the text "The vulnerability of Latin American national territories: the role of finance"), has also published in the theme "Other possibilities of intersection." She joins the following authors in the essential task of interpreting industrial sub-themes in intersection with other sub-themes in Economic Geography: Leandro Bruno Santos / UFF Campos (35 citations for the texts "Industrial capitalism and Brazilian multinationals", "Restructuring, internationalization and new territories of accumulation of the Votorantim Group" and "Origin, consolidation and internationalization of the Camargo Corrêa Group") and Luiz Andrei Goncalves Pereira / UNIMONTES (14 citations for the texts "Planning and development: Transport and exports logistics in the northern mesoregion of Minas Gerais" and "The road transport planning and development process in Brazil").

The subjects "Extractive industry, naval and construction and impacts on the territory" and "Productive clusters and localized systems" should also be mentioned. The former is a key sub-theme in the new cycle of bibliographic production on productive systems. It has third most citations (132), and five authors in the group were cited more than ten times, confirming the relevance of the works investigating the restructuring of the Brazilian territory from large-scale objects and technical systems. The five noteworthy authors are: Lisandra Pereira Lamoso / UFGD (26 citations for the texts "Exploration of iron ore in Brazil and Mato Grosso do Sul" and "Infrastructure as an organizing element of the territory"), Maria Madalena de Aguiar / UNIR (26 citations for the texts "Hydroelectric Plants on the Madeira River-RO: Territory, Technification and Environment", "Study of the Jirau and Santo Antônio Hydroelectric Power Plants in the Madeira River / RO" and "Territorial Transformations in the Upper Madeira River: Hydroelectric Power Plants, Technification and (Re)organization"), Cristóvão Trindade de Brito / UFBA (15 citations for the text "Petrobras and the management of the territory in the Recôncavo Baiano"), Catherine Prost / UFBA (13 citations for the text "Resex marina versus the naval pole in the Bay of Iguape-BA") and, finally, Ricardo Gilson da Costa / UNIR (10 citations for the text "Territorial Policies and Population Mobility in the Amazon: Study on Jirau and Santo Antônio hydroelectric plants").

In the second case, the theme "Productive clusters and localized systems" includes 52 citations for the texts "Beyond local productive arrangements: geographical indications protected as units of local development", "Designations of origin as a unit for planning, local development and social inclusion" and "The importance of the designation of origin for regional development and social inclusion: the case of Abaíra-BA *cachaça* territory", by Alcides dos Santos Caldas / UFBA. There were 19 citations for the

texts "The strength of ties of proximity in tradition and innovation in the Sergipe region of cheese manufacturers" and "Artisanal Cheese: Identity, Cultural Practice and Strategy of Social Reproduction in Latin American Countries," by Sonia de Souza Mendonça Menezes / UFS.

The set of publications and citations in the numerous sub-themes addressed reveals the critical transformation of the discussion about productive systems and their spatial articulations. It is possible to affirm an Industrial Geography that is invigorated in twenty-first century Brazil, marked, above all, by the capacity to absorb new theoretical and methodological influences, but also, by materializing new productive phenomena in line with the importance given to material and immaterial flows, competitive interactions in networks and flexibility in labor relations (MARTIN, 1994; BENKO, 2008; BARNES, 2009). It is increasingly evidenced by a proposal for an intersection between sub-themes involving agriculture, differentiated production processes, mineral exploitation, urbanization, and financialization, among others. In doing so, there is a quest to interpret the complex reality of economic dynamism in Brazil, which merits an equally challenging bibliographic production.

PUBLICATION AND THE PRINCIPAL CITATIONS OF THE SUB-THEMES BY POSTGRADUATE PROGRAMS AND REGIONS OF BRAZIL

The data set available on the Google Scholar platform enables a further two cuts to be made: 1) a systematization of the information by postgraduate Geography program, revealing the concentration / deconcentration of the bibliographical production of a given topic by centers of studies and research; and 2) a selection of the Brazilian regions by number of authors, publications and citations of subjects related to industrial spaces.

Regarding the first cut, Table 3 presents the authors and citations of the themes divided by postgraduate programs in Geography. The analysis of the indicators evidences a combination based on a twofold movement, with both a consolidation and an expansion of bibliographic production in the programs mentioned above.

For this purpose, the information was distributed into three broad groups. The first represents the postgraduate programs in Geography that have strengthened their position in bibliographic production. That is, traditional centers publishing on the subject that renew their importance with further papers published and cited between 2005 and 2016. The second group shows postgraduate Geography programs that did not exist until the 1990s, and therefore, had no publications, but now have several authors, publications and relevant citations, consolidating them in the debate on the Geography of Industries and productive processes at the beginning of the twenty-first century. Thirdly, recent postgraduate programs in Geography (founded in the 2000s), which have already been able to gather authors, works, and citations in an upward rhythm, pointing to an expansion of the geographic axis of publication on the subject in Brazil.

Postgraduate Programs	Authors, themes and citations of works published by postgraduate programs in Geography of Industries								
	Territorial and productive restructuring	Technological poles, innovation, and information flows	Productive clusters and localized systems	Industrial policies	Productive activities, regionalization, and urbanization	Agroindustrial complexes and networks	Extractive, naval and construction industry and impacts on the territory	Other possibilities of intersection	Total
UECE	3 authors 34 citations	1 author 15 citations	-	1 author 40 citations	1 author 14 citations	1 author 109 citations	-	-	5* authors 212 citations
USP	1 author 54 citations	-	-	-	2 authors 71 citations	-	-	1 author 29 citations	3* authors 154 citations
UFPE	-	-	-	1 author 108 citations	-	-	2 authors 8 citations	-	3 authors 116 citations
UFSC	2 authors 62 citations	-	-	-	1 author 15 citations	1 author 18 citations	-	-	4 authors 95 citations
UNESP - Rio Claro.	-	-	-	-	-	1 author 84 citations	-	-	1 author 84 citations
UFBA	-	-	1 author 52 citations	-	-	-	2 authors 28 citations	-	3 authors 80 citations
FURGS	-	-	-	-	2 authors 69 citations	-	-	-	2 authors 69 citations
UFF / Campos	-	-	-	-	1 author 13 citations	-	-	1 author 35 citations	2 authors 48 citations
UNIOESTE	-	-	-	-	-	2 authors 40 citations	-	-	2 authors 40 citations
UFGD	-	-	-	-	-	1 author 8 citations	1 author 26 citations	1 author 2 citations	2* authors 36 citations
UFS	-	-	-	-	-	-	2 authors 14 citations	-	4 authors 36 citations
UERJ / São Gonçalo	1 author 34 citations	-	-	-	-	-	-	-	1 author 34 citations
UNICENTRO	-	-	-	-	1 author 4 citations	1 author 30 citations	-	-	2 authors 34 citations
UNIR	-	-	-	-	-	1 author 7 citations	2 authors 26 citations	-	3 authors 33 citations
UFRJ	-	-	-	-	-	1 author 28 citations	-	-	1 author 28 citations
FEDERAL UNIVERSITY OF PARANÁ (UFPR)	1 author 24 citations	-	-	-	-	-	-	-	1 author 24 citations
UNICAMP	-	-	-	-	-	1 author 19 citations	-	-	1 author 19 citations
UFSJ	-	-	-	-	-	1 author 19 citations	-	-	1 author 19 citations
UFF / Niterói	-	-	-	-	1 author 7 citations	1 author 4 citations	1 author 4 citations	-	3 authors 15 citations
UNIMONTES	-	-	-	-	-	-	-	1 author 14 citations	1 author 14 citations
UFG / Goiânia	-	-	-	-	-	1 author 11 citations	-	-	1 author 11 citations
UFG / Jataí	-	-	-	-	-	1 author 8 citations	-	-	1 author 8 citations
UFJF	-	-	-	-	-	1 author 8 citations	-	-	1 author 8 citations
UFRR	1 author 8 citations	-	-	-	-	-	-	-	1 author 8 citations
UFG / Catalan	1 author 7 citations	-	-	-	-	-	-	-	1 author 7 citations
UFMT / Cuiabá	-	-	-	-	1 author 6 citations	-	-	-	1 author 6 citations
Minas Gerais	-	1 author 4 citations	-	-	-	-	-	-	1 author 4 citations
Rio de Janeiro	-	-	-	-	-	-	1 author 4 citations	-	1 author 4 citations
UFPA	-	-	-	-	-	-	1 author 4 citations	-	1 author 4 citations
UFU / Ituiutaba	-	-	-	-	-	1 author 4 citations	-	-	1 author 4 citations
UFU / Uberlândia	-	-	-	-	-	1 author 4 citations	-	-	1 author 4 citations
PUC-RJ (Pontifical Catholic University of Rio de Janeiro)	-	-	1 author 1 citation	-	-	-	-	-	1 author 1 citation
UFAL	1 author 1 citation	-	-	-	-	-	-	-	1 author 1 citation
UFPEL	-	1 author 1 citation	-	-	-	-	-	-	1 author 1 citation

Table 3 - Authors and citations by postgraduate programs and sub-themes in Geography of Industries (2005/2016)

Source: Google Scholar. Database assembled with citations between 2005 and 2016 of postgraduate programs in Geography that published texts in Geography of Industries.

In the first case, according to Table 3 are programs such as USP (3 authors and 154 citations), UFPE (3 authors and 116 citations), UFSC (4 authors and 95 citations), UNESP / Rio Claro (84 citations for 1 author) and UFRJ (24 citations for 1 author). These are traditional programs, especially the USP, which is the birthplace of postgraduate studies in the Geography of Brazil, where prominent works on industrial production and its relationship with urban, regional and territorial dynamics have provided an essential reading of the reality of São Paulo and Brazil⁷. This has been renewed by the contribution of publications that analyze the productive transformations in line with the metropolis. Likewise, postgraduates from UFPE; the classic works of Manoel Correa de Andrade and Mário Lacerda de Melo and readings of industrial policies and large port equipment. Also, the UFSC, with the production of Armen Mamigonian and that nowadays discusses industry, restructuring, and circulation in the territory. The UNESP / Rio Claro of Silvia Selingardi Sampaio, which is currently discussing the spatial circuits of agribusiness production; and the UFRJ, which produced work on industrialization in Rio de Janeiro and Brazil, and now portrays the transformations of agroindustry in the country's savanna regions.

The second case involves the postgraduate programs in Geography mostly created in the 1990s, and that play an important role in the expansion of the research on the national geographic reality, also with an emphasis on the Geography of Industries. They are programs established in states whose geographical research was already consolidated, such as Unicamp and UFF / Niterói, in São Paulo and Rio de Janeiro, respectively, or programs in states without a tradition in this field, but which expanded greatly in the beginning of the twenty-first century, as in the case of Ceará, Goiás and Bahia.

The UECE Postgraduate Program in Geography is notable. It became a center of production on the Geography of Industries and production systems with five professors researching on the subject, with 212 citations between the years of 2005 and 2016. This is justified by the importance given to economic policy regarding industrial and agroindustrial activities in Ceará, which required a reading of the productive transformations within the territory; a task which Ceará's Geography did not fail to perform.

The Postgraduate Programs in Geography at UFBA (3 authors and 80 citations) and UFS (4 authors and 36 citations) played a comparable role, given the importance that their researchers gave to the dynamics of oil exploration, the petrochemical industry and the productive arrangements in these states. The same was done by the UFPR program (24 quotes for 1 author), not losing sight of the role played by Paraná in the expansion of the new industrial estate that was formed in Brazil (DINIZ, 2000); and the UFF / Niterói program, with 3 researchers (15 citations), who contributed pertinently to the studies that relate industry to agriculture, oil and the production of urban space.

The programs at UNICAMP (1 author, 19 citations), UFG / Goiânia (1 author, 11 citations), PUC Minas Gerais (1 author, 4 citations) and UFU / Uberlândia (1 author, 4 citations) close this group and reveal the growth of the discussions about the relationship between industry and agriculture, including the changes that agroindustry engenders over the new agricultural Brazil.

The third case listed in Table 3 shows the more recent postgraduate Geography programs, which are in full expansion in terms of research, with subsequent increases in the number of authors, publications and citations addressing the Geography of Industries, corresponding to a real expansion front on the theme in Brazil. The programs at FURGS (2 authors and 69 citations), UFF / Campos (2 authors and 48 citations), UNIOESTE (2 authors and 40 citations), UFGD (2 authors and 36 citations), UNICENTRO 34 citations), from UERJ / São Gonçalo (1 author and 34 citations), and UNIR (3 authors and 33 citations) have on average two authors writing on the variations of the theme, each with dozens of citations. Together with the programs at UFSJ, UNIMONTES, UFG / Jataí, UFJF, and UFRR, among others, they develop studies on the history of the relationship between industry and the city, territorial and productive restructuring, corporate strategies and agroindustrial complexes. They also publish on subjects not researched in traditional centers, such as the extractive industry and the construction of large hydroelectric plants in spatial production.

The second cut in this item is the division of authors, publications, and citations from the great Brazilian regions, whose synthesis can be seen in Table 4 and Figure 1. They reveal the expressiveness of the

Southeast and Northeast regions in the production and bibliographic citations on the Geography of Industries. They also highlight the role of the South of the country, indicating its relevant position in the treatment of the subject, but always below the two regions mentioned above. They also demonstrate the opening of a new bibliographical production front in the Geography of Industries in Brazil in the Center-West and North regions, particularly because they bring together recent programs, some established after 2010, but that already have a participation in the number of authors and publications.

Postgraduate Programs	Number of authors with publications	% of Brazil	Number of posts	% of Brazil	Number of citations	% of Brazil
North Region	4	6.7	8	8.6	55	4.4
Northeast Region	16	27.2	27	28.7	446	34.7
Center-West Region	6	10.1	11	11.7	68	5.2
Southeast Region	21	35.5	29	30.8	453	35.2
South Region	12	20.6	19	20.2	263	20.5
Total	59	100	94	100	1,285	100

Table 4 -Authors, publications, and citations in the Geography of Industries by Brazilian region (2005/2016)

Source: Google Scholar. Database assembled with citations between 2005 and 2016 of postgraduate programs in Geography that published texts on the Geography of Industries.

The Southeast has strengthened its position as the leading region in the number of publications compared to Brazil as a whole (30.8%). This is also the case concerning the number of authors (35.5%) and citations from the texts (35.2%). It should be noted, however, that the database that brings together the various authors, publications, and citations of the region's postgraduate programs incorporated numerous new possibilities for thematic readings, and this caused the Geography of Industries to lose representation given the set of topics covered. This is a curious phenomenon since the Southeast is still the region that most concentrates the industrial dynamics of the country, which contributes to its economic centrality. However, the instability felt by this productive sector and the relative loss of its role vis-à-vis other Brazilian regions seems to have discouraged research on the subject in Geography, making it progressively less present in publications from postgraduate programs.

Inversely, the participation of the Northeast in these variables has grown in relation to the national total. Considering the three selected items, that is, the number of authors (27.2%), the number of publications on the subject compared to Brazil (28.7%) and citations from the texts (34.7%), the region's role is significant, especially when findings show that research in postgraduate studies only began to expand from the second half of the 1990s. This expansion also represents the recent trends of new frontiers for the productive dynamization of industry, be it in the countryside or the city, revealing how these transformations have impacted on postgraduate publications on the subject in the Northeast.

The South plays a vital role in the production of this literature. Even with numbers that are slightly below the Southeast and Northeast in relation to Brazil as a whole, these variables show a germane performance, with the number of authors corresponding to 20.6% of the national total, the number of publications on the subject at 20.2%, and citations from publications reaching 20.5%. This production also reflects the changes felt by the regional economic dynamics, especially if we consider that, with the exception of UFPR and UFSC, it originates from postgraduate programs in Geography that are outside the state capitals (FURGS, UFPEL, UNIOESTE, and UNICENTRO), reflecting the diffusion of scientific research to medium and small cities in the region. Compared to the North, Northeast, and Center-West, for example, where practically all production comes from postgraduate programs located in the state capitals⁸, the South highlights publications and authors from four production centers far from the large cities, indicating regional deconcentration of the citations and the work carried out.

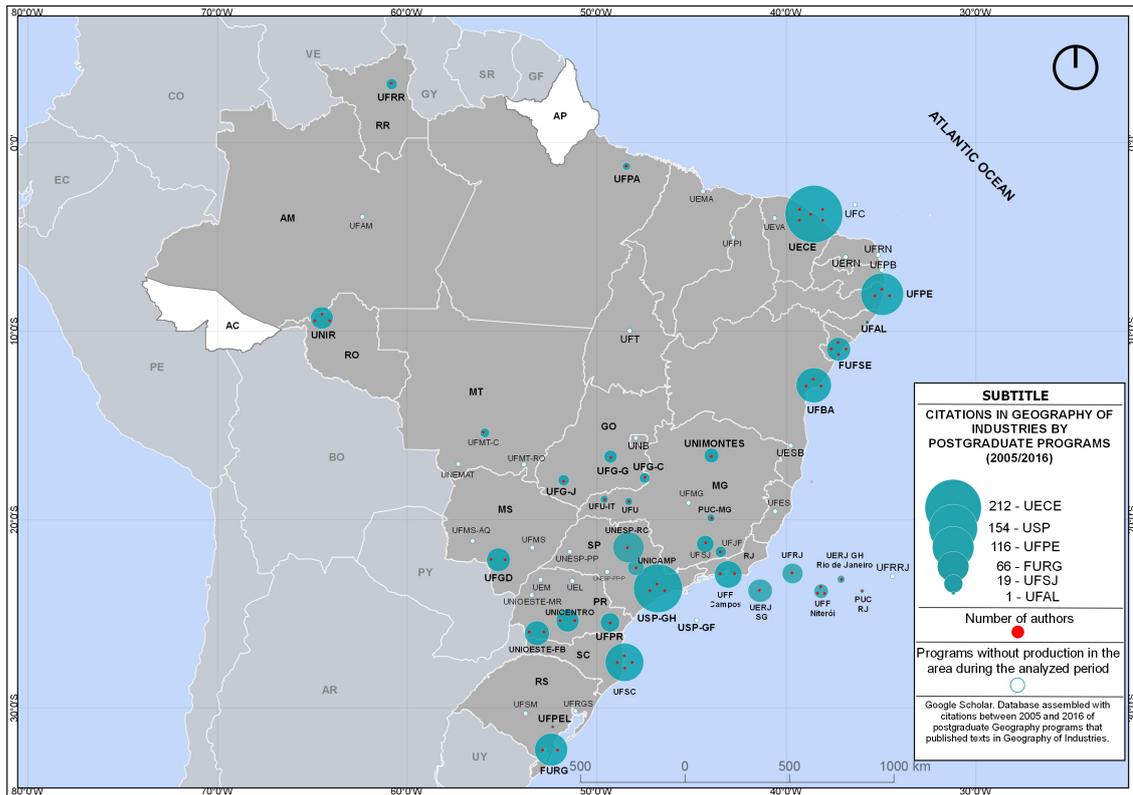


Figure 1 -Authors and citations in the Geography of Industries by postgraduate programs (2005/2016)

Source: Google Scholar. Database assembled with citations between 2005 and 2016 of postgraduate Geography programs

that published texts in Geography of Industries.

Finally, the results from the Center-West (number of authors corresponding to 10.1% of the national total, number of publications on the theme at 11.7% and citations at 5.2%) and North regions (number of authors corresponding to 6.7%, number of publications on the subject at 8.6% and citations at 4.4%), reaffirm a significant change in the reach of the Geography of Industries in Brazil in the twenty-first century.

Unlike the traditional repercussions that texts, authors, and citations had some decades ago, the discussion about space and productive systems has changed, incorporating dispersion in the context of the complex territorial division of labor that the country is going through. The Center-West and the North, although their participation is modest in relation to the national total, already demonstrate that the origin of the production and the reading of the bibliography on the subject is being deconcentrated in the territory, and the instruments of traditional consultation and divulgation, including the subjects selected for interpretation, have also changed.

In general, the map of bibliographic production and citations on the Geography of Industries in Brazil has changed. In addition to the broad participation of postgraduate programs, all Brazilian regions are now represented in the preparation and dissemination of research, even if in different proportions and using various communication channels. The lines of research and thematic cuts have also gained diversity; the type of productive transformation experienced by the regions and states is a relevant factor in the choice of the agenda to be developed by the geographical investigations. The transformations demarcate the new complexity of the subject and the intellectual division of labor in Geography, a demonstration that the spatial interpretation of productive phenomena is increasingly open to new possibilities.

CONCLUSIONS

The interpretation of the database on the bibliographic production of the Geography of Industries and the production systems appears to follow the restructuring felt by the Brazilian territory within the scope of the most recent political and economic regulations. It combines with a set of relationships and settings (SANTOS; SILVEIRA, 2001) when reading the economic and political production of the Brazilian territory throughout the twentieth century and the beginning of the twenty-first century.

Thus, from polycentric Brazil, before the unification of the territory and the market, to the confirmation of São Paulo and Rio de Janeiro as poles of a center / periphery articulation in the postwar period, which intensified as the idea of unifying the territory for transport gained strength. At that time, São Paulo's industrial growth was remarkable and was an indispensable element in the process of national integration based on regional disparity, commanded by the Southeast. The 1990s saw changes in this configuration as São Paulo was affirmed as the main economic force in the country and Brasília deepened its political centrality. New modernization frontiers opened in various parts of Brazil, with the new regional reach of industrialization and the expansion of modern agriculture reaching the Northeast and Center-West (SANTOS; SILVEIRA, 2001).

The bibliographical production in the Geography of the Industries seems to respect this restructuring. Until the mid-1950s, descriptive studies with no abstract concern predominated, marked by historicism and the prevalence of physical factors or reciprocal relationships between physical and socioeconomic factors, at a time when industry and urban space had not profoundly transformed spatial structures. Descriptive studies did not disappear in the following years, but they were supplanted by more nomothetic approaches, based on functionalist interpretations, with an emphasis on polarization (studies of the poles of regional attraction), and structuralist and systemic, whose research focused on the unequal and combined development of productive forces (center-periphery). Industrial Geography studies increased considerably between the mid-1960s and the late 1980s, in a period of accelerated industrialization and implementation of regional development policies.

Currently, the analysis of the indicators indicates some fundamental transformations, pointing to the following findings:

The set of publications and citations in the sub-themes discussed reveals a significant transformation in the discussion about productive systems and their spatial articulations. It is possible to affirm a Geography of Industries that is energized in twenty-first century Brazil, to interpret new productive phenomena in line with the importance given to material and immaterial flows, competitive network interactions and flexibility in labor relations.

This renewal is part of the progress made in the intersection between industrial sub-themes and other sub-themes. In addition to being a new experience, the intersection between sub-themes such as industry and agriculture, industry and mineral exploration, industry and the construction of large-scale projects and financialization and productive activities, marks the new geographical production on the industrial reality.

As well as new thematic influences, new theoretical influences have been consolidated, with most of the works incorporating a renewed Marxist, Schumpeterian, Keynesian and humanist / culturalist reading.

In the postgraduate programs where this research is carried out, there is the combination of a twofold movement, the consolidation of traditional centers or the expansion of bibliographical production in new programs. The latter is represented by the publication and citation of studies in programs opened in the 1990s and by the texts of programs that began their activities from the 2000s.

Also, the map of bibliographic production and citations on the Geography of Industries in Brazil has changed, so that all the Brazilian regions are now represented in the elaboration and dissemination of works, even if in different proportions and using different channels of communication. The Southeast and Northeast regions have the best representation vis-a-vis Brazil as a whole, but the importance of the South is significant and the presence of authors, published papers and citations in postgraduate programs in regions such as the Center-West and North indicate the opening of a new bibliographic production front in the country.

Thus, the recent bibliography on industry in Brazil reflects the transformation of the territory

itself, a result of the economic and political relationships that mark the changes felt in the last decades. Similarly, research lines and thematic cuts are gaining diversity, especially by demonstrating that the spatial interpretation of productive phenomena is becoming increasingly open to new possibilities, and the type of productive transformation experienced by regions and states is a factor in the selection of the agenda to be developed by geographical investigations.

Finally, the transformations demarcate the complexity that the subject and the intellectual division of labor in Geography receives, deserving of a challenging bibliographic production.

NOTES

1 - Google Scholar is an electronic platform that allows the consultation of several research works in a single source, involving scientific articles, books, Master's dissertations, doctoral theses, full texts in annals of scientific events and other materials produced by professional and academic organizations, as long as they are available on the Web and can be accessed by Google. Through it it is also possible to identify the number of citations of the works and the geographic reach of the publication.

2- It is a platform that also allows access to researchers' profiles based on the construction of the H index, proposed by Hirsch, which designates the number of articles published by an author, obtaining a volume of citations higher than or equal to the index in focus. Thus, if the author has published five papers with at least five citations, their H index will be 5. The higher this index, the greater the impact of the author's publication.

3 - This methodology, despite its ample capacity to capture details about the author, type of academic production, institution and the geographic reach of the publication, unfortunately, is not without weaknesses. For the theme of the Geography of Industries, one of the most emblematic examples is Eliseu Savério Sposito / UNESP Presidente Prudente, who, despite his important contribution to the subject in Brazil, presents works from other lines of research with greater citation, which prevents his work from being registered by this methodology. The same happens with authors whose publications have recently migrated to industrial themes, such as Cláudio Zanotelli / UFES, which due to the diffusion of their older research, presents works cited only in other geographical sub-themes.

4 - It is a synthesis of the bibliographic production cited in Google Scholar between the years 2005 and 2016 of authors linked to the postgraduate programs in Geography in Brazil. From the large volume of information provided by the database, we selected the number of authors, the number of papers published and the number of citations of themes that have some relationship with industrial production processes or their circuits of production and circulation.

5 - Four authors, out of a total of 59, have published and been cited on more than one selected topic.

6 - Table 2 corresponds to the synthesis of the bibliographic production cited in Google Scholar between the years 2005 and 2016 of authors linked to the graduate programs in Geography in Brazil. From the large volume of information provided by the database, authors who published from one to three texts, cited at least ten times in the period, were selected who work on themes related to industrial production processes or their circuits of production and circulation.

7 - Lisandra Lamoso also has publications in the theme "Agroindustrial complexes and networks" and is thus one of the four authors to have citations in more than one of the selected sub-themes.

8 - The classic studies of Lea Goldstein, Armando Correa da Silva and Rosa Esther Rossini deserve mention.

9 - The exception is on account of Goiás and Mato Grosso do Sul.

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