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Keywords: *recycling sector; used territory; shift-share template.*

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Quantitative and Qualitative Approximations for the Analysis of Territorial Production in the Recycling Sector in the State of Bahia, Brazil

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I. Introduction

Recycling is an important activity for several product segments. Two elements refer to its relevance and give meaning to the term 'recycling', the first is that these products act as a source of energy in the production line of some industries. The second one is that they substitute raw materials for the manufacture of new products, through the use of materials considered to be disposable.

In Brazil and the state of Bahia, recycling is an economic sector that enables its dynamism through the generation of jobs and income, especially through the manufacturing industry in Brazil. Although, it has been going through a delicate situation for some years, (OREIRO; FEIJÓ, 2010). This article shows a juxtaposition of recycling activity with industrial transformation activities, a discussion to support its production structure as an element that may be present in the planning of this sector in the state of Bahia, Northeastern Brazil.

In order to demonstrate this point of view, this article brings together two exams: a) the application and analysis of the Shift-Share quantitative method, - Esteban-Maquillas version (1972), which analyses the scenario of Bahia and measures its employment capacity in the recycling industries, based on its regional dynamism and competitive capacity; b) analyze its consonance with the concept of territory used by Milton Santos (1999, 2001). This concept comes from Economic Geography and aims to amalgamate analytical possibilities. It is possible to conclude that there is an analytical bias to have a 'territory used' by the recycling sector in the state of Bahia.

II. The Recyclables Markets in Brazil and Bahia State

The recycling sector in Brazil has been showing a visible growth in the last twenty years and it has reached indices that corroborate as a sector belonging to the industrial chain. The combination of studies by IPEA (2010), IBGE (2015), ABRELPE (2020) and Szigethy and Antenor (2020) demonstrated the growth of this sector. The recycles acted as the main materials in the production chain. In Brazil, 72 million tons of solid waste was generated, and in the state of Bahia, the total was 4 million tons. In comparison with 2010, the waste's growth reached 24% at the national level, and there was an increase of 15% at the state level.

In ten years, it has observed that there was a considerable increase in urban solid waste in the country and in the state. However, from the perspective of recycling, the numbers must be taken into account. Of the 100% of waste generated in 2019, 45.3% was the organic matter, 16.8% plastics, 10.4% paper and cardboard, 2.7% glass, 2.3% metals, 1.4% multilayer packaging, 14.1% sanitary waste, 5.6% correspond to textile waste, such as leather and rubber and other residues exhibited a percentage of 1.4%. (ABRELPE, 2020; SZIGETHY; ANTENOR, 2020).

It is clearly noted that all these materials are likely to be part of the productive chain of the recycling industry. In fact, this is an activity that composes the manufacturing industry sector. In view of the growth of recycling activity in Brazil and the increase in the diversity of its sector, this niche has the capacity to assist in the development of transformation industries. Bearing in mind the importance of the productive chain of recycling and its mediation with the sectorial activities of the economy - among them, industrial activities and more specifically the transformation industries, it is clear the existing need, nowadays, to share in interdisciplinary

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perspective aspects related to economic growth, social development and environmental preservation.

Seen in these terms, the application of the Shift-Share method was attributed to measure the levels of dynamism and employability of this sector. The objective was to identify whether or not it can provide a qualitative perspective to the territory of Bahia, in order to make it a 'used territory' and prove that the recycling sector is worthy of being within the main of activities that should be thought and planned by government agencies.

III. The Shift-Share Economic-Regional Model, Esteban-Maquillas Version

The technical model used to calculate the components that generate growth indicators for economic sectors and regions was the Shift-Share. This model became notable from the 1960s onwards for being a methodology that sought to assess the attributes of a spatial, structural, regional and allocative nature of a respective economy's sector. In 1972, Esteban-Maquillas proposed a way to measure the components through the use of a homothetic variable, that is, a function used to prevent the structural effect from interfering with the regional effect. In addition, this method provides an analysis of the competitiveness of the areas (WANDERLEY; ARAÚJO, 2018).

This model (ESTEBAN-MAQUILLAS, 1972), analyze the variables from the CNAE[1]/RAIS[2]/MTE[3] database. It was used to analyze seven mesoregions of the state, through four subclasses related to recycling activity: Recovery of scrap from aluminium; Recovery of metallic materials, except aluminium; Recovery of plastic materials; and Recovery of materials not previously specified. As a variable, it analyzed this scenario in the light of the Occupied Population[4], between the years 2007-2015.

The interpretations of the results of the corresponding participation involve the growth effects: 1) global (GEG), which means what is added for each recycling activity and mesoregion, in the case of an increase in the period with the same employment growth rate of the spatial amplitude (Bahia); 2) structural (GES), identifying reasons of structural nature of production activities and, from the point of view of the mesoregion, the composition of its sectors with greater or less dynamism that adds to the growth of the mesoregion in the period; 3) regional (GER), representing the competitive capacity of the mesoregion to contribute to its growth; 4) allocative (GEA), corresponding to the participatory weight of the subclass position in the mesoregion, in which competitive advantages add to the growth in the range under study (WANDERLEY; ARAÚJO, 2018).

All these effects lead to the measurement of the total growth effect (ECT), which results from the sets of expression effects of Esteban-Maquillas (1972), with its four growth effects, as described below:

$$ECT = GEG + GES + GER + GEA$$

$$\Delta L_{ij} = L_{ij0}\eta_{tt} + L_{ij0}(\eta_{it} - \eta_{tt}) + L_{ij0}^{H}(\eta_{ij} - \eta_{it}) + (L_{ij0} - L_{ij0}^{H})(\eta_{ij} - \eta_{it})$$

Where: L= Employment; η= L growth rate; H = homothetic busy staff; i = Subclass; j = Mesoregion; t = Total (Subclass: it, Bahia Space: tt); 0 = Base year: 2007.

The study reached many considerations, including a Ranking survey for the subclasses of recyclable materials and a lengthy analysis of their contexts by mesoregion. However, trying to avoid an exaggerated emphasis on the study and using only some parts of it as a reference for the proposed discussion.

Under these considerations, the aim is to demonstrate there is a potential to develop this economic sector in Bahia. Additionally, in light of the variable used - 'Occupied Population', the territorialization of this market demonstrates that the mesoregions had positive rates of employability of people in the recovery of recyclable materials, which were divided by subclasses.

There was growth in the years between 2007-2015, but which need, at another time, to be analyzed again concerning disparities or even situations that should be contested, such as a low index of competitive advantages in this market in the Metropolitan mesoregion of Salvador for the Recovery of Plastic Materials, as the Camaçari Petrochemical Complex is located in this mesoregion, where companies such as Braskem and others stand out in the production of different types of plastic for the most varied sectors of the economy.

The production of industries was not evaluated, only the recovery of materials regarding the levels of people employed in these activities. However, it is possible to assume that these rates could be higher in one of the regions of Brazil with the highest concentration of industries in the production of this material (plastic). These and other issues which feed the discussions about this market will be the theme for future debates.

The analysis of the growth effects of the Shift-Share model was performed and it was based on the

[1] Acronym in Portuguese for National Classification of Economic Activities.

[2] Acronym in Portuguese for 'The Annual Social Information Report', which is a socioeconomic information report from the Ministry of Labour and Employment (MTE).

[3] Acronym in Portuguese for Ministry of Labour and Employment (MTE).

[4] Employment level proxy variable.

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hierarchy between the mesoregions and subclasses of the recycling sector in the state of Bahia. The result revealed that there is no homogeneity in the distribution of growth indicators for the activities analyzed. It confirms a historical and geographic aspect of the regional dynamics of the territory of Bahia and Brazil. Therefore, there is no hermetic conduction of development. What was observed is the opposite: regional differences are present and provide the most distinct variations and results.

Given such regional differences and what they may imply for the recycling sector, it was verified through the effects of total growth, indications about the dynamism of each subclass caused by the state increase, by the structural mix of activities, by regional influence and allocation effect. In summary, the following percentages of the growth effects of the components were observed, regarding the total effect and their participation, in the set of mesoregions, about the total of subclasses studied: 1) of the global, they were all positive and with high participation, with 59% in line with the dynamism and 41% corresponding to the non-dynamism of the activities; 2) of the structural, the subclasses were distributed with 35% in agreement and 24% in disagreement with the dynamism and 41% in agreement with the lack of dynamism; 3) of the regional, the distribution occurred with 41% in agreement and 18% in disagreement with the dynamism, and 35% in agreement and 6% in disagreement with the lack of dynamism; 4) regarding to the allocation, the distribution of subclasses was 24% in agreement and 35% in disagreement with the dynamisms, and 23% compatible and 18% incompatible with the lack of dynamism.

The incentives for a dynamic growth in recycling activities were strongly linked to the performance of the state. All subclasses had positive global effects, such that dynamism prevails in more than 50% of subclasses. However, in the other effects, those of aspects of the productive structure, regional influence and allocation, the positive effects for dynamisms were limited to an amount of subclasses below 50%.

Regarding the effects of growth in favor of the dynamism of subclasses, this synopsis reflects the hierarchy of recycling activities by mesoregions, according to the spatial amplitude of the state of Bahia. As expected, the metropolitan mesoregion of Salvador was the one with the greatest dynamism, because of the better results in the four subclasses and showed the greatest increase in the level of employment (WANDERLEY; ARAÚJO, 2018).

Concerning the main criteria adopted in the analysis (the importance of growth inducers and competitive advantages and disadvantages), a cartographic representation was created with the presence of subclasses in mesoregions. The objective of this step was to demonstrate the process of territorialization of this market and to be aware that the stages taken by this sector towards a spatialization of its activities are in line with its reality.

IV. The use of Territory in Bahia by the Recycling Sector: Perspectives for the Construction of a used Territory

The 'Used Territory' category is the product of many theorizations and revisions of Milton Santos' work and it was developed in the last years of author's life. The full development of this category has not been completed, due to his death. The concept of territory refers to the legacies in which the territory received in relation to the ways in which it was used by technical systems. In each moment of their histories, these systems authorized the distribution of labour relations in the constitution of the territory (SANTOS; SILVEIRA, [2001] 2012).

Milton Santos states that 'used territory' is a categorization that needs to be studied along with time. Nevertheless, every category of geographic analysis can be done together with the analysis of time. This concept is called by 'empiricizável'[5]. However, this will depend on the type of object and the set of actions it provides for the analysis. Occasionally, the territory seems to be special, as it is the "frontier" of the other categories that constitute it - from landscape to region - with the "main category" of geographic science: geographic space.

In the specific case of the territory, it is noted in the word "used", coming from the verb to use - that is, to extract its practical essence from something in order to make empirical what has already been developed. For example, the other categories of space analysis, until they form the territory, they use these spaces in a variety of ways, with different scales and with diverse systems of objects and actions (SANTOS, [1996] 2012).

Perhaps thinking in this way, Milton Santos developed this category to explain the territory, which, in the last instance, is the geographic space. 'Territory used' seems to be a tomography of geographic space, relativizing all the nuances in its formation from the forms, functions, structures and processes that its use denotes in relation to all categories and their respective scope or scalar development.

Thus, 'used territory', with the resources that this same territory provides, is also capable of being reinterpreted as a set of economic, social and political dynamics. It is supported by intersectional links in a structure of economic relations that "technify" the territory, conceiving that the result of this technification, positive or negative, occurs through the resources of the territory that a given enterprise uses, and by the techniques used in the use of these resources (BENKO; PECQUEUR, 2001).

[5] In Brazilian Portuguese, it means to make things empiricalal. Therefore, we chose to use, in English, the word "empiricalal".

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Considering the exercise developed using the Shift-Share method, there is a possibility that this sector becomes an element present in territorial planning in Bahia. However, this reasoning makes us realize the need regarding the management of a model for the territorialization of this activity in the state. This stage is supported by a horizontal process of communication between cooperatives and companies, while territorial governance, seeking to transform itself into a model of productive horizontalization, provides the creation of networks of industries, small factories, cooperatives and associations of collectors as part of a process of land use by this sector.

Thus, the way in which the state can be understood as a territory used by the recycling sector refers to the forms undertaken by the networks of large, medium or small companies in this sector through territorialization and territorial governance; the functions that the territory and its use would assume with the territorialization of this activity and its levels of competitiveness; the structure implemented for such use, that is, in Network; to the processes that would be strengthened and established as a brand, that is, the sale of materials directly to industries and the industrial production of consumer goods on a small, medium and large scale.

The operationalization of this point of view is factual and simple to understand. In the research developed by Sebrae (2017) on the recyclables market in Bahia, it is noticeable that this economic niche, as well as so many other activities and sectors that make up the state's economy, use its territory through its dynamics, articulations and decisions, becoming agents of transformation of this same territory. A banal example is to imagine that, institutionally, the Federation of Industries of the State of Bahia (FIEB) becomes an agent of transformation (and consequently a user) of the territory of Bahia, together with the state government, being able to assist in the ordering and spatial configuration recycling industries in the most different spatial categories and at their most diverse scales.

The mentioned process occurs with all those involved in the recycling sector: informal waste pickers, those who work in legal activities in cooperatives and associations, people who work in scraps and those who work in large companies that buy recyclable material. All make the cities economically dynamic by working with this activity; building and developing 'recycling landscapes'; or establishing their locations. This is because they travel to other places (cities) and regions of the state (in their territory itself) in search of the raw material for their livelihood.

This last example concerns what Santos and Silveira ([2001] 2012) used, that is, its discussion and modification to a ‘used territory’: the importance of means of transport and its logistics. The recycling sector, especially recyclable material cooperatives, experience the situation in which the area of influence of a cooperative usually exceeds the limits of their cities and regions, and consequently, transport this raw material that they buy or earn as a donation in other cities. In this sense, as they circulate through the state territory, they fill their trucks with fuel at gas stations and also leave money from the recyclables market. Thus, they streamline the economy by 'exchanging' the money from their activity for another type of service. According to Ribeiro (2013), the use of the territory (by different activities and economic sectors) shows that it is not only used. However, it is also practiced, because different sectors act in the economy generate a movement of interdependence.

These scenarios, ideas and images, in the territory of Bahia, being used by the recycling sector, give the territory its identification with the concept of geographic space. In other words, there is a spatiality socially undertaken by human work and which is made up of techniques and technologies to differentiate it from the natural space (SANTOS, 1978), and whose territory used is consolidated. This is because this territory is also used by materials recovery industries measured by growth indicators of the Shift-Share model.

Thus, we noticed that these elements are the structures that lead the discussion about a territory used. Its usage variations were interpreted as a corollary of circumstances and circumstances that can unite small cooperatives, the third sector (NGOs that provide technical and social support to small cooperatives), the public and private sectors for the construction of a social market fairer. Therefore, this market generates a new dynamic in the use of this territory through the networks that may be created. It is mediated by microeconomic activities and their micro “engineering systems”, making the Networks become an agent of transformation of this territory through the use they attribute to it. Despite the category of male and female workers being the base of the pyramid of this economic sector, it is also the most explored.

Thus, such reasoning brings another interpretation to this category (not just the one developed by Santos and Silveira ([2001] 2012). The territory used and the nickname of its use is under the influence of great capital and therefore there is the possibility of making it empiric. The use of territory in the state of Bahia is under the intermediation of this economic and environmental activity, which in turn is highly exalted in our society, but very little practiced by its members.

Small collectors' cooperatives are essential to moving the economic process that mixes technique, innovation and solidarity. This process demonstrates the feasibility of amplifying a ‘used territory’ model. It is not just the territory used by this sector, but a model that could develop statewide through other networks. And

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why not it could not be related to other activities and sectors?

Using a territory from a particular economic sector and moving it to a 'used territory' is a finding pointed out by Santos (1999), Silveira ([2001] 2012], and other authors (SOUZA, 2013; RIBEIRO, 2013; NOGUEIRA DE QUEIROZ, 2014.) However, the main idea of the territory used is related to the components that lead to such use, more precisely, to what makes this territory used and at the same time providing forms and functions.

Santos and Silveira ([2001] 2012) point out in the constitution of engineering systems a series of elements that support territorial fluidity: infrastructure, services, transport, among other. However, these and other elements need something that modifies their actions and makes them empiric. Thus, it is possible for them to develop their objectives, modify and transform the territory based on the use that one wants to apply in it. Therefore, in addition to the territory used and the use of the territory, there are also the 'territory resources' (Benko and Pecqueur, 2001), which are represented by recyclable materials. This debate has become of paramount importance, as the forms of use of the territory that result in the formulation of the concept of 'used territory' occur through the exploitation of a certain type of resource. However, recyclable materials, unlike natural resources (RODRIGUES, 2009) are, in fact, reified objects, and this is where, in our view, the reasoning used here brings a new discussion to the category under examination: about the possibilities of the territory's resources. In this case, they are also resources of the places that make up the different regions where the Networks can be formed through their technicalization, and are the material substrate for the production of a place, a region and a territory used, that is, a territory used by a type of resource that is not necessarily an original wealth of first nature, but of second nature (MOREIRA, 1988).

V. Conclusions

The article sought to demonstrate how the number of Employed People in the recycling activity generates potential in the state of Bahia between the years 2007-2015. As well as that, this sector has a potential level of employability and, consequently, a good rate of growth and competitiveness in recovering recyclable materials (resources/assets of the territory). The results helped to understand how these factors can be inserted in the territorial planning of the state, making it a 'Used Territory' model. In this way, we reach three conclusions.

Firstly, the recycling sector prints its use on the territory of Bahia, or makes it a 'used territory', through this system of objects and actions (technical) that is in line with the resources that this same territory provides, in this case, waste recyclables, which stand out for their socioeconomic aspects in generating employment and through their environmental appeal. Therefore, it is through the analysis of recyclable waste as resources that the territory offers to this activity, that it would be able to increase this sector and print its mark on the territory of Bahia.

Secondly, the 'used territory' is imbued with intersectoral factors, circumstances, and elements that are mediated by the territory's resources and the way they are used, provide degrees of intersectionality to it, resulting in a process of territorialization of this activity managed by governance between companies and industries in the sector.

Finally, there is a potential for territorial construction/regulation of the recycling sector through the technical action of networks that can be formed, especially by small cooperatives and associations of recyclable material collectors. So that a process of territorialization of innovative capital and territorial governance of the competitiveness of this sector, through the actions instituted by the Network, where its technical correlations that are generated through knowledge and its sharing make visible the possibility of its work being this instrument of transformation of the territory through the development of regions and places (cities) where the nodes of the Network operate.

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