THE SPATIAL COMPETITION FROM THE PERSPECTIVE OF COMPETITIVE STRATEGY

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Even though the spatial competition is a crucial aspect of the competitive strategy of firms, it is still little approached in the competitive and marketing strategy literature. As such, the association between formal spatial models and thee practice of spatial competition between firms should be approached. Addressing this gap in this article, we propose a more formal view of the spatial competition. Based on the concepts of the value of displacement for the customer and the value of location we present several aspects related to the difference in the location of outlets in a hypothetical city. Several measures such as market share, competitive advantage, and value of location, are calculated in this model. This article opens a new perspective to study the competitive positioning of firms in spatial markets.

Palavras-chave: spatial competition; competitive strategy; geographic strategy

1. Introduction

Despite all progress in the last decades, the competitive process and the competitiveness of firms still requires formalism and the establishment of competitive measures. One stream which presents an opportunity to advance in this sense is the spatial competition literature, which studies how firms compete in spatial markets through products and outlets (e.g., FUENTELSAZ, GOMES, 2006; GUEDRI, MCGUIRE, 2011; MOLNAR et al., 2013).

However, it is important to development studies which permit to access and to measure aspects of spatial competition. Based on this opportunity of contributing to the literature, this paper presents a more formal view of spatial competition, whereas based on a hypothetical city it is presented several concepts and aspects related to the spatial competition. As basic element, it is explored the competitive relations between firms in a spatial context, where several elements such as the value to the client, market share, power asymmetry, resource efficiency, competitiveness, resources distribution among others are explored. This concept is perfectly adaptable to the analysis of the spatial strategy of firms in real urban centers and can be adapted, being a relevant mean of knowledge to the elaboration of location strategy of firms.

2. Literature review

This literature review section is decomposed in two parts. Firstly, it is presented the basic concepts related to the main schools of competitive strategy. Next, it is presented the basic concepts of spatial competition.

2.1. A general view of the competitive strategy

The competitive strategy literature is formed by two main branches. The resource-based view (RBV) studies how the firm resources determine the capacity of a firm to generate value to the market, and appropriate of the rents generated through the products sale process (DIERICKX, COOL, 1989; MAKADOK, 2001; OLIVER, 1997). This stream considers the firms as a set of idiosyncratic resources, (WERNERFELT, 1984) that permit offer goods and services that only imperfectly can be generated by competitors in the markets. The second branch market-based view (MBV) studies the competitive aspects related to the interaction of the firm which its external environment. One of the more prominent authors in this branch is Michael Porter (PORTER, 1980) which introduces the five forces model, which considers that a firm in a market will suffer competitive pressures from 1 – clients; 2 – direct competitors; 3

– potential entrants; 4 – suppliers; 5 – manufactures of substitute products. As such, a central issue in the MBV is how a firm generates value to the customer (MELLO, LEÃO, 2008), which occurs basically of two forms, either through its low price, or through its performance in another attribute of interest of the customer, for instance, brand image, quality and so on (e.g. CHAMBERS et al., 2006; KACHANI, SHAATOV, 2011; PEREIRA et al., 2010; PINHO, SILVA, 2001).

One important stream in the MBV literature is that focused on the study the geographic strategy of firms. The geographic strategy is a fundamental element in several segments. It will study the location positioning of firms through the time, their contact and movements relative to rivals (ALCÁCER et al.,2015; MOLNAR et al., 2013) and due to the competitive dynamics, as well as the demographic characteristics of markets (HSIEH, HYUN, 2018).

2.2. Spatial Competition

Spatial competition is a longstanding problem addressed in the literature. Atthe end of the 1930s,Hotelling (1939) presents a spatial location analysis, based on the linear distribution of competitors in a one-dimensional situation, whereas the equilibrium of the dispute through the concentration of rivals is in the central point. As such, the microeconomic thematic of economic equilibrium in spatial games is broadly explored posteriorly.

In a review article Eiselt and Laporte (1989) present several relevant constructs about spatial competition models, such as space can be continuous or discrete, linear of bi-dimensional, the location of firms, the distribution of customers, among others. In the two-dimensional models, the Euclidean space is the basic element, where issues such as product prices, homogeneity between customers and products, displacement/transport costs are the aspects for the economic analysis (Aoyagi, Okabe 1993; Eaton, Lipsey, 1975).

Cahan et al. (2018) use the score preference rules of consumers to analyze the occurrence of co-location of competitors in clusters, where is subjacent the imperfect competition phenomenon.

In other hand, the operational research presents anbroad literature about location of plants in the sense of optimize the profits and reduce transport costs (e,g,, Drezner et al., 2019),considering the location of facilities in a given space based on factors such as the minimal distance traveled by customers, and the maximal profit in an operational research perspective.

In the lights of the literature this paper contributes basically to address several of these questions from a new alternative logic, namely the competitive strategy point of view. Maybe to try to reach equilibrium or the points of cost minimization and gains maximization, this paper presents a spatial instance where the value analysis of each potential corner in a city generates value to each customer, and consider the implications of this to all customers andto potential firms which can compete in this market.

3. Method

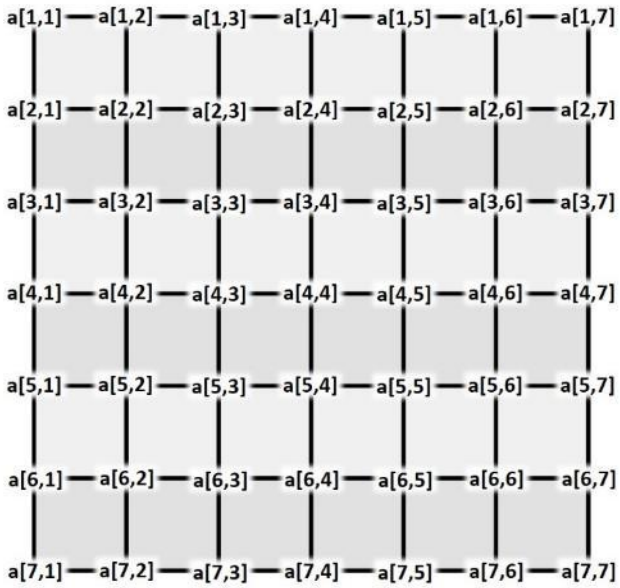
The research method used in this paper is deductive. Based in a formally logic object, namely a squared city with 49 corners, based on the basic assumption, the less displacement, the more the value to the customer, there are exploited various competitive measures for firms hypothetically located in different corners of this city.

The validity of the method is entirely present in the logical model, and in the basic assumptions and hypothesis initially presented, that can be verified through the test of the data presented. Even though it is used an instance of a squared city with 49 corners, the concepts used in this paper can be generalized to any instance of conceptual squared cities, however with the specific value indexes changing in their quantity.

4. The competitive strategy from a location perspective

To presents a more systematic view of the competitive strategy we use the spatial context, based in a squared form network, which represents a hypothetical squared city. Departing from this geometrical form, we will present the main concepts relative to the competitive strategy - Figure 1. The first element in this framework is that each side of the squared city is decomposed in six segments, which seven corners. Thus, this structure refers to a hypothetical "city" with a total of 36 blocks and 49 corners. Each corner can represent the place of a potential outlet, that will compete in this "market," or the location of a house of a client. An important question in this scenario is the distance that each customer has to move to access the firm positioned in one of these corners.

Figure 1 – The hypothetical city formed by 49 corners with unitary distance each other



Source: the authors

Accordingly, considering two different situations, where the first there is only one a firm, and one should be calculated the movement of all "community of clients" to access the product/service of this unique firm, and the second situation where it will be assessed the competitive value of two hypothetical firms, which have a homogeneous product and value generation to the market, diverging only in the location. As such the closer the outlet the more value generates.

4.1. Basic assumptions

Based on the current literature of spatial competition (Aoyagi and Okabe, 1993; Hotelling, 1939) we present below the main assumptions about the competition of firms in a two-dimensional space:

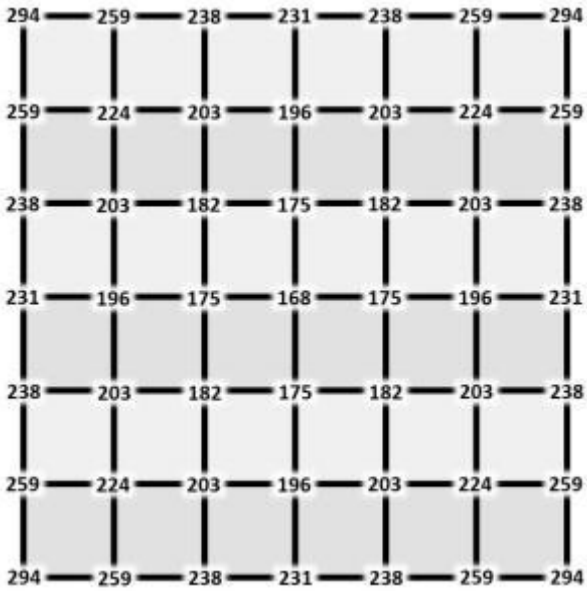
- A matrix forms the market A[i,j], where each a[i,j] instance represents a potential outlet point or the location of the house of a client. It will be used an instance of 7x7 outlets, given by {(a[1,1]…..a[1,7]); (a[2,1]…..a[2,7]); (a[3,1]…..a[3,7]);……..; (a[7,1]…..a[7,7]);
- Each segment between a[i,j] and a[i,j+1] measures 1 (the unit);
- The product/service (henceforth only product) sold by each firm is homogeneous;
- The clients will valorize less displacement. As a result, the closer the outlet is the more it generates value to the client;
- Only the client moves to the outlet to buy a product.

4.2. Competitive measures

4.2.1. The total distance of each client to each corner in the matrix

The first measure presented is to calculate the total distance that all clients should move to access the determined outlet in a given corner of the city. In an alternative view, this measure indicates the total "cost" of the displacement of the all community of clients to access each corner. This matrix with the quantities of displacement is presented in Figure 2.

Figure 2- The matrix of the total displacement of all community to access each corner in the city



Source: the authors

At the figure above is important to note that the closer to the center, the less displacement is necessary to all community access a hypothetical outlet. The central corner, a[4,4] is that the requires the minor displacement of clients, a total of 168 unities. In another hand, the four peripheral corners a[1,1], a[1,7], a[7,7] and a[7,1] are those that require the major displacement of all community, each requiring a total of 294 unities.As such, they are the "worst" location to all community.

4.2.2. Symmetry among corners and their value to the community

Using the squared form to represent the hypothetical city, an important element identified is the occurrence of symmetry between corners, which refers to the situation where a given corner generates equivalent value in quantitative terms to other corners in the city. However, it is important to emphasize that despite to similar corners generate the same quantitative value to the community, in qualitative terms they are different, as well as they generate different levels of value for each customer in the city.

The identification of the occurrence of symmetry permits to avoid repetitive calculus of displacement costs to equivalent corners. Table 1 presents all symmetry situations identified in this instance. It can seem that the unique corner without symmetry with any other corner is the central corner a[4,4], that presents the minimal cost of displacement to the community. This situation of a corner with no symmetrical points occurs because this squared form is based in an odd number of corners (7 x 7 = 49) with constituting the square.

Table 1 - Symmetry between the corners of the hypothetical city

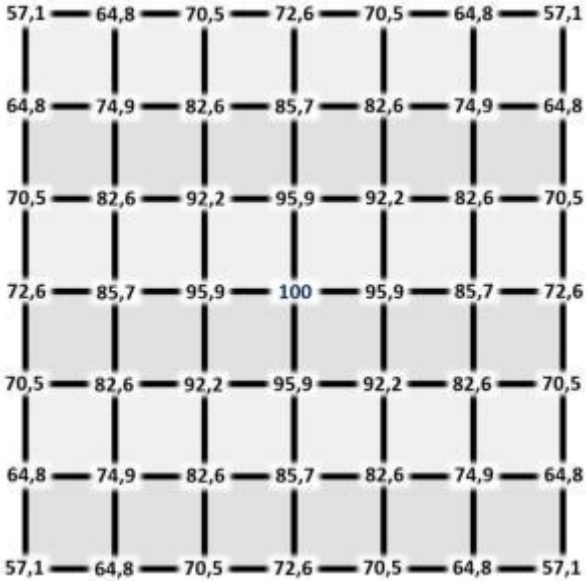
First ring (External ring)	Displacement value	Symmetry
a[1,1] = a[1,7] = a[7,7] = a[7,1]	294us (1/294 =0,00340) (57,1%)	Orthogonal symmetry
a[1,2] = a[1,6] = a[2,7] = a[6,7] = a[7,6] = a[7,2] = a[6,1] = a[2,1]	259us (0,00386) (64,87%)	45 degrees symmetry
a[1,3] = a[1,5]= a[3,7]= a[5,7]=a[7,5]= a[7,3]=a[5,1]= a[3,1]	238us (0,00420) (70,5%)	45 degrees symmetry
a[1,4] = a[4,7] = a[7,4] = a[4,1]	231us (0,00432) (72,6%)	Orthogonal symmetry
2nd Ring		
a[2,2] = a[2,6] = a[6,6] = a[6,2]	224us (0,00446) (74,9%)	Orthogonal symmetry
a[2,3] = a[2,5] = a[3,6] = a[5,6] = a[6,5] = a[6,3] = a[5,2] = a[3,2]	203us (0,00492) (82,6%)	45 degrees symmetry
a[2,4] = a[6,4] = a[4,6] = a[4,2]	196us (0,00510) (85,7%)	Orthogonal symmetry
3nd Ring		
a[3,3] = a[3,5] = a[5,3] = a[5,5]	182us (0,00549) (92,2%)	Orthogonal symmetry
a[3,4] = a[4,5] = a[5,4] = a[4,3]	175us (0,00571) (95,9%)	Orthogonal symmetry
Central Corner		
a[4,4]	168us (0,00595) (100%)	-

Source: the authors

One can observe two types of symmetry, the orthogonal and the 45 degrees symmetry. Imagining two superposed identical squares, the orthogonal symmetry can be verified by turning the superior square above the inferior in successive turns of 90 degrees. The 45 degrees symmetry can be verified by successive turns of 45 degrees of the superior square above the inferior.

Figure 3 presents the value of each corner, based on the total displacement of the community to access them. Considering that the lower the displacement, the more the value it generates to the client, the calculus of the value of each corner is normalized about the corner a[4,4] that presents the greatest value to the community, requiring only the 168 total unities to all clients to access it. Thus, this value was divided by 1, generating the coefficient 0,00595, constituting the normalizing factor (the 100% value), whereas all remaining values of the other corners were divided.

Figure 1 - The value generated for each corner in the city owing to the displacement of the community



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4.2.3. Synthesis of the value of corners to the society

Erro! Fonte de referência não encontrada. presents a synthesis which resumes some general aspects of the "city" used as an instance in this article. Firstly, the corners are grouped in categories, whereas symmetrical corners were put in the same category. The general accounting started from the central corner through the external ones.

The second column presents the total value of corners of a same category to the customers, the third the accumulated value of corners, departing from the center to the external rings, followed by the accumulated percentual value and the population of corners. Based on these numbers one can observe the unequal distribution of value between the different categories of corners, whereas the value of corners is more in the center, and as a result, 51,07% of the corners, positioned in the center of the square, generates 57% of value generated by a total of corners. In contrast, the peripheral corners generatean average less value to the community.

Corners	Individual value	Category value	Accumulated value	Percentual Accumulated Value	Accumulated population
a[4,4] = 168 (0,00595) (100%)	100	100	100	2,6%	2,0
a[3,4] = a[4,5] = a[5,4] = a[4,3]	95,9	383,6	483,6	12,87	10,2
a[3,3] = a[3,5] = a[5,3] = a[5,5]	92,2	368,8	852,4	22,68	18,36
a[2,4] = a[6,4] = a[4,6] = a[4,2]	85,7	342,8	1195,2	31,81	26,53
a[2,3] = a[2,5] = a[3,6] = a[5,6] = a[6,5] = a[6,3] = a[5,2] = a[3,2]	82,6	660,8	1856	49,4	42,8
a[2,2] = a[2,6] = a[6,6] = a[6,2]	74,9	299,6	2155,6	57,37	51,02
a[1,4] = a[4,7] = a[7,4] = a[4,1]	72,6	290,4	2446	65,1	59,1
a[1,3] = a[1,5]= a[3,7]= a[5,7]=a[7,5]= a[7,3]=a[5,1]= a[3,1]	70,5	564	3010	80,12	75,51
a[1,2] = a[1,6] = a[2,7] = a[6,7] = a[7,6] = a[7,2] = a[6,1] = a[2,1]	64,8	518,4	3528,4	93,92	91,83
a[1,1] = a[1,7] = a[7,7] = a[7,1]	57,1	228,4	3756,8	100	100

As a result, it will be expected that the rents charged by their owners in the central corner are proportional to the value generated to the society, whereas the rents charged in the central corners are bigger than the one charged in peripheral ones.

4.3. An instance of rivalry analysis between two corners (the central corner a[4,4] versus a peripheral corner a[1,1])

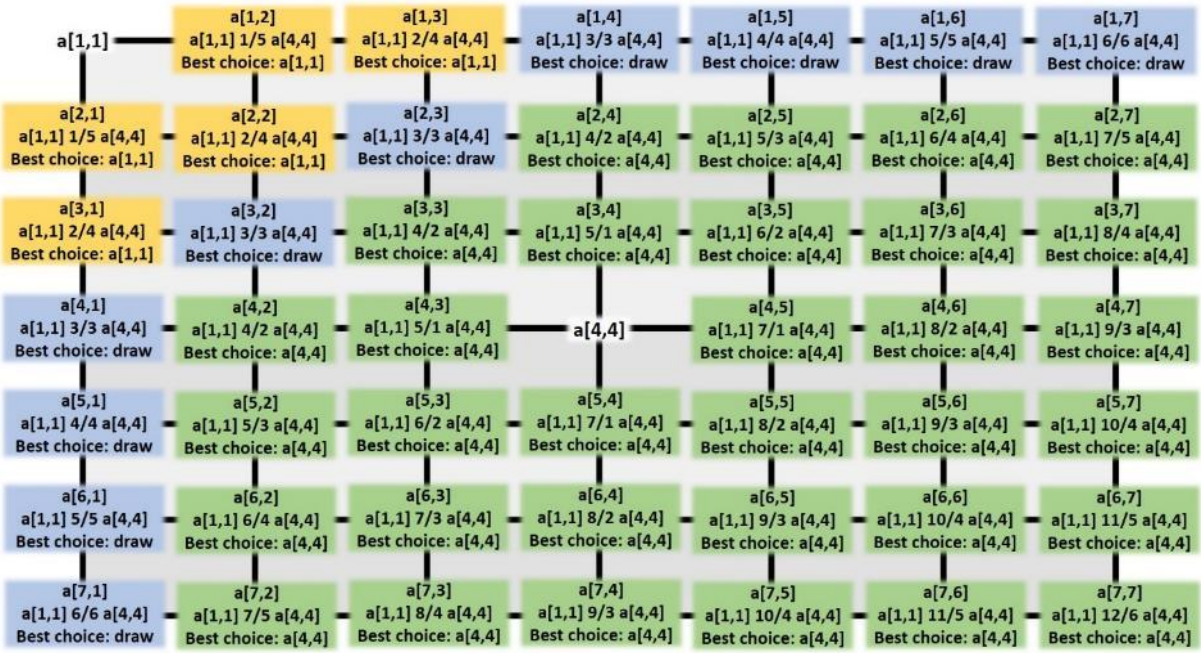
In this subsection is outlined an instance of competition between two hypothetical concurrent firms outlets positioned respectively in the corners a[1,1] and a[4,4] which offer a completely homogeneous product. As a result, the unique competitive factor capable of differentiating these two firms is the location, whereas, as presented previously, the central corner will generate more value than the peripheral ones. Based on this premise, we performed a comparative analysis of the value generated by each corner to each client, whereas the respective quantity of displacement and the decision of client is presented in each cell of Figure 4, which represents the corners of the hypothetical city, which serves of instance across all this article.

Except in the case of the two outlets in each remaining cell is presented the quantity of displacement of the customer positioned a given corner to access the corner a[1,1] and the corner a[4,4], and the correspondent decision, which will privilege the lower displacement. For example, in the case of the corner a[1,2], the displacement to access the outlet located in the corner a[1,1] is 1, and to access the corner a[4,4] is 5. As a result, the client located in this corner will prefer to buy a product in the corner a[1,1]. In other situations, clients positioned in some corners have to move the same distance to access these two corners (e.g., the clients

located in corners a[1,4], a[4,1], among others.). In this case we considerate that the half of clients in these situations will buy from the outlet positioned in a[1,1] and half of the [4,4] (Figure 4).

One can also observe in Figure 4 that most of the clients will choose to buy in the outlet positioned in the central corner, once it generates the smallest path to access the product that both hypothetical competitors firms sell.

Figure 4 - Competitive between the competition of the corner a[1,1]and the central corner a[4,4]



Source: the authors

Table 3 outline the results of the competition in each outlet. As such, the corner a[1,1] is the best choice for 5 clients, a[4,4] is the best choice for 32 clients, and for 10 clients, both outlets generate the same value. This table resumes a crucial aspect in this paper that is to propose a model that permit a formalization and quantification of competitive issues, which is presented in this table in terms of quantity of wins and drew of each competitors in relation to the preference of clients, what to the best of our knowledge still is no presented in the literature.

Table 3 - Results of the competition of the outlets positioned in the corners a[1,1] and a[4,4]

Value generated	Range of clients where the focal firm wins the competition	Total Score	
		a[1,1]	a[4,4]
a[1,1] generates more value for	a[1,2]; a[1,3]; a[2,1]; a[2,2]; a[3,1]	5	0
a[4,4] generates more value for	a[2,4]; a[2,5]; a[2,6]; a[2,5]; a[3,3]; a[3,4]; a[3,5]; a[3,6]; a[3,7]; a[4,2]; a[4,3]; a[4,5]; a[4,6]; a[4,7]; a[5,2]; a[5,3]; a[5,4]; a[5,5]; a[5,6]; a[5,7]; a[6,2]; a[6,3]; a[6,4]; a[6,5]; a[6,6]; a[6,7]; a[7,2]; a[7,3]; a[7,4]; a[7,5]; a[7,6]; a[7,7]	0	32
a[4,4] generates the same value for	a[1,4]; a[1,5]; a[1,6]; a[1,7]; a[2,3]; a[3,2]; a[4,1]; a[5,1]; a[6,1]; a[7,1]; (drew)	5	5
		10	**37**

Source: the authors

4.4. Market share, power asymmetry and other competitive indicators

Table 4 presents a resume of several indicators which permit to compare the competitiveness between a[1,1] and a[4,4], based on the value generated to the clients, relative to the displacement necessary to access outlets in these respective corners in the hypothetical city. Beginning from the market share, the central corner a[4,4] presents the major portion of the market whereas it generates more value to a major portion of clients according to the Table 3 presented in the previous section. The power asymmetry indicator is calculated by the coefficient between the a[4,4] market share and a[1,1] market share. It could be noted that the outlet located in the central point has 2,7 times more market power than the outlet located in the a[1,1].

Table 4 - Competitive comparative data between a[1,1] and a[4,4]

Properties measured	Values
Market share	a[1,1] = 27,02%; a[4,4] = 72,97%
Power asymmetry	a[4,4]/a[1,1]= 2,7
General competitive advantage	a[4,4] for 72,97% of the market
Competitive parity between a[1,1] and a[4,4]	for 10 clients, 21,27% of the market
Local competitive advantage – advantage in a market segment	a[1,1] for 10 clients in average, 27,02% of the market

Source: the authors

Comparatively, the outlet located in a[4,4] has a competitive advantage over the outlet located in a[1,1], which is named as a general competitive advantage, that occurs with the firm between competitors that has the greater absolute portion of the market. The competitive parity occurs when the value generated by two or more firms is equal for the same group of clients. In this instance, it occurs to ten clients. Lastly, even though the a[1,1], has a competitive disadvantage in relation to a[4,4], it has a competitive advantage for the market segment of the customers located close to the right corner of the square. As such, this situation suggests that although central corners have a competitive advantage over peripheral corners, it is possible to find in the periphery corners that can generate a level of value to a population group that makes possible the well-succeeded emphasis in a market segment.

5. Analysis and conclusion

In this paper, we applied the competitive strategy concepts to the spatial competition in the sense of giving a possible path toward the construction of more systematic, formal and feasible measures of competitiveness for firms. Owing to the analysis of the contributions of this work to the current literature of spatial competition we can consider the following aspects.

Even though concepts as market share and power asymmetry were approached in papers of the spatial competition (for this see respectively Eiselt and Laporte, 1989 and Cahan et al., 2018), this paper was not focused in economic equilibrium issues. Rather, its language and graphical structure change the focus from a general economic discursive form, which is naturally peculiar in economics papers which establishes theories in the microeconomy, to a perspective sufficiently detailed form that shows with fine grain capillarity, firms competing each other for specific customers. This approach permits to researchers and entrepreneurs a detailed view about how firms can generate value and compete in the spatial market. This

situation is outlined in Table 3 that shows in the dispute between a[1,1] and a[4,4], whose is the favorite place of shopping for each customer located in the city.

In the firm's economy, this study can inspire works that examine how determined productive resource is distributed in the society, its effects to their owners in terms of competitiveness and profit and to the rest of population in terms of health distribution. Accordingly, even this spatial model is used in the competitive strategy realm, it also can inspire studies about the spatial distribution of resources in society.

Owing to the use of computational methods to study location problems, one can see that it is explored for decades in operational research. However, in this research, we found no work that presents computational methods to analyze measures such as, market share, competitiveness, the preferences of consumers for firms located in different points, and about the pattern of accumulation of resources in squared cities. As such, this article open avenues for the development of algorithms to explore competitive factors in greater cities, for example, a study for a city with 100.000 corners, 1.000.000 and so on. Another opportunity is to explore the initial model with use of heterogeneity in the firms, customers and their distribution in the city.

Lastly, even though this paper follows in a more systematic and formal direction about the study of competitive strategy, their concepts can inspire studies in the empirical realm, considering the value generated by firms due to their location in real urban centers and countries regions, using real demographic data, with heterogeneous data of location and characteristics of population.

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