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THE SPATIAL LOGIC OF STREET MARKETS: AN ANALYSIS OF SANTIAGO, CHILE

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Abstract

Despite the fact that the 331 street markets in Santiago are responsible for almost 75% of fruit and vegetable, 50% of egg, and 50% of seafood and fish consumed by the urban population, there has been very little research on the way in which street fairs are located within urban space.

This paper studies the municipal coverage and configurational characteristics of the 331 street markets in the city of Santiago, taking a sample of about 600 meters (roughly 10 minutes walking distance) of each market, and using a street axis map of where they are located as a base. The results show that, of the total area of the city, street markets cover 58% of the urban fabric. Together with this, it was discovered that street markets tend to be located along the axes of configurationally relevant streets.

Keywords: *street markets, segment analysis, walking reach, Santiago, configurational analysis*

Theme: *Urban Space and Social, Economic and Cultural Phenomena*

INTRODUCTION

Street markets are a fundamental part of cities. They are present in most cities around the world, and play an essential role not only as centers for the supply of produce to lower class populations[1], but also as vital spaces for social cohesion and community strengthening (London Development Agency, 2010). This is especially true among the elderly and female populations.

In the case of Chile, it has been estimated that there are 925 street markets throughout the country, which are responsible for supplying 70% of all fruits and vegetables, 50% of eggs, and 50% of all fish and seafood consumed by the population (Chilean Association of Street Fairs). It is also estimated that over 160,000 people are employed either directly or indirectly by street markets, and that these involve the payment of 40,000 permits. Finally, it is also estimated that the average size of these markets is about 154 formal stands, and 120 informal stands.

Previous Work

A large part of the literature that deals with the nature and functioning of street markets tends to do so from a clearly defined political standpoint. For views closer to the right of the political spectrum, street markets represent the existence of the entrepreneurial spirit among lower-class sectors, characterized by the capacity to take commercial risks with the objective of creating a personal or family-based initiative. According to this vision, street markets have come to represent a deeply embedded, individualist ethos and a desire for self-improvement, though this is at times repressed by state asistencialism of lower class life styles (De Soto, 1986). In this way, the role of the state is to foment this form of proto-capitalism (Cross, 2000) through technical training for market workers, and by providing them with knowledge on marketing and accounting that allows them to formalize their commercial initiatives (Yvonne and Jones, 1998; Cross, 2000).

On the other hand, the vision of academics on the center-left side of the political spectrum is quite different. According to these perspectives, street markets present an anti-capitalist attitude, in the way that they do not obey the economic logic of capital accumulation (as the companies tend to be family-owned), and in representing spaces where the dominant social order is questioned. In effect, in his detailed, historic review of the functioning of street markets in Chile, Salazaar (2004) maintains that these spaces have historically been places of “resistance” to elite social, cultural and economic norms for the lower-class populations of the city. Salazar proposes that, unlike the traditional forms of labor resistance such as marches or strikes, street markets operate by creating a festive, upbeat and liberating environment that offers participants the option of subverting the established order by adopting attitudes and behaviors that are often censured in other circumstances. Salazaar maintains that such behavior also enshrines an anti-capitalist attitude, in which the relationship with the client is not merely a commercial relationship, but one of great care and concern, and in which rather than compete, market vendors develop emotional ties and friendships that often cross generational barriers.

However, views on the nature of street markets are less diverse regarding their location within the urban fabric. Bromley (2000) states that the main characteristics of street markets is their flexibility, which translates into vendor groups varying their locations throughout the week, in order to be closer to their consumers. As such, market vendors seem to follow the demand.

Nevertheless, the question remains: what are the main variables that explain the location of street markets? The principal argument that has been made on this point is centered on the

[1] This is not always the case. In the United States, for example, street markets in the large cities are places that tend to be visited by upper-middle class patrons, interested in organic or specialized products, rather than by the lower-class population.

correlation to constant and mass pedestrian and vehicle flows, as well as regarding well-defined and wide-ranging areas of consumption, with populations that are capable of sustained purchasing of the products sold (Bromley, 1998; Salazar, 2004). Budiarto, for example, maintains that street markets are located within an intermediate layer in the urban hierarchy, which is to say, between the main structure of the city and local roads, as these are the areas that allow residents more efficient access to the more important street systems in the city (known as the super grid). At the same time, the temporary use of these areas (by the street markets) does not imply significant costs to the functioning of the urban system as a whole. In addition, aspects such as the need to avoid conflicts with the police (Bromley, 1998) or the will of the state to relocate certain street markets in order to provide higher degrees of order and improved sanitary conditions to the urban space (Hunt, 2009) play an important role in defining the location of street markets.

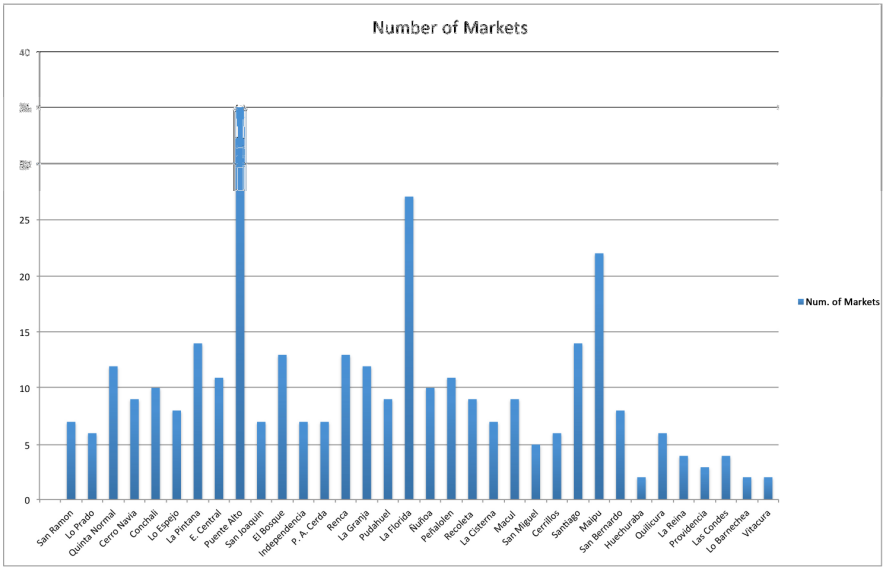
In order to respond to these and other research questions, this work measures the spatial coverage among street grids of the 331 authorized street markets in the city of Santiago, throughout all 34 municipalities where these are located. In addition, the configurational characteristics of these markets have also been analyzed.

Analyzing the location and characteristics of street markets in the city of Santiago

Markets in public spaces

The identification and location of street markets was determined based on the study "Analysis of the street market situation in the Metropolitan Region and its relation with public transportation", completed in 2009 by the Universidad Catolica, sponsored by Transantiago. This study sought to identify differing forms of management, so that street markets could be made more compatible with the changes to the public transportation system. This required specific locations within the urban system, and identifying the main characteristics of the different street markets. Graphic 1 presents some of the results of this study, such as the fact that for the 34 municipalities of the capital city, a total of 331 street markets were detected, involving a total of 57,580 stands. It was also shown that the number of markets per municipality varies significantly, as while municipalities such as Lo Barnechea and Vitacura (in the eastern sector of Santiago) have only 2 markets each, municipalities such as Puente Alto and La Florida have 35 and 27 markets, respectively.

Graphic 1 number of markets in the 34 municipalities of Santiago



Based on the registry compiled by this previous study, the present research project located each of the 331 markets within a Geographic Information System (GIS), over the base of a street axis map of Santiago from 2005. One of the advantages of the street axis map is that it allows for a calculation of the distances that a person must actually walk to go from one side of the market to the other, either by foot or on the sidewalk (Peponis et al., 2007). From the center of each street market, a local coverage study was performed by considering a distance of 600 meters, which is equivalent to about ten minutes walking at a medium pace, or about 6 standard blocks in the city of Santiago. Recent research on buyers at Santiago street markets (Aliaga, 2011) point out that 85% of these users live within a range of 9 to 11 minutes walking distance from the markets where they shop. Figure 1 exemplifies this operation for the case of one market in Santiago. Figure 2 shows this analysis for all of the markets in the capital.

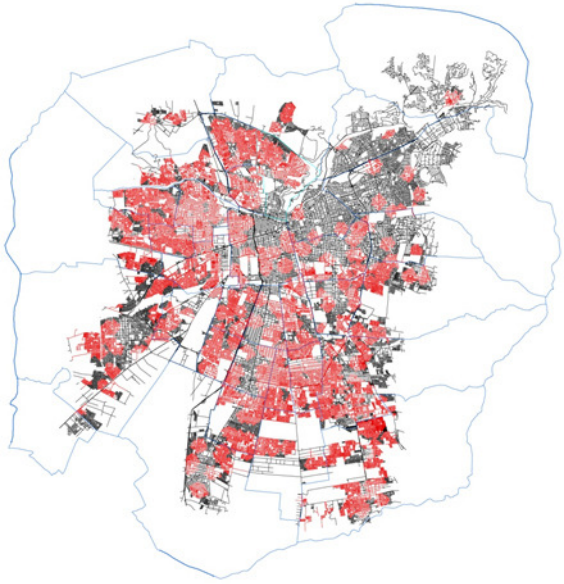


Figure 1 Procedure used to calculate a street-based 600m catchment area from street markets. The light grey line shows the location of the street market.

Figure 2 Area covered by all street markets of Santiago functioning at the same time considering a street-based 600m catchment area.

The results of the coverage analysis for each market (corresponding to the total linear meters of official streets within the determined range of distance) were imposed onto the maps of each of the 34 municipalities of Santiago, and then compared to the total street coverage for each municipality (total linear meters of streets per municipality). For example, if the market in municipality A had a coverage range of 1,000 meters, and the sum of all of the streets in that municipality was 100,000 meters, it could be determined that the 10-minute walk within street market 1 represented approximately 1% of the total municipal street coverage. In following this idea, if street market 2 had a total coverage of 1,500 meters, it could be determined that it covered approximately 1.5% of the total street cover for municipality A. It could thus be determined that, together, street markets 1 and 2 cover 2.5% of municipal street space. This was denominated the Brute Coverage Index (BCI).

It could be argued that it is possible for the coverage of markets 1 and 2 to be superimposed, in that they may share some of the same streets. In order to discover what percentage of total street coverage was 600 meters or less from at least two street markets (or, in practice, the blocks served by more than one street market), a new indicator was created. This second indicator was obtained by adding up all of the streets included in the total municipal street coverage, and subtracting the streets that are 600 meters or less from more than one street market. This index was denominated Net Coverage Index (NCI).

Table 1 Brute Coverage Index (BCI) and Net Coverage Index (NCI) of street markets in the 34 municipalities of Santiago.

	Municipalities	BCI	NCI
1	San Ramon	91%	64%
2	Lo Prado	87%	38%
3	Quinta Normal	87%	37%
4	Cerro Navia	83%	56%
5	Conchali	77%	33%
6	Lo Espejo	77%	65%
7	La Pintana	77%	62%
8	E. Central	75%	50%
9	Puente Alto	74%	52%
10	San Joaquin	73%	61%
11	El Bosque	72%	58%
12	Independencia	72%	35%
13	P. A. Cerda	70%	61%
14	Renca	67%	17%
15	La Granja	66%	34%
16	Pudahuel	66%	57%
17	La Florida	60%	43%
18	Ñuñoa	59%	44%
19	Peñalolen	59%	45%
20	Recoleta	58%	15%
21	La Cisterna	57%	41%
22	Macul	55%	47%
23	San Miguel	53%	48%
24	Cerrillos	51%	43%
25	Santiago	49%	38%
26	Maipu	44%	36%
27	San Bernardo	43%	42%
28	Huechuraba	42%	42%
29	Quilicura	41%	40%
30	La Reina	27%	27%
31	Providencia	19%	18%
32	Las Condes	15%	13%
33	Lo Barnechea	9%	7%
34	Vitacura	6%	4%
	TOTAL	58%	39%

Table 1 shows the BCIs and NCIs for each of the municipalities of Santiago. It can be seen that, all together, the coverage (600 m) of all the street markets in the city of Santiago reach 58% of the entire street grid. However, this value displays significant variations between different municipalities. While in municipalities such as San Ramon and Lo Prado, in the south of Santiago, the coverage of all the markets together reach 91% and 87% respectively of total municipal street grids, in Vitacura and Lo Barnechea this value represents only 6% and 9%, respectively. If the streets that are 600 meters or less from a street market are left out of the calculation, considering that they would have been counted twice or even three times in the BCI, and only the percentage of the municipal street coverage that is served by at least one street market are considered (NCI), an average of 39% of the total street coverage in Santiago are used by street markets. Again, there are significant municipal variations, as in San Ramon and Pedro Aguirre Cerda, 64% and 61% of the total street coverage are 10 minutes or less walking from a street market, respectively. On the other hand, in Vitacura and Lo Barnechea, this value reaches only 4% and 7%, respectively.

Based on these results, it seems that street market coverage is related to the socio-economic level of each municipality. While San Ramon and Pedro Aguirre Cerda are home to some of the lowest socio-economic levels in Santiago, Vitacura and Lo Barnechea are those with the lowest percentages of lower-class strata. In order to delve deeper into this relationship, the following exercise was undertaken. Based on the socio-economic division of social groups (into groups

denominated as ABC1, C2, C3, D and E, in order from highest to lowest) provided by Adimark, the percentage of the municipal population that belong to the C3, D and E groups[2] were determined, which represents almost 68% of the total population in Santiago. This citywide percentage was compared to the municipal net coverage index (NCI). This was done in order to observe the degree of the association, in terms of coverage, between the location of street markets and the middle-lower class sectors of the city.

The results of this operation showed a high correlation between both variables (r2=0.7). This confirms the idea that the location of street markets in Santiago is very much so related to the presence of middle and middle-lower strata in the city. However, this begs several questions: How is this phenomenon brought about? What is the process through which the street market vendors or their associations are able to reach vast segments of the middle and lower-income populations in order to provide them with produce? In order to respond to these two questions, the following section analyzes the configurational characteristics of street markets in the city of Santiago.

Configurational characteristics of the markets

Recent research has sought to observe the association between movement flows and configurational characteristics on a segment map. Hillier and Iida (2005), for example, compared vehicle flows at over 200 points throughout a vast area of London, to metric distances (what average percentage of meters is each segment out of the rest of the segments in the system), topological distances (what average number of intersections have to be crossed from each segment in order to reach the rest of the segments in the system), and geometric distances (how many changes in direction must be made on average from each segment in order to reach the rest of the segments in the system). The results showed that the geometric (the degree of geometric depth) and topological (the number of intersections) characteristics were better associated than the metric distance with movement flows. In order to analyze to what degree the configurational characteristics of each municipality were associated to the location of street markets, a new exercise was carried out.

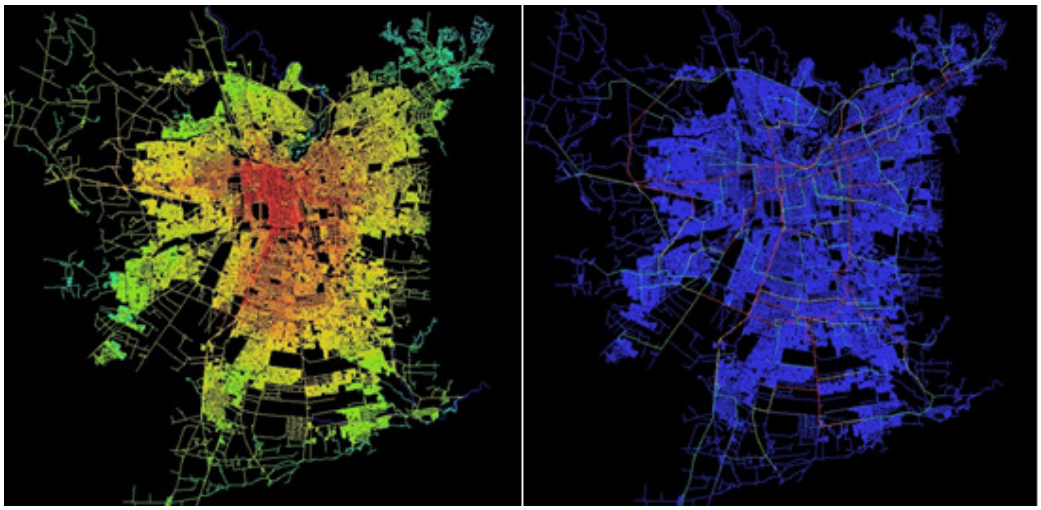


Figure 3a Global Integration of Santiago (segment analysis). Figure 3b: Choice values of Santiago (segment analysis)

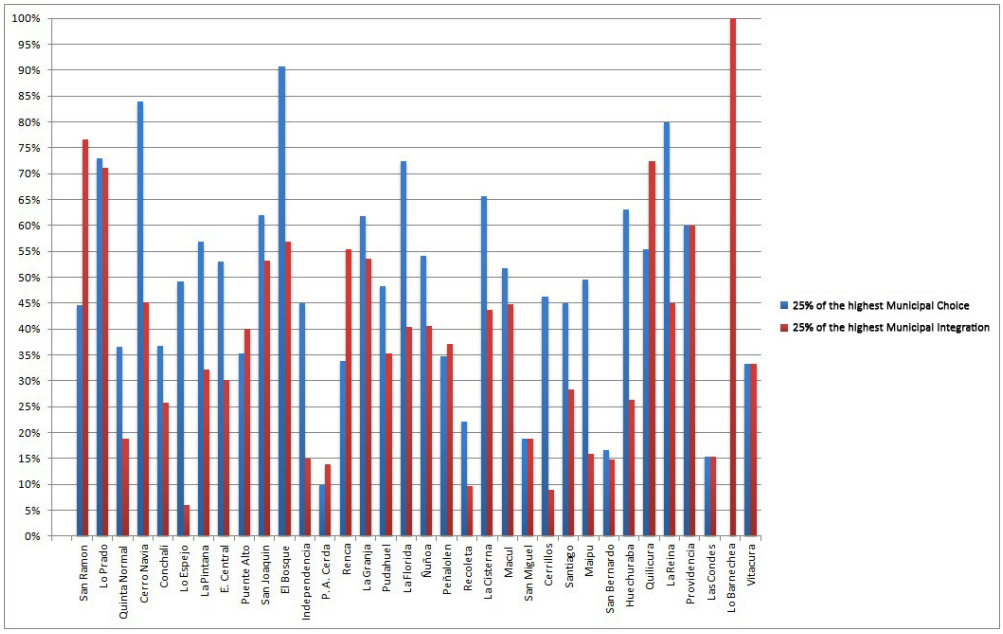
[2] The average monthly household income within the C3 level is between 400,000 and 500,000 pesos, while for the D level this is between 200,000 and 300,000 pesos, and level E corresonds to below 160,000 pesos.

Figure 3a shows the integrated map for the city of Santiago. This includes the segments that are most "accessible" from the point of view of their changes of direction[3] within the urban system[4]. It can be observed that the most integrated segments (in warmer colors) are located in the center of the city, decreasing gradually outwards towards the periphery.

Figure 3b shows the *Choice* values of each of the 330,000 segments that make up the map of Santiago, which reflect the segments through which it is most "probable" (only taking its location within the system into account, and not the width or general quality of the streets) that people will circulate from any other pair of segments in the city. Unlike the previous map, this map shows the existence of a hierarchical system (super grid) with three distinct levels. This division seems to divide the urban structure in a way similar to the veins in a tree leaf.

In order to discover the particular configurational characteristics of each market, an additional analysis was performed. This consisted of attaining the percentage of the market segments (here it is important to remember that one market can correspond to several different segments) that belonged to 10% and 25% of the municipal segments with the highest Integration and Choice values. Graphic 2 reflects the results of this analysis. As can be observed, 18% of the market segments are in the highest 10% regarding Integration values, while almost half of all street markets (47%) belong to the highest 25% regarding Integration. In other words, street markets are almost twice as likely to be located in more integrated segments (10% and 25%), than along any other street. In observing the last two columns of the table, which show the Choice values, the situation is similar. On the level of the entire city, 18% of the segments that correspond to street markets are located within the highest 10% of Choice values, while when the highest 25% of segments regarding choice values in each municipality are considered, 38% of the street market segments are located in these areas.

Graphic 2 Percentage of street markets segments within the 10% and 25% of highest Integration values in each municipality of Santiago



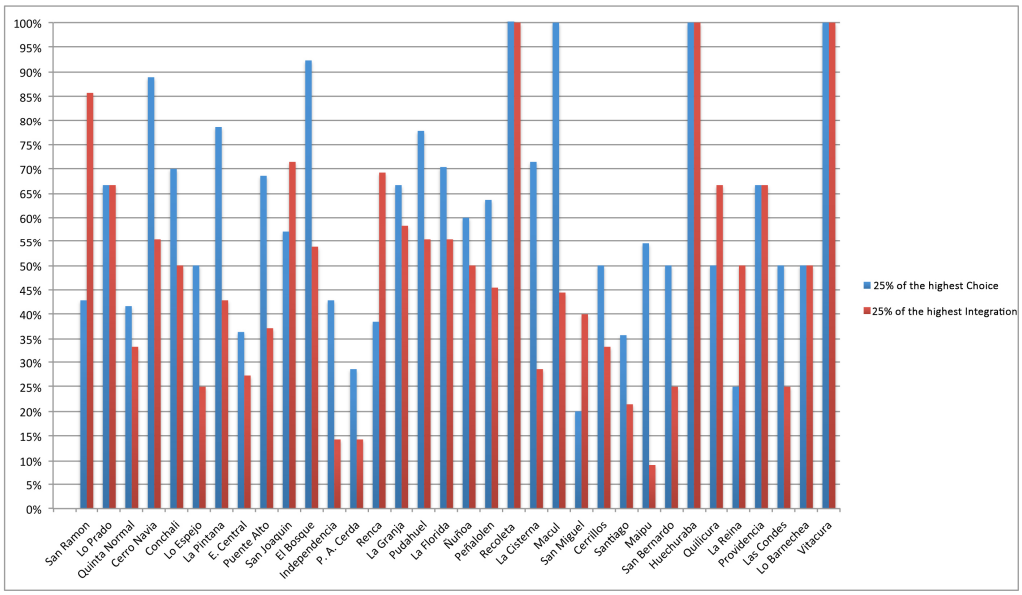
[3] Segment analysis is very receptive to the kind of change in direction that is made, establishing thresholds of about a 3° turn, which are represented with a value of between 0 and 1. For example, a change in direction of 90° between two segments takes on a value of 1, while a 45° turn is equivalent to 0.5. In this way, in establishing all of the changes in direction between all of the 330,000 segments, an average value is obtained, which comes to represent the degree of geometric-topological accessibility of each part of the street in the city.

[4] Given the enormous number of segments in the city of Santiago (330,000), the processing time for this map was almost three days, through the use of a supercomputer rented especially for these ends.

It could be argued that it is improbable for a street market to be located entirely within a segment with a high Choice or Integration value; after all, these are the segments that are most used by vehicles in order to circulate from one side of the city to the other. In this way, it is interesting to note what occurs when instead of having all of the segments corresponding to a street market within the highest 10% and 25% ranges, only the highest value for each street market is considered. In practice, this hypothesis proposes that, more than being entirely located in places that are configurationally notable within the municipal fabric, street markets have at least one section that is located in such places. Here the street markets of each municipality were targeted (for example, in the case of San Ramon, all 7 street markets located there), and the segment of each market with the highest Integration and Choice values were identified. Once these values had been identified, it was verified whether this value was in the range of the highest 10% and 25% of the ranges for both Integration and Choice within the municipality.

Graphic 3 shows the results of this operation. As can be observed, 28% of all the street markets in Santiago include a section that is located in the highest 10% value area regarding municipal integration, while almost half of the street markets (49%) include a section located within the highest 25% of Integration values within their respective municipalities. In other words, street markets are almost three times a likely to have at least one section located in the 10% most integrated areas of their respective municipalities than in the rest of the streets within the municipal urban areas. A similar pattern occurs for Choice values, as 30% of street markets have at least one section located in the highest 10% Choice value areas in each municipality, and 61% of the markets have at least one section in the highest 25% choice value area in their respective municipalities.

Graphic 3 Percentage of street markets segments within the 10% and 25% of highest Choice values in each municipality of Santiago



Discussion

The results obtained in this study show that the street markets established in the city of Santiago are located in urban space according to at least two clear logical patterns. The first, and most significant, is related to the fact that the location of street markets is tightly linked to the socio-economic level of the population that they serve, in which the presence of the C3, D and E

strata are those that most determine the largest coverage of street markets on a municipal scale. Although the international literature on this issue has persistently linked street markets to the presence of middle-lower class sectors, the evidence up to now had not allowed for a more detailed description of this relation (in spatial terms). In only comparing the number of street markets to the percentage of vulnerable segments of the population, the correlation is weak (for example, San Ramon has 7 street markets and Vitacura has 2, but La Florida has 27). Even when correcting this indicator based on the size of the population in each municipality (or calculating the number of markets per capita), a lower level of association is obtained (R2=0.56) than if the coverage of all the markets is studied in a scenario in which they all concur in covering the municipal space simultaneously, in which the relation reaches R2=0.7.

Secondly, the results suggest that there is another important variable for determining the location of street markets. This is related to the configurational characteristics of the streets that the markets use. The results show that these streets are characterized by being double or even triple the average measures of Integration (accessibility relative to municipal space) and Choice (location based on "where people must transit") for the streets in each particular municipality. In practice, this means that once the characteristics of the population in each municipality has been defined, in which the socio-economic level seems to be the most significant determinant variable, the following step is to identify the most appropriate streets, from the point of view of the most efficient coverage. This implies that in this second order of decision-making, configurational characteristics play a fundamental role.

One possible criticism of this reasoning is that street markets are, as a final step, authorized by the Transit Departments of each municipality. For this reason, the degree of freedom regarding location by the street market organizing groups is limited. Although a valid observation, this is only partially true, as typically the Transit Department are not responsible for defining where the markets are to be located, but rather with adapting specific requirements for the market vendors depending on certain locations and given the actual possibilities in each municipality. For this reason, it is possible to speculate that as the Municipal Transit Department does not mediate the process for defining the location of the street markets, the results in terms of municipal coverage could be even higher than previously indicated.

This begs an additional question: what makes the street market vendors tend to choose locations that are well placed within the municipal fabric, from a configurational point of view, in order to sell their products? Common sense indicates that these groups do not have tools of configurational analysis in order to make their location decisions. Rather, these decisions are made based on collective knowledge (Surowiecki, 2004) of an anonymous nature, which is capable of inferring qualitative properties of street networks.

Recent research points to an innate ability of people to infer configurational information in spatial systems. Hillier and Iida (2005), for example, showed that the configurational properties of a street network (geometric and topological distance) are more correlated than metric properties to the movement patterns recorded on an aggregate level for that same network. Based on this, the authors suggest that, "we read the urban network in topological terms more than metric terms. It could be said that the topological structure of the network effects movement, and how distance is defined by this network defines the choices that are made on a cognitive level" (Hillier and Iida, 2005: pp. 562). Conroy-Dalton (2003) demonstrated that on an individual level, people tend to reproduce the regularities found by Hillier and Iida. Mora (2010) showed that even in imaginary street systems, in which all the streets have the same width and street length is varied, people were able to infer qualitative information about the streets, such as identifying the main street in a system, even when this "main street" was not necessarily the longest. Future research could effectively study the selection process for the location of street markets by the vendor groups, which is perhaps their best-kept secret.

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