

Informal economy and spatial configuration in Quilicura, Santiago

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Rodrigo Mora

Universidad Tecnica Federico Santa Maria, Chile

Abstract

This paper analyses how spatial changes have affected the land uses distribution in Quilicura, a peripheral low-income area of Santiago de Chile, which has been growing very rapidly during the last twenty years. In this context, the first part of the paper examines the land use assignation at a global scale, where changes in the accessibility of certain areas have created strategic locations on the grid for large scale commerce, which then has created a new form of communal centre.

The second part of the study examines the grid implications on land uses distribution at a local scale, that is, its consequences for the consolidation of commercial activity on local streets and neighbourhoods. This issue has been divided into two areas: the domestic or small scale commerce, associated to residential activity, and the informal economy, represented by street markets.

One of the main findings of this paper refers to a sort of implicit logic that commands the installation of street markets. In fact, they tend to work parallel to the formal economy, covering the district rather homogeneously, and creating well-defined zones of influence that do not tend to overlap between them. This logic operates somehow opposite to a random process, in the sense that each maximizes its area of influence and, at the same time, minimizes its overlapping, creating a sort of “informal syntactic logic” of great efficiency.

Moreover, the results suggest that street markets may have been playing a decisive role, not only in the definition of local economies but also in the definition of local identities.

1. The construction of centrality in a peripheral district: the case of Quilicura

Quilicura is an industrial and low-income residential area located to the Northwest of Santiago, Chile. Although it has been more than one hundred years since its foundation, Quilicura has still maintained a rural character, because historically it has supplied agricultural produce to the city. Such character has its roots in the district’s relative isolation from the capital, as can be seen in Figure 1. Since 1970,

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morarodrigo@yahoo.com

the situation has been accentuated by the construction of the two main highways of Santiago: Americo Vespucio, that surrounds the capital, and the Panamericana, which divides the city from north to south.

The effect of such isolation can be appreciated in the integration maps of Santiago (Figure 1), where the district does not appear connected to any of the most integrated streets of the capital. In 1992, urban policies defined exclusive residential and industrial areas and, at the same time, a flood risks zone, in which constructions were not permitted. Moreover, in order to constrain the capital's expansion, Santiago's urban limit was marked. As a result, Quilicura is today the district with the largest industrial park in the country and one of the largest areas with available land for residential expansion in the capital.

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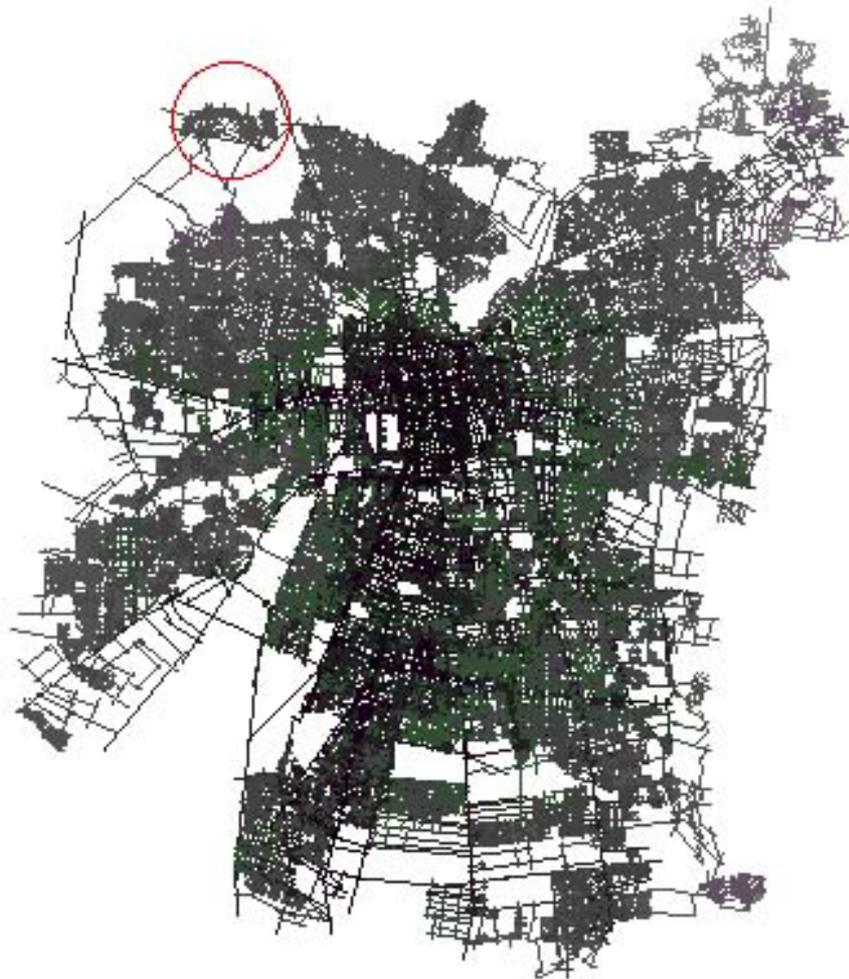


Figure 1: Axial map of Santiago in 1996; (source: Margarita Greene)

On the other hand, Quilicura's population has been growing rapidly since the 1970, with the highest rate in Chile during the last ten years¹. In fact, while Santiago's population has almost doubled since 1970 (from 2,823,524 to 5,071,681), Quilicura's population grew from 10,661 to 126,525 in the same period².

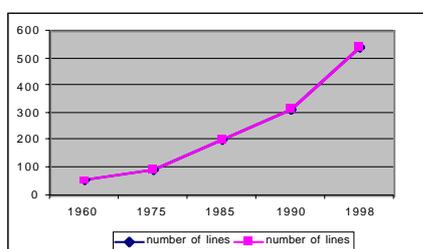
Population growth has been accompanied by a rapid land consumption where, from 1970 onward, the land occupied for residential uses has doubled almost every five years³. Such an expansion has been accompanied by what has been called a new form of residential segregation (Sabatini, 1999), in which the geographical distance that separates different income residential developments is less in the periphery. This fact seems to have its roots in Santiago's real estate dynamic where, due to the scarcity of available land, new middle income groups would have been occupying former low income areas when choosing their house location.

1.1 A syntactic analysis of Quilicura

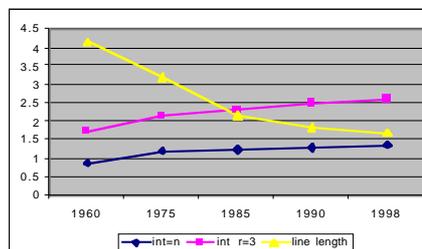
Due to the relative isolation of the district, in this part of the paper the lines that form the axial map of Quilicura have been separated from the ones belonging to Santiago, in order to calculate the district's syntactic values. As it can be appreciated, the settlement has increased its convexity, reducing categorically its former linear organisation, and increasing its number of lines. Such a process is depicted in columns three and four of Table 1 which illustrates that, while the number of lines has increased from 52 to 542 in the period 1960-2000 (in a similar way to the population growth), the inverse occurred to mean line length, which decreased from 4.138 to 1.71. This effect appears to be consistent with Hillier's description of the way in which cities' grow (2001), in which a socio cultural force headed by residential activity fill the interstices between the long axial lines that a settlement displays when it grows.

	mean int r=n	mean int r=3	number of lines	Line length (m)
1960	0.89	1.78	52	4.139
1975	1.23	2.16	91	3.177
1985	1.27	2.31	200	2.173
1990	1.32	2.50	315	1.873
1998	1.37	2.61	542	1.711

Table 1: Quilicura's syntactic evolution
Source: elaborated by the author



Graph 1 (top): Quilicura's number of lines evolution 1960-1998



Graph 2 (bottom): comparison of integration r=n, r=3 and line length in the same period
(Source: elaborated by the author)

The first two columns of Table 1 depict the evolution of integration r=n and integration r=3 of Quilicura, if we take into account just the lines within its limits. We can observe that, during the last forty years, both integration r=n and r=3 have constantly improved, although these levels seem to be stabilised.

If such changes have occurred in such a short period of time, we could ask ourselves what have been the consequences of such a period? And how has this evolution shaped the land use distribution?

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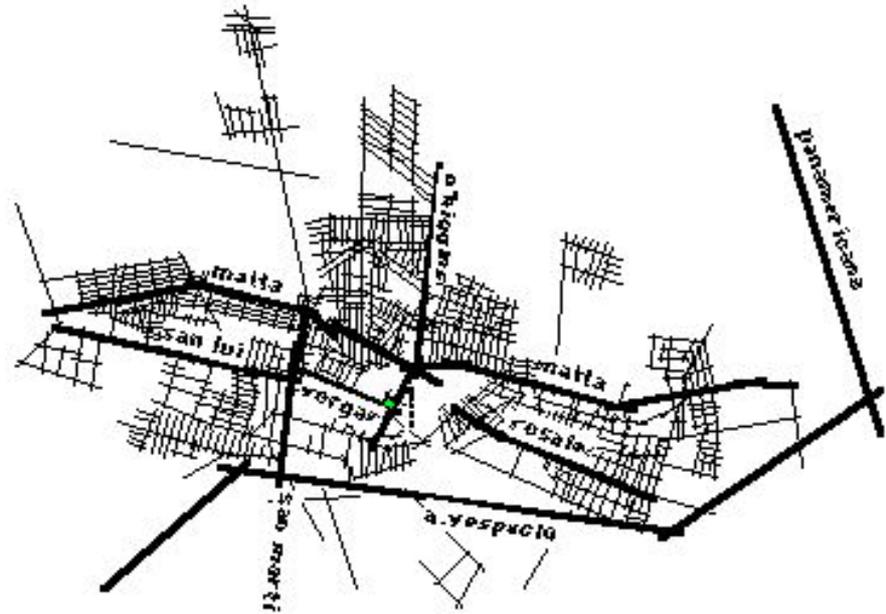


Figure 2: Quilicura's main roads (Source: elaborated by the author)

Figure 2 illustrates the street network in a simplified way. Note that the two large lines, Americo Vespucio and Panamericana, are intercommunal streets, while the rest just operate locally, connecting different places of the district. The most important of them is Matta, which crosses the network in an east-west direction. A set of shorter roads such as San Luis, Rosales and Vergara also work in the same direction. The latter, Vergara, has historically been Quilicura's traditional commercial street, despite the fact of its length (three blocks), and that it ends in the main civic square, where most of municipal services are located. On north-south direction, there are two distinguished streets: San Martin, which serves as an exit to Santiago, and O'Higgins, which starts in the main square and ends in Quilicura's urban limit.

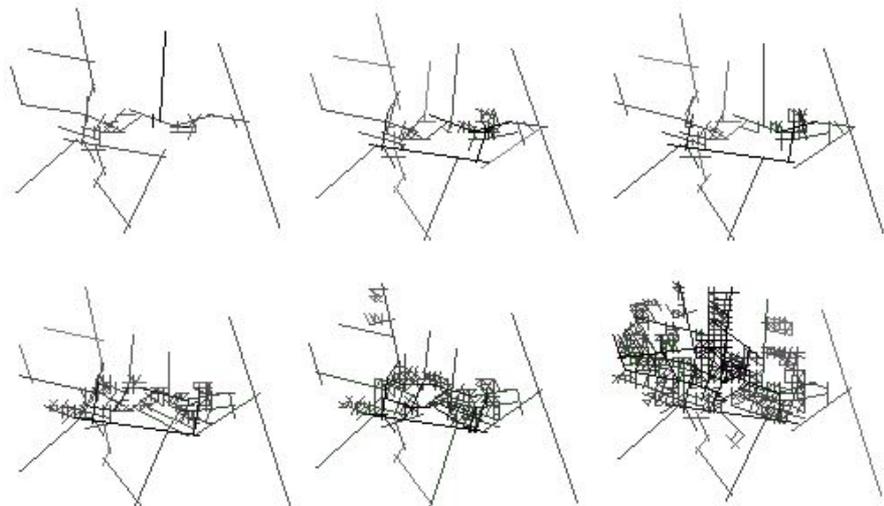
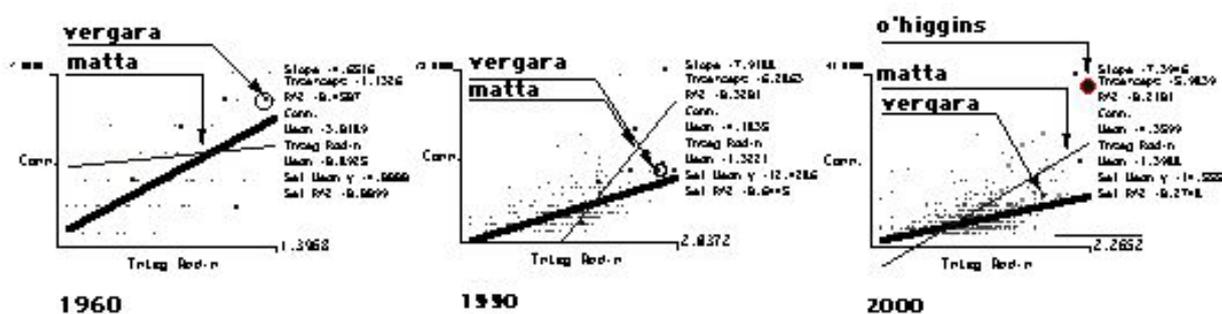


Figure 3(a,b,c,d,e,f): syntactic evolution of Quilicura

Syntactically, the evolution of the district can be appreciated from Figure 3 (a to f). In the first period (top left, top centre), the population was concentrated in two main poles: the eastbound, related to an old station now abandoned, and the traditional core, then related to residential use and agricultural land. In the beginning, Vergara had a high level of integration but, as time passed, new developments concentrated in the east part, moving the locus of integration in this direction. Towards 1985 (top right), growth took place filling a ring formed by Matta-O'Higgins and San Martin, and an incipient expansion started to surround that ring. Once this ring was completed (bottom left), the expansion began to spread from Matta to the north, and from San Martin to the west. A consequence of this is that, although the previous ring still existed, a smaller set of highly integrated lines appeared on the intersection of Matta with O'Higgins (bottom centre). Such a location would have created what we may call a "strategic point", that is, a highly promising location for commerce. In fact, in 1992, a supermarket was installed there, functioning successfully since then. Finally, during the last ten years, new developments have begun to occupy the rest of the available land (bottom right), fundamentally towards the north and alongside O'Higgins. The consequence of this has been a displacement of the most integrated lines from Vergara (the traditional centre) to the geographical centre of the settlement, where a new deformed ring appeared to be formed, changing the locus of the integration to O'Higgins. In fact, such effects can be appreciated in Regressions 1, 2 and 3, where Vergara and Matta appear with the highest syntactic values until 1990. O'Higgins, on the other hand, increased its syntactic values since 1990, skipping from below the settlement's trend line, in 1990, to the highest point of the graph in 2000.

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Regressions 1, 2 and 3: syntactic evolution of Quilicura's main roads (Source:elaborated by the author)

But what has happened at a local scale?

Hillier suggests (1998) that, at a local scale, the construction of centrality would depend on certain grid conditions. These conditions are associated not only with the position of the street in the context of a city, but also with the partition of the block, which would permit increases in the length available for commercial uses. This part of the paper will analyse how these aspects have affected the land uses in Matta, Quilicura's main street and how certain grid conditions have been used for the location of informal economy like street markets.

2. The grid implications on the local scale

As it has been pointed out, though its influence on movement, the spatial configuration of a city would have consequences for the consolidation of certain uses that strongly depend on people's circulation, like commerce and retail, which in turn tend to attract more people, starting a spiral process. This part of the paper examines the process at a local scale, in what we may call the domestic economy, that is, the installation of small-scale commerce associated to residential areas.

In her study of Santiago's low-income settlements, Greene (1999), suggests that the installation of domestic commerce improves importantly the household's income, and that spatial variables would have been playing an important role in what she calls the "consolidation of the periphery", that is, the improvement of neighbourhoods and housing of these informal settlements. Thus, space and its influence on land uses appear to have social implications, both in terms of domestic income and the consolidation of local communities. Because of this, the commercial activity on *Matta*, *Quilicura*'s most important local avenue, will be analysed.

Figure 4 is a transection of *Matta* following a three-step logic. If we consider *Matta* as the first step, then we may agree that the lines that intersect *Matta* are at distance of one step. They are in a second step. The third step corresponds, therefore, to those lines that intersect the second-step ones. The experiment permits us to see that each segment of *Matta* is intersected differently both in terms of the frequency of intersections and in what we might call the depth of the junction, or the continuation of the line to both sides of *Matta*. Figure 5 depicts the domestic commerce in those segments, where we can see that, the closer we are to the supermarket (*Matta-O'Higgins*), the more frequent the number of domestic commerce in both sides of *Matta*. Probably, this could be related to the importance of the supermarket (as an attractor that pulls people most of the day), but also, to the shorter blocks in front of it, which permits easier access to the new centre.

It has been shown that *Matta*'s Avenue grid conditions have been used for local business, which has contributed to improve households' incomes. However, given the conditions of the grid -scarce continuity of lines shown in the results and the low-income nature of the district- then large-scale business tends to be concentrated at the centre of the settlement, leaving the other sectors without this kind of infrastructure. This point is particularly important because low-income areas in Chile have a low capacity of mobilizing, making it more difficult for people to supply their needs.

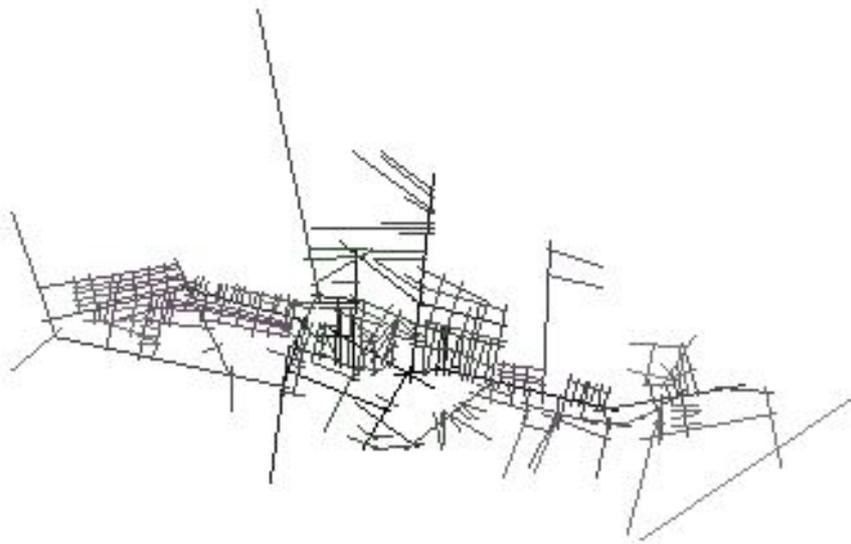


Figure 4 : Three-step transection of Matta



Figure 5: Domestic commercial activity in this segment (Source: Land uses survey elaborated by the author)

The commerce, then, adopts basically two main forms: the domestic commerce associated to residential use, or certain small-scale developments mainly located on specific locations and which operate locally. However, to suppose that only the formal economy could supply the goods and services that low-income people require is far from being real. On the contrary, the reality as shown so far is that the informal economy provides some of the goods and services those sectors require.

2.1 Local economy and street markets

Streets markets have been associated historically to cities. In fact, they have been the natural locations for commerce and interchange, and the places where vegetables, goods and services are offered. Nowadays, in almost every part of the globe is possible to find street markets, either in western or eastern countries or in developed or developing ones. Maybe for that, street markets have been associated with the ultimate nature of urban life because they permit the gathering of different people, becoming a sort representation of urban diversity. One of the crucial aspects of street markets

is that they tend to work locally, that is, most of them provide goods and services just for certain neighbourhoods (see Pictures 1 and 2) Despite this fact, it is usual to take street markets' existence for granted, and not to ask about the reasons behind their success and their capacity for pulling people towards them.

2.2 Streets markets in Quilicura

In the case of Quilicura, the authority detailed seven street markets, which normally work on different days during the week.

One of the aspects to be considered about the informal economy is that it has been formed by autonomous developments over time and, in the case of low-income areas like Quilicura, without a previous plan. They appear as a result of a collective proposal (normally by a group of traders), that ask permission from the local government to occupy the road during certain days of the week. In the case of Quilicura (and in the rest of the districts of Santiago), this permission is given by the local traffic department, where locations that could disrupt normal traffic are discarded, locating them in segments where traffic could be re-oriented. Despite these limitations, street markets appear to be very successful, constantly pulling people to their locations and working every week during the year. So, how has this process occurred, and more importantly, is there any spatial logic behind this?

In order to answer these questions, an exercise was designed. Figure 6 (top) shows the location of the seven streets markets (in black) authorised by the municipality in 1998. In order to know how those markets were working locally, the same three-step logic applied in the case of Matta was repeated. As it can be observed, street markets are distributed quite homogeneously within the grid, leaving few portions of it aside. But what would happen if we compare the market lines with the most integrated seven lines $r=3$ and $r=n$?

In order to test this, an exercise was designed. Figures 7 and 8 show the seven most integrated lines $r=n$ and $r=3$ (in black) respectively, also considering a three-step logic. Please note that, except for two lines (a section of Matta and a parallel section of San Martin), Quilicura's street markets do not correspond to the seven most integrated lines $r=n$ or $r=3$.

As it can be appreciated, the seven most integrated lines $r=n$ are concentrated in what we may call the geographical core and they are covering its central part. In fact, due their closeness, every line is making contact with at least one of the other seven lines, leaving large sections of the grid untouched.

A different phenomenon occurs when considering the seven most integrated lines $r=3$ (Figure 8, bottom right), where the lines appear to be distributed almost homogeneously throughout the grid, without any contact between them. This effect appears to be similar to the street market's effect, in spite of the fact that none of their lines (with the exception of a segment of San Luis), correspond to any of the seven most integrated lines $r=3$.



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Pictures 1 and 2: Street markets in Quilicura (Source: photograph by the author)

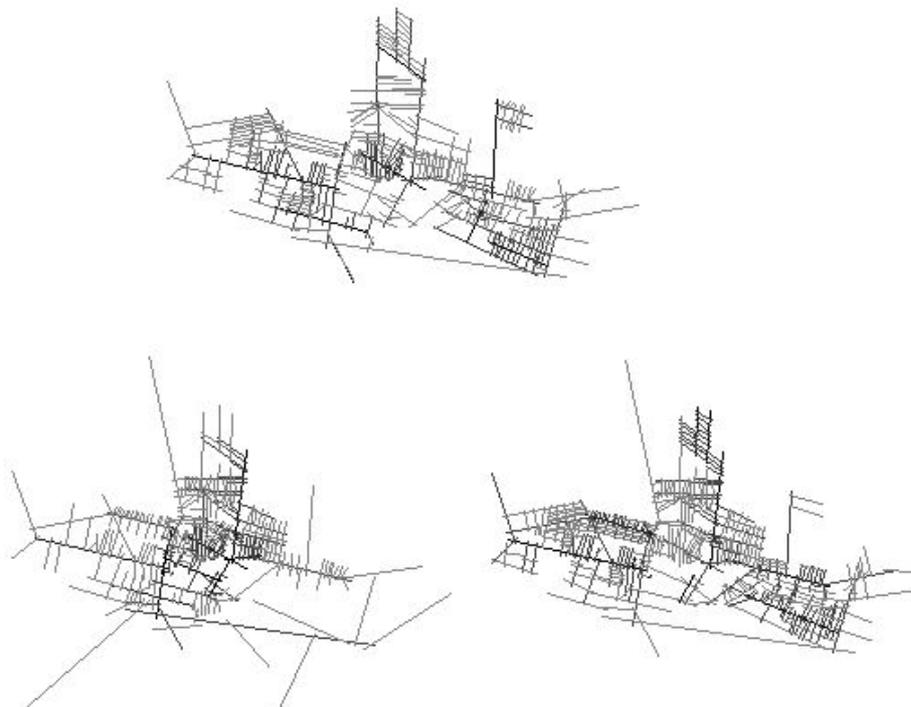


Figure 6 (top): Location of the seven street markets
Figure 7 (bottom left), and Figure 8 (bottom right): Seven most integrated lines $r=n$ and $r=3$ respectively

(Source: elaborated by the author)

Table 2 (below) shows the lines covered considering four situations: the seven street markets, the seven most integrated lines $r=n$ and $r=3$ respectively, and finally seven randomly selected lines. When choosing the randomly selected lines two premises were followed: the line had a similar location and syntactic value to each

of the market ones. The second column shows the number of lines that each situation covers in a three-step logic. The third and fourth columns of the table show, respectively, the average line length and the total length covered by each situation.

The results show that int. $r=3$ case covers 340 lines and a length of 2023 mts, suggesting that this is the most effective way to cover the district. The street markets, on the other hand, although not covering the same amount of lines, have a larger line length which results in a total length of 1789.20 m. Now let us make an experiment: if we consider the seven most integrated lines $r=3$ to be the most efficient way to cover the district's lines under the three step logic, then we may agree in considering its value as a 100% of the maximum of lines to be covered. Such a percentage appears in column 5. Taking the former value as a reference, the street markets represent 83.5%, nearly 10% larger than the seven most integrated lines $r=n$. In the case of the seven randomly selected lines, although they cover more lines than in $t=3$, their short average line length (3.38) gives a total length equivalent to 1155.96, less than 60% of the former. How does this occur?

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Lines	total number of lines at radius 3	Mean line length	Total length at radius 3	Percentage number of lines	Percentage of mean length	Lines taken individually	Line redundancy (number)	Percentage
seven most integrated $r=n$	250	6.33	1582.75	78.2	73.50	532.00	282	53.01
seven most integrated $r=3$	340	5.95	2023	100	100.00	441.00	101	22.9
seven street markets	284	6.30	1789.2	88.4	83.50	366.00	82	22.4
Seven randomly selected	342	3.38	1155.96	100.5	57.10	100.60	465	57.62

Table 2: Syntactic comparison between street markets and integrated lines

(Source: Quilicura's Traffic Department, Table elaborated by the author)

One explanation for this is that the informal economy possesses an effective locational logic, one that distributes diffusely on the grid (as integration $r=3$ does) maintaining, at the same time, a relatively high line length. This seems in opposition to the usual consideration of a random phenomenon, in which a lesser degree of length ultimately diminishes its area of influence.

But the exercise did not consider that street markets do not work on the same day but on different ones, because the traders used to move from one area to other during the week. For this reason, the second part of the exercise considered each of the seven lines that compose Quilicura's street markets working separately, that is, considering one line working just one day of the week (for example, on Monday), counting the number of lines that touch it in a three-step logic, and then repeating the exercise for the rest of the lines. If we sum all these exercises, we can obtain the

total number of lines covered by the seven lines considered in a three-step logic (Column 7 of Table 2). Now the seven most integrated streets are the most effective, with 532 lines, instead of the street markets which just cover 366 lines.

If we extract from those results the amount of lines working on the same day (Second column), we obtain what we could call a “line redundancy”, or the amount of lines that have been counted twice when counting the markets separately. In other words, if the markets would work on the same day (which is unreal in the case of Quilicura and very unlikely in other situations because it leaves the district without commerce), a great amount of lines would be covered twice when considering a three-step logic, especially when the seven most integrated lines $r=n$ are applied. In fact, the system has a line redundancy of 282 lines, equivalent to 53% of the lines when taken individually. Because line redundancy gives an idea of the duplication of lines, we may convey that, the smaller the redundancy number, the more specific is the zone where street markets are located. On the bottom of the table appear the seven most integrated lines $r=3$ and the seven street markets, which have a line redundancy of 101 and 82 lines respectively. These results are equivalent to 22.9% and 22.4% of the lines they covered when taken separately.

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The fact may suggest that the street markets, despite the fact that they do not tend to correspond with the seven most integrated lines $r=3$, are functioning in a very effective manner, such as diffuse distribution and reduced redundancy, practically opposite to a random manner.

Further, they seem to be working in a more “Christallerian” manner (Christaller, 1966), in the sense that their distribution in the grid responds to a necessity of supplying different areas whilst trying to avoid overlapping. This sophisticated way of working might suggest that the informal economy could also be helping in creating of a sort of unplanned commercial neighbourhoods, or well-defined zones with a certain degree of economic autonomy. This point is important, considering that low-income sectors in Chile have a reduced mobility, which do not facilitate the displacement of people to commercial centres. On the other hand, the results suggest that a parallel process may have been forming in low-income areas, where a combination of formal (that requires more mobility and it is intimately related to global integration), and informal economy (which avoids long trips and is related to local economy), would be finally supplying the goods and services for the population.

2.3 Centrality on time: what is coming in Quilicura

This paper has tried to show the implications of a rapid growth in the construction of centrality in a low-income area of Santiago. In doing that, both the global and the local spheres were reviewed. The former appears to be characterized by the definition of the main integrated lines, which result in the definition of strategic locations that were used for intensive commerce. On the other hand, the local sphere, through the location of street market, defines a complementary and very effective logic of distribution.

However, insofar as Santiago is still growing, a new effect is likely to appear, one that comes from a future connection of O'Higgins with Panamericana. The main effect of such an extension would be a displacement of high integration values from Vergara to O'Higgins, where the latter increases its integration value by 16%, whereas Vergara maintains its one. In fact, although both roads now have similar integration values, O'Higgins has a smaller size block, which could facilitate the dispersion of commercial activities.

Thus, as in the recent past, a new centrality could be emerging, as a spontaneous by-product of rapid urbanisation. Insofar as such centrality will demand public infrastructure like commerce, schools and hospitals, syntactic simulations could be used in order to help in the planning process.

3. Conclusions and suggestions

This paper studied the process of construction of centrality of a settlement in a context of rapid growth. It has been shown that, at a global scale, the process is neither stable nor definitive but deeply influenced by the grid. In first instance, this process defines certain strategic forces, where large-scale commerce tends to be installed. Such a location then attracts more people and starts to change the use of the streets by which people circulate, in order to reach that point. In that way, it helps to consolidate certain functional streets and ultimately to consolidate these households' internal economies.

In second instance, a parallel process appears working on that low-income settlement. Because the low level of consumer's capacity, the formal and large-scale is mainly located at its centre (and close to its traditional commercial street), leaving the rest of the district with poor standards of commerce. Normally those neighbourhoods find their way through formal domestic commerce, located in partially converted houses where the front yard is dedicated to business. However,

the main way in which those districts are being supplied with goods and services is the informal economy represented by street markets, which adapts very efficiently to the grid.

That adaptation is characterised by an homogeneous pattern of distribution, that covers practically the whole of the district with a low level of overlap of lines so, in other words, defining certain zones of competence or defined areas of influence. An apparent logic then governs the economy of this settlement: on the one hand, a large scale “movement-economy logic”, where formal commerce locates on certain strategic points and avenues with a high degree of correspondence to syntactic values. On the other hand, a “domestic informal logic”, similar to local integration but parallel to this, maximises the access to goods and services of the population. Because of this, and contrary to the common assumption of an arbitrary nature of street markets, they seem to have a rational logic, one that was not planned despite the fact of being profoundly efficient and complementary to the main one. Local and global logics therefore seem to be working in low-income settlements, and may be helping both in the construction of local centres (at the global scale), and helping in construction of local identities (at the local scale).

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We could say therefore that the challenge for local governments is to understand the centrality as a dynamic process, in the sense that it is influenced by the grid’s arrangement. Such a conception could help in the planning of local infrastructure (either public or private), and to concentrated municipal presence. Such a presence may also be displayed coordinated with street markets, given the fact that their locations could also be used as spaces for local representation.

The main challenge for local governments is then how to face a new scenario, more complex on the social sphere due to the diversification of its inhabitants, and also in the spatial aspect, due the dynamism of its centrality. Perhaps one of the clues to face it resides in understanding the urban economy in its formal and informal forms, in order to create a flexible and, at the same time, purposeful perspective, one that considers space and its implications in a changing but challenging world.

Notes

¹ In fact, according to 2002 Chilean’s census preliminaries figures, Quilicura’s has grown an impressive 237% during the last ten years.

² Source: National Statistics Institute

³ Elaborated by the author based on internal records

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