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BOGOTÁ: FROM INDUSTRIAL TO POST-INDUSTRIAL CITY.
EVIDENCE OF A “NEW” SOCIAL ECOLOGY

Abstract - The premise of a radical change regarding to contemporary urbanization, evidenced in a new physical and social structure of the city, is the main idea of this essay. This idea is applied to Bogotá, a city strongly transformed by the neoliberal globalization process since the 90's. Then, the objective of the essay is to examine the new sociospatial structure, using a multivariate technique of Principal component analysis. The paper is organized in four parts: a discussion about the industrial city and its nature; the description of Bogotá's change towards an economical structure dominated by the tertiary; a Principal component analysis in order to identify the contemporary social ecology of the city and its relationship with a liberalized economy; and finally, the conclusions focused on characterizing a new social morphology in Bogotá.

Key words: Social morphology, social ecology, postindustrial city, Principal component analysis, Bogotá, neoliberalism.

Introduction - The idea of a radical change regarding to urban processes is almost unquestionable. In fact, since *The Global City* (Sassen, 2001[1989]) publication –considered today as a classic work concerning to cities- there is plenty of literature centered in the social impact of this transformation, specially about urban economy and social structure of the city (Knox and Taylor, 1995; Martinotti, 1997, 1999; Baverstock, Smith et al., 2000; Marcuse and Kempen, 2000; Taylor, 2003; Knox Paul and Taylor, 2005; Scott, 2008). This restructuration, highly studied in the First World, has notably affected the Third World, which, as a consequence of this change of structure, appears now to be heterogeneous, and with a remarkable protagonist condition of the so called emerging countries (Nederveen Pieterse, 2011, 2012).

In the case of Bogotá, the city has been through important changes in its sociospatial structure since the forties, result of the migrations and a quick development of industrialization; until the sixties, with the stabilization of the increase of population and the decline of Keynesian model of industrialization (Amato, 1968; Amato, 1969). A third break up is due to the neoliberal restructuration of the nineties (Cuervo and González Montoya, 1997; Cuervo, 2002).

The previous information guides the reader into the purpose of this essay: to examine, based in various impacts of globalization, the sociospatial structure arising in the city, particularly the rearrangement of different social groups and the verification of the hypothesis stating that the contemporary processes of globalization produce a mayor social polarization (Marcuse and Kempen, 2000; Sassen, 2000, 2001[1989]).

The article is organized in the following parts. First, a discussion concerning to the nature of the industrial city; second, an examination of how the properties of the post-industrial city are reflected in a city such as Bogotá, focusing in the recent economical restructuration and modifications concerning to employment. The third part consists in a Principal component analysis with the purpose of identifying the contemporary social ecology of the city and its association with a liberalized economy, which had a particular impact on the real-estate market and the residential location. The last part exposes the conclusions, emphasizing on the different impacts of economic liberalization and, especially of globalization, over the social morphology, besides the description of the arising social structure.

From the industrial to the post-industrial city - One of the main characteristics of urban literature during XX century is the analysis of different aspects of the city from a principal premise: the nature of the city was determined by industrial activity –massive or limited- giving shape to urban structures, either concerning to typology of the work class neighbors, of industrialized zones, transport infrastructures (especially the ones related to freight), or to administrative areas uncharged of managing the different exchanges in order to keep industry working. Also, the way in which the terms of a city were determined by industrialization, especially regarding to Marxism and urban ecology. At the same time, industrialization opened the path to new forms of ideas about the city, both utopias and “dystopias”; these ideas had an important influence over the urban ideal and, with that, the politics and planning of the city –taking as an example the three modern utopias: The Garden City, The Broadacre City of F.L Wright, or the *Ville Radiense* of Le Cobursier (Fishman, 1892)- or the idea of the city as a necropolis, including both the Marxist influences since the half of the XIX century (Merrifield, 2002), as the conservative responses from nostalgic pastoralists and naturalists who proclaimed moral superiority of the countryside over the city (Beauregard, 2009).

The value of industry can be also observed in the physical morphology of the city –so depicts Engels in his classic work about the working class in England; portraying London’s emergency as the commercial capital of the world (Engels, 1960[1845]), as well as the misery of life conditions of the working classes –noticeably linked to the industrial location- in the industrialized zones of Manchester (Vance, 1990). This process of urban change got rapidly extended to Africa and Europe, with a few peculiarities, responding to the context and the moment of escalation of the industrial procedure, but with the common fact of overcoming to the already established morphology, generating a new form denominated by Vance as the complex city (Ibid).

The concept of post-modern city actually comes from Daniel Bell’s work, who defined the post-industrial society as “...deals primarily with changes in the social structure, the way in which the economy is being transformed and the occupational system reworked, and with the new relations between theory and empiricism, particularly science and technology” (Bell, 1999, p. 135). During the nineties, the idea of a postindustrial society became more popular, although the criticism due to its technological determinism (Webster, 2002), gave way to an important theory which not only declared the model based in the industrial

transformation as obsolete, but also the consolidation of global economy founded in knowledge and information (Castells, 1996, 2000).

The post-industrial city raises as a concept in which, gradually, industrial activity has lost the power to define what, according to Simmel (1950), can be denominated as urban sociability, meaning the way in which individuals set up their net of social relationships in the city (which is at the bottom of every social form); including new methods of social organization and new social classes. This sociability defines the way in which citizens organize their activities, but implies a materiality expressed in the resulting morphology, in order to be able to response to their demands: residential spaces; leisure spaces; production spaces; consumption spaces; command, coordination and control spaces (government), etc. In that case, which would be the general characteristics of a post-industrial city that denotes the difference with the old morphology of the city? The following are included by a synthesis:

- The physical deindustrialization of central cities and their replacement for new utilities in terms of consume and residential activity. Like this, a new economy focused in the tertiary appears, controlled by the financial sector, which has an increasing influence in urban activities.
- An expansion and conspicuity of command spaces, particularly office towers, which generate new urban centers and modify mobility, with that affecting the availability of residential areas.
- A new distribution of residential patterns, defined by the disposition in the city for new activities, but also by the new patterns imposed by demography and by new citizen cultures (studio apartments, garden towers, gentrification, etc.).
- A restructuration of social groups that includes both new generations, as well as the emergency of groups associated to the substantial increase of income in certain sectors, for example the “creative” classes (Florida, 2002); or the pauperization and deterioration of the life conditions of other groups (Soja, 2010). In these terms, is necessary considering education as a main component of the new economical project (Bell, 1999), both for its expansion and its importance in social mobility and the reconfiguration of social patterns.

The main objective of this essay is precisely to study this last characteristic.

Bogotá: economical restructuration and evidence of a postindustrial logic - Being the conditions of the postindustrial city already established, now we examine the recent development of Bogotá, especially the changes in urban economy. The analysis of Vancouver as a postindustrial city (Ley, 1980) identified four main characteristics that defined a change in the shape of the city and exposed a way into a new form of organization of liberal capitalism that dominated in Canada. These characteristics were: the enrichment of urban society; a service economy and the domain of employment of the area; the role of expansion of government and its bureaucracy; and the appearance of a new elite with particular styles of consume.

In the case of Bogotá, the city has experimented, during the last decade, an enrichment evidenced in the behavior of the GDP, which had, between 2001 and 2012, an average growth rate of 4, 6% (DANE, 2014). In 2012, the Bogotá's GDP reached US\$87000 million, standing as the eighth place between Latin American cities (América Economía, 2013). These dynamics are linked with the economic transformation of the city and is characterized by a tendency to outsourcing, employment and salary restructuration and industrial relocation motions.

Regarding to outsourcing, is worth standing out the progressive decrease of the relevance of the industrial sector over the city's GDP, as well as its impact in employment generation. As the following figure implies, while during 1990 the industry contributed 19,9% to the city's GDP, this participation has notably decreased in just two decades. In the other hand, participation of other sectors has increased, for example services (4, 2%), commerce (3, 8%) or construction with just 1,1%, an interesting fact taking into account the importance attributed to this sector during history in urban economy.

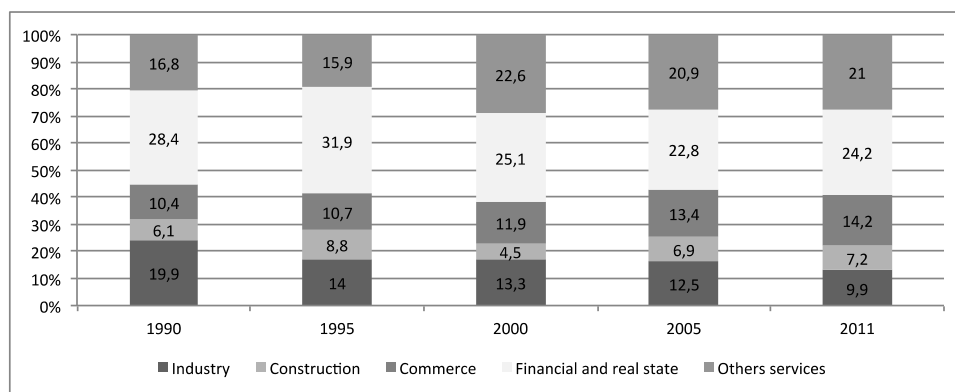


Fig. 1. Composition of Bogotá's GDP by activity sectors 1990-2011.

Source: DANE, calculated from Cuentas nacionales departamentales (2014)

The financial and real estate sector, even when it presents a fall of 9,1% between 1995 and 2005, during 2011 exposed a recovery of 1,4%. However, in this activity is important to stand out the increment of financial intermediation subsector, which's GDP participation passed from 7, 4% during 1990 to 9,3% in 2011. The city has become the financial and real estate activities central point, possessing 55% of the dealings (CCB, 2014). As well, in terms of services, the business services subsector stands out passing from contributing 2,1% to GDP in 1990 to 7,9% in 2011, due to outsourcing as a mechanism of reduction of costs of business operations, gratefully being some of their activities performed and developed out of the city.

Is considered that the progress of service economy of Bogotá, mainly based in commerce, in the financial and real estate, and in general services sectors, has been possible thanks to the magnitude of domestic market, but is also attributed to a change in the accumulation model which has forced industrial outsourcing (Alcaldía Mayor de Bogotá, 2008). The efforts of Bogotá to assume a better position in standings of competitiveness should also been taken into account, which has taken it as the sixth place between the most attractive cities in terms of business of Latin America (América Economía, 2013) and a preference from more than 1.500 foreign companies to settle in the city (CCB, 2014).

The economic transformation of the city is evidenced in the ground of employment and in salaries. Since the nineties, the rate of permanent employment has noticeably decreased while the rate of temporary employment has increased. During 1992 the industrial sector of the city generated around 180.000 permanent jobs, rate that decreased to less than 120.000 by 2005, while temporary jobs went from around 10.000 to almost 30.000, taking into account everything that implies in terms of labor exploitation, working hours without appropriate considerations, or lack of social protection (Alcaldía Mayor de Bogotá, 2008).

On the other hand, the economical restructuration of Bogotá is also characterized by dynamics of industrial relocation which have taken force in the nineties. Industry locations outside of the urban perimeter are mainly established around occident of the municipally Facatativá, towards north of the North Highway of Bogotá over Cajicá and Sopó, towards south (Soacha) and recently towards Medellin Highway. These processes are basically founded by regulations on land use in the central areas of the city, the lack of land inside Bogotá, the availability and land prices in close municipalities, transport logistics, and proximity to Bogotá (Rubiano Briñez, 2010; Mora Ardila, 2012).

However, one of the greatest subjects of debate about industry relocation from Bogotá towards the *Sabana*¹, is related to the tax incentives promoted by close municipalities. According to 2010 data, about 120 industrial firms abandoned the city to settle in a different municipality to benefit from tax exemptions in exchange for employment inside the local population, generating a decrease in the amount of money gathered by the taxes of industry and commerce of Bogotá. Although, the productivity of industrial work in the *Sabana* and its development has become a more powerful device for industrial relocation, to the point that “if the exemptions are eliminated the relocation will probably maintain its course” (Rubiano Bríñez, 2010).

The social ecology of contemporary Bogotá - The purpose of this part of the essay is to examine, based on census statistics, the behavior of social groups in the city, looking to establish its social morphology, explained by the reviewed processes of economic and social restructuration. This chapter contains an introduction to the statistic processes applied in order to examine the results.

Methodological notes over factorial ecology

The Principal components analysis (PCA), and their adequate classification are multivariate statistic techniques that allow us to synthetize the information derived from different variables into structural components, which have as an objective to characterize social reality. The principal component is a lineal combination of the active variables included into the analysis; is important to keep the biggest amount of information in order to maintain the rational sense of the data. For the interpretation of results is imperative to take into account both the angle and the magnitude of variables inside the correlation circle, as well as the positions taken by observations in the factorial plane.

These devices are relational statistic techniques used to graph the associations between variables –using geographical units- in two dimensions, in this circumstance, blocks. These graphs are denominated as factorial planes and their interpretation is linked to the overhaul of numeric data over the quality of representation of each variable (this because this is a technique which's purpose is to resume and therefore it loses information). In the correlation circle and in factorial planes, surroundings must be assumed as a relationship between the categories of the different variables, and conglomerate blocks as possible

1 Plains that surrounds the city with an extension of 4.200 Km², approx.

classes. The device is, then, a statistic mechanism of classification which allow us to observe how the social groups are distributed inside the city.

The objective of using a Principal components analysis and performing a multivariate classification for Bogotá is to categorize the city, including variables that function as characteristics of its socio-economical space. The technique allows us to –in statistic terms– locate structural components that give shape to the contemporary city and classifying the city in groups of blocks that are associated by certain variables and have a specific location into space.

Initial procedures - A first stage in the procedure answers to the selection of active variables: those that belong to the factorial plane and reduce their information in principal components. The correlation between these variables determines the position of geographical units inside the factorial plane. On the other hand, illustrative variables are recognized as well, used to verify the connection between socio-economic conditions and other variables as the stratum² or migratory patterns, allowing us to evaluate its applicability as active variables for the social classification of the city.

This first step had as a result the factorial plane that shows us that there is no relation between migratory patterns and socio-economic differentiation inside the city, reason why the variables associated to migratory patterns were discarded as determinant in the classification.

So, the use of the variables of stratum as an illustrative variable was tested, making evident its relation with the socio-economic conditions while it is correlated to other variables such as land value, value of the built square meter, educative level and the location of economic activities (establishments).

The following active variables were chosen from the tests: land value (m^2), value of built area (m^2), stratum, dependence rate of the elderly population, child dependency ratio, amount of service establishments, amount of commerce establishments, amount of industry establishments, amount of jobs, proportion of households without electricity, proportion of households without aqueduct, proportion of households without sewerage, proportion of population without any education level, proportion of illiterate population, proportion of population graduated from elementary school, proportion of graduates from high school, and proportion of population possessing graduated titles.

2 For tax purposes, the city is divided in 6 groups: 1 for the poorest population and 6 for the richest.

Results: The social group's restructuration inside the city - It was necessary to choose an adequate amount of variables capable of gathering enough percentage of variability of the data, in order to create the correlation circle. For this job four facts were chosen, first, because they hold 67% of the variability of the information, and second because their factorial coefficients are close to 1.

On the other hand, the correlation circle (Figure 2) states a connection between the variables from four different interpretations: length of the variables (that exposes the quality of the representations of each component), the angle formed between variables, the angle formed between variables and each component (both of those indicating the linear association level, that determines a positive or negative strong correlation), and finally, the direction of the variables (which indicates an increment in their own magnitude).

The circle shows two principal components that resume the variable's information; in the center of the circle we find the average value belonging to each one of them. The component number 1 can be denominated as socio-economic conditions, taking into account that the most influential variables are: the ones related to education, stratum, land value and dependency ratios. The component number two can be denominated as economical activities, since the variables involved are: economical establishments, type of activity and employment amount (see Figure 2). In the same figure, the relationship between variables is shown according to selected components 1 and 2, because they retain the biggest amount of relevant information. Even though aspects 3 and 4 are not included inside the circle, the relative contribution of variables to these aspects can be appreciated in Table 1. The third aspect –since the variables involved are related to sewerage, electrical power and aqueducts- can be denominated as public services while variables related to aspect 4 are only related to education.

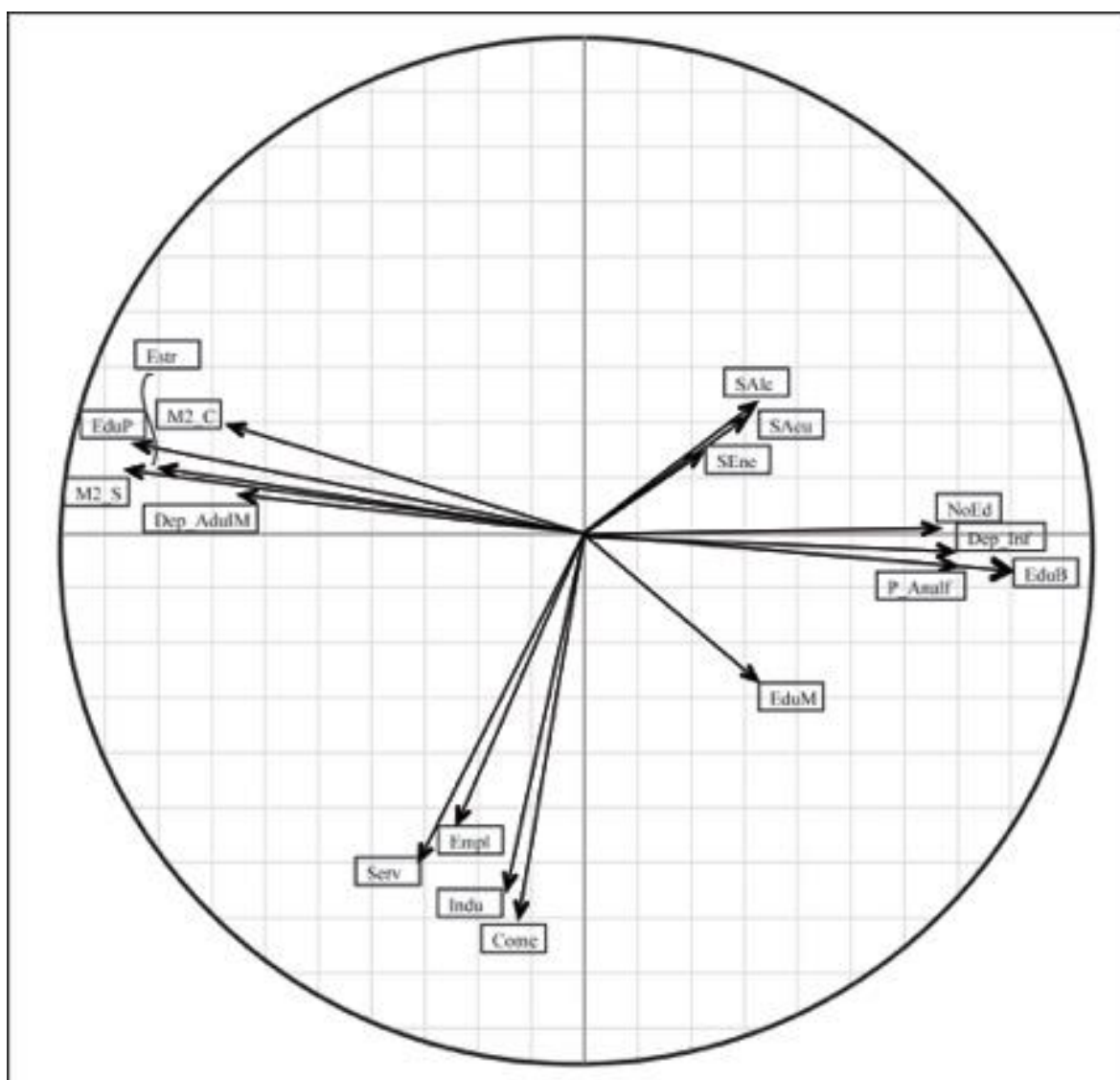


Figure 2: Correlation Circle

Variables	Components		Factor 3	Factor 4
	Factor 1	Factor 2		
Land value of m ² (M2_S)	1144	63	94	338
Value of m ² constructed (M2_C)	818	228	143	603
Amount of industry establishments (Indu)	40	2287	159	24
Amount of commerce establishments (Come)	29	2622	233	2
Amount of service establishments (Serv)	175	1916	531	87
Amount of jobs (Empl)	102	1494	521	37
Dependence rate of the child population (Dep_Inf)	920	4	1	762
Dependence rate of the elderly population (Dep_AdultM)	760	31	77	24
Stratum (Estr)	1153	79	28	161
% of households without sewerage (SAIc)	187	300	2426	688
% of illiterate population (P_Analf)	903	0	184	2208
% of households without power (SEne)	89	130	1688	517
% of population graduated from elementary school (EduB)	1158	24	2	84
% of graduates from high school (EduM)	197	405	1079	1632
% of population possessing graduate titles (EduP)	1342	157	118	59
% proportion of population without education (NoEd)	806	0	230	1989
% of households without aqueduct (SAcu)	175	258	2485	785

Table 1: Relative contribution of the variables to each aspect. Resulting information from PCA.

In order to support the position of the variables and categorize the city according to the information provided by the active variables, another method was used –complementary to the factorial method- that consisted in searching for groups and classifying the units required for the analysis (blocks). Each group associates those units according to a homogeneity criterion. Groups are design so their own geographical units are similar to the ones belonging to a different group. In order to understand the variables of each group is necessary to create a table with their main characteristics for each one of them.

By using this method, the results were two different classifications. The first one (Figure 3), collected information from all four aspects analyzed by the PCA. This headed to the obtaining of three groups: a center, where most of the economic activities are focused, as well as the richest population, therefore an easier access to public and social services of better quality. In this part, blocks containing a high proportion of educated population, high values of the land, high values of build area, stratum over four, high dependence rates of the elderly population, big amounts of service establishments, and an average percentage of amount of employment, are pulled together.

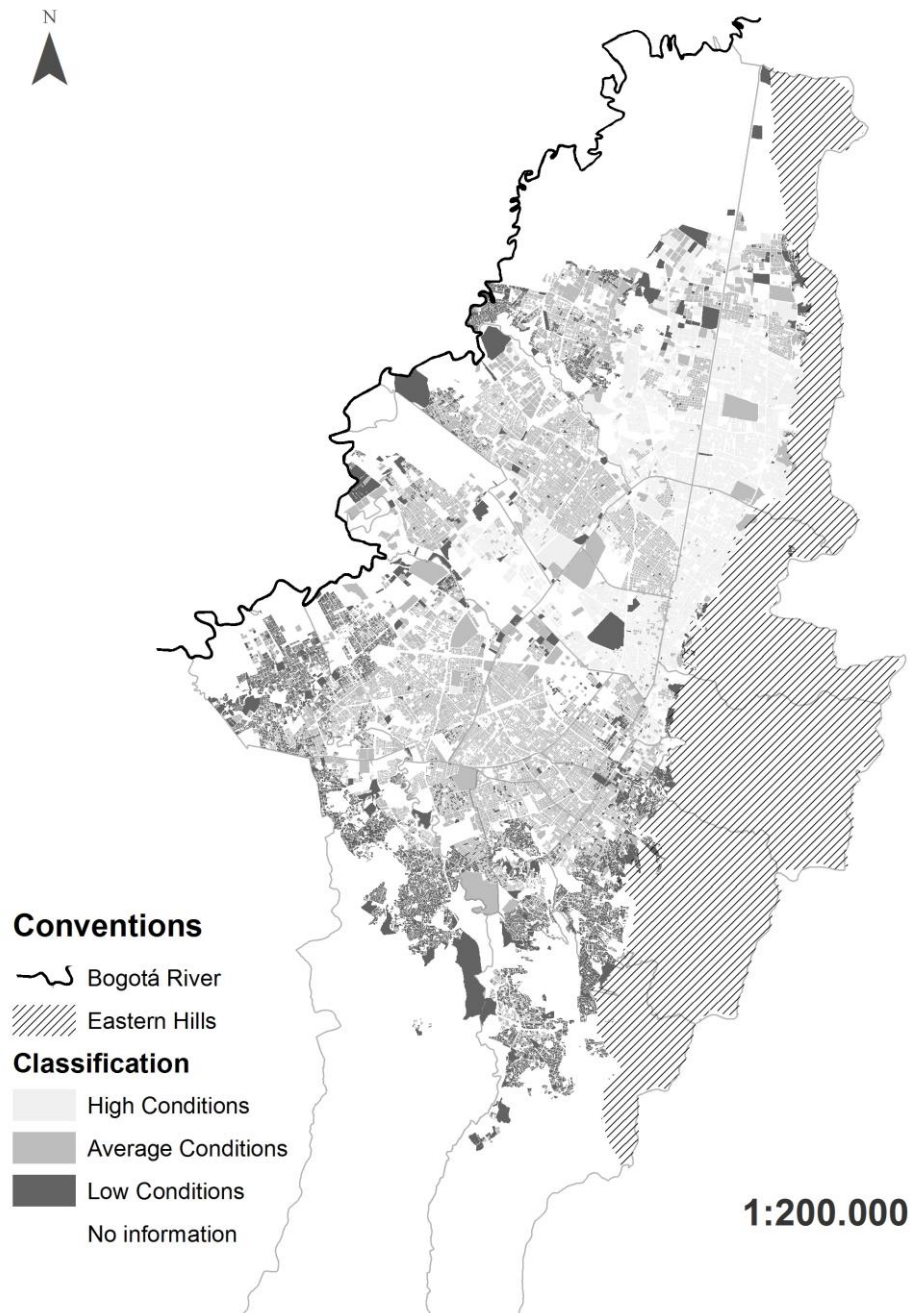


Figure 3. Results of the initial classification with three groups based on socioeconomic conditions, retaining four axes.

Then, a clean ring of middle groups can be observed, especially residential spaces belonging to average families with middle income and lower-middle income, located around west and southwest of the city, area that has notably expanded since 1990 in terms of formal urbanization for strata 2 and 3, as well as self-build neighborhoods (Beuf, 2011). This aggrupation is the one with the major number of blocks and its characteristics are diverse. In this group, we find a big proportion of population possessing middle education (graduated from high school), and in a lower percentage (2%) population owning superior education. The main economic establishments found in this group of blocks are industrial, followed by commerce establishments with a media value of US\$2.500 for one m^2 of land. Finally, the third group exposes the periphery, especially towards south, east and west of the city, where most of dependence child rate, and most of low educated population is concentrated. As well, this group presents an insufficiency from public services.

This first diagnosis corresponds to a city in which, according to the statistic data, a considerable middle class population has taken its place, as a result of the economic expansion discussed at the first part of the essay; but, at the same time, keeps a structure conditioned by the previous processes, characterized by a high migration and a high polarization between a minority with high income and the popular sector –mainly self-built- raised between 1950 and 1990 (Montoya, 2014).

However, the previous diagnosis doesn't allow to detail the social patterns inside the middle and low groups; reason why a second classification was performed, maintaining the same percentage of information, but classifying the city into four groups. Results are exposed in Figure number 4, and the titles assigned to conventions indicate the most influential variables of each of the groups.

Taking into account this result is possible to acquire a more precise outlook of the social structure of the city. In one side, the existence of a core of rich population that includes the central-northern part of the city as well as the area around 26th avenue. The land located in this place is characterized for having a high value, sometimes overpassing US\$5.000 for m^2 (Téllez Oliveros, 2013). At the same time, this sector presents the highest rate of population owning superior education, strata over four; high elderly aged dependence rates, and a high concentration of service establishments. Also, this zone includes both new CBD of the city: Street 72 and Street 100 (Mertins and Müller, 2000); besides other new centralities associated with information economy. In this zone we find settled offices of

entertainment and communications multinationals like Movistar, Huawei, and DirecTv. This group also includes an axis around 26th Avenue; the population of this zone has a high socio-economic level, middle-high land value for m^2 and middle educative levels. The dynamic of this axis is linked to the airport's expansion and politics imposed by the Land Use Plan –which original purpose was to create a zone for technology development– however, it ended like a zone dedicated to the installation of hotels, financial services and office towers of regional scope, for example Sarmiento Angulo Business Complex, which owns headquarters for Avianca, Argos and state entities, and is expected to handle 15 corporative towers (four already built and two of them in process).

The second group refers to central west area and associates the middle groups, which have a 20% of elderly aged dependence rate; a percentage of 25% of population owning superior education; stratum 3 and 4; a significant presence of industrial, commercial and service establishments; an average value in terms of employment and in terms of land value. Most part of the city belongs to this group, including zones as Kennedy, Fontibón and Engativá. The third group, classified like middle-low group, is characterized by the low educational levels, the high child dependence rate, as well as the domain of stratum 1 and 2. This zone refers to the poor part of the city, including localities as Bosa, Suba, Usme and Ciudad Bolívar.

Finally, there is a fourth group, which consists on the area with worst life conditions, particularly regarding to public services and low educational levels and, as the previous group, presents a high rate of child dependence. As the figure designates, this is the smallest of the groups and is mainly located around the boundaries and expansion areas of the city.

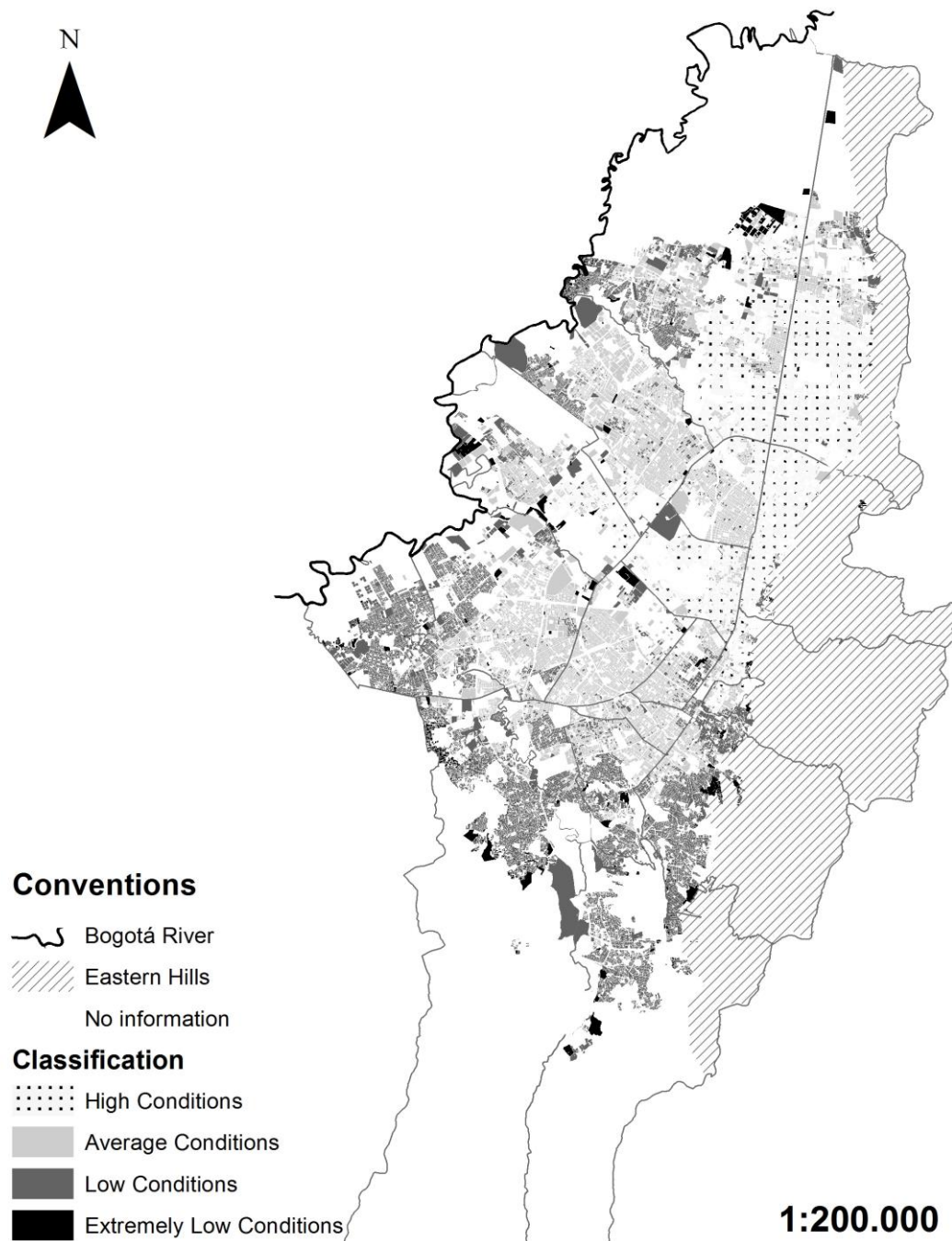


Figure 4. Four groups' classification based on socioeconomic conditions, maintaining four axes.

Conclusions - The previous analysis exposes an ecology of the city influenced by particular elements. First, a strong denial to the contemplation of a rich north and a poor south, long claimed as a fact in various works about urban dynamics in Bogotá since the start of urban expansion in the forties (i.e. Lulle and Dureau, 1999; SDP and UNAL, 2013).

However, the cartography derived from PCA points to a more concentric model, focusing economic activities of more value on northern area, as well as the population with better income, levels of education and access to public service. This core is surrounded by a ring dominated by areas of stratum 2 and 3, as well as areas of industrial and commercial activity, especially small and medium sized companies (Ramírez Castro, 2006). Finally, the further ring is composed by middle- low social groups, located around the periphery of the city –especially zones of informal urbanization- and characterized by low educational levels. Could this social model be linked to globalization? Indeed, this connection is evident when analyzing the wealthiest core, since it is associated to population of middle and high classes, composed by consumers with high salaries –this because of professional training and the possibility to occupy a good job derived from expansion of financial and real-estate sectors. Also, is important to take into account the presence of population with high positions in new enterprises settling in this zone of the city, particularly in areas as La Cabrera, Santa Ana or Eastern Santa Barbara, where a penthouse for rent can cost around 10 thousand dollars per month (Revista Semana, 2012). This can be evidenced in the tremendous increase of land value too, transforming Bogota in one of the most expensive cities of the world (Ibid).

At last, the PCA analysis allows to stand out the importance of educative and professional levels of population in the new configuration of urban ecology, becoming –as well as land value and access to services- one of the main variables in city differentiation, but also and important fact of social mobility.

On the other hand, other sectors are more adjusted to the traditional model that keeps a significant part of the small and middle industry of the city, even though most of the industry has displaced to the periphery of the *Sabana*. However, these zones are characterized by the lack of developable land; although, urban densification promoting policies have generated a strong renovation of old neighborhoods, where old houses become residential towers or closed complexes or –in the case of old industrial zones- commercial areas or malls. Besides, there is also the creation of real-estate macro projects,

located around the few non urbanized zones of the central area, for example: La Felicidad, La Hoja or Ciudad Verde.

So, urban morphology is not characterized just by social groups' distribution, but by requirements demanded by the "new economy" of the city, although outsourcing and deindustrialization have an important influence as well. The distinctive morphological aspects of the "new economy" are evidenced in service company buildings, frequently multinationals as Avianca or Movistar; in new business complexes associated with financial capital, but also command office towers associated to *commodities boom* as Pacific Rubiales over 9th Avenue. Yet, this "new economy" is composed by consumers, and the city has evidenced the growth of these structures, going from 7 establishments of this kind during 1987 to 44 in 2013, according to Colliers International, besides 5 new other projects which will add 196.900 m² to the already existent build area of 1,23 million m² (El Tiempo, 2013). At last, is important to take into account that the infrastructure, derived from the Government services, maintains conspicuous in the city. This is particularly clear regarding to transport issues –an obvious fact in a city that, by economically growing, presents as well a need of mobility for its population; but also by the fact that the Government, contrary to the ideas stated by neoliberal rhetoric, has not become absent: it became even more influential, not only through the power of regulation of urban economy, but also by the construction –direct or indirect- of different "artifacts" such as parks, public libraries, administrative centers (Prosecutor General's Office building for example); transportation infrastructure (Transmilenio, Eldorado and terrestrial terminals); schools and universities (District University new headquarters located in Bosa and Ricaurte); and new big projects of urban renovation around the center of the city and the CAN, which's assignment is to modernize the different headquarters of ministries of national government.

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