

Spatial Patterns and Local Variation of Socio-economic Residential Segregation Trends in Mexico City

Studies on Latin America cities points towards contradictory evidence about socio-economic residential segregation trends: while some studies emphasizes strong class divisions across urban landscapes reflecting prevalent income inequalities (Rubalcava and Schteingart 2000), other studies suggest that historical urban development patterns contributed to enhance social mixing in residential areas (Sabatini 2003, Sanchez 2008, Peter and Skop 2007). In the Mexico City case, lower levels of residential segregation may have been favored by weak land regulation, extensive informal settlements, state provision of urban services and households' strategies in a context of economic instability. These factors seem to have favored heterogeneous landscapes as well as social mixing between neighborhoods; in such a way that although wealthy areas were easily identifiable, it was common to find poor settlements built near wealthy ones, or neighborhoods shared by middle- and low-income households. Preliminary research suggests, however, that residential segregation is on the rise and the spatial distribution of poverty and wealth is shifting towards more clustered and exclusionary pattern (Ariza and Solis 2005, Sanchez 2008). However, there are few studies that measured residential segregation, and none of them consider how the spatial arrangements of poverty and wealth shape its strength and character.

This paper analyzes trends in income residential segregation in Mexico City between 1990 and 2000, but I suggest that to fully examine the degree of social mixing in the city it is necessary to explicitly consider the spatial distribution of socio-economic strata, as well as local variation of residential segregation rates. In particular, there are three questions that needs to be examined through spatial data analysis techniques: a) the contribution of spatial arrangements of socioeconomic groups to residential segregation levels; b) changes in location and dispersion of socio-economic groups; and c) the extent of local residential diversity and patterns of spatial heterogeneity of the urban landscape

Urban Development and Social Mixing in Mexico City

Evidence supporting the social mixing argument is based on Mexico City's urban development patterns than seemed to have favored the heterogeneity of urban landscapes and lessen class segregation within neighborhoods among middle and low income groups. Three factors seem to be particularly important: the way residential land markets operated in the region, the role of the state, and households' strategies in an unstable economic context.

On the one hand, urban land markets did not operate in a purely market-driven manner. Instead, land became available through a combination of market and political mechanisms. City limits expanded not just by real-estate entrepreneurs' actions, but also as a result of urban social movements demanding housing and public services, as well as state responses to such pressures (Gilbert and Ward 1985). Furthermore, rapid population growth and precarious economic development limited both the market and public provision of housing alternatives to low-income households, who in turn relied on self-construction on land they did not own, or for which they had only tenure ownership rights (Oliveira and Roberts 1996). The Mexican state allowed the urbanization of public-owned land and tolerated irregular settlements, in addition to eventually providing them

with basic public services and legalizing such properties (Gilbert and Ward 1985, Roberts 1995). State provision of infrastructure and services –basic urban services as well as transportation, health, and education– had lasting effects on levels of segregation. It improved living conditions of population particularly in the central part of the city, and constituted a central feature of Mexico City's development (Rubalcava and Schteingart 1987, Schteingart 2001). In addition, it helped to reduce segregation by facilitating relocation of middle- and high-income groups to traditionally low-income groups, a process also favored by the economic instability.

The heterogeneity of the urban mosaic was reinforced by middle- and low-income households' strategies. Not only poor households accessed housing through irregular settlements, but middle-class families also did. In fact, ethnographic research documented, during periods of economic downturn, a process of “perverse integration” by which poor and middle-class households increasingly shared residential neighborhoods (Portes 1989, Portes et al 1995). It was perverse because it did not reflect the upward social mobility of the poor, but the downward social mobility of the middle-class as a strategy to cope with economic recession: middle-income households settled in low-income neighborhoods, trading the better-quality services and social prestige of wealthier neighborhoods for larger properties and savings, which were used to purchase services more important for their social mobility -such as private education for their children (Oliveira and Roberts 1996).

More heterogeneous neighborhoods and diffuse class frontiers between residential areas in large extensions of the city were the unintended consequences of the aforementioned elements. While segments of the middle-class may have contributed to social mixing, the literature also suggests that the richest group was living apart, in more homogenous residential areas. Yet, the overall residential pattern points to lower levels of residential segregation than theories would have predicted based solely on Mexico's unequal income distribution. However, studies suggest that growing income and occupational polarization is driving landscape segregation (Portes and Roberts 2004).

Data and methods

Data comes from special runs of the 1990 and 2000 Mexican Census. I employ their correspondent cartographies at the *Ageb* level –similar to census tracts. Income residential segregation is measured among quintiles categories of per capita household earning¹. I compute two spatial indexes of segregation a) the *spatial dissimilarity index* developed by Wong (2003, 2002) to account for geographical evenness of socio-economic groups' distribution across the city. This index considers the social composition of adjacent areas. By doing that it provides an indirect picture of how clustered or dispersed populations groups are. For example, if a given strata tends to be geographically concentrated then the spatial index should yield a larger number than the *spatial dissimilarity index*, b) the *standard deviational ellipse* Wong (2003, 2002), which represents the overall spatial distribution of population group, in terms of their general location, dispersion and orientation.

Spatial indices estimate residential segregation for the entire city, but undoubtedly residential diversity is not homogenous over space (Kriwo et al. 2007, Wong 2002,

¹ Each income group represents the proportion of households that falls within each per capita earnings quintile.

Feitosa et al. 2006). To consider local variations in the degree of socio-economic diversity of each residential area, I use the *entropy diversity index (E)*, which has the advantage of handling multigroup situations and it can be easily mapped facilitating its interpretation (Wong 2002). Analyzing local patterns allows not only considering segregation dynamics by locations, but it provides away to analyze the heterogeneity of social space and regions within the city according to their patterns of social mixing. To that end, I use global measures of spatial autocorrelation (Moran's I) and Local Indicators of Spatial Association to identify the degree of clustering of similar/dissimilar levels of local diversity. A bivariate version of these measures will be used to analyze time changes in spatial patterns.

Preliminary Results:

Contrary to the poverty clustering emphasis in the American literature, Mexico City exhibits a more heterogeneous socio-economic spatial pattern in large extensions of the city, although it is also possible to clearly identify rich and marginal zones. The spatial dissimilarity index shows a tendency to a small increment in the degree of segregation, measured both across all quintiles at once and for each of the income quintiles.

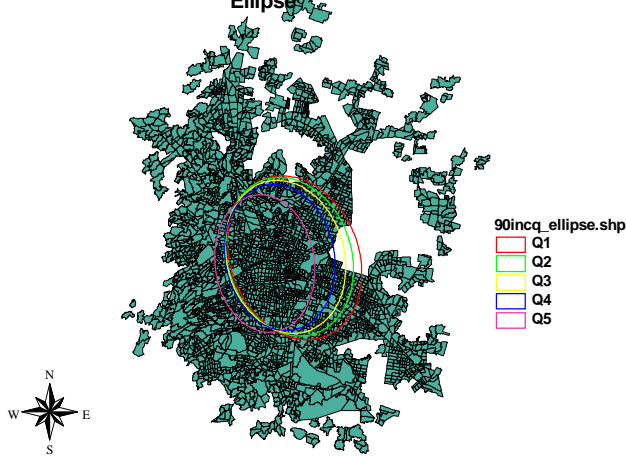
Comparing the spatial two-group dissimilarity index to the aspatial index shows that residential segregation decreases for all income groups if the composition of adjacent Agebs is considered, which reflects the "patchy" and heterogeneous composition of large regions in the city. Moreover, taking into account the spatial composition of adjacent areas decreases levels of segregation of all groups, but less so for the highest quintile since it is more geographically concentrated.

The results of the spatial index show that the spatial arrangement of income groups in Mexico City tended to lower segregation levels, but at the same time suggest that 1990-2000 changes were more pronounced given that some income-groups also separated geographically. In fact, the standard deviational ellipse also points to an increase in segregation, from 0.53 to 0.60, suggesting a more clustered and homogenous distribution of income categories across space. Moreover, the analysis shows that households of the riches quintile do not only live in more homogenous areas but are also more spatially concentrated. By contrast, the segregation of low-earnings households is lessened because of their residential and spatial mixing with middle-low and middle earnings households. Changes between 1990 and 2000 point to increasing geographical concentration of the top quintile, as well as small growing concentration in the distribution of the fourth quintile, a process that, in the long run, may transform the "patchy" spatial pattern that characterized the city. In fact, some regions of the city are becoming more clearly homogenous; this is particularly true in the west where new developments for the middle and upper class are expanding.

Local variation in segregation rates is strong. 1990 and 2000 greater internal diversity characterize areas that the literature identifies as working-class neighborhoods ('colonias populares'), while better-off regions are significantly more homogenous. Further analysis will identify patterns of spatial autocorrelation and non-stationary in the rate rates of local segregation in order to identify the dynamics of residential segregation and to distinguish regional patterns, if any.

Table 1 .Per capita Household Earnings				
Spatial Multigroup	1990	2000	Change	% Change
Dissimilarity (adj)	0.1895	0.1969	0.0074	3.9
Ellipse (S)	0.5273	0.6024	0.0751	14.2
Two-groups Dissimilarity Indices				
Aspatial Index	1990	2000	Change	% Change
Q1 vs. rest	0.2579	0.2694	0.0115	4.47
Q2 vs. rest	0.1838	0.1806	-0.0032	-1.76
Q3 vs. rest	0.1128	0.1112	-0.0015	-1.35
Q4 vs. rest	0.1478	0.1558	0.0080	5.42
Q5 vs. rest	0.4065	0.4327	0.0262	6.44
Spatial Index (adj)	1990	2000	Change	% Change
Q1 vs. rest	0.2012	0.2156	0.0144	7.16
Q2 vs. rest	0.1360	0.1365	0.0005	0.38
Q3 vs. rest	0.0720	0.0749	0.0029	3.97
Q4 vs. rest	0.1055	0.1137	0.0082	7.80
Q5 vs. rest	0.3224	0.3513	0.0289	8.96

Household Per Capita Earnings 1990
Ellipse



Household Per Capita Earnings 2000
Ellipse

