Land Markets and its Effects on the Spatial Segregation: The Case of Ciudad Juarez, Mexico

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Abstract. The objective of this article is to analyze the land market imperfections and their effect on spatial segregation. It uses a spatial approach through the construction of socio-spatial segregation and infrastructure deficit indexes. The principal component element was used to estimate the socio-spatial indexes at the AGEB scale. The data used to calculate the indexes was obtained from the XII Population and Housing Census at census tracts level. The result show that the city suffers from spatial segregation caused mainly by land market imperfections. The land market is not able to ensure an adequate supply at affordable prices and as a result, the biggest sufferers have been the urban poor. The lack of access to urban land has pushed low income inhabitants to the outer limits of the urban core: low value areas without public infrastructure.
Key words: urban spatial segregation, land market, Ciudad Juarez.

Resumen. El objetivo del artículo es analizar las imperfecciones del mercado del suelo y su efecto en la segregación espacial. El estudio tiene un enfoque espacial mediante la construcción de los índices de segregación espacial y déficit de infraestructura. Para la construcción de los mismos se utilizó el método de componentes principales. La información usada para el cálculo de los índices fue el XII Censo de Población y Vivienda (INEGI) a nivel de AGEB. Los resultados muestran que la ciudad sufre de segregación espacial causada principalmente por las imperfecciones del mercado del suelo. Éste no es capaz de asegurar una oferta adecuada de suelo a precios adecuados y como resultado la más afectada ha sido la población urbana pobre. La falta de acceso al suelo urbano ha empujado a los habitantes de bajos ingresos hacia los extremos de la ciudad en terrenos de bajo costo sin servicios públicos.
Palabras clave: segregación espacial urbana, mercado de suelo, Ciudad Juárez.

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Introduction

A quintessential case of urban spatial segregation with its inherent positive and negative consequences is currently underway in Ciudad Juarez. The city suffers from spatial segregation caused mainly by its land market imperfections, characterized largely by dramatic social inequalities, particularly in reference to access to urban land and services. These inequalities are expressed in urban land price differentials that are associated with the process through which land value increments are generated, appropriated, and used.

Land price differentials are basically a product of supply and demand factors. Land supply depends upon the amount that is newly serviced (produced) per year, the amount that is retained from the market, and intensity of the use of the existing serviced land. The demand depends on the annual rate of formation of new households, adjusted by their income and/or purchasing power, their preferences and the prices of other items in their budgets. Beyond these conventional arguments regarding supply and demand, one may also consider the dynamics or interdependency of formal and informal urban land markets as a factor contributing to high land prices. Specifically, the high prices for serviced land in the formal market seem to affect the relatively high prices of unserviced land in the informal market, and viceversa.

These actions have generated overvaluation of urbanized land and as a result, the scarcity of urban land for the city´s impoverished inhabitants. The absence of special programs geared toward procuring cheap land for low-income groups has been responsible for the proliferation of irregular settlements or marginal neighborhoods. Most of these arise at the edge of the urban core on real estate, which is easily accessible to the urban poor given its low value and undesirable topography.

The spatial segregation is characterized by households with incomplete or deficient access to public network or services, lack of integration with the remainder of the city, and irregular tenure.

This essay uses a spatial approach through the construction of socio-spatial segregation, and infrastructure deficit indexes. In order to estimate the socio-spatial indexes on the AGEB scale, the principal component analysis was applied as the basic methodology.

This essay is divided into four parts. The first presents the methodological note. The second describe the rapid urbanization process of Ciudad Juárez. The third provides an analysis of the characteristics of the city´s land market, and the fourth presents the socio-spatial effects.

I. Methodology

1) Principal Component

a) Socio-Spatial Hierarchy Index

The methodology used to construct the Socio-Spatial Hierarchy Index is the following:

The method creates separately both a poverty and wealth index for each census tract (AGEB) and then integrates them into a single index. In order to arrive at a single index of socio-spatial hierarchy, the poverty index must be multiply for (-1). Subsequently, the arithmetic mean is calculated for the new index. The resultant values will determine the hierarchical position of each AGEB.

The index is calculated in two steps: 1) calculate the principal component that represent the best set of variables through factor analysis. It has different level of correlation with the variables. The value of these correlations are the weight of each variable in the component and it is the weighting factor to estimate the hierarchical location of the AGEB according with this variable.

$$IS = \sum_{m=1}^{N} FP \, \frac{Xij - \overline{X}}{\delta}$$

where:

IS_j = poverty or wealth indexes of each $AGEB_j$
FP_j = weighting factor of the variable *i* that comes from the factor analysis
X_{ij} = value of the variables *i* in the $AGEB_j$
$\overline{X}$ = the urban average of the variable *i*
δ = standard deviation of the variable *i*

The second part of the calculation includes the construction of the index. It consists of the sum of the distances of the variables' values with the weighting mean according to the weight of each variable.

where:

JS_j = socio-spatial hierarchy of each AGEB$_j$

Variables:

The variables used in the calculation of the poverty and wealth index include income (V1,V8), working conditions (V2,V3, V9, V10), education level (V4,V5,V6,V11,V12,V13), and health (V7,V14). The data corresponds to the 2000 Population Census at census tract level.

Variables of the poverty index:

V1 = % of the EAP with income lower than 1 minimum wage
V2 = % of the EAP not working
V3 = % of the EAP that is peasant
V4 = % of the population aged 6 and over that does not attend school
V5 = % of the population aged 15 and over that is illiterate
V6 = % of the population aged 15 and over that did not attend middle level school
V7 = % of the population under 60 years of age

Variables of the wealth index:

V8 = % of the EAP with income lower than 5 minimum wages.
V9 = % of the EAP working
V10 = % of the EAP that is entrepreneur
V11 = % of the population aged between 6 and 14 that does attend school

V12 = % of the population aged 15 and over that is literate
V13 = % of the population aged 15 and over with a middle level
    education
V14 = % of the population aged 60 and over.

b) Infrastructure Deficit Index

The index is an indicator that represent to the set of deficits. Its estimation consists of two steps: 1) through factor analysis the principal component that best represents the set of variables is determined. It has different correlation levels with each set of variables. The values of the correlations are the weight of each variable in the principal component and it is the weighting factor for each variable; 2) calculation of the index.

$$IDj = \sum_{m=1}^{N} FP \; \frac{Xij - \overline{X}}{\delta}$$

where

ID_j = infrastructure deficit of each AGEB$_j$
FP_j = weighting factor of the variable *i* that comes from the factor analysis
X_{ij} = value of the variables *i* in the AGEB$_j$
$\overline{X}$ = the urban average of the variable *i*
δ = standard deviation of the variable *i*

Variables

The variables are constructed from the data gathered from public utilities. They are the proportion of urbanized area not serviced with water, sewage, electricity, paved roads, and transportation.[1]

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[1] The methodology was taken from Tito Alegría, "Consideraciones teóricas y metodológicas de estructura urbana", in T. Alegría y R. Sánchez (coords.), "Las ciudades de la Frontera Norte", research report, El Colegio de la Frontera Norte, Tijuana, 1993.

Urbanization Patterns: The Case of Ciudad Juarez

Historically, Ciudad Juarez has experienced one of the fastest rates of population growth in the entire country. From 1856 to 1960, the city remained relatively compact. It was characterized by higher population density and less vacant land than cities north of the border (Arreola and Curtis, 1993). In 1856, Ciudad Juarez's population density was very high for such a small city (482 inhabitants per hectare).[2] After the Mexican revolution, the city began to experience population pressures as a product of immigration flows from central Mexico. In 1921, Ciudad Juarez's population was growing at a rate of 5.5%, reaching 19, 457 inhabitants. By the 1930's its population had reached nearly 40,000 and the urban area encompassed 471 hectares. The city experienced a high population growth rate but a decrease in population density. In the 1940s, these indicators slowed their pace: over the decade, Ciudad Juarez's population growth rate was only 2.0% and the urban area increased by only 92 hectares (Fuentes, 2000).

Beginning in the 1950s, the city embarked upon a phase of renewed spatial expansion. Ciudad Juarez experienced the highest population growth rate in its history in 1950 (9.2%) and its urban area totaled 800 hectares. As a result of immigration flows, the city became relatively densely inhabited (164 inhabitants per hectare). The city continued to grow at a high population rate of 7.2% in 1960 and its urban area reached 1,894 hectares.

Ciudad Juarez experienced two periods of expansion during this era. The first, from 1856 to 1930, is characterized by a high population growth rate and physical expansion. The second, from 1931 to 1960, began with a decrease in population and population density. Throughout the entire period, however, Ciudad Juarez could be characterized as a relatively compact city (see table 1).

The city's urban growth is also impacted by intense immigration flows and the location patterns of the industrial parks. The great supply of jobs generated by the *maquiladora* industry attracted a

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[2] One hectare is 2.47 acres.

Table 1. Population and Urban Growth in Ciudad Juarez
(1856-2000)

Year	Population	Population rate of growth (%)	Urban area (ha)	Population density (pop./ha)
1856	4,342		9	482
1894	7,582	1.4	60	126
1900	8,218	3.5	61	134
1910	10,621	2.5	119	89
1921	19,457	5.5	N.D	N.D
1930	39,669	7.9	471	84
1940	48,881	2.0	563	87
1950	131,308	9.1	800	164
1960	276,995	7.2	1,894	146
1970	424,135	5.2	5,608	75
1980	567,365	4.4	9,395	60
1990	798,499	3.4	14,049	57
2000	1'217,818	4.2	21,572	56

large number of workers who eventually became integrated into the city. The city's number of inhabitants grew from 276,995 in 1960 to 424,135 in 1970. The urban area increased from 1,894 hectares in 1960 to 5,608 hectares in 1970, a growth rate of 10.8 %. Population density decreased from 146 inhabitants per hectare in 1960 to 75 inhabitants per hectare in 1970. In others words, during this decade the city inaugurated a pattern of extensive urban growth.

The first industrial park was established in 1967 on the northeast side of the city, with an extension of 174.2 hectares (Fuentes, 1992). Previously this land had been used for irrigated agricultural[3] purposes, primarily to grow alfalfa and cotton. In the early 1970s, two new industrial parks were opened up, occupying 125.8 hectares, but only 81.8 hectares had been used previously for agriculture. Commercial land use represented 305 hectares, located in the central business district and on the main arterial network.

[3] The watering district 009 has a total area of 61,100 acres.

The population growth has transformed the dimensions of the city, pushing urban landscapes into previously fringe zones. Since 1986, Ciudad Juarez has added on as much as 300 acres per year (Cabral, 1991). Growth on the periphery has occurred primarily toward the west, up the lower flanks of the Sierra Juarez, south along the railroad and Pan American Highway corridor to Chihuahua, and east into previously cultivated land. The expansion west and southwest is primarily in residential areas, organized in a one-to three-mile radius from the central plaza and populated by squatters who have invaded public lands since 1960 (Ugalde, 1974; Valencia, 1969). The city's irregular settlements cover approximately 35% of the urban land (Caraveo, 1993), most of them located towards the northwest and southwest.

The growth east and southeast is, similarly, one to three miles from the center but is mostly middle –to upper– income, residential development (Lloyd, 1986).

Many of the existing irregular settlements owe their origin to the irresponsible complacency of politicians turning a blind eye to the irregular occupation of public or unsuitable areas or, worse yet, ceding public land for electioneering purposes.

Over the next few decades, the city´s population continued to grow at a very high rate. However, the urban area grew at an even higher rate, and as a consequence the city´s population density continued to decrease: from 567,365 inhabitants in 1980 to 798,499 inhabitants in 1990. Urban land reaches 9,395 hectares in 1990 reducing population density to 57 inhabitants per hectare. In 2000, the population growth rate was similar to that of urban area growth, resulting in the stabilization of the extensive pattern of urban growth. The spread of the settlement has resulted in lower densities within the city. Table 1 shows the declive of the city´s population density. The decline is partly demographic –the reduction of household sizes– and partly the result of new perimeter development. With shifting densities and the outward spread of development, there has been a significant shift in the location of rich and poor.

III. Land Use Patterns

Cities with growing populations, whether they are increasing through high rates of natural increase or net-in migration, like Ciudad Juarez, require additional space to support housing, commercial, industrial and public activities.

In 1980, the city limits had an encompassed 15,227 hectares, of which 9,385 hectares were urban land. Residential use covered 6,061 hectares, industrial use, 378; commerce and service, 688; open spaces, 401; and internal roads, 1,857. Four years later, the urban area reached 13,170 hectares, with 6,452 hectares taken up by residential use, 681 by industrial, 380 by commerce and service, 461 by open spaces, 1,529 by urban vacant land, 2,150 by internal roads, and 656.5 by other uses (see table 2).

Industrial growth toward the northeast and southeast also demanded the establishment of residential and commercial areas. From 1984 to 1988, the land with residential and industrial occupancy increased by 337.49 and 159.13 hectares respectively. By 1988, four new industrial parks that occupied another 175.8 hectares, all four were established southward and were smaller in size.

In 1995, the urban land represented 18,767 hectares, the residential use reached 8,416 hectares, industrial use 1,209, commerce and

Table 2. Land Use in Ciudad Juarez (1985, 1995 and 2001)

Land use \ Year	1984 Surface	%	1995 Surface	%	2001 Surface	%
Residential	6,452	48.9	8,416	44.8	9,992	45.1
Industrial	681	5.7	1,209	6.4	1,844	8.3
Commerce and service	380	2.9	1,075	5.7	1,638	7.4
Mixed use	656.5	4.9	617	3.2	503	2.2
Open space	461	3.5	446	2.3	605	2.7
Internal road	2,150	16.3	4,785	25.5	5,040	22.7
Urban land vacant	1,529	11.6	2,219	11.8	2,500	11.3
Total	13,170	100.0	18,767	100.0	22,122	100.0

Source: Plan Director de Desarrollo Urbano de Ciudad Juárez, 1979, 1984, 1995, 2001.

services 1,075, mixed use 617, open spaces 446, internal roads 4,785 and vacant urban land 2,219.

The land use of the city has not changed substantially since 1995. Residential occupancy corresponds to 45.17% of the urban area; the roads system reduced its percentage in three points with respect to 1995 (22.78%); industrial land use has increased its proportion from 6.44% in 1995 to 8.34% in 2001; the commerce and service land area increased to 7.40% (see table 2).

Table 2 shows that, in relative terms, the residential use of land has no changed substantially since 1984. However, land used for industrial purposes increased from 5.7% in 1984 to 8.3% in 2001. Since 1995, nine industrial parks have been constructed, giving a total of 23. It is important to mention that the last nine industrial parks are located near the working class neighborhoods and main roads.

The traditional pattern of centralization in commercial and service land use has been modified as a result of four processes: 1) greater competition between regional and national chains of commerce, resulting in the southward relocation of warehouses near residential areas, 2) deficient public transportation, 3) intensive investment in freeways, and 4) exhaustion of the agglomeration economies of the central business district (Fuentes, 2001).

In summary, the plan of the Junta Municipal de Agua y Saneamiento (JMAS) notes that the portion of the irrigation district closest to Ciudad Juarez has seen a decline of more than 1,000 hectares (2,471 acres) as a result of conversion to urban use.

The Instituto Municipal de Investigación y Planeación (IMIP).[4] predicts that the use of urban land in Ciudad Juarez will reach a total of 32,421 hectares by 2020. Compared to today's total of 21,572, future expansion will add 10,848 new hectares of new land to urban development. IMIP estimates that about one quarter of new urban land will be converted from land previously used by agriculture.

How land is urbanized greatly affects the quality of urban environment, the cost and location of housing, the accessibility of jobs,

[4] Municipal Institute of Planning and Research's (MIPR).

and the flow of traffic. An obvious question is how efficient is the process of urban land conversion in Ciudad Juarez? Shortages of land or development restrictions can greatly increase the land prices and housing cost.

The price of serviced land, like prices in other markets, is determined by supply and demand.[5] The supply of land depends on the amount that is newly serviced (produced) per year, the amount that is retained from the market, and the intensity of the use of the existing serviced land. The demand for housing expands due to increases in household formation and income. High population growth and household formation rates increase the demand for housing. Table 3 illustrates housing formation and housing production trends for the Mexican border cities. It shows the rapid increase in household formation that is common in fast-growth cities. For example, the annual rate of household formation in Ciudad Juarez is 4.9% per year. The

Table 3. Households and Housing Production in Ciudad Juarez
(1990-2000)

City	2000 Households	2000 Total dwelling units	Annual household formation (%)	Annual average household increase (a)	Annual average dwelling increase (b)	(b)/(a)
Ciudad Juárez	279,874	293,752	0.049	10,954	12,316	1.12
Matamoros	103,696	103,009	0.043	3,649	3,610	0.98
Nuevo Laredo	74,389	73,744	0.048	2,879	2,850	0.98
Nogales	38,076	37,741	0.051	1,540	1,443	0.93
Piedras Negras	32,078	31,645	0.036	1,032	1,000	0.96
Monterrey	267,962	256,073	0.017	4,246	3,346	0.78
Guadalajara	388,751	369,894	0.015	5,618	4,233	0.75

[5] Conventional economics argues that free market prices reflect the level at which a buyer's ability and willingness to pay matches a supplier's ability and willingness to sell, but in practice no assurance is given with respect to meeting social needs. That is, the market for serviced land may be functioning well, even though many families (even non-poor ones) are unable to access such land, and some existing urbanized lands are being kept vacant intentionally.

city fails to keep pace with burgeoning demand: annual rates of housing production exceed annual household formation by 1.12%.

The average income of the Mexican border cities is higher than the national average, and the affordability of a house depend on family or individual income. In order to qualify for most of the government housing programs, a workers needs to have an income equal or higher than three Monthly Minimum Wage (MMW). Although Ciudad Juarez has a higher percentage of economic active population that earns an income higher than three minimum wages, most of the workers do not qualify for a government program or bank credit (see table 4).

Table 4. Income Distributions by Group and Cities (2000)

Income groups	National ave.	Tijuana	Acuña	Piedras Negras	Ciudad Juarez	Nuevo Laredo	Reynosa	Matamoros
No Income	8.4	1.0	1.2	1.2	1.1	1.5	1.5	1.5
>1 MMW	12.3	2.3	2.1	3.4	2.3	4.2	3.9	4.6
From 1 until 2 MMW	30.3	15.0	27.2	18.7	36.3	31.9	39.1	31.6
+ than 2 until 3 MMW	17.6	24.3	36.7	27.1	19.6	19.1	18.7	24.2
From 3 until 5 MMW	14.1	26.5	15.1	23.4	17.9	18.6	15.2	19.3
+ 5 MMW	11.9	23.9	11.4	19.5	16.2	17.1	15.1	12.7
No information	5.4	6.8	6.0	6.5	6.3	7.2	6.1	5.7
Total	100	100	100	100	100	100	100	100

Additionally, many families, even those with relatively high incomes, work in the informal sector and are excluded from the market because they lack the credentials required by financial agencies to apply for a loan. The need of self-finance housing production on a

piecemeal basis through non-traditional funding sources extends the time between acquisition and occupation of land, thereby adding to both the cost of financing and the overall demand for land. Furthermore, the legacy of high inflation, ill-developed or inaccessible capital markets, and limited participation in the social security system are responsible for nurturing a well established culture and preference by lower income sectors to use land as as reserve land and as a popular means of capitalization, which also adds to the demand for land. In other words, holding the undeveloped land and the culture of land speculation are not excessive to high-income areas.

On the supply side, property taxes, a major potential source of revenue to finance the production of service land, are ridiculously low. The substantive observed land value increments resulting from investments in urban infrastructure and services are basically neglected as a revenue source to finance such investments, due to weak sanctions on capturing land value increments or simply holding improved land from the market (Smolka and Furtado, 2001).

Beyond these conventional arguments about supply and demand, one may also consider the dynamics or interdependency of formal and informal urban land markets as a factor contributing to high land prices. Specifically, the high prices for serviced land in the formal market seem to affect the relatively high prices of unserviced land in the informal market, and viceversa. In addition, the disposition of considerable amounts of land is controlled by agents that do not follow strict economic rules (some public and private agents). In Ciudad Juarez, land speculation continues as an important practice, according to the 1984, 1995 and 2002 urban master plans, the urban land vacant have been increasing passing 1,529 hectares in 1984 to 2,219 hectares in 2002. This situation generates overvaluation of the urbanized land and as a result, increases the scarcity of urbanized land for poor inhabitants of the city. In effect, usually the provision of public services raises the land prices by an amount superior to the cost of the public services. Lans lots considered urban are valued in $20-30 US dollars per meter² (m²). The provision of the public services cost $20-30 US dollars per m² approximately, but the commercial price can reach $50-100 US dollars per m². In this context, the

urbanized land prices of 150 m² are equal to at least triple the annual income of most of the *maquiladora* workers.

The acquisition of urban land by rich entrepreneurs and families is an old practice, and has actually become more frequent among industrials and political groups during the last 22 years following the urban boom produced by the maquiladora industry (Stoddard, 1987). Overall, the most important beneficiaries of this process of land accumulation in the city have been former politicians, industrial entrepreneurs and members of the richest families who have taken advantage of their economic power or political positions to amass urban land (Velazquez and Vega, 1993).

Politics has also aided industrial park promoters to concentrate great portions of land. For example, four families – the Villegas, Bermúdez, Zaragoza and Quevedo– own about 78,777 acres of land (Velazquez and Vega, 1993). The vast properties, equivalent to double the size of the current urban area, have left the city without vacant land toward the west and south for future urban growth (Llera, 2001). This situation has forced the local government to expropriate land from two groups of investors and to negotiate the city´s future urban plans and projects with them.

The extremely restrictive and exclusionary nature of the land market obliges many families to look for alternatives outside the formal market. In Ciudad Juarez, an estimated 30% of the population lives below the poverty line with average monthly incomes of US$ 250 (INEGI, 2000). There are definite economic barriers impeding access to the housing market, even under optimal conditions. However, in addition to the economic limitations, the structural barriers of the land market make the housing market even less accessible. In addition, for those families facing the greatest number of barriers, few economic programs are available; those that exist have not yet reached the dimensions necessary to successfully address the problem, not are they effective in the targeting of beneficiaries. With little no real access to urban land and an equally difficult access to the rental market, alternative strategies for satisfying shelter needs, namely land invasions are adopted.

VI. Spatial Segregation: The Case of Ciudad Juarez

This case of socio-spatial segregation[6] is particularly compelling because of the extreme nature of the physical segregation (families are being resettled at a great distance from the downtown) as well as the clarity of three sets of variables influencing the resettlement sites: land market forces, institutional mechanism and the political and social pressures that emerged since the maquiladora program.
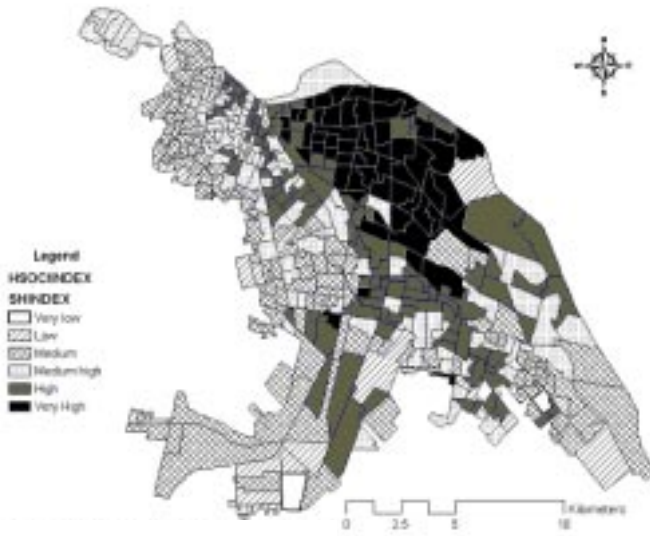
In this particular land market, the city has followed the same trend, although perhaps more intensely, as that of many Latin American cities, with informal settlements or marginal neighborhoods. Most of them growing at the edge of the urban core on real estate, which is easily accessible to the urban poor due to its low value and undesirable topography. The marginal neighborhoods in Ciudad Juarez, which are often time found in areas with an excessive slope gradient, are characterized by an improvised settlement pattern, lack of integration with the remainder of the city, and irregular tenure.

The socio-spatial index shows that the northeast of the city has the highest values, which means that this part of the city presents the best indicators in terms of education, income, and health. In contrast, if we move to the south and west we can find lower values of the index. The extreme northwest is one of the areas of the city with the lowest values of the index. This section was developed mainly through land invasion as a result of the elements described in the previous section.
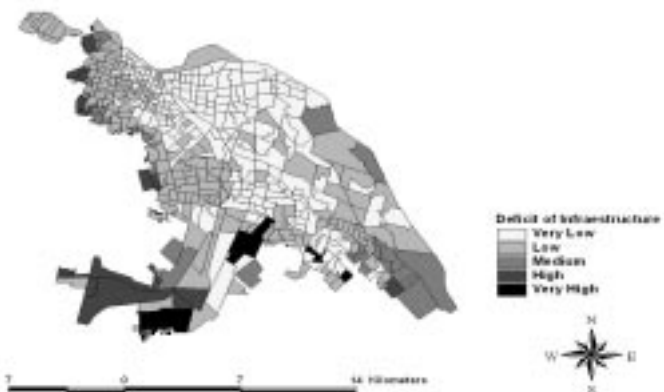
The spatial segregation is characterized by households with incomplete or deficient access to public network or services, as well as irregular land tenure commonly characterized by an original land invasion which may later submit to a process of legal regularization. Despite these deficiencies, the population of the marginal neighborhoods maintained relatively easy access to the urban economy, including jobs, consumer markets, financial and transportation services, etc. Thus, the nature of the segregation is based on the physical distance separating these residents from the urban economy.

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[6] This topic is analyzed through the construction of the socio-spatial segregation.

Map 1. Index of socio-spatial hierarchy by AGEB
for Ciudad Juarez, Chihuahua

Map 2. Index of infraestructure deficit by AGEB
for Ciudad Juarez, Chihuahua

The infrastructure deficit index shows a pattern similar to the socio-spatial index: the northeast part of the city has the lowest infrastructure deficit. Towards the northwest and southwest, the deficit worsens.

The fundamental element of access in each of these scenarios suggests a preliminary operational definition of urban spatial segregation: *unequal access to either public networks of services or private networks of the market place*. In Ciudad Juarez, urban spatial segregation is, furthermore, a results of existing legal and institutional frameworks that are unable to prevent the proliferation of spatially segregated human settlements or effectively mitigate their negative consequences.

Poor people living in squatter settlements end up paying a higher price for land than do the inhabitants of other parts of the city, and pay more for services like potable water, construction materials, food, etc. In addition, the risk to contracting diseases is higher given the hygiene conditions of their environment and the limited access to public services.

In the absence of policy and legal reforms, these forces provide a context whereby spatial segregation will continue to occur and, under particular circumstances, become exacerbated, as has been demonstrated by the present case. In this context, the municipal authorities of Ciudad Juarez (1992-1995) decided to participate in the local land market through the following measures: 1) Avoiding the negotiation with the leaders of land invasions, regularozing land occupancy directly with the invaders. As a general rule, the municipal government negotiates with the invaders and the landowners, whereby the inhabitants of irregular settlements pay the land to the municipality which, in turn, pays the landowner. This strategy seeks to reduce the land prices by avoiding intermediate participants and political control. 2) Given the fact that the local government did not have a land reserve for low-income population, and the private landowners were unwilling to sell land, the government wsa pushed to expropriate 1,200 hectares of land, known as *lote* (lot) Bravo (Guillén, 1995).

Conclusion

Ciudad Juarez, like any other Latin American city, offers clear evidence that pervasive and persistent informality in land markets is both an effect of and a major contributing factor to spatial segregation. The exclusion is directly related to land speculation, the highly regulated legal housing market, the concentration of infrastructure investment, housing financing problems and construction productivity.

Given the characteristics of its land market, the outcome of the situation in Ciudad Juarez is agravated. As a border city, there is a very large demand for urbanized land for industrial parks, residential areas and commercial districts. The *maquiladora* industry became an organizing element of the urban structure as its presence meant increased competition for access to public infrastructure, ports of entry, and main arterial network. In this economic context, middle and upper-income populations, as well as other activities such as services and commerce, have the possibility to competing with industrial promoters for land that comprises the city's resources located east of the city. However, low-income groups, the majority of which was attracted by the great supply of jobs that the *maquiladora* industry generated, are being resettled to the edge of the urban core product of inability to compete with other sectors for urban land.

This mechanism operates through the close relationship between landowners, industrial park promoters and politicians that have used their economic support and political membership to influence the elaboration of local policies and encourage urban expansion towards their properties to speculate with urban land. This has led to a concentration of a high percentage of the land reserves thereby creating land monopolies. These actions have generated an overvaluation of the urbanized land wich has resulted in the scarcity of urban land for poor inhabitants of the city. Consequently, the working class population does not have access to the land market, generating low density's housing away from the urban center.

In the land market area, the municipal government recognizes the need to review the existing regulatory environments in Ciudad Juarez land policy agendain order to design new urban norms and

regulations that can be complied with more realistically by low-income sectors. This means adequately assessing the effects of alternative regulations on the pattern of land uses, specifically, on the access to land and urban services by the poor.

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