PERVERSE SUBURBANIZATION IN JERUSALEM

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The paper argues that under conditions of rapid urban population growth, "normal" patterns of suburbanization may break down, leading to "perverse" suburbs, composed of crowded low-quality housing. Such a development is documented for Jerusalem.

Urban economic theory has long postulated the existence of exponential density and land use functions. Mills (1972) was a major exposition of the theory, and more recent developments include Harrison and Kain (1974), McDonald and Bowman (1976), and Couch (1980). Mills and Tan (1980) review the literature on applications of the theory to less developed countries.

Among recent papers, there has grown increasing awareness of certain limitations in the exponential land use function. Specifically, these functions would be manifested in prices and urban density patterns only if there were no adjustment costs, or if developers had perfect foresight.

In a dynamic setting, urban areas grow over time, often without any awareness of future population trends. Thus, different regions within an urban area may develop in response to very different supply and demand functions. Land use in dynamic models has been analyzed by Fujita (1976; 1982) and Anas (1978).

When urban population growth is highly erratic, standard patterns of density and land use may be disrupted, or even reversed, with density increasing with distance from the center. Some casual evidence suggests this may have been the case for some Israeli cities. The Hebrew word for suburb *(parvar)* long carried opposite connotations to the usual concept of suburb. In recent years however, *parvar* seems to be reversing connotations and is used for low density, middleclass neighborhoods, perhaps reflecting changing economic reality. For example, Alperovich (1980) documented "normal" housing density patterns for Tel Aviv.

It can be shown that, under fairly simple assumptions, standard urban models predict that higher income households will locate at greater distances from the center than lower income households. A housing income demand elasticity greater than one is a sufficient, but not a necessary, condition for this to happen if commuting costs are not large. Even if this elasticity is less than unity, the same pattern may appear if different income groups value commuting time differently, or have different elasticities of demands (see Mills, 1972: ch.5).

This implies that one could draw a circle with center in the Central Business District (CBD) and with almost any radius shorter than that of the urban area itself and divide the area into two concentric rings. The outer "suburb" would contain wealthier families, would be less densely populated and would have more owner-occupied houses (this presumably a function of income). This would, of course, be an over-

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simplification, since one would actually expect to find a continuum of concentric circles, each progressively more "suburban-like," as one went further from the CBD. This represents the "normal" pattern of suburbanization.

An alternative way of stating this is to suggest that at greater distances from the CBD, wealthier households have a higher land rent function than do poorer ones. One implication of this is that if housing construction takes place mostly at the outskirts of a city, it will be wealthier households who will buy houses there.

This leads to the standard theory of suburbanization and house filtering. Briefly, this states that land rent functions flatten over time and the urban area's radius expands due to rising incomes and/or falling transportation costs. Wealthy families move to new homes built at the margins of the urban area, selling their old homes to not-quite-so-wealthy families who are living closer to the CBD, and they in turn sell their old homes to even less wealthy families living closer still to the CBD, and so on. The houses closest to the center are oldest, in poorest condition and occupied by the poorest families.[1]

New housing construction would essentially meet the demand of higher income households and would take place at the margins of the "suburb." The rate at which the urban filtering process can then take place is limited by the rate at which new housing is built at the city margins, i.e. by the resource constraints of the private construction sector. If the overall urban population is not growing or growing very slowly, the population of the "inner city" may decline over time as some people move to the "suburb", and as the filtering process supplies them with better housing. Empty houses might then be found in the "inner city."

Suppose that there exists a stream of migrants into the urban area, and suppose further that they are members of the lowest income group (which may have been their motivation for migrating to the city in the first place). These migrants will move into the "inner city," i.e. into the cheapest, lowest-quality oldest houses, which are vacated by veteran urban residents buying better, filtered houses further away from the CBD. As long as the construction of new houses at the margin, and the filtering process together supply housing in the "inner city" to all new migrants, the pattern continues. However, this urban model is implicitly based on the assumption that migration is sufficiently small so that there will never be excess demand for housing in the "inner city," i.e. demand greater than the supply that can be met through filtering - given the resource constraints of the construction sector.

What happens when the supply of housing through filtering cannot meet the demand by migrants for "inner city" houses? At first, greater crowding in existing houses may occur. There may occur some increase in the rate of construction of new housing and in the rate at which filtering takes place, if land rent functions rise. However, there could come a point when urban migration would be so large that regular patterns of urban expansion and migrant absorption could not supply a sufficient amount of housing to all migrants.

If the migrants are nevertheless to live somewhere in the urban area, the only place where they may do so is at the margins of the city where no (or little) private construction has as yet taken place. If they do so, the previous "suburban" ring will then find itself surrounded by a third ring of low income households, possibly living in shanty-towns or temporary housing. Assuming that some houses are built for these new migrants (perhaps through governmental intervention), as long as the urban migration is very large, this third ring will expand. Houses there will be newer, but presumably of a lower quality than those in the second ring or the old "suburb." They will also be more

crowded, since these households cannot afford to buy a lot of land or a large house. If the new migrants have higher fertility rates and larger families, density in the third ring will be even higher. One would expect a lower per cent of owner-occupied homes there than in the second ring. In short, "perverse" suburbanization would occur.

This pattern of suburbanization represents a departure from "normal" land use that would prevail if adjustment were costless. The higher the cost of adjustment, the longer the anomaly would persist. The remainder of this paper will be an attempt to document a pattern of "perverse suburbanization" that prevailed in Jerusalem.

In 1948, when Israel achieved independence, the city of Jerusalem was divided into two parts. One was annexed by Jordan and thereafter followed a separate development until 1967, when it was reunited with the Israeli section, following the June war. The Israeli section of the city had a population of some 84,000 in 1948 (see Israel Central Bureau of Statistics, 1974). Its expansion and suburbanization was constrained during the next 19 years by the location of the border. Because of this border line (and to some extent for topographic reasons), expansion was in a westerly and south-westerly direction during this period.

Before 1948, Jerusalem seems to have followed the "normal" suburbanization pattern. Population density tended to decline with distance from the walled Old City and from the commercial downtown district (around Jaffa Street). This is apparent from a density map of the city in 1944 prepared by the Mandatory Government (see Kendall, 1948).

It is also apparent from the statistical evidence presented below on housing patterns extant in 1961(which of course includes information about neighborhoods built earlier). "Normal" suburbanization seems to have characterized both the Jewish and Arab section of the city before 1948.

In 1948, most of the Arab population of what became Israeli Jerusalem, and all of the Jewish population of Jordanian Jerusalem, left their homes and crossed the border line. From 1948 to 1950 the population of the Jewish section of Jerusalem grew at an average annual rate of 21%. From 1950 to 1952,it grew at an average annual rate of 8%. By 1952, the city's population (Israeli section) reached 143,000, compared with 84,000 in 1948. From 1952 to 1961 the population grew to 167,000 - double the 1948 figure - but this represented a considerable reduction in the growth rate compared to the previous period.

In 1961, detailed statistical urban data were collected through a census. Disaggregated data were published for Jerusalem (and the other major cities) according to "statistical area." The city was divided into 14 statistical areas, with a fifteenth (No. 23) that was essentially unpopulated (containing government offices, the Israel Museum and the Hebrew University). In Figure 1, a map of the city is shown, where the fifteen sections are delineated, along with Jaffa Street (the center of the downtown commercial area).

Jerusalem in 1961 consisted roughly of three major regions: a section built before World War I, a section built between World War I and 1948, and a section built between 1948 and 1961. This last section consisted of neighborhoods built mostly during the period of very rapid urban population growth.

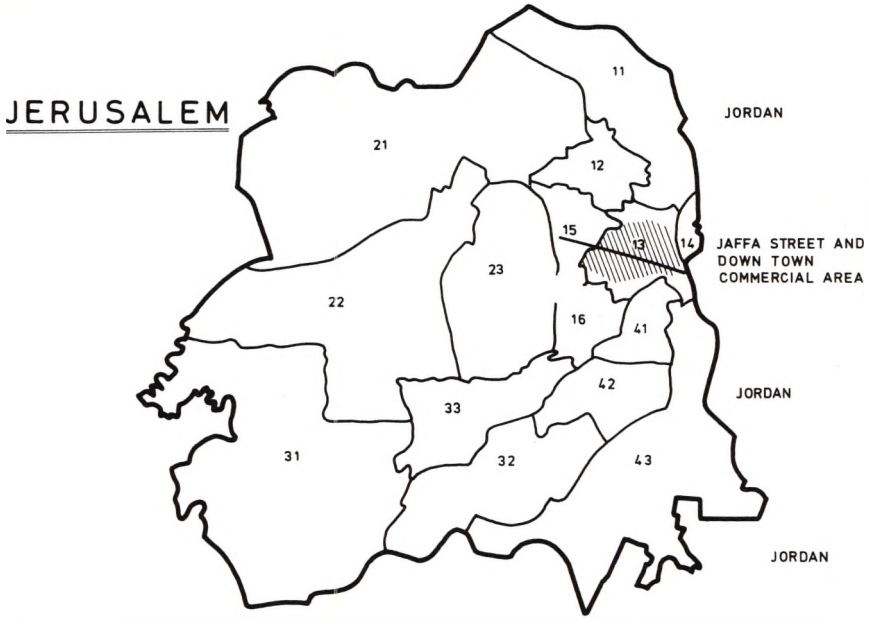


FIGURE 1. MAP OF JERUSALEM IN 1961 WITH STATISTICAL AREAS. (NUMBERS ARE OF MUNICIPAL SUB-QUARTERS)

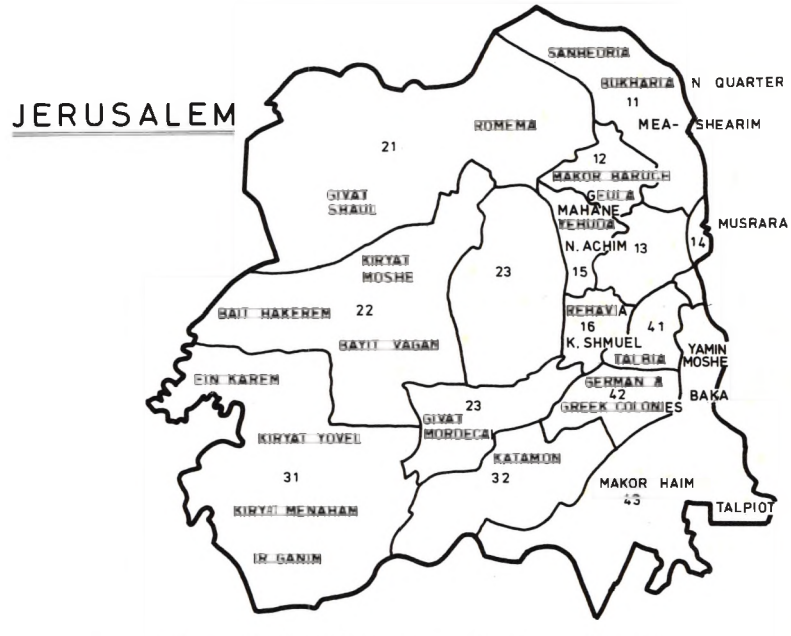


FIGURE 2. LOCATION OF NEIGHBORHOODS IN STATISTICAL AREAS - JERUSALEM

The first of the three sections corresponds approximately to statistical areas Nos. 11, 12, 14, 15, and 21. These areas include the following neighborhoods, which were built before World War I (year established in brackets):[2]

Even Israel	(1875)
Ohel Moshe	(1883)
Mahane Yehuda	(1887)
Shaare Tsedek	(1889)
Mea Shearim	(1875)
Beit Yisrael	(1885)
Bukhara Quarter	(1891)
Nahalat Shiva	(1869)
Mazkeret Moshe	(1883)
Beit Yaakov	(1877)
Musrara	(1875)
Mahane Yisrael	(1868)
Zikron Moshe	(1905)
Givat Shaul	(1910)

These areas also included a few neighborhoods built shortly after World War I, including Romema (1921), Nahalat Achim (1924), and Sanhedria (1925).

The second section corresponds approximately to statistical areas Nos. 16, 22, 33, 41 and 42. These areas include the following neighborhoods, built between 1921 and 1948:

Rehavia	(1924)
Kiryat Shmuel	(1924)
Beit Hakerem	(1923)
Kiryat Moshe	(1924)
Bayit Vagan	(1925)

Also included are several neighborhoods which were established earlier as "suburban" areas by non-Jews: Talbia, the German colony, the Greek colony, San Simone.

The third section corresponds approximately to statistical areas Nos. 31, 32 and 43. These areas include neighborhoods built between 1948 and 1961, e.g. Kiryat Yovel, Kiryat Menahem, Ir Ganim. They include some neighborhoods which were established earlier but expanded rapidly during this period, e.g. Makor Haim, Talpiyot, and Katamon. They also include neighborhoods inhabited before 1948 by non-Jews, that were deserted, repopulated with new immigrants and expanded after 1948, e.g. Ein Kerem, Baka, Katamons.

If we look at the Jerusalem of 1961, the sections may then be thought to comprise three "rings". The first ring is an "inner city" of older neighborhoods, built mostly before World War I. The second "ring" consists of neighborhoods which, prior to 1948, comprised the "suburbs" of the first "ring." (This second "ring" is in fact really more of a quarter-ring around the "inner city")[3]. Finally there is a third "ring" (or more properly, quarter-ring) consisting of those neighborhoods built during the period of rapid growth after 1948.

Table 1. Three Ring Characterization of Jerusalem, 1961.

	Dependent Variable	Ordinary Least Squares (OLS) Coefficients & Standard Errors D_1	D_2	D_3	Unweighted Mean of city stat. areas	Actual population mean	R^2
1	Percent of male workers in high status occupations[a]	32.00* (4.8)	64.40 (4.3)	29.70* (6.1)	45.40	43.00	.75
2	Percent of households owning dwellings						
	A. Regular classification	24.9*** (8.1)	51.30 (7.4)	48.10 (10.4)	41.20	38.70	.37
	B. Counting No.13 in first "ring"	25.40* (6.7)	56.00 (7.3)	48.10 (9.4)	41.20	38.70	.48
3	Mean density per room[b]	2.51* (0.14)	1.47 (0.13)	1.89**** (0.18)	1.93	1.99	.74
4	Mean housing quality index	7.30* (0.5)	10.60 (0.5)	8.30** (0.7)	8.90	8.90	.68
5	Percent of houses in high quality range[c]	15.30* (5.5)	64.70 (5.0)	24.20* (7.0)	38.40	37.00	.82
6	Percent of houses in low quality range[d]	9.70* (1.8)	1.10 (1.6)	4.70 (2.3)	5.00	4.60	.53
7	Percent of houses with hot water	18.70* (6.5)	72.30 (5.9)	33.40* (8.3)	44.80	43.40	.78
8	Percent of households born in Asia-Africa	28.40** (4.3)	11.50 (3.9)	45.90* (5.5)	24.90	25.00	.71
9	Percent of houses without own kitchen or kitchenette	10.10 (3.7)	10.70 (3.4)	6.50 (4.8)	9.60	11.20	.50
10	Percent of houses with flush toilet	62.00* (6.5)	96.20 (5.9)	86.50 (8.4)	81.90	84.40	.59
11	Percent of houses without bath or shower	38.60* (5.9)	4.90 (5.4)	16.60 (7.6)	19.40	17.20	.62
12	Percent with some form of central heating	18.70* (6.5)	72.30 (5.9)	33.40* (8.3)	44.80	40.80	.78

* Coefficient is significantly different from that of D_2 at 2% (one tail T test)

** Coefficient is significantly different from that of D_2 at 4% (one tail T test)

***Coefficient is significantly different from that of D_2 at 10% (one tail T test)

****Coefficient is significantly different from that of D_2 at 15% (one tail T test)

a. Includes professional, technical and scientific, managerial, executive and clerical workers.

b. Counting all rooms in house except kitchen, bath or shower.

c. Dwellings rating 0-2 on housing quality scale. (See 1961 census, Volume 42, p. 260)

d. Dwellings ratings 11-13 on housing quality scale.

D_1 = Dummy Variable for 1st Ring

D_2 = Dummy Variable for 2nd Ring

D_3 = Dummy Variable for 3rd Ring

Source: Israel, Central Bureau of Statistics, Population and Housing Census, 1961, Volume 38.

This correspondence is at best approximate. Using the statisical areas as described, the first "ring" includes some parts which may more properly belong to the middle "ring," such as Romema. The third "ring" includes one section (Yemin Moshe - built in 1894) which should be part of the first. There was also new construction in the first and second "rings" after 1948.

Nevertheless, a fairly unambiguous pattern may be observed. In Table 1, a number of dependent variables are shown regressed on three dummy variables, one for each "ring". The regressions are based on the unweighted values of the dependent variables for the 14 statistical areas. The statistical areas were divided as above, i.e. so that those areas consisting primarily of pre-World War I construction were associated with the first dummy (areas Nos. 11, 12, 14, 15, 21); those areas consisting mostly of post-World War I but pre-Independence construction were associated with the second dummy (areas Nos. 16, 22, 23, 41, 42); those areas consisting mostly of post-1948 construction were associated with the third dummy (areas Nos. 31, 32, 43). In some calculations, the data for area No. 22 included the essentially unpopulated No. 23. Area No. 13 does not easily fit into any "ring," since it contains much of the downtown commercial district. It lies in between the first and second "ring". Unless indicated otherwise, No. 13 was included as part of the second "ring".

The results in Table 1 offer a description of Jerusalem in 1961. Comparing the first "ring," or "inner city," with the "second," we find that the first contains a lower percentage of high-status employees; a smaller percentage of owner-occupied dwellings; a higher level of density; more low-quality houses and fewer high-quality houses; and fewer houses with hot water, a kitchen , a flush toilet, a bath, or central heating.

Comparing the third "ring" with the second, we find that the third contains a lower proportion of high-status employees; fewer owner-occupied houses; higher density; more low-quality housing and less high-quality houses; and fewer houses with hot water, a kitchen, a flush toilet, a bath or central heating.

The distribution of Jews from Asian-African countries of origin also follows the pattern with fewest in the middle ring.

In each of the regressions, the pattern is consistent with a three "ring" pattern representing "perverse" suburbanization. While the sample of statistical areas is small and the methodology somewhat primitive, the regressions produced estimates of R^2 generally greater than 0.5, often higher than 0.7. A simple division into three "rings" explains most of the variance for nine out of the twelve dependent variables. Since it would be meaningless to test whether the OLS (Ordinary Least Squares) coefficients were different from zero, the hypothesis was tested that the coefficients were different from the mean value of the independent variable for the 13 observations. In 22 out of 39 cases, this was the case ($\alpha < 10\%$). The significance of the F-statistic was considerably higher than 1% for each and every equation.

Since 1961, no new set of disaggregate data on housing in Jerusalem has been published. A census was taken in 1972, but disaggregated neighborhood housing data from this census have not yet been published.

In 1967, the two sections of Jerusalem were reunited following the June War, and the city continued to grow. In 1974, the population of the whole city was 344,200. Of these, 251,000 were Jews - compared with 189,100 Jews in 1965 (Israel Central Bureau of Statistics, 1974).

A number of new neighborhoods have been built since 1967. Some of these are in

what was previously Jordanian territory. All of these are at what was previously the margin of the city. While no data is yet available on housing in these neighborhoods, casual observation suggests that they look very much like lower-density, higher-quality houses. This new ring probably represents the return of Jerusalem from "perverse suburbanization" to the "normal suburbanization" patterns that prevailed prior to 1948. This would also support the hypothesis that "perverse suburbanization" is an anomaly, occurring when rapid population growth overwhelms the normal filtering process.

In sum, it has been argued that the "normal" patterns of suburbanization are limited to the case where urban population growth (e.g. through migration) is moderate or predicted in advance. In this case, incomes and housing quality rise with distance from the center, and housing density falls. If however, the growth rate is sufficiently large, the normal filtering mechanism will break down. New migrants will be housed at the margin of the city, creating a ring of low-income, low-quality housing. "Perverse" suburbanization occurs.

It has been shown that Jerusalem developed a third "ring" of low-quality, low-income housing during the period of very rapid growth which took place following Independence in 1948. "Perverse" suburbanization was demonstrated, using a number of criteria. Since 1955, growth rates have been slower (while per capita GNP and industrialization have increased). There are signs that a fourth ring is emerging, as Jerusalem returns to "normal" suburbanization patterns.

The housing patterns in Jerusalem may be representative of a more general phenomenon. "Perverse" suburbanization may be a common pattern in those countries that have experienced rapid urban population growth.

FOOTNOTES

1. For discussions of these theories, see Mills (1972: Chs. 2,3,6), and Edel and Rothenberg (1972: Part 3).
2. Sources for following divisions are Israel Central Bureau of Statistics, unpublished data; Israel Ministry of Labor, Atlas of Israel (1970).
3. Note that we are only discussing the sections of the city which were in Israel after 1948; the second "ring" may well have continued through the Jordanian section of the city. In a special census of East Jerusalem carried out after 1967, it was found that "normal" suburbanization had prevailed throughout the previous period, with density generally declining with distance from the Old City Walls. See Israel Central Bureau of Statistics, East Jerusalem (1967); Sharon (1973:146).

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