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## The Causes of Metropolitan Suburbanization

Peter Mieszkowski and Edwin S. Mills

**I**n the United States, 69 percent of the population lived in what the government statisticians call metropolitan statistical areas (MSAs) in 1970, 75 percent in 1980 and 77 percent in 1990. But while a greater proportion of the population is living in urban areas broadly defined, a smaller proportion is living and working in the central cities. In the 1950s, 57 percent of MSA residents and 70 percent of MSA jobs were located in central cities; in 1960, the percentages were 49 and 63; in 1970, they were 43 and 55; in 1980, they were 40 and 50; in 1990, they were about 37 and 45. The United States is approaching the time when only about one-third of the residents within an MSA will live in central cities and only about 40 percent of MSA jobs will be located there.

Many popular discussions are written as if suburbanization were a postwar U.S. phenomenon, induced by circumstances peculiar to the period. For example, during the 1950s, it was claimed that home mortgage insurance by the federal government was responsible for suburbanization. In the 1960s, the interstate highway system and racial tensions were popular explanations of decentralization. More recently, crime and schooling considerations have been prominent explanations of urban decentralization. While all of these factors have played some role in causing suburbanization, they are all postwar phenomena, and are mostly provincial U.S. problems. In reality, the trend toward suburbanization has been prewar as well as postwar, and has been international in scope.

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The growth and suburbanization of MSAs have been international trends. Most high income countries are 60–85 percent metropolitan, and the growth in U.S. metropolitan population has slowed relative to national population growth as it has approached the upper end of that range. Suburbanization in metropolitan areas has also occurred worldwide during the postwar period, although it has proceeded farther and faster in the United States (Mills and Tan, 1980).

Two classes of theories of suburbanization have been offered. The first, favored by urban theorists and transportation experts, might be called a natural evolution theory. When employment is concentrated at the center of a city, around a port or railhead, residential development takes place from the inside out. To minimize commuting costs for work trips to the Central Business District (CBD), central areas are developed first, and as land in the central city becomes filled in, development moves to open tracts of land in the suburbs. As new housing is built at the periphery, high income groups who can afford larger and more modern housing settle there. The older, smaller, centrally located units, built when average real incomes were lower, filter down to lower income groups. This natural working of the housing market leads to income-stratified neighborhoods, and there is a tendency for low income groups to live in central locations and for affluent households to reside in outlying suburban areas. The majority of the middle class apparently prefers larger single family lots in the suburbs to denser multi-family residences in the central city.

The tendency of the middle class to live in the suburbs has been reinforced by transportation innovations and travel time considerations. During the mid-19th century, when the cost of moving goods and people within cities was high, and urban areas were dense and spatially small, high income groups located at the center, while low income groups walked to work. When streetcars, commuter railroads, and finally the automobile were developed, they were fast but (relative to earnings) expensive modes of transportation; they were initially utilized by the well-to-do, who used these fast modes to commute from suburbs. Increases in real incomes allowed the general public to adopt the faster modes of transportation. Moreover, the falling cost of intra-urban transport following the construction of freeways significantly increased the size of the urban area, decreased residential densities and allowed MSAs to develop in all directions at suburban locations.

The decentralization of residential activity was followed by employment decentralization, made possible in part by the adoption of truck transport for goods. Firms followed the population to the suburbs, both to provide services to suburban residents and to take advantage of lower suburban wages and land costs. This process was self-reinforcing: as large employers became suburbanized, their employees followed them.

This natural evolution theory of urban development emphasizes the distance of residential sites to central work places, the effects of rising real incomes over time, the demand for new housing and land, and the heterogeneity of

the housing stock. Other important considerations for this theory are transportation costs, innovations of intra-urban transportation and changes through time in the comparative advantage of different income groups at commuting longer distances to work.

In contrast, a second class of explanations for suburbanization stresses fiscal and social problems of central cities: high taxes, low quality public schools and other government services, racial tensions, crime, congestion and low environmental quality. These problems lead affluent central city residents to migrate to the suburbs, which leads to a further deterioration of the quality of life and the fiscal situation of central areas, which induces further out-migration.

Those who move to the suburbs often seek to form homogenous communities, for several reasons. There is the preference for residing among individuals of like income, education, race, and ethnicity. By residing in income-stratified communities, the affluent avoid local redistributive taxes. Homogenous community formation is also motivated by varying demands for local public goods, caused by income and taste differences. Homogenous groupings enhance the quality of education, as there is evidence that peer-group effects are important in the production of educational achievement. In earlier periods, people of English backgrounds moved away from the influx of low income European immigrants. More recently there has been the flight of middle class residents from central cities caused, in part, by the fact that low-income blacks commit a disproportionate share of crime.

The fiscal-social problems approach is a generalization of the well-known Tiebout (1956) model. Although Tiebout did not mention land use controls, they have clearly been an important part of the suburban homogenization process at least since World War II. Once a relatively homogenous group has collected in a suburban jurisdiction, they can exclude people whose housing demands are very different by land use controls on residences. To some extent, they can exclude other types of people by similar controls on commercial development. Land use controls have become increasingly stringent in the 1970s and 1980s, and residential segregation now works increasingly by income, and somewhat less by race and ethnicity.

Also, as affluent groups first had the means to use expensive transportation innovations to commute from suburbs, this natural process was instrumental in the formation of well-financed and high-achieving school districts. Once high quality school districts became established, they became magnets for further suburbanization and attracted other households that placed a high value on education, furthering their quality and reputation.

The two theories have a number of interactions and interrelations, and consequently, it is difficult to distinguish between them empirically. For example, income differences among households is a primary explanatory variable for both the natural evolution and "flight from blight" explanations of suburbanization. The "flight from blight" theory implies that important externalities are

involved between income groups: positive externalities from the affluent to the poor, and negative externalities running the other way. But the other theory, based on income changes and technology, is consistent with the same externalities.<sup>1</sup>

Take another example: as a large share of new, modern houses is built on open suburban land, the demand for the new housing also satisfies the demand for affluent neighborhoods and low-tax communities. As MSAs are naturally expanded at their peripheries, new communities form there; as affluent groups have controlled this process, these communities have facilitated the introduction of a variety of exclusionary and fiscally motivated land use controls. In this way, the natural evolution and fiscal-social factors can interact. Once residential decentralization was established it promoted the movement of employment to the suburbs, and thus led to further residential suburbanization. The two hypotheses are by no means mutually exclusive.

With these approaches to the issue of suburbanization in mind, let us now move to examining how suburbanization has been measured and studied.

## **The Monocentric Model and Analyzing Suburbanization with Gradients**

Before offering some cross-country comparisons of suburbanization, we first sketch the monocentric model of urban areas and discuss the gradient measure of suburbanization.

The monocentric model of urban spatial structure was developed by Alonso (1964), Mills (1967) and Muth (1969). The model formalizes what we have referred to as the natural evolution model of urban areas. In this model, all employment is concentrated at the central business district (CBD), and the locational choice of identical households is modeled solely on the basis of access to the employment center. In the monocentric model, centrally located housing is expensive, and households economize on housing and live in small housing units. Households that incur higher commuting cost are rewarded by lower housing prices farther from the CBD and consume more housing. Under certain simplifying assumptions about preferences and technology population density is shown to have an exponential form (Brueckner, 1982),  $D(\theta) = D_0 e^{-\gamma\theta}$ , where  $\theta$  is the distance from the CBD,  $D_0$  is the population density at the edge of the CBD, and  $\gamma$  is the gradient or the constant percentage change in the population density per unit change in distance from the CBD.

The basic form of the monocentric model assumes that there is one mode of transportation and the cost per unit distance is constant. The best theoretical

<sup>1</sup>A number of studies bearing on these views will be discussed throughout this paper. However, the reader interested in a good starting point on the "flight from blight" theory might begin with Oates, Howrey, and Baumol (1971) and Bradford and Kelejian (1973). A good starting point for the alternative view might be Mills and Price (1984), or the papers by Straszheim (1987), and by Brueckner (1987).

and historical account of the importance of transportation innovations in explaining suburbanization in general and the suburbanization of the affluent is developed by LeRoy and Sonstelie (1983). They extend the basic model of urban location by allowing for slow and fast modes of intra-urban transportation. Initially, the slow mode was walking and the fast mode was streetcar—later replaced by the automobile. As the rich could better afford the fast mode they were the first to suburbanize, but as the ownership of the automobile became general among income classes the less affluent also moved to suburban locations. As the affluent place a higher value on their commuting time, they are at a comparative disadvantage in commuting and LeRoy and Sonstelie predict the gentrification of central cities by the more affluent as the poor became more suburbanized. This historical explanation of the location of different income groups in terms of transportation modes of varying speeds is an ingenious explanation of the income stratification of MSAs and confirms the difficulty of establishing the relative quantitative importance of competing explanations of suburbanization. This is economics in its purest form, as preferences are stable over time and are invariant among income levels. Observed changes over time and differences in choice for different households at a point in time are simply the result of differences in budget opportunity sets and changes in these sets over time.

Beginning with the work of Colin Clark (1951), many writers have used estimates of the density gradient, the slope of the log density function, as a measure of the degree of decentralization of MSAs. The more uniform the population density as a function of the distance from the central business district the smaller the gradient, so decreases in the value of the gradient over time have been taken as increases in the decentralization or suburbanization of urban areas. Clark's work was based on census tract data for a number of urban areas throughout the world, some dating back to the early nineteenth century. He established declining density gradients and the flattening of density functions over time. Muth's (1969) work for a sample of U.S. cities was also based on census tract information.

In contrast, the work of Mills (1972) and the later work of Mills and Tan (1980) and Edmonston (1975) is not based on census tract information, which is nonexistent for early time periods. Mills assumed, first and most importantly, that population density follows the exponential form. Second, he assumed that population density is zero at the boundary of the urban area. The second assumption is unnecessary and was dropped in later work. With these two assumptions, he is able to obtain a perfect fit for the function yielding the population density at the CBD and the density gradient from information on the population of the central city, the population of the suburbs and the distance of the central city boundary from the CBD. On the basis of these two-point estimates, Mills and Tan (1980) conclude that density gradients have flattened for a large number of countries over long time periods. Mills (1972) found that population and employment density gradients decreased for a large number of MSAs in the United States in the postwar period. Also, Mills

estimated gradients to be declining from 1880 to 1940 for a sample of five MSAs. On the basis of the estimates of the density gradients for the early part of this century, Mills concluded that American suburbanization has not accelerated in the post-World War II period, when central city fiscal problems and racial tensions were at their height. This finding, and the findings that suburbanization as measured by the flattening of the density gradient is a worldwide phenomena and has occurred over a long time period, are strong evidence in favor of the natural evolution theory of suburbanization.

Mills's estimates for the early part of the twentieth century have been questioned by Harrison and Kain (1974), who developed an alternative set of density gradient estimates based on historical information of the percentage of structures which house single families. Their estimates of density gradients, while generally lower, are in general accord with Mills's estimates for the postwar period.

But while Mills found gradients to be declining from 1910 to 1930 for a sample of five MSAs, the Harrison-Kain estimates indicate an *increase* in the density gradient for the same MSAs, as vacant land in the central city is filled in. The difference is especially striking for Denver in 1910 for which Mills estimated sharply declining density, while Harrison-Kain estimated uniform population density. These authors remind us that urban development is not just a simple outward expansion, a point to which we will return later.

Edmonston (1975) applied Mills's method of two-point estimates to a much larger sample of cities. For 41 cities that were metropolitan districts in 1900, Edmonston found that the average density gradient was roughly constant at .8 between 1900 and 1920. Between 1920 and 1930 the average gradient fell to .66, and between 1940 and 1950 it fell significantly from .61 to .39. There was no acceleration in the rate of decline between 1950 and 1970.

Data on population growth between 1900 and 1950 for individual metropolitan areas contained in Bogue (1953) confirm these findings. For virtually all older metropolitan areas along the eastern seaboard and in the midwest the population growth of central cities was quite modest after 1930, with virtually all growth occurring in the suburban rings. Also, large older cities such as Boston, Chicago and Philadelphia have decentralized continuously since 1900.

We conclude that Mills overstated the rate of suburbanization for MSAs as a whole for the period 1900–1920. But it remains true that the most rapid period of suburbanization as measured by the change in the density gradient occurred between 1920 and 1950, a period not known for racial tensions, school desegregation, rising local taxes and high crime rates. In fact, between 1940 and 1950, national crime rates fell.

Muth (1969) was the first to attempt to explain variations in density gradients statistically. He found no relationship between suburbanization and a variety of "flight from blight" variables. More recently, Mills and Price (1984) and Mills (1986) estimated population and employment densities for 62 urban



areas for 1960 and 1970 and then used regression analysis to explain urban decentralization.

They find that lagged (1960) population decentralization influences current (1970) employment decentralization. But the prior decentralization of employment does not explain current population decentralization. A number of proxy variables for commuting costs or convenience have the wrong sign or are statistically insignificant. The most important finding of Mills and Price is that the set of measures of central city problems—crime, educational attainment and taxes—adds nothing to the understanding of population and employment suburbanization. The strong exception was racial shares. It was consistently found that both population and employment density gradients were smaller, the larger the ratio of percent black in the central city to percent black in the suburbs. Mills (1985) considers the effect of moving 50,000 central city blacks to the suburbs and replacing them with 50,000 whites from the suburbs. For a hypothetical MSA of two million, after the movement of the population, 45 percent of the central city and 10 percent of the suburbs are black. The long-term effect of this modest integration of suburban housing is estimated (based on earlier Mills and Price regressions) to increase central city employment from 54 to 65 percent of metropolitan employment, a 19.5 percent increase in central city employment, and to increase central city population by 8 percent. The importance of race in influencing suburbanization is confirmed in alternative measures of decentralization as discussed later on.

## **Inter-country Comparisons of Suburbanization**

One advantage of the density gradient as a measure of urban decentralization is that it readily accommodates cross-country comparisons. Casual observation indicates that U.S. MSAs are less dense and more suburbanized than metropolitan areas in other high income countries. These differences have been attributed to the abundance of land in the United States, greater reliance on the automobile, a more extensive system of freeways within urban areas, greater suburban fiscal autonomy, higher crime rates in central cities, and greater ethnic and social diversity in the United States.

In general, the cross-country comparisons found in the work of Mills and Ohta (1976), Mills and Song (1979), Glickman (1979) and Goldberg and Mercer (1986) confirm the common perception that cities in Japan, Canada and Germany are relatively less suburbanized. However, it is difficult to decompose these differences into specific factors and explanations.

Evidence developed by Mills and Ohta and reproduced by Glickman demonstrates that central densities and density gradients in Japan are relatively high. Japan is ethnically and socially homogeneous, but it is also relatively land



poor and relies to a much greater extent than the United States on public transportation for intra-urban travel.

Glickman used population information for small areas (wards) to estimate density gradients for German and British metropolitan areas for 1960 and 1970. He found that German metropolitan areas are relatively less decentralized and that the rate of suburbanization between 1960 and 1970 was much slower there than in the United States. Somewhat unexpectedly, Glickman demonstrated that, on average, the central density and density gradients in United Kingdom metropolitan areas are similar to those in the United States.

Goldberg and Mercer set out to demonstrate that Canadian metropolitan areas are relatively compact and more centralized than those in the United States. However, the authors conclude from density gradients estimated for the period 1950 to 1975 that Canada and U.S. metropolitan areas were decentralizing at the same rate. They also conclude that the central densities of Canadian metropolitan areas are roughly twice those of U.S. metropolitan areas, but the average density gradient is the same in both countries. However, larger metropolitan areas, with populations exceeding 500,000, are denser and more decentralized in the United States. For population size 500,000 to one million, the average density gradients are .48 and .26 for Canada and the United States, respectively. For metropolitan areas one million the average gradients are .4 in Canada and .19 in the United States.

Evidence is presented that metropolitan areas in Canada have fewer fiscal jurisdictions. There are fewer freeway miles per capita in Canada, confirming map analysis which shows that major U.S. metropolitan areas have many more freeways running through their central areas. Also, public transit is more important in Canada as a means of intra-urban transportation. Goldberg and Mercer also present evidence that the percentage of households resident in Canadian central cities and with school-age children is much higher, 57 percent versus 40 percent in the United States.

Finally, there are no significant differences in urban property crime rates between Canada and the United States. However, violent crime is 4 to 6 times higher in the United States, and the differential between center cities and suburbs is much greater in the United States.

This cross-country evidence is consistent with the "flight from blight" explanation of the greater degree of suburbanization in the United States. But there is no precise way of determining what portion of the difference should be attributed to crime and schooling considerations and what portion is explained by the more centralized integrated approach to land use planning and transportation policy in Canada and Europe.

## **Conclusions about Suburbanization from the Gradient Approach**

The gradient approach has several advantages. It's relatively simple. The exponential density function is a reduced form equation of a simple and robust

model of metropolitan spatial organization. Also, the assumption of the exponential density function permits estimation of central densities and density gradients from simple information about the central city population, the metropolitan population, and the radius of the central city—the two-point estimates.

The fundamental problem with using the density approach to test different explanations of suburbanization is that small errors translate into large absolute quantities. Even if the effect of the “flight from blight” factor is relatively small, it could have considerable effect on the margin. It should be remembered that the measurement of gradients is on an exponential scale rather than a linear one. An absolute change of .05 in the density gradient in the range .20 to .25 is quite significant. Mills and Hamilton (1989, p. 381) calculate that an MSA with a central city radius of eight miles and a density gradient of .20 implies that 47.5 percent of the population lives in the central city; with a gradient of .25 the percentage living in the central city rises to 59 percent. Thus, it could be that even if “flight from blight” is a relatively small explanation for suburbanization, it is an important factor on the margin, and thus a key to whether it is considered a manageable phenomenon or a “problem.”

It is difficult to measure “flight from blight” effects precisely. One problem was first noted by Harrison and Kain (1974). They argue that the exponential form for density may not be appropriate for small urban areas. As noted earlier, they estimate uniform density for Denver in 1910. But for this case, the two-point estimate of the exponential form yields a high central density and a large density gradient.

Edmonston (1975) and Goldberg and Mercer (1986) find that gradients for small urban areas are considerably larger than those for large urban areas. To explain this result it is necessary to compromise the exponential form by noting that employment decentralization is more likely to occur in large urban areas. There is also the possibility that estimates of density gradients for small urban areas are biased upwards, because two-point estimates of an exponential form for a city with a small area force the population density to decline quickly and yield high densities close to the center. But as noted by Harrison and Kain (1974), population densities in small cities are actually quite uniform. This bias affects the Mills-Price conclusion that race has a significant effect on employment decentralization if minorities tend to reside in large metropolitan areas.

Beyond the interpretation of gradient-based results, the idea of an exponential gradient itself has been questioned (Mills, 1992). First, if variables that relate to local government jurisdictions are important, no theoretical approach implies that the same exponential density function should hold within or among jurisdictions. Thus, the fiscal and social factors call into question the functional form.

Perhaps more important, although the widespread existence of gradients has been taken to support the basic monocentric model of MSAs, this approach may fail to offer a good approximation of many MSAs. Western and southern MSAs have tended to grow in a dispersed pattern, with leap-frog development,

rather than simply spreading out. Mieszkowski and Smith (1991) have shown for Houston that population density on developed residential land is quite uniform and that the declining density gradient is largely a statistical artifact, resulting from the increase in the amount of vacant land with distance from the central business district.

Moreover, the 1970s and 1980s have seen the development of large suburban office complexes, or the formation of “Edge Cities” as described by Garreau (1991). They are to be understood as collections of employment and surrounding residential areas which are located in the suburbs—often distant suburbs—of large urban areas. They increasingly resemble small, free-standing and self-contained cities, often containing 50,000 to 100,000 people. One important factor which has enabled such cities to arise is the beltways around large cities, which create intersections of important highways.

Although the monocentric model and the exponential density function have been valuable in understanding and documenting past trends in urban decentralization, the rise of “Edge City” makes the model and function increasingly irrelevant. Also, explanations of variations in the density gradient among metropolitan areas have not been successful in determining the relative importance of the natural evolution and the “flight from blight” explanations of suburbanization.

## Conclusions and Policy Implications

Our judgment is that both the natural evolution and fiscal-social approaches are important. Much evidence and analysis indicate that MSA size, income levels and distribution, transportation evolution and housing demand are important in understanding MSA structure and decentralization. On the other hand, no careful study has failed to confirm that central city racial mix and suburban land use controls interact to help explain both the extent and pattern of suburbanization in U.S. MSAs.

However, the relative importance placed on the two theories can lead to different policy conclusions. At issue is the appropriate role of the federal and state governments in shaping urban development. If suburbanization is largely the result of natural evolution, and technologically- and income-induced changes in the demand for land, then it is appropriate for the public sector to accommodate these demands. State and federal governments should be neutral in allocating development funds between suburbs and the central city. If households prefer to live in low density suburbs, and to use automobiles as their primary means of intra-urban transportation, the public sector should validate these preferences with the appropriate highway and infrastructure investments.

From this view, the requests of central city landowners to prop up their declining fortunes with area-specific transportation investments or subsidies

should be resisted. Rail transportation might be justified as part of an overall public investment strategy, but only if it is the best means of satisfying trip demand, whether these work trips are from the suburbs to the central city, from central city to suburbs, or within the central city, and only if rail is cost-effective relative to an alternative means of transportation such as the automobile. While this point of view would still allow the use of eminent domain in some cases—on the grounds that markets do not work perfectly in assembling land for central city redevelopment—this power should not be accompanied by fiscal subsidies; otherwise the apparently high cost of residential and non-residential redevelopment (because of the strategic behavior of individual landowners) will be confounded with the remaining service value of existing properties.

In an idealized policy environment, the allocative and distributive objectives of higher level governments should be separated. Direct income assistance to the poor should be the responsibility of the federal and state governments. Also, if large numbers of poor are concentrated in central cities, grants to local governments can be justified as a means of increasing the government service levels for low income groups. But the strict separation between allocation and distribution is difficult to maintain, except for the special case where all redistribution for private and governmentally-provided goods are provided directly to individuals and all local governments impose benefit taxes and charges on all income groups residing within their jurisdictions.

When all income groups are initially located within one central city jurisdiction, fiscal factors do not affect location. From this starting point, if some affluent households move to the suburbs to satisfy their demands for new housing, in all probability they also improve their fiscal situation. The creation of income-stratified suburbs weakens the fiscal base of the central city, and their existence creates a fiscal incentive for other affluent households to move to suburbs. So even when non-fiscal factors are the initial forces behind suburbanization and remain important, once affluent suburbs are formed, fiscal considerations necessarily influence suburbanization to some extent.

The magnitude of the fiscal distortion resulting from these fiscal effects in influencing location is uncertain. Part of the differential between central city and suburbs is neutralized through capitalization in land values. But as long as industrial and residential land densities can vary and/or land can remain vacant, allocative distortions are not fully eliminated by capitalization. In addition, land use controls prevent resource mobility. Another consideration is the extent to which local governments respond to fiscal competition and move towards benefit taxation.

There are several ways of characterizing or representing the inefficiency associated with redistributive taxation within the central city. If taxes are higher in the central city than in the suburbs, and households are indifferent between the two general locations, a move to the suburbs by these households results in a social loss. The difference in taxes represents a loss of output with no change

in welfare for the households that move. The loss in output may be largely the higher commuting costs associated with suburban residence. Households trade off higher commuting costs against the higher taxes and lower service levels at central locations.

We judge that tax and government service level considerations inhibit central city redevelopment. In many cities, affluent households are willing to pay high prices for housing in secure, high-income, centrally located neighborhoods. Yet since 1950, many central cities have lost large amounts of population and appear ripe for redevelopment. This development would be more likely to occur if the vacant or underutilized central city land could be incorporated as an independent jurisdiction. Or equivalently, the centrally located land would be worth more if the landowners could secede from the central city. The difference between the value of land in a hypothetical independent jurisdiction and its current value is a measure of the welfare loss, for a specific area, of being part of a redistributive central city fiscal system.

Once fiscal distortions are recognized, the decision-making process of higher level governments becomes more complex, since the effects of redistributive policies include the aid they provide low income groups, the fiscal relief this aid provides to the immediate neighbors of the poor, and the allocative improvement that these policies may bring about by moderating out-migration to the suburbs. Similarly, the benefits of state government financed investments in either the suburbs or in the central city should account for direct benefits and the social benefits of promoting central city location.

A necessary condition for an efficiency-based intervention on behalf of central cities is the demonstration that fiscal and related factors are quantitatively important in affecting the degree of decentralization of MSAs. This evidence would also strengthen the case for equity-based aid to central areas so as to share more equitably the cost of central-city government services and to aid low income groups.

A more direct use of the quantitative research on the causes of suburbanization is for the policy formulation of local governments. Evidence that high crime rates are important in determining population and employment growth would provide a justification for large expenditures on crime prevention. The finding that high central city taxes lead employment but not population to move to suburbs might be used to impose higher taxes on city residents relative to business.

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