

Highway Impacts on Downtown and Suburban Shopping

DAVID K. WITHEFORD, Transportation Planning Consultant, West Haven, Connecticut

Growth in urban area retail sales occurs in suburban but not in downtown locations, according to most recent surveys. This study, developed from NCHRP research into travel characteristics associated with shopping centers, airports, and manufacturing plants, was aimed at assessing the role played by highways, if any, in this development.

The characteristics of market areas within a fixed travel time from a hypothetical CBD and shopping center are compared. Then it is assumed that urban area-wide highway improvements take place, bringing about an increase in average travel speeds and thus enlarging the market areas accessible within the same travel time as before. A test case, using socioeconomic and network data from the Niagara Frontier Transportation Study, was used to demonstrate the conclusions of these hypothetical cases. For values of travel time coincident with a typical market area boundary for the shopping center, it was found that gross family incomes totaled more in the shopping center market area than in the area within the same travel time from downtown. When highway improvements affecting the whole urban area are introduced, the relative advantage of the shopping center is enhanced.

Implications with respect to downtown redevelopment activities are briefly discussed. The condition described is likely to have its greatest impact where the traditional community retail center is not truly central but somewhat removed from the present and future centroids of urban population and income.

•STUDIES in most metropolitan areas show that retail sales growth in recent years has occurred primarily in suburban fringes while downtown sales have remained static or have declined. The reason, of course, is the shopping center development that has taken place with suburban population expansion. The fivefold increase in listings between 1957 and 1965 in the Directory of Shopping Centers is one measure of this development. The preface to the 1965 edition notes that "There will be many new advances in the new shopping centers. . . in almost every way conceivable, shopping centers will transplant all of the services and activities of the central city core to the new centers of population in the suburbs." Whether or not this transplanting will happen, it seems that the effect of urban highway programs will inevitably assist rather than hinder the dispersion of core area activities. The purpose here is to test this conclusion, first with a hypothetical example and then with a case study of one shopping center in Buffalo, N. Y. It is hoped that the evidence may stimulate further fact-finding concerning other suburban retail examples and other activities subject to similar influences.

Easier parking, more pleasing environments, and greater accessibility to potential customers have all contributed to the success of shopping centers. Weighing the importance of each factor is difficult, but some of the values accruing from urban highway programs were investigated in recent research. Land use-travel pattern relationships for shopping centers were studied in a research project (1) which used data from urban transportation studies. One of the studies represented was the Niagara Frontier Transportation Study, whose data on network travel times and socioeconomic characteristics were employed to analyze the actual situation presented here.

HYPOTHETICAL CASE

Demonstration of a theoretical situation requires certain assumptions about metropolitan area development. In the following case, residential densities are assumed to decline regularly with increasing distance from the core, and highway travel speeds to increase correspondingly. This is a normal pattern, as high-rise apartments and low-income high-density housing give way to garden apartments and single-family homes with succeeding distance from downtown. Because of increasing highway speeds, lines connecting points of equal travel time to a shopping center enclose an area of different size and shape from the circle described by the same time line around the CBD. The use of travel time rather than distance is essential because of the varying speeds which create this size and shape variation. Research has shown that shopping-center trip-generation rates at the residential origin zones are more sensitive to time than distance. Figure 1a shows the large eggshaped area circumscribed around the shopping center by a line connecting points of equal travel time, compared to the smaller circle around the CBD for the same time value. Inasmuch as the two areas touch, the time value shown is half the travel time between the shopping center and downtown. The area shapes, however, are valid for other time values.

Within the larger suburban area surrounding the shopping center, it is likely that the population typically possesses not only greater income per capita, but, because higher income families show higher levels of car ownership, also more mobility. Thus, even though population density is lower, the purchasing power within reach of the center may equal or exceed that of the area surrounding the CBD.

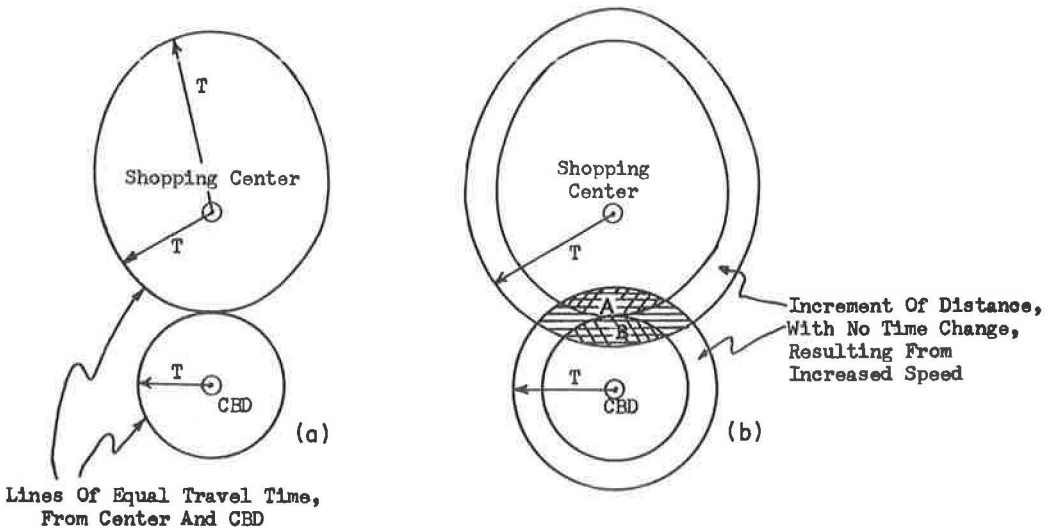


Figure 1. Influence of highway improvements on CBD and shopping center market areas: (a) lines of equal travel time; and (b) increment of distance, showing market area overlap resulting from a uniform speed increase (area A denotes penetration of original shopping center market area, within time T, by CBD; area B is that portion of original CBD market area now reached from shopping center).

Figure 1b shows the effect of highway improvements on the two market areas. A band of uniform width, added to each area, represents the increase in market areas within the same travel time resulting from uniform numerical increase in travel speeds. Such a result might be achieved by an urban freeway network, or even by improved traffic operations on a major arterial street system. For example, a uniform increase of 5 mph would add a bandwidth of 1 mi to each area if the selected travel time value were 12 min. Such a gain, of probably 10 to 15 percent in suburban speeds and 30 to 40 percent in core area speeds, represents a possible goal for urban highway system planning. Its impact, therefore, is worth examination.

First, the increment added to the shopping center market area is much larger than that added to the downtown market area. Even allowing for lower densities, it is still quite likely that the incremental accessible purchasing power is greater for the shopping center. Second, there is now an area of market overlap within the travel time that previously established abutting areas. The proportion of the original shopping center market area now within reach of the CBD is smaller than the proportion of the original CBD market area now within reach of the shopping center. This may also be true in terms of purchasing power. If so, the shopping center has benefited more from the newly created shared market area than has the downtown. In other words, at the given travel time, the downtown now has a greater proportion of its market area penetrable by competition than the shopping center. Therefore, uniform improvement in highway speeds not only improves on the initial area advantage of the shopping center, but also enhances its power to attract shoppers from market areas shared with the CBD. This is extremely significant, because typical shopping center travel patterns show generally that more than half the trips to shopping centers originate in areas lying between the shopping center and the CBD.

Where the CBD is off-center in the urban area, the typical shopping center position is even more strongly bolstered by highway improvement. Many cities fall into this non-central category: for example, port, lake and river cities, such as Boston, Chicago, Cleveland and Memphis; cities with topographic and other developmental restrictions, such as Pittsburgh and Tucson; and many state-line communities where taxation or other public policy differentials frequently produce uneven development patterns. In such instances, the centroids of present population are removed from the historic and traditional focal points of the community. Even where population distribution may be more uniform, such as in many Midwestern cities, the distribution of total income may result in purchasing power centroids not coincident with the CBD's.

Shopping centers, located with judicious regard to such development patterns, cannot help but benefit more than the CBD from generalized highway improvement programs.

ACTUAL CASE

Examination of a Buffalo, N. Y., shopping center demonstrates the locational advantage of one shopping center in that community. Area characteristics germane to the problem are first, that the CBD is located virtually on a waterfront, with the result that surrounding development encompasses only about 200 deg instead of a full 360 deg, and second, that the selected shopping center is less than 1 mi from an interchange of the New York Thruway, which in this area is toll-free for many short trips.

Data on households, income, and travel times were made available by the New

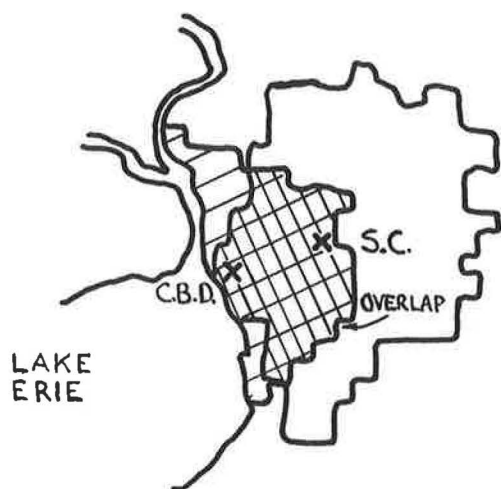


Figure 2. Market areas within 14 min from CBD and shopping center, Buffalo, N. Y.

TABLE 1
COMPARISON OF TOTAL INCOMES BY TIME INCREMENTS—DOWNTOWN AND
SHOPPING CENTER

Time Increment (min)	Family Income (\$ million)				Cumulative Difference
	CBD		Center		
	Income	Cumulative	Income	Cumulative	
0-2	37.4	37.4	34.1	34.1	-3.1
2-4	80.5	117.9	74.4	108.5	-8.4
4-6	136.0	253.9	196.1	304.6	50.7
6-8	132.0	385.9	179.9	484.5	96.6
8-10	192.8	578.7	276.9	761.4	182.7
10-12	232.9	811.6	251.7	1013.1	201.5
12-14	265.9	1077.5	315.4	1328.5	251.5

York State Department of Public Works, from the files of the Niagara Frontier Transportation Study, for this and other use (1). In the present evaluation, survey zone household and income data were arrayed by minutes of travel time from both downtown Buffalo and the shopping center, the travel times being obtained from computer-built "trees" based on the 1961 highway network. In the following tables, time increments are carried to a 14-min maximum, which accounts for about 75 percent of the tripmaking to the center, and which, because it represents completely unrestricted flow, is equivalent to at least 20 min normal over-the-road trip and terminal time. This limiting time value defines an approximate but reasonable boundary to the prime market area of the center.

Figure 2 shows the areas within 14 min of both the shopping center and downtown. The most significant characteristic is that most of the downtown area is also within 14 min of the shopping center. Only a very small area is not. However, the shared market area represents less than one-third of the total shopping center market area. The total family income reported by 2-min time groups within each area is given in Table 1. Except for the two initial time bands, the center consistently leads. Generally, the center can tap almost 25 percent more income than the CBD within their respective areas designated in Figure 2.

Differences between the two market areas are evident when incomes are stratified by level. Table 2 gives the accumulative number of households with over \$5,000 and \$8,000 income for both market areas. There are 23 percent more families with over \$5,000 income, and 77 percent more with over \$8,000 in the shopping market area. In either income group comparison, the shopping center has an edge at every time increment. Car ownership, the best indicator of mobility, follows a similar pattern. There are 29 percent more cars within 14 min of the shopping center.

Within the overlapping trade areas (Fig. 2) are 21,570 households with over \$5,000 income. This represents 24.2 percent of the downtown market area share, but only 19.6 percent of the shopping center's market area households with \$5,000 income. The total income in the overlap area is \$821 million, or 76 percent of the downtown

TABLE 2
HOUSEHOLDS BY INCOME GROUP BY TIME—ACCUMULATION

Time Accumulation	No. of Households, Over \$5,000 Income		No. of Households, Over \$8,000 Income	
	CBD	Center	CBD	Center
	0-2	2,120	3,125	673
2-4	7,096	10,419	1,676	3,045
4-6	18,412	26,878	8,230	9,990
6-8	30,158	41,819	11,542	16,034
8-10	45,614	63,555	16,222	24,643
10-12	64,554	83,012	23,599	32,468
12-14	89,140	109,992	24,629	43,616

TABLE 3
EXPANDED MARKET AREA CHARACTERISTICS

Item	CBD	Center
Increment characteristics:		
Added households with over \$5,000 income	22,468	24,796
Added total income (\$ million)	248.4	288.9
Added income in overlap increment (\$ million)	206.2	220.9
Added income in non-overlap increment (\$ million)	42.2	68.0
Overall characteristics:		
Total non-overlapping area income (\$ million)	77.9	369.4
Percent of income within total non-overlapping area	5.9	32.8
Total income in new 14-min area	1325.9	1617.4
Total households with over \$5,000 income	111,608	134,788

total, and 62 percent of the shopping center total. Thus, a greater part of the downtown market area income can be tapped by the shopping center within 14 min than that of the shopping center from downtown.

What happens if a 1-mi band is added to each of the two market areas? If the travel time to the new periphery remains at 14 min, this is roughly equivalent to the effect of a uniform increase in urban travel speeds of 4 mph—not an unrealistic benefit of a completed transportation plan. Table 3 summarizes the result.

The shopping center has not only added more households and more income to its market area than downtown, it has also added more income in the non-overlapping areas. Adding the mile-wide bands considerably increased the shared market

area, the income of which increased from \$821 to \$1,248 million. This means a change from 76 to 94 percent of the downtown market area being shared with the center, but from only 62 to 77 percent of the center market area being shared with downtown.

The tendency for the gap between center and downtown purchasing potentials to widen cannot continue indefinitely. The outer boundaries of the shopping center market area reach the rural boundaries of urban development before those of downtown. But the disparity between cumulative income totals in Table 1 increased with increasing time values, and the tendency continued at least through the addition of the mile-wide band to each market area. And this despite the fact that the incremental speed gain proportionally aided downtown speeds more than those of the suburbs. There is no question, in this instance, that general highway improvements strengthened the position of the shopping center more than that of downtown.

OTHER CONSIDERATIONS

There are, obviously, many other influences affecting suburban and downtown shopping and the relative balance between them. Downtown shopping has been treated here as if market areas within relatively short travel times were the only consideration. Downtown shopping trips by office workers and nonresident visitors (tourists and convention-goers) are unaffected by such considerations. Downtown generally has the benefit of a transport mode not available to the shopping center. For example, Pittsburgh's Golden Triangle drew 18,000 daily shoppers by transit in 1958 compared to only 8,000 as auto drivers and passengers.

However, shopping centers usually locate in growing market areas, and stand to gain more from upward trends in real family income. More income means more cars owned, and more cars owned means growing pressure for highway improvements. Furthermore, the effect of different merchandising policies and practices, such as telephone and mail-order shopping, suburban discount store developments, and changing trends in shopping center size, clearly cannot be evaluated here. These may very much outweigh the impact of highway improvement programs.

SIGNIFICANCE OF THE HIGHWAY IMPACT

The indication that urban highway improvements do more for suburban than for downtown shopping, even though biased to favor downtown speeds, may not be new. However, demonstrated measures of the effect may be. As suburban growth can be related in part to rises in family income, so can pressures for highway improvements. Both developments strengthen the competitive position of the shopping center with respect to downtown.

Redevelopment schemes or other improvements to downtown, consequently, must significantly overshadow the shopping center improvements being designed to entice downtown services and facilities out to the suburbs. Improvements must be made not only in CBD facilities but also in the means of getting there. Inasmuch as even downtown-oriented highway improvements tend to favor the shopping centers, it is easy to conclude that transit is the answer, especially when statistics such as "70 percent of downtown shoppers use transit" can be cited. Undoubtedly, downtown merchants' associations and similar organizations see transit as a beneficial factor in maintaining or stimulating their economic health. But the characteristics of transit shoppers need to be checked to see if they represent significant buying power. To use the Pittsburgh example again, less than 1 out of 8 shopping trips went to the CBD, and transit was not the favored mode when all urban area shopping trips were considered. Improved CBD attractiveness must, therefore, overcome both the lesser attractiveness of the transit mode and the advantage given to shopping centers by highway improvements.

Finally, where growing urban development is tending to shift population and income centroids away from the traditional commercial center of the community, it may be wise to consider a public policy of redirecting development patterns rather than merely propping up the old center as a countermeasure. Uniformity of development by direction from the CBD may provide more hope for continued downtown vitality than massive revitalization of a location no longer in the mainstream of retail accessibility. Awareness of such factors, and of the total effect of improved transportation on retail activities, should be part of all studies aimed at preserving the existing values and functions of central business areas.

REFERENCE

1. Keefer, Louis E. Urban Travel Patterns for Airports, Shopping Centers, and Industrial Plants. NCHRP Report 24, Highway Research Board, 1966.