Downtown Retail in Boston: Social Trends and Impact of a Pedestrian Mall

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After decades of rapid decline, Boston's downtown retail area, known as the Downtown Crossing, has nearly stabilized. Growth in downtown Boston employment and in downtown Boston neighborhoods is beginning to offset the population loss of the city of Boston as a whole. The 1978 implementation of an automobile-restricted zone in the retail area appears to have had an additional positive effect. Preliminary empirical results indicate that the automobile-restricted zone may have been responsible for a 6 percent increase in trips to the area by workers and an 11 percent increase in trips by others. On the average, workers and downtown Boston residents say they are coming more to the Downtown Crossing now than 2 or 3 years ago whereas residents of other Boston neighborhoods and the suburbs say that on the average they are coming less. The automobile-restricted zone in the Downtown Crossing was able to attract more visits from the otherwise declining residential market further strengthening the potential for improvement in the area. Currently, the Boston Redevelopment Authority is evaluating improvements for the Downtown Crossing in areas such as maintenance, security, promotion, retail mix, and parking.

The objective of this paper is to examine the social and economic trends that have affected retail in downtown Boston and to isolate the effect of an automobile-restricted zone that was implemented in 1978.

There has been a continuous decline in central business district (CBD) retail sales since World War II in most of the larger metropolitan areas in the United States. In Boston CBD retail sales in 1977 constant dollars dropped from $1,129 million in 1948 to $464 million in 1977 (1). Such declines in sales have followed declines in population and employment in the larger central cities and increasing competition from suburban malls.

In the 1970s, however, structural changes occurred in the employment base of a number of older cities, including Boston, and these changes mitigated the employment losses. A recent Business Week article (2, p. 100) reported that unemployment in many older cities is lower than the national average principally because these cities have been moving away from traditional manufacturing and toward service industries like health care, education, finance, and trades, which are less sensitive to swings in the business cycle.

Whether a stable or increasing employment base will help CBD retail areas depends on a number of factors. A primary factor is the location of retail in relationship to the employment base. In Boston, much of the growth in employment has taken place in an area less than a 10-min walk from the traditional retail center of the city. Other factors that help to determine the health of retail areas in CBDs are the existence and size of close-in residential communities, the degree to which the area is an attraction for culture and tourism, and the amount of cooperation between local government and merchants in making the CBD retail area an attractive place to visit. In Boston all of these factors have had a positive effect on retail in the CBD.

In 1978 the city of Boston made a major effort to improve the downtown retail area by implementing an automobile-restricted pedestrian mall known as the Downtown Crossing. The Downtown Crossing represented a major public funding commitment in the heart of the retail area. More than $5 million was spent on capital improvements from combined city and federal funds. Traffic was barred from parts of Washington, Summer, and Winter Streets and rerouted to other corridors. Streets were bricked over and new lighting and benches were provided.

A number of data sources on Boston's Downtown Crossing is examined in this paper in order to draw conclusions about the effect of the automobile-restricted zone and about the downtown Boston retail market. Data sources include the U.S. Census, the Census of Retail Trade, state employment data, a home interview survey, pedestrian surveys, a retail inventory, and a telephone and mail survey.

DESCRIPTION OF DOWNTOWN BOSTON

Most of the office employment in Boston is located within Boston proper, a glove-shaped section of land bordered by the Charles River to the north, Massachusetts Avenue to the east and southwest, and Boston Harbor and the Fort Point Channel to the east. Within Boston proper the Census of Retail Trade defines two retail districts: the CBD and the Back Bay. The CBD includes both the traditional retail core of Boston and a newer retail and entertainment center known as the Quincy Market or Faneuil Hall. The traditional retail area is now known as the Downtown Crossing. Within the Downtown Crossing, parts of Winter, Summer, and Washington Streets were made into pedestrian streets. The pedestrian surveys, taken in years before, during, and after the pedestrian area was constructed, were limited to interviewing people as they left the pedestrian streets.

The major part of CBD retail is contained within the Downtown Crossing. Out of an estimated $423 million in CBD retail sales in 1982, $373 million came from the Downtown Crossing (3).

The Downtown Crossing is located at the intersection of four rapid transit lines. It is also adjacent to the theater district, Boston's Chinatown, and Boston's adult entertainment area (known as the "combat zone").

Whereas the Boston Standard Metropolitan Statistical Area (SMSA) extends some 20 to 24 miles from Boston proper, the major part (about 85 percent) of the customers for the Downtown Crossing come from cities and towns located adjacent to or inside MA-128, a major circumferential highway that runs 8 to 12 miles from the Downtown Crossing.

POPULATION, EMPLOYMENT, TRAVEL, AND RETAIL SALES TRENDS

Many variables affect retail sales. These include (a) population and employment located in relative proximity to the retail area, (b) the income of the population, (c) the travel time to the area in comparison with the time to competing areas, and (d) the attractiveness of the retail area in comparison with that of competing areas. Almost all of these variables have been changing, some adversely for downtown Boston, others positively.

Figures 1, 2, and 3 show how population and employment in the Boston area have been changing over the past decade. According to the 1980 U.S. Census the Boston SMSA, like much of the Northeast, lost population between 1970 and 1980. The city of Bos-

ton also decreased in population in that period by about 78,000. The city is an important part of the Downtown Crossing retail market. The 1978 and 1980 pedestrian surveys showed that 43 percent of the Downtown Crossing pedestrians came from Boston. A positive trend was a 5 percent gain in the residential population of Boston proper (4). Twelve percent of the Downtown Crossing pedestrians counted in the 1978 and 1980 surveys were residents of Boston proper. According to the Boston Redevelopment Authority (BRA), the number of jobs in Boston proper increased 13 percent between 1970 and 1980. This rate exceeded the SMSA job growth rate of 8 percent during the same period. The 1978 and 1980 pedestrian surveys showed that 43 percent of the Downtown Crossing pedestrians worked in Boston proper.

Because of the growth of the service industry in Boston and the continued decline in manufacturing jobs, the occupational profile of residents of the city of Boston has been changing. In 1980 nearly 59 percent of Boston's employed residents were employed in the service sector or in government. This is approaching 63 percent (5). An additional positive trend was a real increase in per-capita income of 18 percent for Boston residents and 24 percent for the SMSA between 1970 and 1980 (6). Figure 4 shows these trends.

Transit has always been the predominant means by which shoppers have traveled to the downtown Boston retail area. Although travel-time data for transit are difficult to obtain, ridership trends on the rapid transit lines are available. Between 1970 and 1976, annual boardings at CBD transit stations decreased 14 percent (7). An accelerating downward trend of 15 percent was observed for the main retail station at Washington Street between 1978 and 1980. These later counts are significant in that they took place between 10:00 a.m. and 4:00 p.m. and thus give a better representation of the use of transit by shoppers (8). Figure 5 shows trends in transit use.

State employment figures show that between 1967 and 1972 there was a sharp increase in the number of people employed in the retail trade in the SMSA. Between 1972 and 1977 there was a slight drop in retail employment. Since 1977 retail employment in the SMSA has again been increasing (1). Figure 6 shows the employment trends.

In summary, the positive trends that have affected the Downtown Crossing area include the growth in downtown employment, the downtown residential

Figure 1. Boston population.

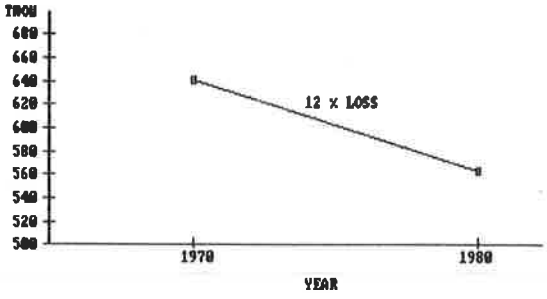


Figure 2. Boston downtown residential population.

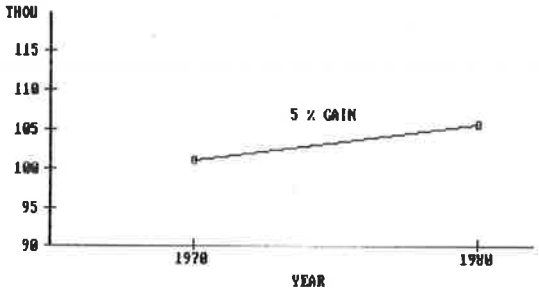


Figure 3. Growth in downtown Boston employment.

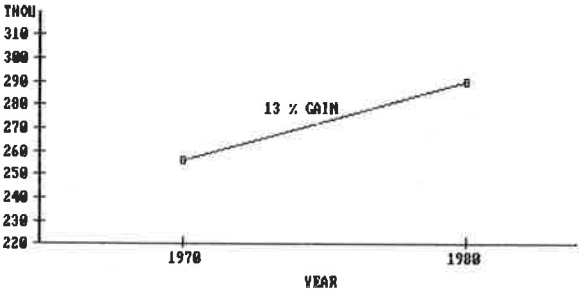


Figure 4. Growth in per-capita personal income.

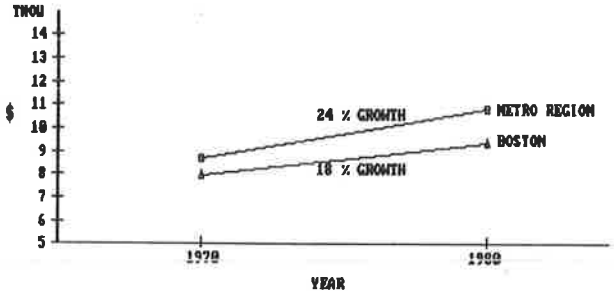


Figure 5. Annual boardings at CBD transit stations.

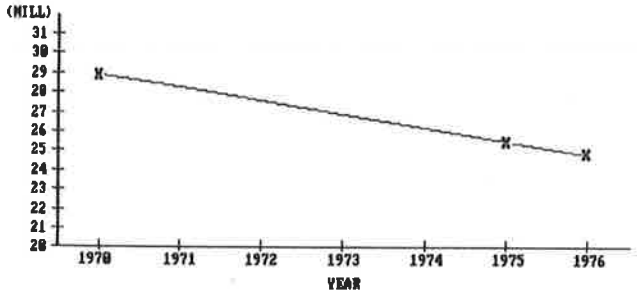


Figure 6. Number of retail employees in Boston SMSA.

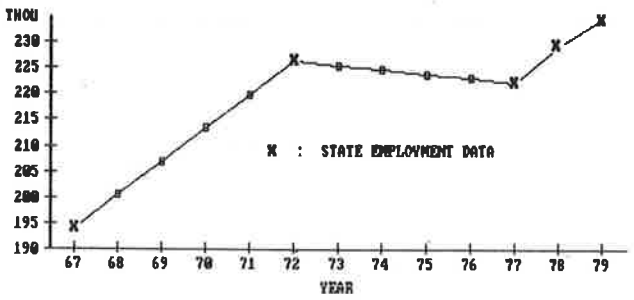
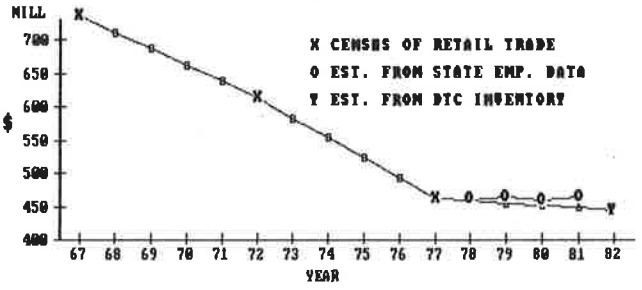


Figure 7. CBD retail sales in 1977 constant dollars.



community, and income. Negative trends include the population decline of the city of Boston, the loss of downtown transit users, and growing competition from other SMSA retail areas.

Given these mixed trends, what has been the overall effect on the Boston CBD retail area? Between 1948 and 1977 there was a steady decline in the real dollar value of retail sales in the CBD. Since 1977 the decline in CBD retail sales appears to have slowed considerably. Three sources verify this change.

Melvin F. Levine and Associates, a retail consultant working for the Boston Redevelopment Authority, conducted a detailed retail inventory of the Downtown Crossing area in 1982. The inventory included data on number and size of establishments by Standard Industrial Classification code and number of employees. In addition, the consultant visually inspected the remainder of the CBD and gathered information on the sales volume in the Quincy Market complex. By comparing the current number of establishments and employees with the number reported in the census, the consultant concluded that the area's retail sales were declining by 0.5 to 1 percent/year (3).

A second source of verification of the decline in CBD sales is state retail employment data for the city of Boston. Assuming that the CBD share of Boston retail employment continues to drop slightly, following past trends, 1979 and 1980 CBD retail employment can be estimated. These figures would indicate slight gains in retail employment in the CBD since 1977. Figure 7 shows CBD sales and indicates the trends since 1977.

A final source is Cambridge Systematics, Inc., the consultant that evaluated the Downtown Crossing for UMTA. Pedestrian counts taken in the spring of 1978 and 1980 in the Downtown Crossing showed the number of visitors to the area to have increased by about 11 percent. Pedestrian interviews conducted in the 2 years also showed that the current dollar value of expenditures per pedestrian had not changed. Cambridge Systematics estimated that inflation was 12 percent during the same period, so the overall effect is a slight decline in the real dollar value of retail sales in the Downtown Crossing (8).

Thus, three different sources appear to indicate that the decline in Downtown Crossing sales has slowed since 1977. The 1982 Census of Retail Trade will give the definitive answer in the near future.

EFFECT OF DOWNTOWN CROSSING

Given the various trends affecting the Downtown Crossing area, a question arises: How much of the 11 percent increase in pedestrian traffic found by Cambridge Systematics was due to the automobile-restricted zone and how much was due to exogenous forces? In order to get a more specific measure of the effect of the automobile-restricted zone on retail sales, some preliminary research findings from an ongoing Massachusetts Institute of Technology (MIT) research project are presented here.

One of the purposes of an MIT research effort sponsored by the U.S. Environmental Protection Agency (EPA) and the BRA was to measure the effect of the automobile-restricted zone on retail sales. Because the automobile-restricted zone produced a qualitative improvement in the retail area, it was not possible to measure its effect by using traditional retail analysis tools like the gravity model. The gravity model is capable of measuring impacts when there is a change in variables such as square feet of store space or travel time to the center, but it has no variables that can show the change in attractiveness of a retail area because of qualitative improvements such as an automobile-restricted zone.

To measure qualitative effects, two techniques that have been used in the field of marketing were borrowed and combined. One technique models shopping-area choice by using qualitative variables such as categorical rating scales and preference measures as independent variables. An example of the use of a categorical rating scale is asking a survey respondent to rate a shopping area on its parking conditions on a 7 point scale ranging from unusually good to unusually poor. An example of the use of a preference measure is asking a respondent to divide 100 points between two centers to show how much one is liked in comparison with the other. Koppelman and Hauser (9) used this approach to model shopping-area choice for the Chicago area.

A second technique is to ask survey respondents to rate hypothetical changes for the Downtown Crossing on categorical scales and with preference measures in order to isolate the effect of such changes. This approach was used by Neslin (10) to set priority design concepts for a new health center. The resulting changes in ratings were then used with models of existing shopping-area choice to predict the effect of the hypothetical changes on trips to the Downtown Crossing.

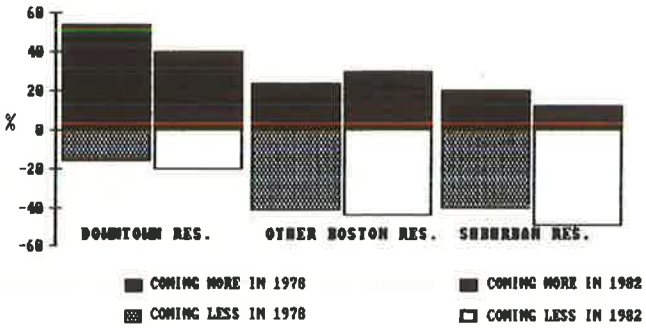
A two-part survey was designed to test these techniques for the Boston automobile-restricted zone. A telephone survey of households in communities within MA-128 was used to determine who shopped in the Downtown Crossing, where else respondents shopped, and their willingness to complete a follow-up mail survey.

The mail survey was specially designed for each respondent. It asked for categorical ratings of the Downtown Crossing, another shopping area used by the respondent, and the Downtown Crossing given various hypothetical changes. Categorical ratings were requested for the attributes of quality of goods and stores, variety, value, parking convenience, and walking environment. The mail survey also asked for preference information for the various alternatives, details about the last shopping trips taken, and socioeconomic information. Follow-up telephone calls were made to encourage response to the mail survey. Response rates for both surveys were fairly good overall, and the quality of the response to the somewhat complex mail survey was excellent.

There was a problem with bias in that the respondents visited the Downtown Crossing more frequently than the general population. Respondents also tended to have higher levels of education than the general population. The effect of the response bias will be assessed in later phases of the research.

Examination of several preference and choice variables for shopping areas indicated that these variables were measured successfully. Although many of the categorical rating variables also passed

Figure 8. Trends in visits to Downtown Crossing by area of residence.



validity tests, there was a problem with halo effects--i.e., respondents rating all perceptual variables higher or lower when they felt strongly about an alternative.

Analysis-of-variance models were estimated for perceptual rating differences as a function of alternative policies for the Downtown Crossing. Almost all coefficients expected were significant. Unfortunately, there was a halo effect for some variables, which had to be taken into consideration in forecasting change in actual behavior.

A linear regression model of preference as a function of categorical ratings and a binary logit model of choice as a function of preference and time to reach the shopping areas were estimated. Separate choice models were estimated for Boston proper workers and for all other respondents. The various models were then used in sequence to predict the changes in destination choice given the various hypothetical scenarios tested.

To test the effect of the automobile-restricted zone, one hypothetical scenario asked respondents to rate the Downtown Crossing with automobiles allowed back on the street. The response to this scenario was overwhelmingly negative from all classes of respondents, in terms of both categorical ratings and preference measures. Response was so negative that there were strong reverse halo effects for categorical ratings that should not have been affected by the change. Even when adjustment was made for this problem, a 6 percent decline in traffic was predicted for Boston proper workers and an 11 percent decline was predicted for all other shoppers given removal of the automobile-restricted zone. Because Boston proper workers currently visit the Downtown Crossing about twice as much as other visitors, they are less sensitive to changes than other visitors.

Although there are not many data available to check these results, the 6 and 11 percent changes are compatible with the reported 11 percent increase in pedestrians when the automobile-restricted zone was implemented. When Downtown Crossing pedestrian data are broken down to show weekly totals for Boston proper workers and all other pedestrians, an 11 percent increase in pedestrians is found for both workers and others. The MIT research finding implies that most of the increase in nondowntown workers was due to the automobile-restricted zone and more than half of the total worker increase was due to the zone. Note that the number of people working in the area was increasing while the home-based population was declining.

Even though the implementation of the automobile-restricted zone seems to have brought about an increase in nonworker shoppers in the Downtown Crossing, in the absence of other actions this segment of the market seems likely to resume its decline. Evidence of this is seen in a comparison of the results of the 1982 mail survey with the results of a home interview survey conducted by the Metropolitan Boston Transit Authority (MBTA) in 1978. The 1978 MBTA survey asked home interview respondents to state whether they were coming to downtown Boston more than, less than, or about the same as they were 2 or 3 years ago. In 1978 before the Downtown Crossing was implemented, only Downtown residents said they were coming downtown more on the average. The 1982 MIT-BRA survey asked the same question. Based on mail responses, the trend was the same as in 1978: only downtown residents said they were coming downtown more. Figure 8 shows these results. In the 1982 survey, workers in Boston proper also indicated that on the average they were coming downtown more. Similar information was not available in the 1978 survey.

The point is not to compare the surveys, which used different techniques and had different sets of respondents, but to recognize the similarity of trends. These surveys would indicate that the loss of the residential market seen before the implementation of the Downtown Crossing is continuing. Further improvements would be required for the area to maintain the gains made in the home-based market due to the automobile-restricted zone.

CONCLUSIONS

After decades of more rapid sales decline, the Downtown Crossing retail area of Boston appears to have slowed its decline to a rate of 0.5 to 1 percent/year. The area has been helped by growth in the number of workers, in downtown residential neighborhoods, and in income but has been hurt by expanding competition, deteriorating transit ridership, and loss of city population.

The Downtown Crossing automobile-restricted zone greatly improved the walking environment in the retail core of Boston. Reaction against allowing automobiles to return to the shopping area was extremely strong. Preliminary analysis suggests that to remove the automobile restrictions would bring about a 6 percent loss in shopping trips of downtown workers and an 11 percent loss in shopping trips of other visitors.

What lies ahead for the downtown retail area of Boston? Clearly, the improvement in conditions for pedestrians because of the pedestrian mall must be maintained and further improved if the current advantage is not to be lost. Maintenance as well as security measures are important to both workers and other shoppers.

Research efforts are being undertaken by the BRA and MIT to help Boston policymakers and retailers to assess the relative potential of various strategies, including better maintenance, security, parking, and retail mix. The results of these efforts should help in setting action priorities in the current atmosphere of fiscal constraint.

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Land Use-Transportation Analysis System for a Metropolitan Area

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Results are reported of a study conducted to develop a land use-transportation analysis system that will be useful for assessing impacts of transportation improvements. The study consists of two major parts. The purpose of the first part is to develop models that adequately describe the locational behavior of land uses and consequently forecast future land use patterns. The purpose of the second part is to develop a computer-aided analysis system that makes it possible to manage vast amounts of spatial data and to create an easy-to-use system to manage a complex array of integrated programs by man-machine interactive methods. The land use-transportation model has a hierarchic structure that first allocates land use demand into city-sized zones and then into 1-km^2 grids. The allocation model for the zone level has a Lowry-type structure, but each submodel for industrial, business, and residential use is based on its own locational behavior. The allocation model for the grid level describes competition among land uses under constraints of zoning regulations according to the principle of maximization of locational surplus. Transportation conditions are determined by estimating trips generated from new locations. The location of land uses and transportation conditions interact in the model. The computer-aided system contains a data base system for data processing of land use-transportation analysis as well as an interactive operation system that uses computer graphics and a hierarchic menu for program execution. To illustrate this system, future changes of land use and transportation in the Tokyo metropolitan area due to the proposed Tokyo Bay Bridge are forecast.

The relationship between changes in land use and transportation are interactive and highly complex. However, this relationship has tremendous implications for transportation planners who must gauge future traffic generation levels, environmental implications of development, and economic factors affected by future transportation investments, such as land values, employment, and industrial production. Therefore, the assessment of transportation improvement will be greatly aided if more accurate forecasts of land use patterns can be made.

Since the early 1960s, many models have been developed to describe the relationship between land use and transportation. However, in the evaluation of projects in actual practice, these models give less than satisfactory results because the models have one or more of the following deficiencies: simplifications in the modeling of behavioral patterns of location, assumption of rather homogeneous conditions inside each zone, a lack of explicit description of the effect of the level of transportation services, ignorance of the active role of land price in the location process, and less than realistic classification of land use patterns. These difficulties in practice may be caused by one or more of the following:

1. The lack of appropriate data for land use-transportation models,
2. Difficulties in finding behavioral norms to introduce into location models because of a lack of analyses of locational behavior of activities, and
3. The inability of existing computer systems to undertake simulations using large models with vast amounts of data.

During the past few years, these restrictions have been substantially reduced as data and analyses of locational behavior have been accumulated and data processing techniques have advanced along with the development of computer hardware systems.

In this paper, an integrated land use-transportation analysis system for evaluating the impacts of transportation facilities in the Tokyo metropolitan area is described. This system takes into account previous experiences and recent research developments. The major characteristics of the analysis system are the modeling of concepts of locational