

TRANSPORTATION RESEARCH RECORD 1067

Social and Economic Factors in Transportation

TRB

TRANSPORTATION RESEARCH BOARD
NATIONAL RESEARCH COUNCIL

WASHINGTON, D.C. 1986

Transportation Research Record 1067

Price \$6.80

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Layout: Marion L. Ross

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Printed in the United States of America

Library of Congress Cataloging-in-Publication Data

National Research Council. Transportation Research Board.

(Transportation research record, ISSN 0361-1981 ; 1067)

Reports of the TRB 65th annual meeting.

1. Transportation—United States—Congresses.

I. National Research Council (U.S.). Transportation Research Board. II. Series.

TE7.H5 no. 1067 380.5 s 86-21675

[HE203] [380.5'0973]

ISBN 0-309-04061-2

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Analysis of Demographic Trends and Travel Patterns: Implications for the Future of the Portland Transit Market

ROSS A. ROBERTS

ABSTRACT

Demographic changes affect the market for urban transportation in many ways. Identifying these changes and monitoring demographic trends can give the planner better insight into the future nature of the transit market. An inductive approach is used to examine some of the demographic variables most important to the transit market. Then the market segmentation that exists in the Portland standard metropolitan statistical area is identified.

The provider of transit service in the Portland standard metropolitan statistical area (SMSA) is the Tri-County Metropolitan Transit District (Tri-Met). Tri-Met is currently reevaluating its mission and goals. The agency has been faced with difficult financial circumstances in recent years. These financial difficulties have prompted the formation of a task force on mass transit policy charged with redefining the agency's direction. The central debate is whether to expand service and to garner new revenue sources to support that service or to reduce the role of the agency in the provision of transit service. Given the recent difficulties of the agency, the issue of increased funding for transit is politically quite sensitive.

An examination of the markets that exist for transit in terms of travel behavior and demographic composition can be used to identify the markets that are most promising for the future. The types of transit service that might be necessary to meet future and existing needs can also be evaluated. A clear understanding of the nature of the population and its travel habits could aid substantially in the formation of local transit policy.

Significant shifts in demographics and travel patterns are occurring nationwide. In 1984 UMTA released a report on the status of the nation's local public transportation (1). This report was candid in its observations and insightful in its conclusions. A key part of this report is a synopsis of nationwide demographic changes that will affect the nature of urban public transportation in the future. This section of the report will be reviewed and the trends and conditions observed in the Portland area will be compared with national trends. From this comparison, it may be possible to tell if the problems faced in Portland are typical of those that might be faced by any metropolitan area.

Demographic changes will be assessed through the Census of Population and Housing for 1970 and 1980 (2). Specific areas to be addressed include the changes that have occurred between 1970 and 1980 with regard to the distribution of the transit-dependent population. Changes in travel patterns will be assessed by using the Bureau of the Census journey-to-work data for 1972 and 1982 (3) and origin-destination surveys undertaken by Tri-Met in 1980 and 1983

(unpublished data, Roberts and Zatarain, 1984). By using these two types of data it will be possible to identify transit markets both in terms of the person who is dependent on public transportation and in terms of discretionary transit riders (i.e., those who choose to ride transit). Examination of these two areas may reveal a complete picture of the market segmentation that exists in the Portland SMSA.

REVIEW OF NATIONAL DEMOGRAPHIC TRENDS

The population of the United States grew from 179 million in 1960 to 227 million in 1980. Population is forecast to increase, but at a decreasing rate. Almost three-fourths of the nation's population lives in urban areas. More important than the general increase in population is the change in distribution of that population increase. The population of central cities increased only 0.2 percent from 1970 to 1980 compared with 18.2 percent for other metropolitan jurisdictions. This relative decline in central city growth has implications for public transportation service, which has traditionally been oriented toward the central business district (CBD) travel market.

In the next 20 years much greater growth is expected in suburban areas than in central cities. As detached housing becomes more expensive, it is likely that households will locate in areas where housing is less expensive and trade off transportation costs. This could result in more dispersed single family housing growth and leave central city higher density housing to those who have lower incomes and cannot make a transportation trade-off.

Changes in the nature and location of urban jobs strongly affect the market for transportation. Nationally, manufacturing employment is on the decline and service sector employment is growing. In all geographic areas, employment is growing fastest in the suburbs, and central cities are growing at a lesser rate or stabilizing. Industry is also exhibiting a preference for locating in suburban areas. Reasons for this preference include the inability of central area transportation facilities to expand significantly to accommodate increased automobile travel to the work site, the complications of social and fiscal problems in central areas that offset the benefits of a central location, and the reduced travel time to work that can be experienced by workers who often live in suburban locations.

The transit-dependent population is also growing and changing in its distribution across urban areas.

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The proportion of the population aged 65 and older is increasing. These elderly people have different travel patterns than does the general population. They make few trips, tend to have greater physical disability, and tend to use transit for a higher proportion of trips. It is quite likely that in the future the elderly population will move in greater numbers to suburban locations and will make greater use of the automobile than has been the case in the past.

The transportation-handicapped population is expected to increase only slightly. The majority of this increase can be attributed to the growth of the elderly population. These persons often require special transportation services that take the form of on-demand door-to-door service.

Those with low incomes are also identified as transit dependent. Poverty is increasingly concentrated in the central cities. In 1980, 36 percent of the 28.3 million people below the poverty level lived in central cities. However, 25 percent of those with incomes below the poverty level lived in suburban areas. In the 1970s, growth of the central city poor averaged 2.7 percent per year. Transit will remain a major component of the mobility of poor persons.

The automobile has had a profound impact on the pattern of urban development. In 1980 only 15.9 percent of all households were without automobiles. Decentralization and suburbanization have meant that those areas that formerly displayed substantially lower automobile ownership (more no-car households and fewer many-car households) have moved closer to the national average. During the 1970s the cost of owning an automobile increased substantially, and gasoline prices increased by 249 percent. Average transit fares rose only 62 percent.

In addition to the areas just discussed, the UMTA report also mentioned several macroeconomic factors that influence public transportation. These include the price and availability of fuel and the structure of employment and its effect on automobile ownership and transit patronage. It is beyond the scope of this discussion to try to forecast macroeconomic trends or the foreign oil situation. The difficulty of such forecasting was exemplified by the oil embargo of 1973, an event that had significant transportation effects but was not predictable. For purposes of this discussion, it is assumed that the macroeconomic climate will remain relatively stable in the near future and that no catastrophic disruptions are likely to occur.

The UMTA report concluded that there are four main areas in which external factors will have a significant impact on the market for transit. These include downtown-oriented travel, intrasuburban work trips, public transportation for the elderly, and public transportation for the handicapped.

An increase in downtown employment will generate more peak-period travel. It is likely that the automobile will serve a majority of these trips but that transit may capture a higher market share in areas where parking limitations and congestion are pervasive conditions.

The intrasuburban work trip is the travel market most likely to show the largest increase in the next 10 to 15 years. Because suburban areas are capturing high percentages of housing and employment growth, greater amounts of travel within suburban areas will occur. This market is served mainly by the automobile, and this is likely to remain the case until CBD-like congestion in suburban areas makes transit a more attractive option.

The elderly and handicapped travel markets represent challenges for transit agencies. As the elderly become more suburbanized, some special problems will become apparent. In particular, service will need to

be designed to minimize long walks from cul-de-sacs to arterial streets and to serve a more dispersed elderly population. The role of fixed-route service will likely diminish in these areas.

DEMOGRAPHIC TRENDS IN PORTLAND

The Portland SMSA is made up of four counties: Washington, Multnomah (containing Portland), and Clackamas counties in Oregon and Clark County in Washington. Figure 1 shows the Portland SMSA, including the city of Portland and its satellite suburban cities. The Willamette River divides Portland into a west and an east side. Reference will be made to the east and west sides in relation to the river. The east side of Portland is generally flat with a few rolling hills. Consequently, there is a strong grid street pattern on the east side. Bordering the CBD to the west, the Tualatin mountains form a strong physiographic barrier and rise to an elevation of approximately 1,000 ft. The street pattern on the west side is less gridlike close to the city and more gridlike farther to the west.

For purposes of this analysis, the region has been divided into 18 subdistricts as shown in Figure 2. The CBD and suburban and city subdistricts have been highlighted.

Population

The decade of the 1970s was a time of growth for the Portland SMSA as a whole. Population increased from 1,000,129 to 1,242,594, an increase of 24.24 percent. This growth was not evenly distributed, however. The suburban counties of Washington, Clark, and Clackamas grew 55.7, 45.7, and 49.6 percent, respectively, while

the city of Portland lost 4.2 percent of its population. Multnomah County, which includes the bulk of the city, grew only 1.1 percent.

That such lopsided suburban growth is typical of many cities is evidenced by the UMTA report. However, many of the cities with declining population are older, eastern cities of larger population. However, Portland is a prime example of decentralization. As its satellite communities have grown, the central area has declined.

Washington County to the west is experiencing the most dramatic growth, much of which is in anticipation of a high technology "boom" in the Sunset Corridor area. As this area grows, it is likely that a large percentage of the population will both live and work in Washington County, which will increase the market for intrasuburban work trips and decrease the Portland CBD travel market.

Median Income

Median income increased in all counties between 1970 and 1980. The greatest increases were in Washington and Clackamas counties with 87.9 and 98.3 percent, respectively. Multnomah County and the city of Portland median income increased proportionately less at 50.9 and 58.6 percent, respectively. Median income was highest in 1980 in the outlying counties, and the lower income areas were in the central city. For example, the median income for residents of the CBD and the northwest areas of the inner city was \$7,659 and \$8,487, respectively. Median income in the southwest portion of the city and Beaverton ranged from \$22,589 to \$23,375. The SMSA average was \$15,230.

Portland closely mirrors national trends. Median

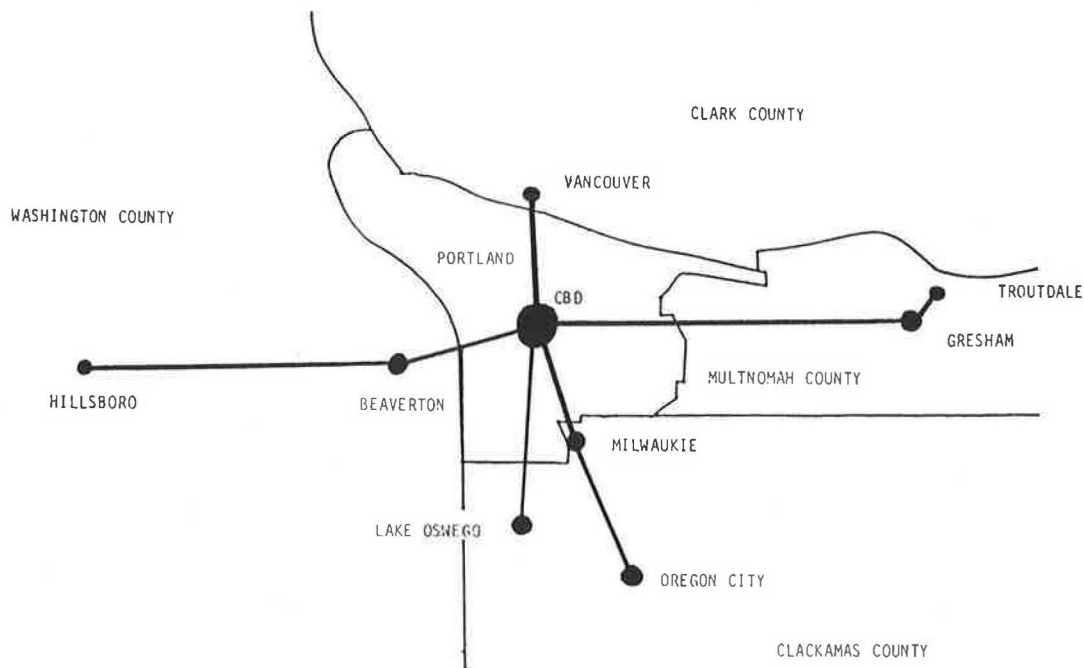


FIGURE 1 Portland SMSA with suburban cities (1 in. ≈ 5 mi).

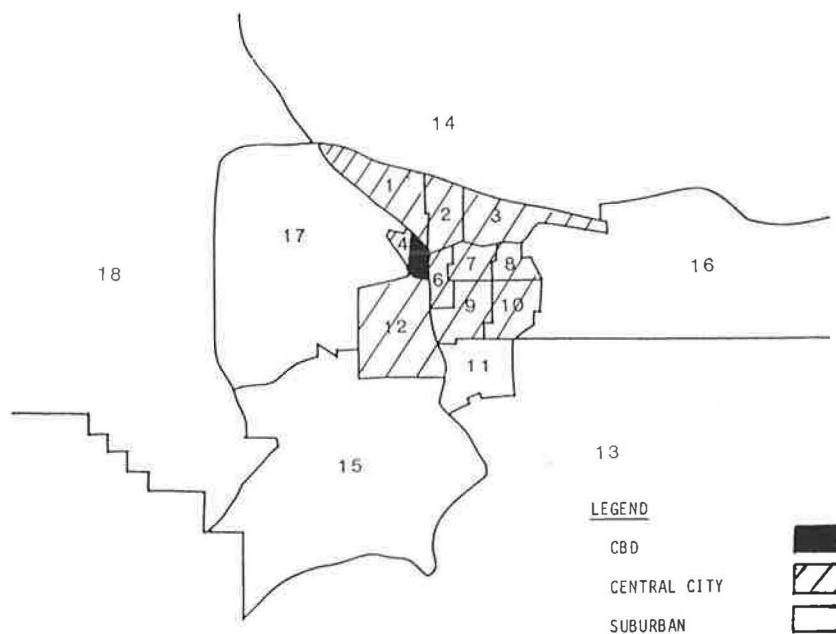


FIGURE 2 Analysis subdistricts.

income overall is increasing, but suburban areas tend to exhibit a higher median income than do central city areas. By the criterion of income, it is quite likely that a high proportion of central city residents are transit dependent.

Elderly Population

For the Portland SMSA as a whole, the population of elderly persons increased 23.9 percent. The highest increase was in Washington County at 66.7 percent, whereas the city of Portland showed a slight decline of 1.3 percent.

The CBD population has the highest concentration of elderly persons; more than 25 percent of all residents in the CBD are over 65. This is in comparison with the SMSA average of 11 percent. Conversely, the smallest concentrations of elderly persons occur in suburban areas where they range from 5.9 to 9.0 percent of the total population. The trend toward an increasingly large elderly population can be somewhat illuminated by this uneven distribution. Although the actual numbers of elderly people are increasing in outlying areas, it is likely that they form a more dispersed pattern than in the central areas.

In general terms, the concentration of the elderly

population in Portland forms a decreasing gradient from the central city outward. It is likely that there are some anomalies in this pattern produced by residential care facilities that could be tapped as significant point-specific transit trip generators. If the elderly population is indeed spreading outward to the suburbs, this trend has not significantly altered the pattern just described.

When income and the concentration of the elderly are viewed together, it becomes increasingly clear that the central city will form the core of the transit-dependent travel market.

Automobile Ownership

Automobile ownership is a valuable indicator of where a transit market may be strong in addition to showing where it may have difficulty competing with the automobile. To a certain degree, income can be used as a surrogate variable for automobile ownership, assuming that households that can afford an automobile will purchase one and use it for some or all of their transportation needs. It is expected that low-income areas should be highly correlated with areas of low automobile ownership.

Automobile ownership, particularly multicar households, is increasing in the SMSA. Between 1970 and 1980 the number of households without automobiles decreased by 3.2 percent. Households with one automobile decreased by 11.1 percent, and the number of two-car households held relatively constant with a 0.1 percent gain. The number of households with three or more automobiles increased by 14.2 percent, the biggest change in any category.

Seventy-five percent of the total households in the SMSA without automobiles are located in Multnomah County, and 85 percent of the carless households in the county are located in the city of Portland. The area with the highest concentration of households without automobiles is the CBD (72.2 percent of households). This is not unexpected given the expense of parking an automobile in the CBD and the low median income of area residents.

Because census data are compiled in intervals of 0, 1, 2, or 3 or more automobiles per household, it was necessary to devise a way to evaluate uniformly the distribution of multicar households. A measure of per capita automobile ownership was used with the condition that households with three or more automobiles would be treated as though they had exactly three automobiles. This condition will result in per capita rates that will be slightly lower than actual rates.

The highest per capita automobile ownership occurred in suburban areas and ranged from 0.63 to 0.76 per capita. In contrast, the central city per capita ownership rates ranged from 0.25 in the CBD to 0.66 in an outer city area. A gradient of automobile ownership can be visualized from the CBD to suburban areas ranging from a high percentage of households without automobiles to a large percentage of households with more than one automobile.

Automobile ownership is a good indicator of transit market expansion potential. Households without automobiles are likely to rely on transit for a high proportion of trips whereas, depending on their size, households with one automobile will have a diminished need for transit. Households with two or three automobiles are probably not using transit for a very high proportion of their travel needs. As can be seen from this analysis, it is likely that the suburban areas will be the most difficult areas for transit market expansion. The trend is toward higher automobile ownership in suburban areas where parking is inexpensive and plentiful and where there is a well-

developed highway system that allows speedy travel to suburban shopping and work destinations. This is consistent with the trends outlined in the UMTA report.

Employment Characteristics

The number of employed persons increased in all areas between 1970 and 1980. The smallest increase was in Multnomah County at 18.8 percent, and the largest was in Washington County at 93.7 percent. Again, the trend toward decentralization is apparent in these growth comparisons. Washington County's strong growth is likely to continue, especially with the anticipated high technology boom in the area. In Washington County the number of manufacturing and wholesale and retail workers nearly doubled. As this particular suburban area develops, it is quite likely that it will have a significant degree of autonomy from the Portland central area. The intrasuburban work trip will likely be an increasing factor in this area's travel market. If this trend toward suburbanization continues, and it is quite likely that it will, the nature of the work trip will change and the central area and suburbs will have quite different travel and transit needs.

The Portland city area is still the SMSA's largest employer of workers. Portland has 34.6 percent of all professional workers in the SMSA, 30 percent of wholesale and retail workers, and 23.7 percent of manufacturing jobs. However, the Portland city area experienced a total growth in employment of only 10.9 percent, and most of this was in the professional area. It appears that the Portland city area is becoming more specialized in professional employment while service sector employment is becoming redistributed toward suburban areas. Again Portland holds true to the national model as delineated in the UMTA report.

Summary of Demographic Trends

To a large extent, the Portland SMSA exhibits many of the trends identified at the national level by the UMTA report. Portland's suburban areas are growing at a faster rate than the central city in both population and employment. Portland exhibited a decline in central city population, a trait usually found in much larger eastern cities.

The elderly, those with low incomes, and those without automobiles tend to be concentrated in the central city. This concentration decreases as distance from the central city increases. Portland's suburban areas have higher median income, higher employment, and a greater number of households with high per capita automobile ownership rates.

What these trends imply for transit is that the central city is and probably will continue to be an area where a high proportion of residents will depend on transit to serve a high proportion of their travel needs. This transit-dependent population makes up transit's "captive" market, those without any other modal choices. Transit ridership and journey-to-work data will be examined next to identify other, more discretionary transit markets. From the discussion of demographic data it becomes clear that the central city is the area where inherent attributes of the population will most assuredly guarantee a high level of transit ridership.

JOURNEY-TO-WORK AND ORIGIN-DESTINATION PATTERNS

In the previous section, areas in which transit use is likely to occur, given certain demographic char-

acteristics, were reviewed. Now it is necessary to see where transit use is occurring and what travel markets exist in Portland. Tri-Met's 1980 and 1983 origin-destination surveys and the 1970 and 1980 Bureau of the Census journey-to-work information will be used to evaluate current travel patterns. The journey-to-work data will be examined first because a high proportion of all transit trips are work related.

Journey to Work

The Bureau of the Census compiles data documenting the place of work and the place of residence of workers in the SMSA in both its journey-to-work (3) and Census of Population and Housing (2) publications. The data are aggregated to the county and city level for this analysis and will be used to examine the flow of commuters in the Portland SMSA. This information is important in determining how the work trip market is distributed. The trips to be discussed may be made by automobile or by transit (Figure 3).

In 1980 the city of Portland was the strongest work destination with 58.2 percent of all work trips in the SMSA ending in Portland. The CBD accounted for 7.5 percent of all work destinations. Between 1970 and 1980 trips to the city of Portland excluding the CBD increased by 48.2 percent. CBD commutes increased by 27.3 percent. The highest percentages of commutes both to the CBD and to the rest of the city originated from within Multnomah County; smaller numbers of trips were accounted for by the more suburban counties.

Of the remaining counties, Washington had the largest share of work trip destinations in 1980, with 17.5 percent of all work trip ends in the SMSA. This is in contrast to the smaller shares of Clark and

Clackamas counties at 10.4 and 11.5 percent, respectively. Of these counties, Washington showed an increase in work trip destinations of 101.3 percent for the largest suburban increase. Washington County also had the single largest increase in work trip destinations in the entire SMSA. The number of work trips originating in Washington County also increased, by 86.3 percent, for the largest increase in the SMSA. The discrepancy between the increases in origins and destinations indicates an increasing flow of trips to the county from points outside Washington County.

Work trips that both begin and end in the same county are also increasing in the suburban counties. The largest increase again was in Washington County, at 107.25 percent. Clackamas County also increased within-county trips by 69.5 percent. Trips within Multnomah County also increased, but at a smaller rate of 27.8 percent. The number of trips from Portland to the rest of Multnomah County decreased by 44.4 percent. Trips within the city increased by 12.6 percent and represented more than 20 percent of all work trips in the SMSA in 1980.

Several important trends emerge. First, more than half of all work trips in the SMSA occur in Multnomah County, and the largest percentage of these occurs within the city of Portland. The city- and CBD-destined work trips are increasing but at a slower rate than those of suburban areas. Second, trips within suburban jurisdictions are also increasing at a rate greater than trips within Multnomah County and the city; however, these trips represent a smaller proportion of total trips in the SMSA. Third, the greatest increases in work trip activity are occurring in Washington County with increases in trips to the CBD, Multnomah County, and within the county. Also, the largest increase in trips from the city of Portland was to Washington County. Fourth, the only

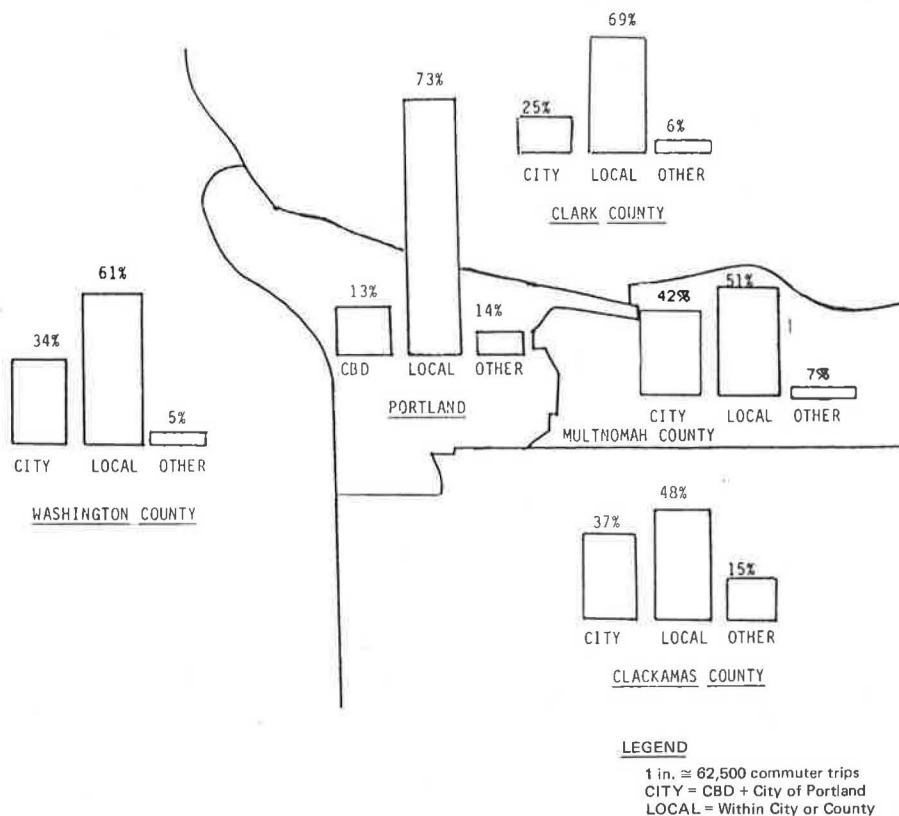


FIGURE 3 Commuter flows by county and city of residence (2, 3).

commute to decrease significantly was from the city of Portland to the remainder of Multnomah County.

Multnomah County forms the heart of the work trip travel market. Although this market is large, it is increasing at a lesser rate than that of suburban jurisdictions, particularly Washington County. This indicates a pattern of shifting growth in the work trip travel market. For a more complete picture of the shifts in the SMSA travel market, the patterns and trends in transit use will be examined and compared with the journey-to-work patterns. This will also give insight into the transit market share of these work trips.

Transit Origin-Destination Patterns

Total ridership on Tri-Met decreased by 11 percent from 138,860 to 123,180 daily weekday originating rides from 1980 to 1983. There are numerous reasons for this decline in ridership including the adoption of higher fares for long-distance trips; the decreasing population of the area due to the economic recession of 1982, which, in turn may have reduced work trips; and the restructuring of the east side system into a grid in 1982.

Looking at total origins and per capita transit rides by subdistrict, it can be seen that, even though transit trip origins are high in the suburban areas, actual transit use in rides per capita is rather small, which indicates that suburban areas are largely transit independent. This pattern is inversely related to the higher-than-average rates of automobile ownership in these areas. The central city population appears to be using transit on a more regular basis than are suburban residents.

Despite significant increases in total trips within and between neighboring subdistricts, system ridership is still heavily oriented to the CBD, although this orientation decreased between 1980 and 1983 with the implementation of the east side grid system. Roughly one-third of all trips on the system begin or end in the CBD.

The average 1980 share of trips originating in suburban areas and destined for downtown was 40.9 percent. For city subdistricts, this figure is 39.0 percent, excluding trips that originated in the CBD. This shows that there is a nearly equal CBD orientation in suburban and city areas. The CBD therefore is a uniformly strong destination for trips across the system.

The city-to-CBD market accounts for the greatest share of trips destined to the CBD. City subdistricts accounted for 52.5 percent of the total trip volume destined to the CBD in 1983 compared with 37.7 percent for suburban locations. Again, trips originating in the CBD were factored out. The share of trips destined to downtown from individual subdistricts is relatively uniform across the system, but the actual percentage of trips destined to the CBD that is accounted for by any given subdistrict may vary greatly. The CBD market is the single largest travel market in the system.

Within this market two submarkets can be identified. These are the suburban and the city commuter. The city market has the greatest share of trips and is the single largest transit travel market in the system.

The conclusions regarding CBD travel drawn from the origin-destination (O-D) survey are consistent with the census journey-to-work data. The proportionately smaller share of trips to the CBD accounted for by suburban riders is borne out by the small numbers of suburban residents who work downtown. These comparisons can only be drawn if it is assumed that work trips account for the largest

share of trips by purpose on the system, as indeed they do.

Aside from the CBD, local trips comprise the next largest share of trips on the system. Within-subdistrict travel accounts for between 5.7 and 23.0 percent of origins from any given subdistrict. The average trip share across the system for within-subdistrict trips is 13.0 percent. The largest percentages of within-subdistrict trips appear to occur in suburban subdistricts, but this is slightly distorted because of the large size of the suburban subdistricts compared with other subdistricts in the system. However, it is important to note that short local trips make up a large share of trips on the transit system. This has been facilitated to some extent by the implementation of a grid system on the east side.

Despite the exaggeration of within-subdistrict trips that occurs because of the large size of the subdistricts, the relatively high percentage of trips that remain in suburban areas is significant. This supports the journey-to-work data on intrasuburban work trips and is consistent with the pattern of growth and development in these areas. It is important to note that as a share of trips from suburban areas, a high percentage stay in suburban areas, but as a share of trips on the entire system, suburban areas have less transit ridership than the central city areas. The high rates of automobile ownership and the large and inexpensive supply of parking in suburban areas will continue to suppress transit ridership in these areas.

To summarize transit trip patterns, the CBD is the single largest travel market in the transit system. Of the non-CBD travel market, short within-subdistrict trips and trips to neighboring subdistricts make up the largest market. Intersuburban and reverse commute trips do not appear in any large proportion with the exception of some trips east from the city to east Multnomah County and from the inner city to Washington County.

MARKET SEGMENTATION

From the discussion in the previous sections it is now possible to identify the market segmentation for transit in the Portland SMSA. The categories to be described consist of both transit-dependent and discretionary riders, who may not depend on transit to serve a high proportion of their trip needs. The market segments include

1. Central city transit dependents,
2. Suburban transit dependents,
3. City-to-CBD commuters,
4. Suburban-to-CBD commuters,
5. Intrasuburban commuters, and
6. Central city-to-suburban commuters.

Each of these markets will be discussed in terms of its current status, future prospects, and overall importance to the success of transit service in Portland.

Central City Transit Dependents

As noted in the section on demographic trends, this market is characterized by those who live in the central city and are elderly, have low incomes, or have no automobile in their household. All of these demographic characteristics are in high concentrations in the central city, which makes it the largest portion of the transit-dependent travel market.

Given the demographic changes that occurred be-

tween 1970 and 1980, it is quite likely that the transit-dependent population will remain in large numbers in the city. Currently, most transit dependents, with the exception of those who have a handicap that prohibits them from using conventional bus service, are being served by conventional fixed-route bus service. A small proportion of transit dependents does use dial-a-ride service that allows door-to-door travel for elderly and handicapped persons. This service is not extensive at present. Users of the service must schedule their trip 1 to 2 days in advance and must plan around a 2-hour window for their departure time.

If the assumption is made that most elderly transit dependents do not make long-distance transit trips on a regular basis and few work trips, some generalizations can be made about the type of service they are receiving. If most elderly people are making short shopping or medically related trips, the conventional bus service currently on the street should serve their needs reasonably well. For example, the east side grid system has made possible a number of short trips that were difficult or impossible with the previous system configuration. Given that the grid system is being used for short trips that often are not in peak periods, it can be assumed that a high proportion of these trips is by elderly persons or other transit dependents who are using the local service for a variety of trip purposes.

The inner city transit-dependent population should continue to be a stable market for public transportation. Depending on the financial health of the transit system and the changing role of private service providers, the type of service provided for these residents might be improved in terms of ease of accessibility and convenience, but at present it appears that the system is being used by this group on a regular basis without substantial difficulty.

Suburban Transit Dependents

This is currently a small market for transit, given the dispersed nature of the population in suburban areas. These dependents are currently being served in the same manner as are those in the central city but with more trunk lines and radial service as opposed to a grid. Short trips are being made in suburban areas, but it is likely that, on the whole, these riders must travel farther for shopping, medical, or some work-related trips. Also, in outlying areas, service is more dispersed than in the central areas, and there are longer headways in some areas.

In suburban areas, the household without an automobile is less common than in the central city, as are elderly persons and low-income persons. It would appear that a large number of elderly people might be better served in suburban areas by service that is oriented toward a residential care facility or areas where high concentrations of low-income or elderly people may live. To a certain extent, current service tries to include these point-specific generators. Given the nature of suburban street grids, serving all residential care facilities in suburban areas would be difficult because of the circuitousness of the routes that would result. It would appear that the suburban transit-dependent market is one that might be best served by a system of on-demand service of a door-to-door nature. At least this is a type of service that should be considered if the suburban transit-dependent population continues to grow and is spatially distributed in a manner similar to current patterns.

In summary, the suburban transit-dependent population does not currently represent a large portion of the market for transit. It is uncertain how much

this market can be expected to grow in the future, given the increasing rate of automobile ownership and a higher proportion of the elderly population driving automobiles than in years past.

City-to-CBD Commuters

This market forms the largest single share of transit ridership in Portland. This market is oriented toward the work trip, with a high peak demand on service. Other nonwork trips in off-peak hours are also important to this market. The city-to-CBD commute is currently served by fairly high frequency fixed-route bus service. It appears unlikely that this market will change significantly in the future. The number of transit riders to the CBD decreased in the period from 1980 to 1983, but this does not appear to be a reflection on the vitality of downtown as a workplace. As mentioned earlier, systemwide ridership dropped for a variety of reasons that cannot be directly tied to downtown.

If there is any area that should remain stable as a firm ridership base, it is the city-to-CBD market. Many riders have been discouraged by parking costs and congestion. For short trips from the city, transit is a good competitor with the automobile, with an estimated 30 percent downtown modal split. This percentage may increase because the downtown parking lid, or limitation on number and types of parking spaces, will be reached soon. A policy has been adopted by the city to increase total trips to downtown and to have that increase in trips carried on transit, which should eventually give the CBD a 75 percent transit modal split. Also, the inclusion of the Banfield light rail line to downtown in 1986 will further the downtown orientation of the system, although it will probably draw most of its passengers from existing bus ridership.

Conventional fixed-route bus service appears to be the best way to serve the downtown city commuter market. Innovations such as flexible working hours might help reduce the cost of additional peak-period service in addition to reducing some congestion problems.

Suburban-to-CBD Commuters

This market does not represent a large portion of transit ridership. The current trend is toward more local trips in suburban areas. The increase in long-distance fares in 1982 was seen to have been a major contributor to the reduction in ridership from suburban areas to the CBD. The journey-to-work data show that the reduction in trips may also be a function of more suburban residents working closer to home.

The suburban service is currently provided on conventional sized buses. This service is expensive, especially in the peak period. There are several options that might improve the attractiveness of this service in terms of convenience and reduce the cost to the service provider. These include subscription service, vanpools, commuter clubs, and carpools. In some instances, removing the paid driver from the service and sharing driving would reduce costs substantially and provide a more personalized, higher level of service.

At present it appears that the long-distance commuter market will continue to diminish and that those who make the commute will do so increasingly in private automobiles or carpools. Competition with the automobile in suburban areas is stiff, and it is probable that the longer the trip and the higher the value of travel time, the more likely a commuter is to use an automobile.

Intrasuburban Commuters

This market currently does not represent a large share of the market for transit in Portland, but it is the fastest growing of the market segments that have been identified. The future of this market appears to be one of increased expansion. Again, this is a market that might not be best served by conventional fixed-route bus service given the low population densities in the areas and the often circuitous street patterns.

A large number of firms that will employ sizable numbers of workers are locating in the Portland SMSA, particularly in Washington County. These destinations could be well served by vanpool or subscription service. Because in many cases conventional bus service would be underutilized, and because of the peaked nature of the trips generated by these workplaces, it makes sense to look to other means of serving this market. Again, this is a market that does not have a sizable transit-dependent population or a low level of automobile ownership, which makes the automobile a strong competitor. Also, the large supply of inexpensive parking in these areas makes the incentive to use transit quite small.

This market will likely be served in the near future by the automobile. If transit is to make a serious attempt at capturing a larger share of this market, some innovative service may be necessary. In the distant future, it is possible that the suburban centers will begin to take on more CBD-like characteristics, in which case the incentive to use transit would increase. At present, this is a rapidly growing travel market that helps to solidify the autonomy of these suburban centers from the central city. Given the abundance of free parking and the ease of automobile access, this solidification is likely to continue with the automobile dominating the travel market.

Central City-to-Suburban Commuters

This market is at present quite small. The reverse commute of lower income inner city residents to suburban service sector employment does not appear to be evident in Portland either from the journey-to-work data or the O-D surveys. This market could grow in the future if the right chemistry of inner city resident and suburban employment develops.

CONCLUSION

The identification of the market segmentation that exists in the Portland SMSA allows some conclusions to be drawn about the current policy dilemma faced by Tri-Met. First, the structure of the population is changing, both in its characteristics and in its geographic distribution. These changes have brought and will continue to bring the emergence of new transit markets that may or may not be served adequately by the conventional fixed-route bus service that the agency currently provides.

Second, automobile ownership is increasing and, unless drastic macroeconomic or petroleum-based disruptions occur, is likely to continue to increase. As mentioned earlier, the fastest growing, and as yet largely untapped, transit market is that of the intrasuburban commuter. It is unlikely that conventional fixed-route bus service will be able to attract a larger share of this travel market. The type

of transit service extended to this market must be able to compete favorably with the automobile in terms of travel time and convenience. With the abundance of free parking in suburban areas and the ease of automobile access in these areas, some rethinking will be necessary to increase transit's share of the travel market.

Third, it appears that the days of the dominant CBD market are beginning to fade. Portland's transit system is still heavily CBD oriented and may not be able to rely solely on this market to carry the system forever. This market is currently quite strong and an immediate downturn in the CBD market is not expected. Because this market may provide a relatively stable base for transit service, any future expansion potential in the transit market will be in the suburban areas.

Given the uncertain financial future of Portland's transit system, it is difficult to make any predictions about what future transit service may be. It is possible to say what the transit system should do in order to capture a larger share of the new markets that have been discussed, and this is to tailor the transit service provided to the type of market it is to serve. The alternative would be a more modest role for transit, scaling back service to serve only the existing transit-dependent and CBD markets. This scaling back would be in contradiction to Portland's existing commitment to a strong CBD market, particularly in light of the Banfield light rail service that will begin operation in 1986.

The policy dilemma faced in Portland is not an easy one. The decision to aggressively pursue revenue for expanded service will have to be based on a clear understanding of the form that service is to take and the markets to which it will be directed. The decision to scale back service would have repercussions throughout an area that has based many other land use and development decisions on what was thought to be expanding transit service and an expanded role for transit in the region.

From this analysis, it can be seen that the role of transit in the Portland area may have to change if larger shares of the new and expanding markets are to be obtained. Careful attention must be paid to the nature of the markets for transit service if that service is to adapt to the changing needs of the population.

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The views expressed in this paper are those of the author and do not reflect policies of the City of Portland Planning Bureau.

Publication of this paper sponsored by Committee on Transportation Data and Information Systems.

Employee Transportation Survey for Center City Philadelphia

THABET ZAKARIA

ABSTRACT

The development and findings of a questionnaire survey that sampled the 236,000 employees of Center City Philadelphia are described. The survey was conducted in February 1985 by the Delaware Valley Regional Planning Commission in cooperation with the city of Philadelphia and public transit authorities. The purpose of the study was to determine how employees travel to and from work, their means of transportation, and the time and cost required for the work trip. In addition, the survey was intended to provide information on perceptions of the public transportation system in general and its operation in particular. For analytical and planning purposes, the questionnaire was also designed to obtain statistics on workers' place of residence, previous employment location, and many other socioeconomic characteristics. The response to the survey was excellent. About 10,000 questionnaires were distributed at random and more than 4,000 were received and processed by computer. The results will be used to develop plans, programs, and policies for improving highway and transit facilities and attracting people to use the public transportation system.

The results of a survey designed to elicit the travel habits of some 236,000 workers employed in Center City Philadelphia (central business district) are briefly described. The questionnaire asked about their means of travel, time and cost involved in their journey to work, and their perceptions of the quality of the public transportation system. Information about age, sex, family income, and vehicle ownership was also asked in order to examine any differences in travel habits attributable to socioeconomic characteristics of the employees.

The basic objective of this survey was to collect information that could be used to develop plans, programs, and policies to improve transportation services in general and public transportation, including commuter rail service, in particular. The results of this survey will be important to decision makers and providers of public transportation who seek to improve services and facilities, enhance economic development, and attract new jobs to Center City. Specifically, the survey findings will enable these agencies to develop and implement marketing programs to increase the use, which is declining, of public transportation, especially commuter rail facilities. In addition, the survey results will be used in the preparation of programs to encourage the use of transit passes, provide adequate parking, implement a reasonable transit fare structure, and make the journey to work much more convenient and comfortable.

The survey was designed and conducted by the Delaware Valley Regional Planning Commission (DVRPC) in cooperation with the city of Philadelphia, the Southeastern Pennsylvania Transit Authority (SEPTA), the Philadelphia Chamber of Commerce, and many large and small Center City employers. The local press gave special coverage to this survey and the Philadelphia Inquirer (February 22, 1985) published an article urging employees to fill out the questionnaire. Em-

ployers were requested to coordinate the dissemination and collection of the survey forms and to return them to DVRPC for processing.

The survey methodology, including the design and distribution of questionnaires, is also discussed. Some comparison of the survey results with 1980 census data is made where information is available.

DESIGN OF SURVEY QUESTIONNAIRE

The survey questionnaire was designed after careful consideration of the data needs of the planning and operating agencies involved. For example, the city of Philadelphia wanted to obtain recent transportation information on Center City employees, such as their commuting pattern, place of residence, mode of travel, and other traffic characteristics, for use in the development of a new master plan for Center City. The city was also interested in obtaining information on the use of commuter railroad stations before and after the opening of the Center City commuter tunnel, a \$350 million facility that has connected the Pennsylvania and Reading railroad systems. The transit authorities were especially interested in knowing employees' reasons for not riding public transportation to work, in order to develop marketing programs that will attract automobile users to the transit system. They were also interested in factors that would encourage the use of transit passes, which generally make transit service faster and reduce the cost of fare collection. Finally, DVRPC was interested in gathering data on all aspects of employment and traffic characteristics that are needed for testing and recalibrating traffic simulation models and for updating long-range plans and transportation improvement programs.

The questionnaire (Figure 1), in 30 questions, integrates four essential areas of study: (a) trip characteristics, (b) usage of highway and transit modes, (c) socioeconomic characteristics, and (d) place of residence and work. The following paragraphs describe briefly the contents and purposes of the questionnaire.

Center City Employee Transportation Survey

A MESSAGE FROM
THE MAYOR OF THE CITY OF PHILADELPHIA

Dear Center City Employee:

About 300,000 people commute to work in Philadelphia Center City every weekday from other Philadelphia areas and the surrounding suburban counties. To plan for an effective and convenient highway and transit system, we need information on how you and others travel to and from Philadelphia Center City.

The Delaware Valley Regional Planning Commission, in cooperation with the City, Philadelphia Chamber of Commerce, and SEPTA, is conducting this survey as part of its transportation planning program. Your answers to the survey questionnaire will be used to develop plans, programs, and policies for improving the regional transportation system which serves Center City commuters. My administration is committed to providing you with convenient transportation service and to improving transportation facilities which will enhance economic development and attract new jobs to Center City.

Thank you for your cooperation.

W. Wilson Goode
W. Wilson Goode
Mayor

COMPLETE THIS QUESTIONNAIRE IF YOUR PRESENT PLACE OF EMPLOYMENT IS WITHIN CENTER CITY PHILADELPHIA — BOUNDED BY VINE ST., SOUTH ST., AND THE SCHUYLKILL AND DELAWARE RIVERS. ANSWER THE QUESTIONS WITH RESPECT TO YOUR TRAVEL TO AND FROM CENTER CITY PHILADELPHIA. BE SURE TO COMPLETE EACH PAGE.

- How often do you usually travel to work in Center City Philadelphia?
(Check one Box)
Three days per week or less ☐ 1
Four days per week ☐ 2
Five days per week ☐ 3
Six or seven days per week ☐ 4
- How often do you usually leave your place of work during the lunch hour or at other times during the workday for the purpose of:
Midday
Eat Meals Shopping Work Activities Entertainment Other
(Check one Box in each Column)
Less than once per week ☐ 1 ☐ 1 ☐ 1 ☐ 1 ☐ 1
One day per week ☐ 2 ☐ 2 ☐ 2 ☐ 2 ☐ 2
Two or three days per week ☐ 3 ☐ 3 ☐ 3 ☐ 3 ☐ 3
Four or five days per week ☐ 4 ☐ 4 ☐ 4 ☐ 4 ☐ 4
Six or seven days per week ☐ 5 ☐ 5 ☐ 5 ☐ 5 ☐ 5
- How often do you travel from your home to Center City on non-work trips such as shopping, entertainment, doctor visits, etc.?
Once a month or less ☐ 1
Twice a month ☐ 2
Three to five times per month ☐ 3
Six to fifteen times per month ☐ 4
Sixteen or more times per month ☐ 5
- What time do you normally:
(Check one Box)
12:00 AM to 6:00 AM ☐ 1
6:01 AM to 9:00 AM ☐ 2
9:01 AM to 3:30 PM ☐ 3
3:31 PM to 6:30 PM ☐ 4
6:31 PM to 9:00 PM ☐ 5
9:01 PM to 12:00 (Midnight) ☐ 6
- What is the average time it takes you to travel (door-to-door) from:
(Check one Box)
Up to 15 minutes ☐ 1
16 to 25 minutes ☐ 2
26 to 35 minutes ☐ 3
36 to 45 minutes ☐ 4
46 to 60 minutes ☐ 5
61 to 90 minutes ☐ 6
More than 90 minutes ☐ 7
- What is your usual means of transportation from home to work?
(Check one Box next to the Means that carries you into Center City.)
Drive alone ☐ 1
Carpool (two or more persons) ☐ 2
Vanpool ☐ 3
Bus or Trolley ☐ 4

FIGURE 1 Survey questionnaire.

- Subway-Surface ☐ 5
 Broad Street Subway, Market-Frankford or
 Lindenwold Line ☐ 6
 Commuter Rail (Regional High Speed Lines) ☐ 7
 Walk (only) ☐ 8
 Other (Specify) _____ ☐ 9

- Lower fares ☐ 9
 More courteous employees ☐ 10
 Improved cleanliness ☐ 11
 Better feeder service connections ☐ 12
 Additional and/or more secure parking ☐ 13
 Other (Specify) _____ ☐ 14

7. What is the total cost per day for you to travel from home to work and back (include transit fare, parking, tolls, gasoline, and car maintenance costs)?

- Free ☐ 1
 Less than \$1.50 ☐ 2
 \$1.50 to \$2.00 ☐ 3
 \$2.00 to \$3.00 ☐ 4
 \$3.00 to \$5.00 ☐ 5
 \$5.00 to \$8.00 ☐ 6
 \$8.00 to \$12.00 ☐ 7
 More than \$12.00 ☐ 8

8. How long have you been using your usual means of transportation to work, that is, the one indicated in Question 6?

- Less than one year ☐ 1
 One to five years ☐ 2
 More than five years ☐ 3

9. What was your usual means of transportation to work prior to the one you use now?

(Check one Box)

- Did not work in Center City before ☐ 1
 Drove alone ☐ 2
 Carpool (two or more persons) ☐ 3
 Vanpool ☐ 4
 Bus or Trolley ☐ 5
 Subway-Surface ☐ 6
 Broad Street Subway, Market-Frankford or
 Lindenwold Line ☐ 7
 Commuter Rail (Regional High Speed Lines) ☐ 8
 Walk (only) ☐ 9
 Other (Specify) _____ ☐ 10

**CONFIDENTIALITY WILL BE MAINTAINED
 WITH REGARD TO INDIVIDUAL RESPONSES**

10. If you changed your means of transportation, what were the reasons?

(Check the most
 important reasons)

- Did not work in Center City before ☐ 1
 Changed place of residence ☐ 2
 Transit service not on time ☐ 3
 Reduced frequency of transit service ☐ 4
 Increased or reduced fares ☐ 5
 Automobile is now available ☐ 6
 Automobile is no longer available ☐ 7
 Attractive Carpool/Vanpool options ☐ 8
 High parking rates ☐ 9
 Improved transit service ☐ 10
 Inadequate personal safety ☐ 11
 Other (Specify) _____ ☐ 12

11. If you could use a commuter rail line but now commute by other means, what changes in the commuter rail system would make you use the railroad to travel to work?

(Check the most
 important reasons)

- More reliable service (on time) ☐ 1
 Faster Trains ☐ 2
 More frequent service during:
 Morning Peak (6:00 AM-9:00 AM) ☐ 3
 Midday (9:00 AM-4:00 PM) ☐ 4
 Afternoon Peak (4:00 PM-6:00 PM) ☐ 5
 Evening (6:00 PM-12:00 Midnight) ☐ 6
 Night Time (12:00 Midnight-6:00 AM) ☐ 7
 Better communications during breakdowns ☐ 8

**IF YOU USE AUTO OR VAN TO COMMUTE TO YOUR PLACE
 OF WORK, ANSWER QUESTIONS 12 THROUGH 15.**

12. How many people, including the driver, are typically in the car, truck, or van that carries you to work?

(Check One Box)

- | Auto/Carpool | | Vanpool | |
|--------------|----------------------------|--------------------|----------------------------|
| One | <input type="checkbox"/> 1 | Nine or less | <input type="checkbox"/> 1 |
| Two | <input type="checkbox"/> 2 | Ten to Eleven | <input type="checkbox"/> 2 |
| Three | <input type="checkbox"/> 3 | Twelve to Thirteen | <input type="checkbox"/> 3 |
| Four | <input type="checkbox"/> 4 | Fourteen or More | <input type="checkbox"/> 4 |
| Five or More | <input type="checkbox"/> 5 | | |

13. If three or more persons are in the vehicle, do you usually meet at one central location?

Yes ☐ 1 No ☐ 2

If yes, what is your meeting place?

(Check one Box)

- Train Station ☐ 1
 Shopping Center ☐ 2
 Church or Civic Center ☐ 3
 My home or someone else's home ☐ 4
 Other (Specify) _____ ☐ 5

14. If you drive a car to Center City, how much do you pay to park your vehicle per day?

- Free ☐ 1
 Less than \$2.00 ☐ 2
 \$2.00-\$4.00 ☐ 3
 \$4.01-\$5.00 ☐ 4
 \$5.01-\$7.00 ☐ 5
 \$7.01 or More ☐ 6

15. Why don't you use public transit to reach your work place?

(Check the most
 important reasons)

- Parking unavailable at transit stations ☐ 1
 Transit service not on time ☐ 2
 Infrequent transit service ☐ 3
 Auto faster and more convenient ☐ 4
 Poor condition of transit vehicles ☐ 5
 Crowded transit vehicles ☐ 6
 High fares ☐ 7
 Inadequate police protection ☐ 8
 Doesn't take me to my work place ☐ 9
 Have company car and/or parking space ☐ 10
 Auto required for work-related activity ☐ 11
 Other (Specify) _____ ☐ 12

**IF YOU USE PUBLIC TRANSPORTATION TO COMMUTE TO
 YOUR PLACE OF WORK, ANSWER QUESTIONS 16
 THROUGH 21.**

16. From your home, how do you reach the public transportation facility that carries you to Center City?

(Check one Box)

- Walk (only) ☐ 1
 Drive auto and park ☐ 2
 Ride with someone who parks ☐ 3
 Someone drops me off ☐ 4
 Bus or Trolley ☐ 5
 Other (Specify) _____ ☐ 6

17. Do you transfer to another public transportation facility within Center City?

Yes ☐ 1No ☐ 2

If yes, to what?

(Check one Box)

Commuter Rail ☐ 1
 Subway/Elevated ☐ 2
 Trolley or Bus ☐ 3
 Other (Specify) _____ ☐ 4

18. If you ride the Commuter Rail System, which Center City station have you used before and after the opening of the Center City Commuter Tunnel?

(Check one Box in Each Column)

Before After

Reading Terminal ☐ 1 ☐ 2
 Market Street East ☐ 3 ☐ 4
 Suburban Station ☐ 5 ☐ 6
 30th Street ☐ 7 ☐ 8

19. If you regularly ride the commuter rail system and don't use a weekly or monthly TrailPass, what are your reasons for not using it?

(Check the most important reasons)

I don't know about the TrailPass. ☐ 1
 I do not ride the railroad frequently enough. ☐ 2
 It limits my options to drive, carpool, vanpool or take public transit. ☐ 3
 I frequently travel at non-peak times, when bargain fares are in effect. ☐ 4
 I cannot afford to pay a month's or week's fare at one time. ☐ 5
 I don't have occasion to use SEPTA subways, buses or trolleys. ☐ 6
 Other (Explain) _____ ☐ 7

20. If you regularly ride SEPTA's subway, bus, or trolley routes and don't use a weekly or monthly TransPass, what are your reasons for not buying it?

(Check the most important reasons)

I don't know about the TransPass. ☐ 1
 I do not ride SEPTA frequently enough. ☐ 2
 There are no convenient sales locations. ☐ 3
 I cannot afford to purchase the TransPass. ☐ 4
 I buy the TrailPass instead. ☐ 5
 I buy tokens instead. ☐ 6
 Other (Specify) _____ ☐ 7

21. If you regularly ride NJT and don't use an Interstate Monthly Bus Pass, what are your reasons for not using it?

(Check the most important reasons)

I don't know about the Interstate Monthly Bus Pass. ☐ 1
 I do not ride NJT frequently enough. ☐ 2
 There is no convenient sales location. ☐ 3
 I cannot afford to purchase a monthly Pass. ☐ 4
 I prefer a ten-trip ticket. ☐ 5
 Other (Specify) _____ ☐ 6

FIGURE 1 (continued)

EVERYONE ANSWER QUESTIONS 22 THROUGH 30.

22. How long have you worked at your present Center City job location?

Less than one year ☐ 1
 One year to five years ☐ 2
 More than five years ☐ 3

23. If your employment address has changed within the last five years, where did you previously work?

(Check one Box)

Center City Philadelphia ☐ 1
 Philadelphia Outside of Center City ☐ 2
 The Pennsylvania Suburbs ☐ 3
 Southern New Jersey ☐ 4
 Other (Specify) _____ ☐ 5

24. Sex:

Male ☐ 1Female ☐ 2

25. What is your age?

Under 18 ☐ 1 18-34 ☐ 2 35-44 ☐ 3
 45-54 ☐ 4 55-64 ☐ 5 65 or over ☐ 6

26. What is your household income?

Under \$15,000/year ☐ 1
 \$15,000-25,000/year ☐ 2
 \$25,000-35,000/year ☐ 3
 \$35,000-50,000/year ☐ 4
 \$50,000 or more/year ☐ 5

27. How many cars are available to members of your household?

None ☐ 1 One ☐ 2 Two ☐ 3 Three or more ☐ 4

28. How many drivers live in your household?

One ☐ 1 Two ☐ 2 Three ☐ 3 Four ☐ 4 Five or more ☐ 5

29. My home address is:

No. _____ Street _____
 Municipality _____ County _____ Zip Code _____

30. My work address is:

No. _____ Street _____ City _____ Zip Code _____

THANK YOU FOR YOUR HELP
 PLEASE FOLD, TAPE OPEN EDGE, AND MAIL.

Trip Characteristics

Questions 1 through 5 and Question 7 solicit information on the frequency of work trips, other trips made during the workday, nonwork trips from home, time of departure from home and return from work, duration of home-to-work and return trips, and the daily cost of work trips. Question 6 and Questions 8 through 10 were designed to collect information about existing travel modes, duration of use, previous means of transportation, and reason, if any, for change of mode. Question 11, directed toward commu-

ters who can but do not use commuter rail, tries to elicit respondents' reasons for not doing so.

Usage of Highway and Public Transit Facilities

Questions 12 through 15 are directed toward users of the highway system--private automobile, carpool, and vanpool. These questions are related to vehicle occupancy, location for collecting passengers (for car- and vanpools), parking costs, and reasons for not using the public transit system. Questions 16

and 17 are for existing users of the transit mode. Information is requested about the mode used to access the transit system and the means of transfer to other modes within Center City, if any. Question 18, directed at commuter rail riders, is intended to determine the downtown stations patronized by them before and after the opening of the commuter tunnel in Center City, in order to assess the impact of this new major facility. Questions 19 through 21 seek to determine reasons for not using the TrailPass, TransPass, and New Jersey Transit Interstate Pass. Questions 22 and 23 asked all employees the duration of work at their present location, and the previous work location if they had been at their present location less than 5 years.

Socioeconomic Characteristics

Socioeconomic information was requested in Questions 24 through 28 and is related to the sex, age, household income, vehicle ownership, and number of drivers in the household of the respondent. The purpose of asking these questions was to build a basis for making comparisons among respondents. For example, by cross-checking responses, determinations could be made about whether a given age or income group is more likely to drive to work than take public transit or if the number of drivers in a household affects this statistic in any way.

Place of Work and Residence

The purpose of the last two questions was to determine where Center City employees live and work. Question 29 asked for the address, municipality, county, and zip code of residence. Question 30 asked the survey respondent to specify the street address and zip code of place of work. Center City Philadelphia was divided into eight neighborhoods before distribution of the questionnaires (Figure 2). In this way relationships could be formed among work

location, home address, and travel mode to and from work in Center City.

SAMPLE DESIGN AND SIZE

A sample of Center City employees was selected for the distribution of survey questionnaires. In consideration of practicality, administration, and cost, a cluster sampling procedure was employed. A simple random sample was drawn from each of the eight neighborhoods shown in Figure 2, and every employee had an equal probability of being included in the sample. The statistics obtained from the random sample were then used to draw conclusions about the total work force.

The design of the sample size was based on the 1980 census employment estimates contained in the 1980 Urban Transportation Planning Package (UTPP), prepared by the Bureau of the Census for the Delaware Valley region (1). According to the UTPP, the number of workers in the Philadelphia central business district (CBD) is about 236,000. It should be noted, however, that the number of workers by place of work included in the UTPP is lower than the number of jobs because of omission from the count of second job holders and workers who were absent from work on the census day because of illness, vacation, or other personal reasons. As seen from Figure 2, the eight neighborhoods are not of equal size. However, the number of jobs located in a large neighborhood is not necessarily large, as the data in Table 1 indicate.

According to the UTPP, the largest number of jobs in Central City Philadelphia is in the service sector (33.5 percent), followed by finance, insurance, and real estate (19.6 percent), wholesale and retail (15.1 percent), and the construction and manufacturing sector (13.6 percent). The transportation, communications, and utilities sector provides 9.2 percent of the jobs, and public administration accounts for 8.6 percent. These proportions were accounted for in determining the sample size and composition for each neighborhood.

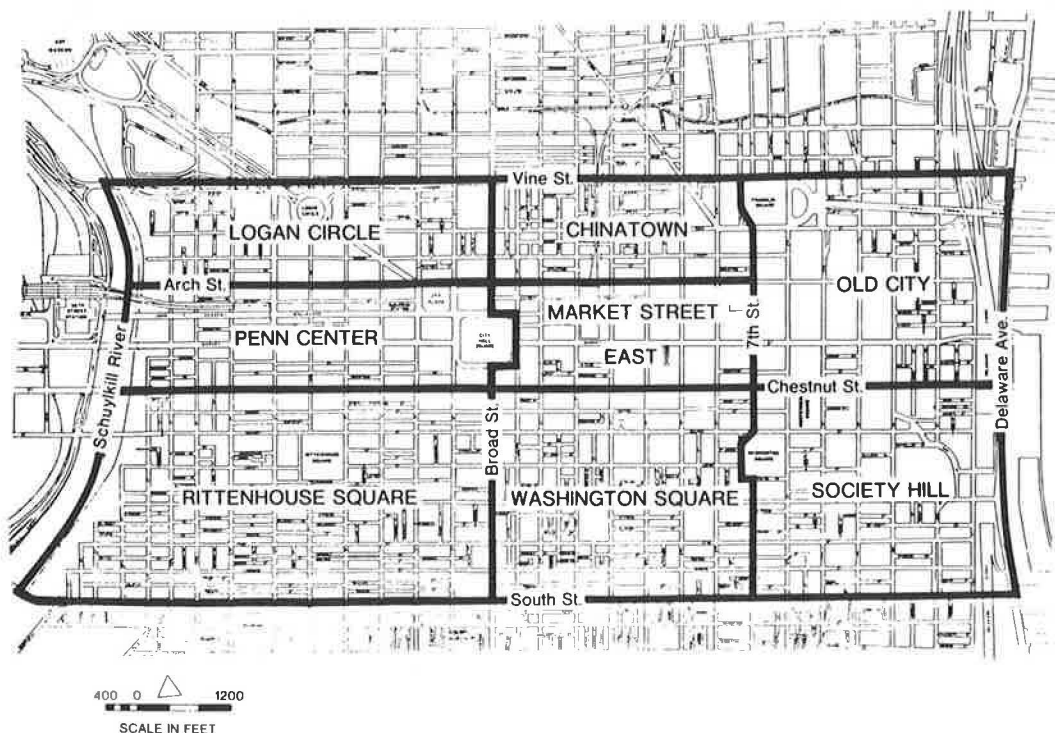


FIGURE 2 Philadelphia Center City core neighborhoods.

TABLE 1 Distribution of 1980 Philadelphia CBD Workers by Neighborhood (1)

Neighborhood	No. of Employees	Percentage of Total
Logan Circle	18,512	7.8
Penn Center	57,549	24.4
Rittenhouse Square	42,554	18.0
Chinatown	12,957	5.5
Market Street East	35,300	15.0
Washington Square	27,268	11.6
Old City	26,433	11.2
Society Hill	15,252	6.5
Total	235,825	100.0

The sample size was determined on the basis of specified levels of sampling error and confidence interval in the survey results. Statistical inference provides a relationship between sample error and the probability of obtaining this precision in the survey results (2,3). This relationship is as follows:

$$h = [(z^2/n) (p \cdot q)]^{1/2}$$

where

- h = specified (tolerable) sampling error,
- z = confidence interval or the multiple of standard errors corresponding to the specified probability of obtaining the specified precision,
- n = sample size,
- p = probability that the population possesses certain characteristics, and
- q = 1 - p.

For the purpose of this survey, an error of ± 4 percent was specified at a confidence interval of 95 percent ($z = 1.96$), and p equals 0.5. Under these assumptions, the equation yields a sample size of about 600.

Accounting for the respondents who do not return the completed questionnaires (assumed 50 percent), and those whose responses have to be disregarded because of errors or inaccuracies (assumed 5 percent), a sample size of 1,265 was estimated for distribution in each of the eight neighborhoods within Center City Philadelphia. As the data in Table 2 indicate, the target sample size averages to 4.3 percent, with neighborhoods ranging from a minimum of 2.4 percent in the Penn Center area to a maximum of 9.7 percent in Chinatown. More than 10,200 employees were reached by the survey.

DISTRIBUTION OF QUESTIONNAIRES, RESPONSES, AND PROCESSING

As mentioned before, the survey questionnaires were distributed to employees through a random process.

The participants were reached in two ways. First, Center City companies employing 100 persons or more were chosen from the Business Firms Directory of the Delaware Valley, provided by the Greater Philadelphia Chamber of Commerce (4). This directory was used to compile listings of the corporate recipients of the questionnaires. In all, 91 companies representing various employment sectors were reached in this way. The number of questionnaires sent to the executives of the companies was proportional to the size of their work force. Company executives were reached through personal contact or by letter and were requested to distribute about 8,000 questionnaires to their employees. Many companies appointed special liaisons to distribute, collect, and return the questionnaires to DVRPC.

Second, the remaining 2,200 questionnaires were distributed by DVRPC staff to employers of fewer than 100 persons. These were also selected at random from the Business Directory. The employees were requested to mail back the completed questionnaires. Although the completed questionnaires could be mailed back without postage, some companies delivered their responses personally.

Response Rate

The response to the survey was excellent. Table 2 gives the number of valid responses by neighborhood. In all, 4,219 questionnaires were found acceptable for data processing after being manually checked for invalid forms. The accepted questionnaires constituted a 1.8 percent sample of the total workers within Center City. The rate of return varied from 25.6 percent in Chinatown to 60.2 percent in Penn Center and averaged 41.3 percent.

Data Processing

In view of the large number of questionnaires returned and the quantity of information collected therefrom, the data processing was done by computer. The major steps followed in processing the data and preparing the survey results are outlined next.

1. All questionnaires were examined individually and those with apparent mistakes were discarded. The remaining questionnaires were then keypunched according to a specified record layout. The responses to the questions were coded in 76 fields of 88 columns using the specified codes.

2. The format of the computer results was designed for each question. Wherever appropriate, additional information about averages was included in the output (e.g., average trips per week, average age, car- or vanpool occupancy). The responses (proportions) were tabulated for each of the eight sections in which the final output was organized.

TABLE 2 Questionnaires Distributed and Valid Responses Received

Center City Neighborhood	No. of Employees			Valid Responses Received	Percentage of Total	Percentage of Samples
	Total	Sampled	Percentage			
Logan Circle	18,512	1,265	6.8	616	3.3	48.9
Penn Center	57,549	1,363	2.4	821	1.4	60.2
Rittenhouse Square	42,554	1,265	3.0	348	0.8	27.6
Chinatown	12,957	1,265	9.7	323	2.5	25.6
Market Street East	35,300	1,267	3.6	515	1.5	40.8
Washington Square	27,268	1,266	4.6	555	2.0	43.9
Old City	26,433	1,267	4.8	486	1.8	38.5
Society Hill	15,252	1,267	8.3	555	4.5	43.9
Entire Center City	235,825	10,225	4.3	4,219	1.8	41.3

3. A previous DVRPC FORTRAN program was rewritten to process the information in the desired format. Contingency checks were included within this program to consider correct responses and leave out those that were inconsistent with the intent of the questionnaire. For example, the information in Questions 12 through 15 was compiled only if the existing mode of the respondent indicated in Question 6 was highway oriented (i.e., drive alone, carpool, or vanpool). The program was edited, debugged, and tested on a smaller data set, and the results were verified by manual calculations. After additional improvements were made in the output content and format, the program was run on the total data set.

SURVEY RESULTS

The survey results were tabulated in a series of eight detailed sections that showed the percent response and the sampling error associated with each answer to the questionnaire. It should be noted that the sampling error is high if the number of responses to a question is small (Figure 3). Although the survey was designed to restrict the sampling error to ± 4 percent, a few responses did fall outside these sampling error limits. A brief discussion of the responses to each of the 30 questions asked in the survey follows.

Frequency of Weekly Work and Nonwork Trips and Trips During the Day

1. The vast majority of Center City employees (88 percent) commutes to work 5 days per week. Only 7 and 5 percent of the employees commute either more or less often than 5 days per week, respectively. Overall, 4.9 trips are made by the average employee every week, which reflects relatively stable and full-time employment. The frequency of work trips,

however, varies inversely with the distance traveled from the place of residence to Center City.

2. Center City employees indicated leaving work for meals on the average of 2.5 times per week. This occurred almost twice as frequently as shopping (1.4 times per week on the average). Work-related activities required the employee to leave the work place about 1.1 times a week, and trips for entertainment purposes averaged only 0.7 time per week. About one-third of the employees (34 percent) eat out 4 or 5 days a week. Shopping is a rather infrequent activity during the workday--43 percent of the employees shop less frequently than once a week. Entertainment was cited as a reason to leave the work place less frequently than once a week by 88 percent of the employees. Travel within Center City during the workday for work-related activities showed a rather low frequency, with nearly 7 of 10 employees (68 percent) traveling less than once a week and only 18 percent more than twice per week.

3. As expected, not many Center City employees travel from home to Center City for nonwork purposes. On the average, they make about three trips per month. More than half of the employees (53 percent) make one trip or less per month, and only 4 percent make more than 16 such trips. Nearly equal proportions of employees, 16 and 18 percent, make two and three trips per month, respectively. Another 9 percent make between 6 and 15 trips per month to Center City for nonwork activities.

Time of Leaving Home and Work and Door-to-Door Travel Time

4. The morning peak travel period to Center City occurs between 6:00 a.m. and 9:00 a.m., when 93 percent of the employees commute to work. In the afternoon peak period, between 3:30 p.m. and 6:30 p.m., 90 percent of the employees return to their homes. The off-peak hours attract the remaining 7

PHILADELPHIA CENTER CITY
EMPLOYEES TRANSPORTATION SURVEY
FINAL RESULTS: JUNE 14, 1985.

PERCENT RESPONSE / SAMPLING ERROR

	PLACE OF WORK							
	TOTAL CENTER CITY	LOGAN CIRCLE	PENN CENTER	RITTEN HS SQUARE				
RESPONSES	4219	616	821	348				
1. HOW OFTEN DO YOU USUALLY TRAVEL TO WORK IN CENTER CITY PHILADELPHIA?								
THREE DAYS PER WEEK OR LESS	3	1	2	1	3	1	6	2
FOUR DAYS PER WEEK	4	1	3	1	6	2	6	3
FIVE DAYS PER WEEK	88	1	90	2	88	2	84	4
SIX OR SEVEN DAYS PER WEEK	5	1	5	2	3	1	4	2
TOTAL RESPONSES	100	0	100	0	100	0	100	0
NO RESPONSE	0	0	0	0	0	0	1	0
AVERAGE TRIPS PER WEEK (X 10)	49		50		49		48	
2. HOW OFTEN DO YOU LEAVE YOUR PLACE OF WORK FOR THE PURPOSE OF:								
A. EATING MEALS:								
LESS THAN ONCE PER WEEK	25	1	28	4	22	3	21	5
ONE DAY PER WEEK	14	1	15	3	14	3	13	4
TWO OR THREE DAYS PER WEEK	26	1	28	4	26	3	24	5

FIGURE 3 Final results of Philadelphia Center City employees transportation survey, June 14, 1985.

percent of trips from home to work and 10 percent from work to home.

5. The average trip from home to work takes 42 min, and the trip from work to home is 3 min longer. About 44 percent of the employees spend more than 90 min (45 min each way) commuting to and from work. Nearly one in seven employees spends more than 1 hr commuting from home to work in Center City (Figure 4). Travel time from home to work varies significantly by mode of travel. On the average, it takes 36, 38, 55, 42, 45, and 52 min to commute to Center City by automobile, carpool, vanpool, bus or trolley, subway-elevated, and commuter rail, respectively.

Means of Transportation and Travel Costs of Work Trips

6. Sixty-two percent of employees use public transportation to go to work in Center City. The commuter rail system carries 17 percent of the employees (Figure 4). The subway-elevated and Lindenwold high-speed lines accommodate 23 percent. Eighteen percent of the workers ride a bus or trolley, and 4 percent patronize SEPTA's subway-surface lines. Nearly one in three employees drives alone (19 percent), carpools (11 percent), or vanpools (2 percent) to work. Except for the data on drive-alone and subway-elevated work trips, the survey findings on travel modes are consistent with those contained in the 1980 UTPP, as shown in the following tabulation.

Mode of Travel	Percentage of Center City Employees	
	1980 Census UTPP	1985 DVRPC Survey
Commuter rail	18	17
Subway-elevated	17	23
Bus or trolley (surface)	24	22
Drive alone	22	19
Carpool	10	11
Truck and van	2	2
Walk	6	4
Other	1	2
Total	100	100

7. It costs the average employee \$3.58 per day to commute to and from work. This cost accounts for transit fares, parking fees, tolls, gasoline, automobile maintenance, and so forth. The cost for 45 percent of the employees is more than \$3 per day. For nearly one-half of the employees (49 percent), however, the daily commuting cost is between \$1.50 and \$3.00. Six percent of the respondents did not report any cost for the work trip. This category includes employees who walk or use bicycles and those whose commuting costs are paid by their employers. Except for commuter rail, the cost of commuting by public transportation is less than that of driving to work. On the average, it costs \$4.79, \$4.46, \$3.79, \$2.33, \$2.83, and \$4.58 to commute to work by automobile, carpool, vanpool, bus or trolley, subway-elevated, and commuter rail, respectively.

Duration of Use of Travel Mode and Previous Means of Transportation

8. In general, the Center City employee's choice of travel mode to commute to work is stable over time; the average time for using a travel mode is 4.4 years. Only 18 percent of the employees have used their present travel mode for less than 1 year. Forty-one percent have used the same mode for from 1 to 5 years, and 40 percent for more than 5 years.

9. A significant proportion of the employees (37 percent) did not work in Center City before their present jobs. Other responses indicating previous mode of travel, in order of importance, were bus, trolley or subway-surface (15 percent), subway-elevated and Lindenwold line (12 percent), drive alone (12 percent), and commuter rail (11 percent). Six and 1 percent of the employees, respectively, had previously carpooled or vanpooled.

Reasons for Changing Travel Mode and Operational Changes for Increasing Commuter Rail Ridership

10. Center City employees primarily made a shift in mode or modes of travel to work because they had changed place of employment (25 percent) or place of residence (15 percent). Transit unreliability (10 percent), transit fare hikes (7 percent), high parking cost (7 percent), and attractive carpools and vanpooling (6 percent) were also cited as concerns that caused employees to change their means of transportation to work.

11. More reliable service and lower fares were cited as the two most important reasons (19 percent each) for increasing ridership on the commuter rail lines. In addition, those non-rail users who reside reasonably close to a rail station indicated that more frequent service during the morning rush hour (12 percent), better communication during breakdowns (10 percent), and improved vehicle cleanliness (6 percent) would encourage them to use the commuter rail system for work trips.

Automobile Drivers, Carpools, Vanpool Vehicle Occupancy, Parking Cost, and Reasons for Not Using Public Transit

12. Fifty-six percent of the automobile commuters drive alone to work, and only 6 percent rideshare in carpools of four or more passengers (Figure 5). Slightly more than 6 in 10 vanpoolers (64 percent) rideshare in vans with 10 to 13 passengers. The average car- and vanpool occupancies are 1.3 and 12.1 persons, respectively.

13. Slightly more than one-half of the employees (54 percent) who commute to work in vanpools and carpools carrying three or more persons meet at a central location to depart for Center City. A co-rider's home is the usual meeting place for 62 percent of those employees, and 18 and 12 percent, respectively, use shopping centers or commuter rail stations.

14. Of those employees who drive to work in automobiles, one-third pay no parking cost, 31 percent pay daily fees of between \$2.00 and \$4.00, and 23 percent pay more than \$4.00 (Figure 5). Overall, the average parking cost is \$2.33 per day.

15. The automobile's superiority as a faster and more convenient mode of travel to work was cited by employees as the major reason (28 percent) for not taking public transportation to work. However, 52 percent of the employees cited several deficiencies in transit service that caused them to use other means of transportation. High fares (12 percent), service unreliability (12 percent), overcrowded vehicles (10 percent), and infrequency of service (8 percent) were claimed as the major reasons for not using public transit.

Home Access Mode to Public Transit, Center City Transfer, and Usage of Center City Stations

16. Forty-one percent of the employees walk to a train station or bus stop to board the transit modes that carry them to Center City. Nearly one in three employees (32 percent) drives an automobile from home

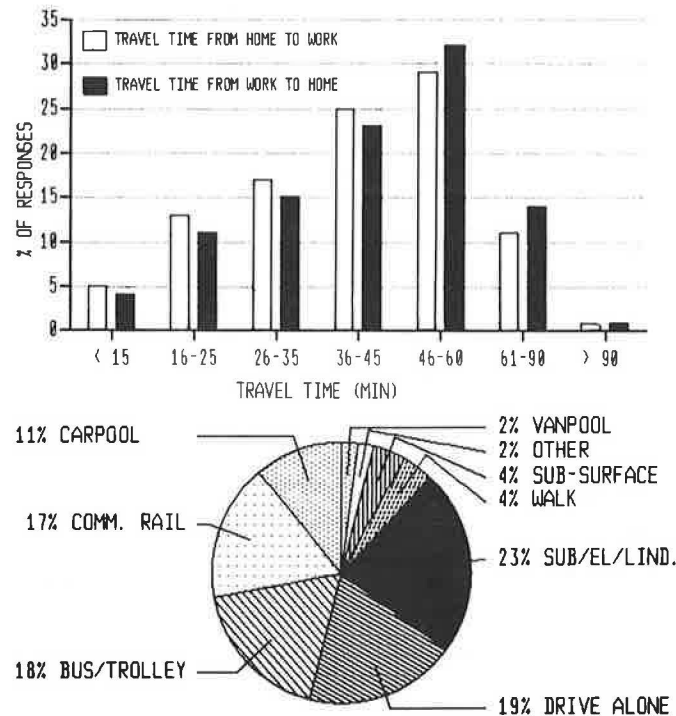


FIGURE 4 Workers' travel time and means of transportation.

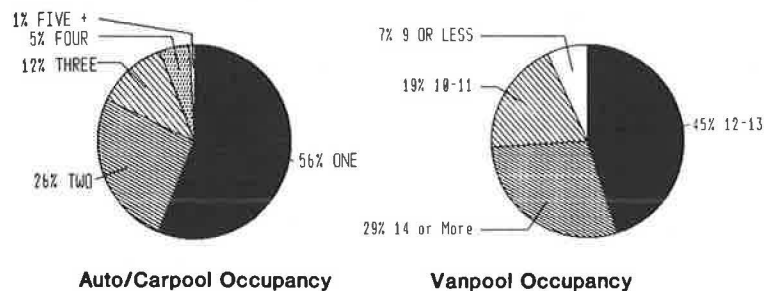


FIGURE 5 Automobile drivers, carpools, vanpools, and parking cost.

and parks adjacent to the station before boarding a train, subway, or bus. In addition, one in five employees arrives at a transit station by bus or trolley, and 6 percent are driven by someone else (kiss 'n ride).

17. The overwhelming majority of employees who commute by public transportation (81 percent) walks to their destinations once they arrive in Center City. About 2 in 10 (19 percent) transfer to another transit mode within Center City. SEPTA's subway-ele-

vated and bus and trolley lines accommodate 57 and 37 percent of those employees, respectively.

18. The responses of the 17 percent of employees who ride the commuter rail system indicate that there has been no significant change in the percentages of passengers who use Center City stations. About 36 percent of the commuters used Reading Terminal before the opening of the tunnel, and 38 percent use Market East station at the present time. Because the tunnel has connected the Philadelphia and Reading railroad

systems, passengers now arrive at a station closer to their place of work.

Reasons for Not Using TrailPasses, TransPasses, and New Jersey Transit Bus Passes

19. It appears that the SEPTA's TrailPass is well advertised; only 2 percent of the respondents indicated a lack of knowledge of it. The major reasons for not using the TrailPass include not riding the commuter rail system frequently enough (20 percent), use of bargain fares during off-peak hours (12 percent), and inability to pay a month's or a week's fare in advance (7 percent). Fifteen percent of the rail commuters said that they did not have occasion to use SEPTA's other transit systems, and 17 percent said it would limit their travel options.

20. The two most important reasons for not using SEPTA's TransPass fare program are purchase of tokens (56 percent) and infrequency of transit use (20 percent). However, 5 percent claimed inconvenience of sales locations as a reason for not buying the TransPass. Another 5 percent of the transit users said that they cannot afford to purchase the TransPass.

21. The 10-trip ticket is the most popular fare program among New Jersey commuters and is purchased by 34 percent of N.J. Transit's interstate bus riders. Insufficient information about the Interstate Monthly Bus Pass (19 percent) and inconvenient sales locations (16 percent) deter commuters from using the discounted fares. Another 12 percent believe that the cost of the monthly bus pass is too much to pay at one time. Not riding the bus frequently enough was cited by 16 percent of the riders who do not purchase the N.J. Transit pass.

Duration of Employment in Center City and Previous Work Location

22. Nearly one-half of the employees (44 percent) have worked at their present location for more than 5 years, and about 16 percent have worked in Center City for less than 1 year. The remaining 39 percent indicated that they have been employed at their present location between 1 and 5 years.

23. About one of three employees (34 percent) who have changed work location within the past 5 years moved from another Center City location. Nearly one-quarter (24 percent) came from other sections in the city of Philadelphia. Seventeen and 7 percent, respectively, came to Center City from either the Pennsylvania or the New Jersey suburbs. It should be noted, however, that only 18 percent moved to Center City from areas outside the nine-county DVRPC region.

Employees' Sex and Age, Household Income, Automobile Ownership, and Number of Drivers in the Household

24 and 25. Philadelphia's Center City workers are 57 percent female and 43 percent male. The average male employee is 39 years old, and the average age for the female is 35 years. About three of four employees (73 percent) are older than 18 and younger than 44 years of age. In the age group of 35 to 44, there are slightly more men than women (29 versus 24 percent). In the 18 to 34 group, women outnumber men (55 versus 37 percent). According to the 1980 UTPP, 52 percent of Center City workers were male and 48 percent were female. These figures are significantly different from the DVRPC survey findings.

26. Although 43 percent of the employees reported

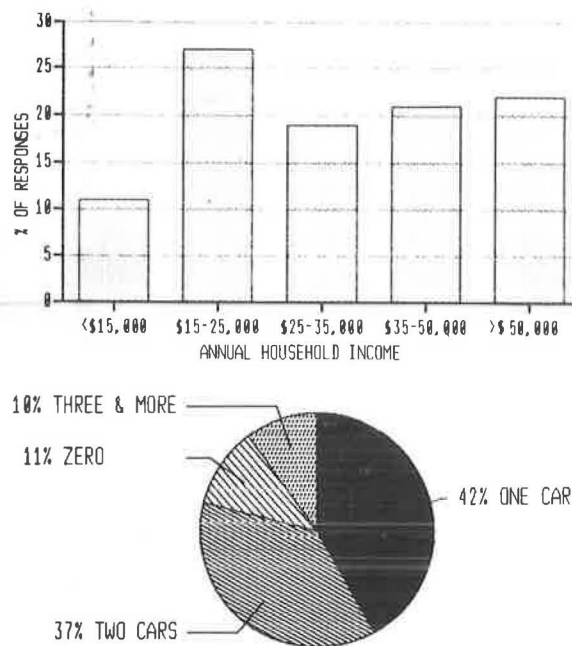


FIGURE 6 Household income and automobile ownership.

household incomes higher than \$35,000 per year, the average household income of all employees is \$35,260 per year (Figure 6). The highest household income was reported by employees from Chester County (\$55,270), and the lowest was indicated by Philadelphia residents (\$28,880). The average annual household income for female employees is about 33 percent less than the corresponding income of males (\$30,870 versus \$41,090). Household income of Center City employees increased significantly during the past 6 years, from \$26,482 in 1979, reported in the 1980 UTPP, to \$35,260 in 1985, found in this survey.

27. Only 1 in 10 employees (11 percent) does not own an automobile (Figure 6). Forty-two percent reported owning a single automobile, and 10 percent own three or more automobiles. On the average, there are 150 automobiles per 100 households; however, this rate varies significantly among employees depending on place of residence. For example, there are 210 automobiles per 100 households among the employees who reside in Bucks or Chester counties, but the corresponding rate for Philadelphia residents is 120 automobiles. Like income, household automobile ownership has increased from the 1980 level. The following tabulation indicates this trend:

No. of Automobiles Available	Percentage of Employees by Household Automobile Ownership Level	
	1980 Census UTPP	1985 DVRPC Survey
0	18	11
1	40	42
2	31	37
3 or more	11	10
Total	100	100

28. There are two automobile drivers in more than one-half of the employees' households (54 percent). More than one-fourth of the households (27 percent) have one driver, 12 percent have three drivers, and 7 percent have four or more drivers. This high number of drivers per household indicates a strong tendency to use the highway system for commuting to work.

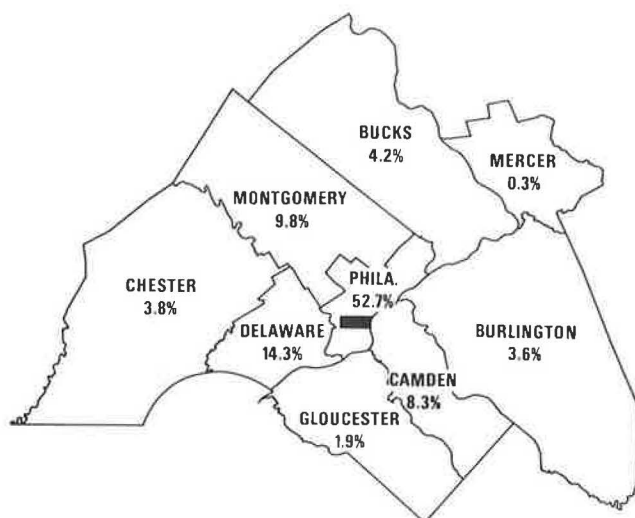


FIGURE 7 Workers' place of residence.

Place of Residence and Work

29. Only 1 percent of Center City jobs are held by workers who are not residents of the Delaware Valley region. Slightly more than one-half of the jobs are held by residents of the city of Philadelphia (Figure 7). Suburbanites from Pennsylvania and New Jersey hold 32.1 percent and 14.1 percent of the jobs, respectively. Philadelphia's share of Center City jobs has declined as shown in the following tabulation, which compares the 1980 UTPP data with those found in this survey.

Worker's Place of Residence	Percentage of Center City Employees	
	1980 Census UTPP	1985 DVRPC Survey
Bucks County	3.3	4.2
Chester County	2.0	3.8
Delaware County	10.7	14.3
Montgomery County	8.4	9.8
Philadelphia County	61.4	52.7
Burlington County	3.0	3.6
Camden County	8.0	8.3
Gloucester County	1.9	1.9
Mercer County	0.2	0.3
Other	1.1	1.1
Total	100.0	100.0

30. According to the 1980 census UTPP, the total number of jobs in Center City was 264,000. Approximately 236,000 workers commute on an average weekday. Penn Center contains about 25 percent of Center City jobs (Figure 2). Other employment concentration areas are Rittenhouse Square (18 percent) and Market Street East (15.0 percent). These are followed by Washington Square (11.6 percent), Old City (11.2 percent), and Logan Circle (7.8 percent). Society Hill has the smallest employment concentration (6.5 percent).

FINDINGS AND CONCLUSIONS

The DVRPC Center City Employee Transportation Survey results provided essential information for the plan-

ning and programming of transportation improvements. In general, the survey results are consistent with those contained in the 1980 UTPP prepared by the Bureau of the Census. Some information, however, is only available from this comprehensive survey.

The average employee travels during the morning and evening peak hours; makes a few trips per week during the working day for meals, shopping, and entertainment purposes; and rarely goes to Center City from home for nonwork purposes. Because they do not ride public transit enough or use transit passes for all trip purposes, most commuters do not purchase the monthly or weakly passes. Although driving alone to work can be expensive, some employees do not ride public transit because they believe travel by automobile is faster and more convenient than transit, which is expensive, unreliable, and uncomfortable. Such information is important for the development of marketing programs to attract automobile users to transit and encourage the use of passes, which makes transit faster and more convenient.

The number of employees who work in Center City varies inversely with the travel time from their place of residence. Sixty-two percent of employees use public transportation to go to work in Center City, 32 percent use the highway system, and 6 percent walk or use other means of transportation. Such data, in addition to other survey findings on access and egress travel modes, place of residence and work, and employment locational changes, are being used to recalibrate DVRPC travel forecasting models and test the feasibility of additions, deletions, or improvements to transportation facilities in Center City and throughout the Delaware Valley region. They are also being used by the Philadelphia City Planning Commission to prepare a comprehensive master plan for Center City redevelopment.

ACKNOWLEDGMENT

This survey was financed in part by the Urban Mass Transportation Administration and the Pennsylvania Department of Transportation. Several DVRPC staff members participated in the project including Laurie Schall, Thomas Walker, William Stevens, Abdul Latif, and P. Salpeas. The author, however, is responsible for the results and conclusions, which may not represent the views of these persons or policies of the funding agencies.

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Publication of this paper sponsored by Committee on Transportation Data and Information Systems.

Intrametropolitan Trends in Sunbelt and Western Cities: Transportation Implications

ROBERT CERVERO

ABSTRACT

As the nation's economic growth continues to focus on sunbelt and western metropolises, rapid changes are taking place, particularly on the peripheries of these areas, that have major mobility implications. Most notably, jobs are increasingly leaving traditional downtowns for new suburban employment complexes and sprawling office complexes. As a result of this decentralization, predominant trip patterns are becoming more and more diffuse and lateral in direction, not only in burgeoning sunbelt cities but all over the country. Congestion has seemingly lost its directional bias and can now be found in all corners of rapidly expanding metropolises like Houston, Denver, and Orange County, California. All signs suggest, moreover, that the private automobile will continue to gain dominance in commuting markets in the nation's fastest growing areas, largely because of the emerging low-density settlement patterns. From a policy standpoint, emphasis needs to be placed on substantially reorganizing traditional public transit as well as modifying radial-circumferential systems so as to better mimic scattered trip patterns. Busways and timed-transfer arrangements, such as those pioneered in several Canadian cities, are promising. Strong political resistance to radical changes in transportation service delivery practices, however, could prove difficult to overcome.

During the past two decades the nation's economic epicenter has been drifting in a southerly and westerly direction. The lower cost of doing business coupled with favorable weather and environmental conditions have lured thousands of companies, investors, and job seekers to America's sunbelt crescent. Major metropolises in Texas, Florida, and California have enjoyed particularly prosperous times. Inter-regional shifts in labor, capital, and investments to these states since the 1960s have produced extremely healthy and vibrant local economies, exemplified by the meteoric rise in white-collar office employment. America's political power base has likewise swung to the South and the West. The states of Florida, Texas, and California, for example, picked up nine representatives in the 1982 reapportionment of congressional seats. In total, the nation's southern and western tier states took away 16 congressional votes from the snowbelt that year.

Moreover, sunbelt cities appear to be sustaining this growth posture during the 1980s. About 90 percent of the population increase in the United States between 1980 and 1984 occurred in the South and the West. All of the 50 fastest growing metropolitan areas during this period were located in the South and the West (1). The only two metropolitan areas outside of the South and the West with populations over 1 million to grow faster than the national average during the early 1980s were Washington, D.C., and Minneapolis-St. Paul (2).

Within booming sunbelt and western regions, much of the recent population and employment growth has taken place in the suburbs and accretions beyond. New office and home building has been particularly prodigious in the suburbs. Some observers have warned, however, that unless prompt actions are taken to safeguard fast-growing metropolises and suburban

corridors from the rapid influx of traffic, such areas are apt to face gridlock conditions not at all unlike those found in some of the nation's most congested central cities (3-5). To probe the implications of recent growth trends for transportation and regional mobility, in this paper are examined pertinent demographic, economic, and commuting data on the suburban versus central city spheres of 12 of the nation's fastest developing standard metropolitan statistical areas (SMSAs): Atlanta; Dallas-Ft. Worth; Denver; Houston; Los Angeles-Long Beach; Orange County, California; Phoenix; San Diego; San Francisco-Oakland; San Jose; Seattle; and Tampa-St. Petersburg. All 12 have metropolitan populations above 1 million and represent the very largest SMSAs in the South and the West. The only other southern and western SMSAs above 1 million population in 1980 not included in this list are Miami and New Orleans, both fairly mature metropolises by sunbelt standards.

Because the emphasis is on comparing trends geographically within each of these metropolises, it should be noted that there really is no clean distinction between what is and what is not a suburb in any of these 12 case areas. The Bureau of the Census simply designates parts of an SMSA either as "central city" or "not in central city"; the former designation comprises the official boundaries of the most populous municipality and, in the case of twin cities, the second largest municipality as well. This dichotomy unfortunately does not always provide an accurate portrayal of what is urban versus what is suburban. Some cities, such as Houston and Phoenix, have annexed so much surrounding territory during the past several decades that the bulk of regional jobs and residences falls into the "central city" census category, even though densities in newer annexed neighborhoods are frequently suburbanlike.

Notwithstanding these definitional problems, useful insights into mobility issues can still be gained by examining assorted demographic and commuting

TABLE 1 Population Changes, 1970-1980, Total SMSA and Suburban Population (6)

SMSA	Total Population		Percentage Change	Percentage Living Outside Central City		
	1970	1980		1970	1980	Change
Atlanta	1,390,164	2,029,710	+46.00	58.6	74.6	+16.0
Dallas	2,318,036	2,974,805	+28.33	46.6	56.7	+10.1
Denver	1,227,529	1,620,902	+32.15	58.1	64.9	+6.8
Houston	1,985,031	2,905,353	+46.42	38.0	45.1	+7.1
Los Angeles	7,037,075	7,477,503	+6.30	54.2	54.3	+0.1
Orange County	1,420,386	1,932,709	+36.12	68.3	76.5	+8.2
Phoenix	956,572	1,509,052	+56.07	35.7	45.1	+9.4
San Diego	1,357,854	1,861,846	+37.10	45.4	51.2	+5.8
San Jose	1,064,714	1,295,071	+21.64	50.3	57.2	+6.9
San Francisco	3,109,519	3,250,630	+4.57	65.4	65.7	+0.3
Seattle	1,421,869	1,607,469	+13.11	58.9	65.9	+7.0
Tampa	1,012,594	1,569,134	+58.00	51.2	67.5	+16.3
Twelve-SMSA average ^a	2,117,159	2,587,732	+32.15	52.7	60.4	+7.7
United States ^b	203,211,916	226,545,805	+11.54	42.3	44.2	+1.9

^aNonweighted average of 12 SMSAs.^bTotal U.S. population and percentage of population living outside central cities.

trends taking place both in the cores and on the fringes of these 12 SMSAs. The extent to which intrametropolitan trips increasingly focus on outlying corridors, for instance, raises important questions regarding future transportation investment policies. The roles of different transit service strategies, such as timed-transfer systems and integrated busways, in serving increasingly dispersed travel patterns are probed. General policy inferences of emerging commuting trends are also drawn in the concluding section.

DEMOGRAPHIC TRENDS IN SUNBELT AND WESTERN METROPOLISES

The explosive population growth experienced by many southern and western metropolises during the past several decades has been well documented and needs no particular elaboration here. For the 12 case areas of interest, Table 1 gives population growth trends during the 1970s. On average, total population increased three times faster in these metropolitan areas between 1970 and 1980 than in the nation as a whole. Tampa and Phoenix had the greatest percentage of growth, and Houston outgained all others in absolute terms (nearly 1 million new residents).

With the exceptions of Los Angeles and San Francisco, moreover, all of these areas decentralized more rapidly during the 1970s than did the nation at large. When the relatively large suburban population base that already existed in 1970 in these areas is considered, recent gains are all the more impressive. The most dramatic suburban growth occurred in Tampa, Atlanta, and Dallas. On average, more than 60 percent of the total SMSA population currently lives outside of the central city in all 12 case areas compared with a national figure of 44.

This suburbanization wave has continued unabated into the 1980s. The five fastest growing large metropolitan areas in the country between 1980 and 1984 were Houston, Dallas, Tampa, Phoenix, and Denver, all with annual growth rates of more than 2.7 percent and all exploding on their urban perimeters. Suburbanization, moreover, appears to have picked up momentum in most sections of the country during the 1980s. In the 36 U.S. metropolitan areas with over 1 million population, the suburbs grew at an annual rate of 1.25 percent from 1980 to 1984; in comparison, the major central cities grew at a much slower, 0.42 percent, pace (1,2).

In terms of several other demographic character-

istics--population density, household size, and family income levels--the 12 metropolises appear quite similar to other urbanized areas around the country. The data in Table 2 indicate that these case areas are slightly denser than their urbanized counterparts in the North and the East, partly because most have comparatively large average household sizes and partly because, as do most big cities, they have sizable numbers of apartment dwellers. Median family incomes of these 12 areas generally also exceed the national average, although a fair amount of variation exists even among sunbelt cities. At the lower end of the earnings scale is Tampa-St. Petersburg where median yearly annual household income falls nearly \$5,000 below the national average. The high proportion of retirees living on Florida's Gulf Coast heavily skews this figure, however.

Table 2 also gives 1980 vehicle ownership rates for these 12 SMSAs. All but 2 of the 12 metropolises exceed the national average of vehicles per household; the exceptions are Tampa and San Francisco. Tampa's relatively low ownership rate again reflects the area's large retirement population, and the Bay Area's low figure can be attributed to public transit's relatively strong presence in the region, particularly within the city of San Francisco. Among the 12 selected SMSAs, Denver holds the highest rate

TABLE 2 Summary of 1980 Demographic Characteristics for Urbanized Areas of SMSAs (7)

SMSA	Population Density ^a	Vehicles per Household ^b	Persons per Household	Median Income (\$)
Atlanta	1,783	1.6	2.8	21,509
Dallas	1,915	1.8	2.7	24,463
Denver	3,080	1.8	2.6	18,622
Houston	2,300	1.9	2.8	24,463
Los Angeles and Orange County	5,188	1.7	2.8	22,049
Phoenix	2,198	1.8	2.7	20,545
San Diego	2,790	1.7	2.7	20,095
San Francisco	4,009	1.5	2.5	24,599
San Jose	3,816	1.9	2.8	26,695
Seattle	2,874	1.7	2.6	24,930
Tampa	2,621	1.5	2.5	16,543
Eleven-SMSA average ^c	2,961	1.7	2.7	22,228
U.S. average	2,676	1.5	2.8	21,243

Note: An urbanized area consists of a central city or cities and surrounding closely settled territory ("urban fringe"), as defined by the Census Bureau.

^aTotal population per square mile of urbanized land.

^bTotal vehicles, including automobiles, trucks, vans, and motorcycles.

^cNonweighted average for 11 SMSAs.

TABLE 3 Employment Totals and Concentrations Outside Central Cities, 1970-1980 (6)

SMSA	Total Employment			Percentage of Employment Outside Central City		
	1970	1980	Percentage Change	1970	1980	Change
Atlanta	587,708	966,935	64.53	64.4	81.9	+17.5
Dallas	976,077	1,488,947	52.54	45.2	56.7	+11.5
Denver	492,961	819,770	66.30	51.3	65.1	+13.8
Houston	797,421	1,448,657	81.67	35.3	42.9	+7.6
Los Angeles	2,826,565	3,471,764	22.83	54.3	55.1	+0.8
Orange County	544,313	974,845	79.10	67.8	72.1	+4.3
Phoenix	362,156	663,624	83.24	36.4	44.7	+8.3
San Diego	430,495	756,400	75.70	41.2	52.6	+5.4
San Francisco	1,267,643	1,592,892	25.66	63.9	69.5	+5.6
San Jose	409,077	661,063	61.60	60.5	53.4	-7.1
Seattle	556,755	791,049	42.08	55.7	65.4	+9.7
Tampa	346,353	613,308	77.08	50.1	66.4	+16.3
Twelve-SMSA average ^a	841,016	1,239,631	59.57	52.2	60.5	+8.3
United States	76,852,389	96,617,296	25.73	35.6	47.7	+12.1

^aNonweighted average of 12 SMSAs.

of vehicles per person (0.70) and Atlanta has the lowest (0.57).

EMPLOYMENT IN SUNBELT AND WESTERN METROPOLISES

Employment growth in the 12 case SMSAs has been just as impressive as population gains (Table 3). Overall, the number of jobs grew about twice as fast during the 1970s in the 12 areas as it did in the nation as a whole. Phoenix, Houston, and Orange County enjoyed the healthiest gains. Moreover, the share of total regional jobs outside the central city rose in all but one of the 12 SMSAs; the exception was San Jose where the shrinkage in the suburban share of jobs can be attributed to the ongoing high technology employment boom of the renowned Silicon Valley, much of which has occurred within San Jose's northern city limits. The vast majority of San Jose's growth since the early 1970s, however, could nonetheless be characterized by sprawling, low-rise office development.

The data given in Table 4 further highlight the ascendancy of suburbia as the preferred employment location in most of the 12 SMSAs. Particularly in Tampa-St. Petersburg, Atlanta, Denver, Houston, and Phoenix, suburban employment flourished throughout the 1970s at the expense of the respective downtowns.

Most of the gains in both regional and suburban

employment, not only in these 12 areas but throughout the United States, have been registered in the tertiary (i.e., service), quaternary (i.e., information-based), and advanced technology sectors. The rapid growth of these sectors has reflected the largest postindustrialization of America's economy--the change from a heavy "smokestack" manufacturing base to one devoted more to the production of ideas and information. Nationally, the share of jobs in manufacturing has fallen from 32 percent right after World War II to 24 percent in the early 1980s (8). Combined, the nation's nonmanufacturing and nonagricultural sectors, including jobs in offices, retail, government, education, and entertainment, grew from 49 to 66 percent of total employment during this same period.

It has been this "white-collarization" of employment that has prompted many businesses to relocate their offices in suburbia. No longer are most firms tied to rail spurs and ports; they have become footloose, able to make locational decisions on the basis of factors other than proximity to raw materials and goods. Particularly in the case of high technology industries, the miniaturization of product lines has drastically reduced the cost of shipping goods to the point where firms are virtually free to move wherever they can maximize their net advantage. In most cases this has been the suburbs because of a combination of factors including lower rents and land costs; the presence of large labor pools, especially married women who are often available for clerical jobs; better access and visibility; and a perceived higher quality working environment attractive to highly skilled labor (9). In addition, the rapid acceleration of telecommunications technologies has enabled many businesses to spin off portions of their back-office operations (e.g., computer functions) to less expensive suburban environs.

A few additional statistics underscore the full scope of recent suburban office development in the nation's fastest growing southern and western metropolises. In Houston, only 39 percent of all office construction was outside downtown in 1970; by 1982 the share had catapulted to 87 percent (10). In the Rocky Mountain states, although Denver has emerged as the undisputed regional hub, most office building activities have actually taken place outside its downtown. The suburbs' share of annual office construction erupted from just 15 percent in 1970 to 73 percent in 1981 (10). Along Denver's southeast I-25 corridor, a stretch dotted with business-executive parks, more office space has already been produced than in all of downtown Denver. Phoenix's suburban employment growth has been

TABLE 4 Changes in Office-Related Employment Within and Outside Central City (6)

SMSA	Change in Office-Related ^a Employment, 1970-1980 (%)	
	Inside Central City	Outside Central City
Atlanta	-16.4	109.2
Dallas	20.5	91.3
Denver	19.4	110.8
Houston	60.4	120.6
Los Angeles	20.7	24.6
Orange County	55.7	90.5
Phoenix	59.5	124.7
San Diego	57.8	95.7
San Francisco	6.1	36.7
San Jose	90.7	42.6
Seattle	10.9	66.9
Tampa	19.2	134.8
Twelve-SMSA average ^b	33.7	87.8
United States ^c	15.0	115.9

^aOffice-related is defined as those Standard Industrial Classification (SIC) codes in services, retail, light manufacturing, and associated industries.^bNonweighted average of 12 SMSAs.^cAJI U.S. SMSAs.

even more staggering. Of the Phoenix SMSA's 21 million square feet of privately owned, multitenant office space, only 2 million square feet have been built downtown. Although the city of Phoenix has actively pursued downtown redevelopment, no new office buildings were constructed during the late 1970s or early 1980s. In contrast, Phoenix's northern suburban corridor witnessed the addition of four new office towers that total 1.3 million square feet during 1982 and 1983 (11).

Although such statistics bode favorably for the economic future of suburbia in the 12 case metropolitan areas, it should be noted that office employment grew even more precipitously in other nondowntown settings across the country. New white-collar jobs were particularly plentiful on the fringes of a number of smaller metropolitan areas in the 250,000 to 1 million population range. For example, employment in the suburbs of Des Moines, Norfolk-Virginia Beach, Memphis, and Tulsa rose by 112, 126, 154, and 166 percent, respectively, during the 1970s. Among the 36 U.S. metropolitan areas of 1 million or more population, however, the suburban work force of the 12 case areas grew head and shoulders above the rest. In addition, it should be noted that the averages given in Table 4 are suppressed by the inclusion of California cities, in particular Los Angeles and San Francisco, both of which have reached fairly mature stages of their growth cycles compared with the other case areas. Excluding West Coast cities from Table

4, the average change in suburban office-related employment during the 1970s was 125 percent, above the national average.

GEOGRAPHY OF COMMUTING

Contrary to popular belief, the largest share of work trips made in the SMSAs of the United States is not radial ones from the suburbs to central cities but lateral ones, both beginning and ending in the suburbs. The data given in Table 5 indicate that this preeminence in suburb-to-suburb commuting holds for all four regions of the country. Intrasuburban travel is actually most prominent in the Northeast, largely because of the enormous amount of crosstown and interstate travel throughout the greater New York metropolitan area. The South has the highest share of the traditional suburb-to-central city radial commuting, and the highest incidences of reverse commuting can be found in the Pacific states.

The data in Table 6 disclose 1970-1980 trends in intrametropolitan as well as suprametropolitan travel for the 12 case areas, broken down by place of residence within each SMSA. The table reveals that the shares of trips destined to suburbs--reverse commutes and suburb-to-suburb journeys--rose in nearly all of the 12 case areas. Long-haul trips from suburbia to places outside of SMSAs likewise jumped during the 1970s in most places. Correspondingly, the role of inner-city trip making dropped sharply in almost all of the study areas. Only in the cases of Atlanta and Tampa did commuting shares within central cities rise.

Several areas recorded particularly significant increases in reverse commuting, notably Dallas, Orange County, and San Jose. Orange County also sustained high rates of intermetropolitan commuting during the 1970s. In 1980 nearly one-quarter of Orange County's employed residents commuted to surrounding counties, and 18 percent went to neighboring Los Angeles County. Atlanta, Dallas, and San Jose experienced the greatest gains in suburb-to-suburb commuting during the decade. The Atlanta region also stands out for its increasingly insular pattern of commuting--residents within Atlanta's city limits are making relatively more intraurban journeys whereas those living outside the city proper have

TABLE 5 1980 Work Trip Patterns Within SMSAs for Different Regions of the United States (12)

Region	Percentage of Total Work Trips Within SMSA			
	Central City to Central City	Central City to Suburbs ^a	Suburbs to Central City	Suburbs to Suburbs ^a
Northeast	32.2	4.7	15.3	47.8
North Central	30.7	7.0	20.3	49.0
South	36.1	6.1	23.7	40.1
West	32.4	9.3	19.9	38.4
Total United States	33.1	6.7	20.1	40.1

^aSuburbs represents all areas in an SMSA outside the central city.

TABLE 6 Changes in Commuting Patterns Within and Between Central City and Other Locations, 1970-1980 (6)

SMSA	Percentage of Central City Residents Commuting						Percentage of Residents Living Outside Central City Commuting					
	Inside Central City		To Outside of Central City ^a		To Outside of SMSA		To Central City		Outside Central City ^a		To Outside of SMSA	
	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980	1970	1980
Atlanta	69.2	73.3	18.4	14.6	12.4	12.1	36.2	26.9	62.7	68.3	1.1	4.8
Dallas	81.2	74.9	11.1	18.7	7.7	6.4	41.7	30.9	54.7	60.1	3.6	9.0
Denver	78.3	75.5	14.9	16.4	6.8	8.1	41.2	38.6	58.7	61.0	0.1	0.4
Houston	78.4	77.5	7.4	8.2	14.2	14.3	40.4	43.8	59.5	54.0	0.1	2.2
Los Angeles	63.5	63.8	22.9	24.2	13.6	12.0	16.3	19.4	76.0	79.8	7.7	0.8
Orange County	44.5	40.9	29.0	34.8	26.5	24.3	19.9	19.2	65.0	69.3	15.1	11.5
Phoenix	78.6	74.5	13.0	14.9	8.4	10.6	26.8	26.4	73.2	72.9	.0	0.7
San Diego	78.2	73.1	14.0	12.7	7.8	14.2	29.5	30.2	70.4	69.4	0.1	0.4
San Francisco	75.6	73.4	11.1	13.2	13.3	13.4	25.8	28.7	67.6	66.0	6.6	5.3
San Jose	46.5	42.6	36.2	41.5	17.3	15.9	15.7	8.2	84.2	91.5	0.1	8.5
Seattle	80.8	77.4	12.6	15.3	6.6	7.3	41.4	36.1	58.2	60.8	0.4	3.1
Tampa	73.3	75.2	16.3	18.9	10.4	5.9	32.3	29.6	67.4	66.9	0.3	3.5
Twelve-SMSA average ^b	70.7	68.5	17.2	19.5	12.1	12.0	30.4	27.3	66.4	68.5	3.2	4.2
United States ^c	80.7	71.8	15.2	14.5	4.1	13.7	32.8	28.0	59.4	55.8	7.8	16.2

^aOutside the central city but within the SMSA.

^bNonweighted average of the 12 SMSAs.

^cAll U.S. SMSAs.

stepped up their intersuburban travels. Dallas, moreover, witnessed the largest increases in commuting between its suburbs and exurbs (i.e., areas outside the SMSA), and Los Angeles registered equally dramatic declines in suprametropolitan travel (i.e., to and from different SMSAs).

Combined, these trends suggest that trip patterns in the most prosperous regions of the United States are becoming more convoluted. Symmetric, star-shaped commute paths, long a hallmark of U.S. cities, have been replaced by a patchwork quilt of intrametro-politan travel. No longer does commuting follow a distinct directional orientation; heavy rush-hour traffic, once the dubious privilege of downtown motorists, now impinges on everyone to some degree (3). For many, the days of a leisurely contra-flow commute are fast coming to a close. Along the Katy (I-10W) and Gulf (I-45S) Freeways in Houston, for instance, inbound and outbound traffic volumes are today virtually identical during both the morning and the evening peaks (13). With more than 400 new automobiles being added to the streets of Houston each day, clogged arteries and congested freeways are virtually assured during rush hours in almost any part of the SMSA.

Not only are Houstonians plagued with "ubiquitous congestion," they, along with Dallas commuters, are chalking up more miles to get to and from work daily than people anywhere else in the country. The per capita miles of daily vehicular travel in Houston and Dallas were 20.7 and 21.6, respectively, in 1980. This compares with a per capita average of 16.5 mi for all 12 case areas and 14.2 mi for all 366 U.S. urbanized areas.

URBAN VERSUS SUBURBAN COMMUTING: WHICH IS FASTER?

Accompanying the sprawl of U.S. cities during the past several decades has been a lengthening of average commuter travel times. Between 1970 and 1980, for instance, the mean time to get to work increased from 23 to 26 min (14 percent) in Atlanta and from 21 to 26 min in the San Francisco Bay Area (24 percent). Nationwide, average commuting times rose from 22 to 24 min (9 percent) during the 1970s.

Although suburbanites generally commute longer distances than their central city coworkers, they often do so at faster average speeds such that the total time both groups spend behind the wheel is nearly equal. In 1979, for the nation as a whole, the data in Table 7 indicate that the typical suburban motorist traveled more than 3 mi farther to get to work than the average city dweller; however, suburban motorists traveled at speeds more than 5 mph faster. On average, urban commuters beat their suburban counterparts to work by only 1 min. (Within any single modal category, however, central city residents generally got to work at least 3 min faster than suburbanites; the comparability of travel time for all modes combined largely reflects

the fact that urban commuters patronize slower bus transit modes far more frequently than do suburbanites.) The longest commuting times were experienced by those suburbanites who opted for public transportation, which reflects the lengthy waits associated with scheduled bus services in low-density areas.

On the whole, the regional dispersal of trips has been a mixed blessing to the average commuter. He tends to travel farther; however, a smaller share of his time is generally spent in frustrating, slow-moving traffic. The disadvantage of traditional downtown-focused radial commuting is that it results in "trip convergence"—motorists from the outskirts are funneled into the same geographically limited space, which produces traffic standstills. With dispersal, trips tend to be more circuitous; however, the multidestinational commuting patterns help to free downtown traffic snarls. As employment activities continue to intensify along the urban fringes, many new confluence points will emerge, and the speed advantages of intrasuburban commuting could quickly become a relic of the past. In time, new traffic equilibriums are likely to be reached, and the shorter commute distances afforded by the relocation of jobs to close-by suburban residences will be offset by slower home-to-office travel speeds.

MODAL COMMUTING TRENDS

With the steady decentralization of jobs and housing, it is no surprise that the private automobile is, by a wide margin, the preferred mode of passenger travel in the nation's most rapidly growing metropolises (Table 8). Unlike most other areas of the country, however, the share of total trips has actually been shifting slightly from the automobile to public transportation modes in Los Angeles, Orange County, San Jose, and Seattle. In contrast, every SMSA in the North Central region of the country except Minneapolis-St. Paul lost transit patrons during the 1970s. This is not to suggest that diesel buses have won the affections of southerners and westerners, however. Slight gains in transit's modal share, although against the grain of national trends, are fairly inconsequential in real terms because ridership levels have historically been low in the South and the West. Among the 12 case areas, only San Francisco and Atlanta (both of which have modern rapid rail systems), along with Seattle, presently have transit usage rates appreciably above the national average.

At the other end of the modal spectrum are Houston, Dallas, and Tampa, each with more than 90 percent of all commuter trips made by private automobile and rapidly dwindling transit ridership levels. Annual bus patronage declined by more than 15 million riders in these three areas during the 1970s. Houston does, however, enjoy comparatively high rates of carpooling; 22 percent of its daily vehicular work trips involve one or more passengers (compared with a national average of 18 percent for urbanized

TABLE 7 1979 Journey-to-Work Distance, Travel Time, and Speed Statistics for the United States by Place of Residence Within SMSAs (14)

	Average Distance (mi)		Average Travel Time (min)		Average Travel Speed (mph)	
	Central City	Non-Central City	Central City	Non-Central City	Central City	Non-Central City
Automobile or truck	9.4	12.7	20.5	23.4	27.5	32.6
Drive alone	8.8	11.8	24.7	29.0	21.4	24.4
Carpool	11.7	16.4	19.5	22.0	36.0	44.7
Public transportation	9.0	20.0	39.9	48.7	13.5	24.6
All modes ^a	8.8	12.6	23.1	24.2	22.9	31.2

^aIn addition to automobile or truck and public transportation modes, this category includes cycling, motorcycling, walking, and other means of travel.

TABLE 8 Modal Distribution of Commuter Trips in 12 SMSAs, 1970-1980 (15)

SMSA	Percentage of Total Commuter Trips Made by								
	Private Vehicle			Public Transportation ^a			Other ^b		
	1970	1980	Change (%)	1970	1980	Change (%)	1970	1980	Change (%)
Atlanta	84.6	88.3	+3.7	9.4	7.6	-1.8	6.0	4.1	-1.9
Dallas	88.0	91.8	+3.8	5.2	3.4	-1.8	6.8	4.8	-2.0
Denver	85.2	85.5	+0.3	4.4	6.1	+1.7	10.4	8.4	-2.0
Houston	86.9	91.9	+5.0	5.4	3.0	-2.4	7.7	5.1	-2.4
Los Angeles	85.9	85.5	-0.4	5.5	7.0	+1.5	8.6	7.5	-1.1
Orange County	92.5	90.9	-1.6	0.3	2.1	+1.8	7.2	7.0	-0.2
Phoenix	88.9	89.1	+0.2	1.2	2.0	+0.8	9.9	8.9	-1.0
San Diego	75.8	81.2	+5.4	4.2	3.3	-0.9	20.0	15.5	-4.5
San Francisco	73.5	73.7	+0.2	15.2	16.4	+1.2	11.3	9.9	-1.4
San Jose	88.7	89.0	+0.3	2.3	3.1	+0.8	9.0	7.9	-1.1
Seattle	83.5	82.1	-1.4	7.1	9.6	+2.5	9.4	8.3	-1.1
Tampa	87.6	90.4	+2.8	3.1	1.8	-1.3	9.3	7.8	-1.5
Twelve-SMSA average ^c	84.8	86.2	+1.4	5.5	5.8	+0.3	9.7	7.9	-1.8
United States ^d	77.7	84.1	+6.4	8.9	6.4	-2.5	9.4	7.9	-1.2

^aIncludes bus, rail transit, railroads, and taxicab modes.^bIncludes bicycle, walk, and other modes as well as residents who work at home.^cNonweighted average of 12 SMSAs.^dAll U.S. SMSAs.

areas). Still, carpooling rates appear to be either declining or stabilizing in almost all of the 12 case areas. On average, peak-hour vehicle occupancy levels dropped from 1.14 to 1.13 (-0.2 percent) during the 1970s in these 12 areas compared with a decline in all of the nation's SMSAs from 1.18 to 1.15 (-2.5 percent).

The data in Table 8 also reveal that cycling and walking to work consistently declined in all 12 areas during the 1970s. The largest drop-off was in San Diego. Still, more than 15 percent of all journeys to work there are made by nonmotorized modes. The popularity of walking and cycling among San Diegans can be partly attributed to the area's large concentration of enlisted personnel, many of whom live either on a military base or close by.

Finally, changes in the geographic distribution of different commuter modes within SMSAs are also worth noting. In most places, both automobile and transit usage have risen in the suburbs and remain fairly stagnant (or declined) elsewhere (16). Nationwide, the percentage of transit users who live in the suburbs rose from 25 to 30 percent during the 1970s. Every large SMSA in the South and the West, with the exceptions of San Antonio, Ft. Lauderdale, and New Orleans, experienced a drop in central city ridership and a corresponding increase in suburban usage during the 1970s (16). This flip-flop largely reflects the redeployment of bus services from central cities to outlying areas by many regional transit authorities during the 1970s, a maneuver used to gain the tax support of wealthier suburban communities.

The shifting of transit's market to the South and the West provides new, untapped frontiers for industrywide innovation. Traditionally, transit bosses in the United States have viewed suburbia as forbidden territory. A vast majority of bus operators in this country continue to offer fixed-route, radial services focusing on downtown hubs with an occasional foray to an outlying shopping mall. Yet the congregation of employment and retail activities along the urban fringes of many booming metropolises presents a unique opportunity for the transit industry to carve out a new niche for itself. In particular, employment subcenters offer natural intercept points for building coordinated networks of converging transit routes. Clearly, if the nation's public transit industry is to reinvigorate itself, burgeon-

ing suburban work centers are the place to begin focusing its dwindling resources.

POLICY INFERENCES

Census trends during the 1970s offer graphic evidence of the explosive growth in sunbelt and western conurbations, particularly in suburban and fringe settings. The mobility implications of rapid interregional and intrametropolitan shifts in population and economic activities are substantial. A labyrinth of commute patterns now characterizes cityscapes, casting serious doubts over the future of conventional bus transit and other shared-ride modes of transportation. Despite some recent gains in transit usage in the western United States, all signs point to greater reliance on automobiles in the future. Only a ubiquitous transportation system that emulates the interconnectivity of a telephone network, some argue, can thrive in an environment of scattered trip ends (17).

Unfortunately, these trends do not square well with the current transportation networks of many U.S. cities, irrespective of the region of the country. Most metropolitan highway systems were built to funnel commuters from the outskirts to downtown. Many radial thoroughfares are simply incapable of handling large volumes of lateral and peripherally oriented trips. Yet money is drying up for new road building, and priority is usually given to the maintenance and restoration of facilities already in place. Even if there was available funding, it is questionable whether politically potent suburban constituencies would allow their idyllic neighborhoods to be disrupted by new highway construction (3). For example, in Walnut Creek, a booming suburb east of San Francisco and Oakland, local residents recently approved a strict growth control ordinance as a means of containing traffic instead of supporting a \$400 million bond referendum for new road construction. Increasingly, suburbanites are opting to halt growth altogether rather than risk future traffic snarls brought on by new road improvements.

Transit Choices

Conventional fixed-route, set-schedule bus transportation is in dire need of a radical overhaul if it

is to become a viable mode in the nation's fastest growing metropolises. Serious consideration needs to be given to the replacement of radial systems by grids offering high degrees of route interconnectivity to better serve the continuing dispersion of regional commuting patterns. Only this kind of network eases the burden of making transfers. Outlying office centers, shopping malls, and other activity centers form natural building blocks for multifocal, timed-transfer networks. Recent experiences in two Canadian cities, Edmonton and Ottawa, provide useful precedents for designing such multidestinational networks.

In the mid-1970s Edmonton Transit reconfigured its bus routes to feed, in synchrony, into 19 dispersed transit centers. At present, anywhere from five to ten bus routes converge simultaneously on one of Edmonton's transit centers precisely 5 and 35 min after the hour during the off-peak period and at 15- to 20-min intervals during the peak period. Those patrons continuing their trip scramble to another bus to make their connections, and, like clockwork, buses depart 3 to 5 min later. Pulse scheduling and timed transfers have enabled Edmonton Transit to adapt its service to best mimic the area's dominant crosstown commuting pattern. As a result, Edmontonians can today reach nearly 90 percent of a 130-mi² service area within 50 min or less during the midday via public transit (18).

Insightful lessons about how transit can be made to work in low-density settings are also offered by Ottawa's recent experiences. In the early 1980s Ottawa introduced a timed-transfer network similar to Edmonton's, with the notable exception that a mostly grade-separated, dedicated busway serves as the main-line connector between outlying transit centers and downtown. The transitway operates just like any other rapid transit facility, with vehicles, in Ottawa's case buses, stopping at every station. Special ramp access from criss-crossing surface streets is provided at most stations so that feeder buses can connect directly into the main line without any transfers having to be made.

What makes Ottawa so unusual is that, after completing a detailed alternatives analysis, it opted for busways over the eminently more popular light rail transit (LRT) technology. Ottawa's primary reason for choosing busways over LRT is compelling: by best estimates, the busway would cost 50 percent less to construct and 20 percent less to operate and would provide roughly the same capacity (19). Because buses can also feed into Ottawa's sprawling residential neighborhoods whereas LRT would rely on transfers, the busway was also deemed superior in terms of overall service quality. By all accounts, Ottawa's busway, coupled with other supportive programs such as restricted downtown parking and a central city transit mall, has been an unqualified success. More than 30 percent of all vehicle trips in the region and 60 percent of downtown-destined peak-hour journeys are currently made via public transit, a phenomenal achievement for a bus-only community. Judging by experiences in both Ottawa and Edmonton, it is evident that a suburban environment and viable public transit are indeed compatible if planned in tandem.

Calls for major reform within the urban transit industry in the wake of major population shifts and suburbanization, it might be noted, are nothing new (20,p.486):

Can we not pause long enough in this headlong decentralization process to see where we are going. The mass transportation industry is caught in a strong tide which is sweeping this and many other businesses toward disaster. [The] situa-

tion calls for strong expression and vigorous leadership.

Delivered at the 1940 annual meeting of the American Transit Association, this forewarning indeed holds as much relevance today as it did nearly one-half century ago.

Automobile-Highway Choices

Given the low-density settlement pattern of many rapidly growing metropolises, equally important questions can be raised about the abilities of the automobile-highway system to adequately meet emerging trip patterns. As the nation's political power base shifts more to the South and the West, larger sums of federal transportation dollars can be expected to flow in these directions as well. Some southern and western cities, however, appear to be more inclined to sink billions of dollars into building new fixed-guideway systems rather than reforming roadway networks; perhaps the perceived environmental benefits of rail transit sway these investment choices the most. Private-sector contributions to road financing perhaps represent a more promising avenue for constructing new roadways in growth areas. Already, more than \$300 million in private-sector contributions has been spent on or pledged to roadway improvements in a dozen rapidly growing communities; most activities have been recorded in California, Texas, and Colorado (21). The most generous contribution to date has come from developers of the Hacienda Business Park in Pleasanton, California, some 35 mi east of downtown San Francisco. There, more than \$80 million has been committed to major freeway and arterial investments as well as the construction of areawide pedestrian and cycling trails, residential sound barriers, and flood control canals (3,21). Although adequate funding programs might be designed along specific corridors in fast-growing regions, building a suburban constituency that is supportive of new road building is apt to be a far more difficult challenge.

Future Challenges

The suburban corridors of rapidly expanding communities, many of which are concentrated in the nation's southern and western states, represent a new frontier for the transportation planning profession. These settings offer unprecedented opportunities not only for technological and policy innovations but also for reinvigorating more established modes of transportation, such as bus transit.

In light of recent demographic and commuting trends, the logic of sinking billions of dollars into building new rail transit systems in fast-growing sunbelt metropolises should be reassessed. The sprawling, fragmented profiles of many of these areas were indelibly shaped by the automobile-freeway system, and nothing suggests that these settlement patterns will be reversed by building new rail systems. Rail advocates and critics continue to argue about the long-term costs of rail versus nonrail systems, but, in terms of the demand side of the equation, every trend suggests that carefully integrated timed-transfer networks and busways would be wiser investments for the nation's fastest growing communities.

ACKNOWLEDGMENT

Julia Perez assisted in compiling some of the census data presented in this paper.

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Publication of this paper sponsored by Committee on Social, Economic and Environmental Factors of Transportation.

Transportation and Downtown Revitalization in Small and Medium-Sized Urban Areas

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ABSTRACT

Four small and medium-sized New England cities were studied to determine the role played by transportation improvements in efforts to revitalize downtown areas. Results indicate that ease of access and parking are particularly important to the revitalization of the central business districts of small and medium-sized cities.

A complex of economic and social forces has resulted over the past several decades in the decline of the central areas of most of the nation's older cities. Concern about this decline has led many communities to undertake efforts to renew their downtown districts. Typically, these efforts focus on improving the physical environment of the central business district (CBD) in order to increase activity and promote economic development in the core. CBD revitalization generally involves a mix of public and private investment and almost invariably includes some measures to improve access to and circulation within the district.

The importance of transportation improvements in downtown renewal is, even after a considerable history of analysis and debate, a matter of conjecture. The common conclusion is that good transportation is "a necessary but not sufficient condition" for economic revitalization. Most studies of the impact of transportation improvements in downtown areas have been concerned with large urban areas and have concentrated on impacts immediate to a given project (1,2). For example, the effect on retail sales of the creation of an automobile-restricted zone (ARZ) is usually analyzed by studying changes in retail sales within the ARZ. The possibility that sales increases in the improved area are matched by decreases elsewhere in the community is rarely explored.

Consideration of these broader economic impacts, appropriate in every instance, is particularly critical in the case of smaller communities because of scale effects. In larger cities, the impacts of closing one or two downtown streets or introducing an express bus service are likely to be absorbed quickly by the mass of surrounding economic activity. In contrast, such changes in the CBD of a smaller city will tend to have a more significant and widespread effect.

Despite their potential importance, downtown revitalization efforts in small and medium-sized cities have received relatively little critical attention. These cities are making investments of varied kinds, most of which are intended to support the traditional functions of the CBDs as places for business, services, culture, recreation, and meetings. Transportation investments have been a major component of these revitalization efforts. Such investments include improvements in traffic operation, signalization, traffic restraint, transit systems, paratransit operations, and parking. In some instances, trans-

portation changes involve building highways and arterials to provide easier access to the CBD.

The scope of this paper is limited to an analysis of downtown revitalization efforts in small and medium-sized cities, with special emphasis on the role of transportation improvements in these efforts. The vehicle for this analysis is a set of case studies of four New England cities--Portland, Maine; Springfield, Massachusetts; Hartford, Connecticut; and Burlington, Vermont (Figure 1).

SELECTION OF CASE STUDY SITES

Each of the cities selected for this study has, during the past decade or so, undertaken revitalization of the CBD and has included various transportation improvements in the revitalization program. Table 1 gives the major improvements undertaken by each city.

Portland, Maine (population 65,000), is a major

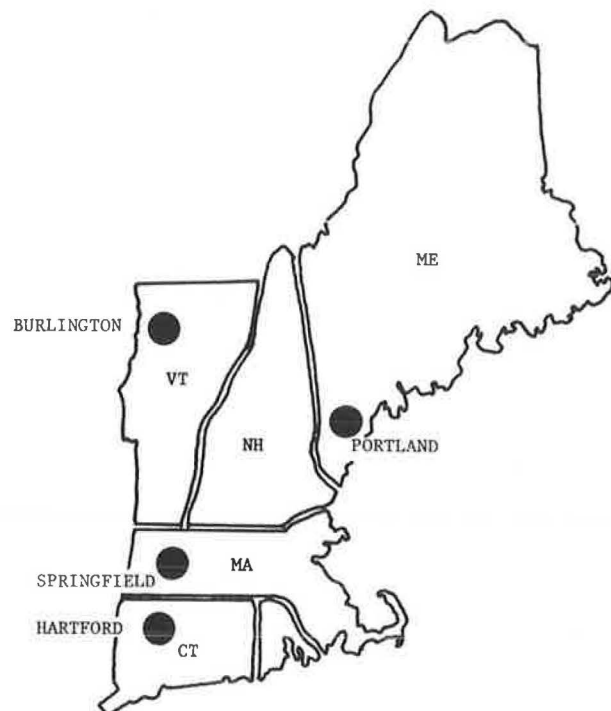


FIGURE 1 Location of case study sites in New England region.

TABLE 1 Case Study Sites: CBD Redevelopment Projects

City	Population	Projects
Portland, Maine	65,000	Pedestrian-oriented street improvements, parking garages, private office building investment, urban park, museum and hotel renovations
Springfield, Massachusetts	150,000	Retail-office-hotel complex, civic center, private office building investment, parking facilities, ARZs, reconstruction of major shopping street
Hartford, Connecticut	136,000	Retail-office complex, civic center, private office building investment, Downtown Hartford Transportation Project
Burlington, Vermont	39,000	Indoor retail mall, ARZ-major shopping street transit improvements, waterfront development

Note: See Figure 1 for location in New England region.

regional center for southern Maine and northern New England. During the mid-1960s, the city's leaders recognized the need for a healthy downtown and realized that transportation improvements were an essential component of reaching this goal. Portland has seen major street improvements in the past 20 years, especially pedestrian-oriented street and transit improvements. Other projects have included parking garages, private office building investment, an urban park, and museum and hotel renovations.

Springfield, Massachusetts (population 150,000), is one of western New England's major regional centers. Beginning in the early 1970s the city launched projects aimed at revitalizing its commercial core. A retail-office-hotel complex and a civic center were both completed by the middle of the decade. With the aid of a consortium of private banks and insurance companies, additional construction is now under way in the city. Several other projects in Springfield include additional parking facilities, development of ARZs, and reconstruction of the main shopping street.

Hartford, Connecticut (population 136,000), is the capital of Connecticut and, like Springfield, a major center of western New England. From urban renewal programs in the early 1960s to the promotion of office construction in the last decade, the city has tried to stimulate downtown activity and rejuvenate the CBD. More recently, the Downtown Hartford Transportation Project was instituted to address issues such as parking, vehicle and pedestrian flow, transit, and goods delivery.

Burlington, Vermont (population 39,000), is Vermont's largest city and also serves as a major commercial center for northern Vermont and upstate New York. During the last 20 years, the city has revitalized its downtown by making use of urban renewal programs in the 1960s and, more recently, by attracting private investment to develop its waterfront. Two major projects have concentrated on producing an attractive pedestrian-oriented downtown. In conjunction with public transportation improvements and increased vehicular and pedestrian access to the CBD, the efforts of the city are now geared to maintaining the vitality of its downtown.

METHODOLOGY

The initial step in each case study was to define the characteristics of the CBD and to review the

city's goals and objectives for its downtown: Did the city want to expand a specific sector of its downtown? Was the city aiming to increase the variety of retail businesses in the CBD? Or did the city seek to maintain the status quo and simply protect its downtown against possible decline? Included in this first step was an examination of the city's plans for land use, transportation, and economic development.

To examine the overall progress each city had made in terms of its CBD objectives, all actions the city had taken in the last 20 years were identified. These actions included both transportation and nontransportation investments. In addition, population and retail trade data gathered from the Census of Population and Retail Trade were analyzed for the period from 1960 to 1980 for each city to obtain an overall picture of the city's growth and economic vitality.

Informal discussions were held with local merchants and developers. These discussions focused on the importance of downtown transportation improvements and their impacts on developers' decisions to invest in downtown and retail sales. Retailers were asked questions about what impacts, if any, specific transportation improvements had on retail sales. Similarly, the interviews with local developers focused on recent private developments downtown and to what extent transportation improvements affected their location decisions.

Civic leaders, such as city managers, planners, and transportation officials, were asked about the overall direction in which the city had been moving and specific plans that had been implemented to make the downtown more attractive to investors and retailers. Findings and conclusions drawn mainly from discussions with developers, retailers, and local officials are presented in the following section.

CASE STUDY FINDINGS

Portland, Maine

As noted previously, the starting point for Portland's revitalization efforts was the realization by the city's leaders in the mid-1960s that a good transportation linkage between the regional transportation system and the business district was essential for the continued viability of the CBD. Until I-295 was built with several exits in the periphery of downtown, the city was virtually bypassed by the major highway, the Maine Turnpike. Because tourism is a major factor in the local economy, accessibility to Portland's downtown and its connection to the region was an important issue. With the use of public funds for transportation improvements, the Franklin Street construction and the Maine Way pedestrian-oriented projects were implemented to increase accessibility. In addition, new parking garages were built and signalization improvements were introduced to make the downtown more attractive to automobile owners; at the same time transit service was expanded.

These transportation improvements were facilitated or initiated under the leadership of a former city manager of Portland. Although these improvements were not undertaken solely for the benefit of downtown commercial interests, and cannot be linked to specific downtown private investments, they appear to be part of a conscious plan on the part of the city's planners to make Portland accessible and competitive.

The consequences of this long-term plan are clearly visible in Portland. Today downtown Portland is a booming commercial, retail, and cultural center. These improvements have led to the development of dual retail centers in the city along Congress

Street--the original "Main Street"--and in the Old Port area. Revitalization in the Old Port area consisted not only of new construction but of rehabilitation of the older French and Italian style buildings as well, which maintained the European flavor of the area.

Of the set of transportation improvements affecting downtown, only one assumed any direct significance in the view of the real estate and business community. That improvement is off-street parking. The city's commitment to meeting the parking needs of major private office developments has led to substantial private investment downtown. Retailers view this continuing program of garage construction as a sign of the city's commitment to supporting business and retail growth. Though retailers complained of insufficient parking spaces, they also acknowledged that the city was working hard to solve parking problems. Off-street parking garages have also played a major role in promoting active street life in retail areas by encouraging pedestrian rather than automobile movement.

Although parking improvements were significant, both developers and retailers viewed favorably other investments such as those in arterial streets and pedestrian and transit system improvements. Retailers thought that arterial street improvements did not have a direct impact on their sales. However, they did acknowledge that these improvements not only provided easier access to the downtown but also made for easier movement within the downtown. The Maine Way project (pedestrian improvements) was viewed favorably by merchants in the Congress Street area, where improvements are highly visible. Retailers in Congress Street also cited increased police presence and sidewalk maintenance as positive factors. Retailers generally agreed that the bus system improvements have facilitated access to downtown, though lack of service to the Old Port area was viewed as a drawback.

In a more general sense, civic projects such as the construction of a the civic center and public library and the expansion of the Portland Museum of Art set the pace for additional development. Portland's commercial sector has evolved well, and the city's links to the region by air, land, and water have helped to stabilize its position as a major city in northern New England.

Hartford, Connecticut

Hartford's revitalization experience in the late 1960s illustrated that successful urban renewal projects may not always serve as a catalyst for continued growth. Although the Constitution Plaza development was fully occupied soon after construction, major spin-off benefits were minimal. This situation could be attributed to the lack of coordination among interrelated aspects of planning including office, retail, housing, and transportation needs.

The construction of the civic center in the mid-1970s and the assignment of its operations to a life insurance company (Aetna) prompted Sheraton Hotel to locate its new branch in the vicinity of the civic center. Heavy private office development investments in downtown Hartford followed.

Although Hartford's downtown had begun to experience the transition from a retail economy to a service-oriented economy at the beginning of the century, city leaders failed to clearly understand the importance of meeting the transportation needs of the city. The office building boom in the 1980s took place in the absence of adequate transportation planning efforts, and there were consequent problems.

For example, although several parking garages were constructed in downtown Hartford, the spaces are mostly occupied by the employees of the private office developments. The need for short-term, on-street parking for midday shoppers or tourists remains crucial. The limited availability of on-street, line-of-site parking in downtown after 10 a.m. has had a negative impact on the willingness of the region's residents to travel downtown for retail activities.

Hartford decision makers recognized that transportation problems could hinder future growth in the downtown. The Downtown Hartford Transportation Project, recently initiated, was an attempt to address the transportation issues in the city, such as vehicular and pedestrian circulation and parking demand due to private office developments. Monitoring and implementation of the project's recommendations were assigned to a private transportation management organization (The Rideshare Company) whose Downtown Transportation Working Committee meetings include 13 major corporate representatives of Hartford.

Although this transportation planning effort could be considered the most comprehensive transportation planning approach undertaken by any of the cities studied, an earlier decision to integrate transportation improvements with economic development efforts would have been helpful. A clear example of this need is that one of Hartford's major employers (Travelers) had decided to relocate part of its downtown corporate headquarters. It was only in 1982 (the same year that the Downtown Hartford Transportation Project was initiated) that Travelers decided to stay in downtown Hartford.

Springfield, Massachusetts

In Springfield the development of a major Interstate (I-91) brought with it mixed results. The highway has allowed the city to "billboard" itself to travelers and has provided an incentive for a downtown mall (Baystate West) and hotel growth (Marriott). However, this highway was also particularly influential in accelerating further migration to the suburbs.

The revitalization process in Springfield is one of the best examples of the positive outcome of public and private organizations working together toward a common goal. A consortium of banks and insurance companies led by the Springfield-based Massachusetts Mutual Life Insurance Company and supported by the city's chamber of commerce, community development agency, and the Greater Springfield Chamber of Commerce was formed. This consortium, named Springfield Central, Inc., was instrumental in providing financial incentives for private-sector investment. So far this corporation has facilitated more than \$250 million in downtown investments, including office, commercial, retail, and residential development projects. Moreover, the most ambitious mixed-use complex in the city's history (Monarch Place) is now under construction.

Except for the early highway investments, there were but moderate transportation improvements in the downtown. These were mainly the use of transportation management techniques such as signalization, ARZs, provision of parking facilities, and transit service expansion. There was no clear attempt to integrate these transportation improvements with downtown revitalization efforts. However, these efforts appear to have paid off because there are no apparent problems of accessibility, parking, or circulation in downtown Springfield.

Springfield's revitalization efforts, though successful, have so far been unable to overcome the impacts of suburbanization. Perceptions of a declining

city--high rates of street crime, poor shopping facilities, and insufficient parking--were difficult to overcome. Though these problems are no longer as extreme as they were, the downtown has not blossomed as a commercial, retail, and recreational center. Continued revitalization efforts, however, could attract more middle-income households to downtown Springfield. Only then would Springfield have the potential to establish a healthy office-sector employment base. This, in turn, would help to boost retail and cultural activity downtown.

Burlington, Vermont

The city of Burlington approached its revitalization efforts through the active collaboration of planners, transportation officials, and civic groups. Local officials worked extremely hard to prevent the development of an outlying shopping mall and encouraged such development in the CBD. In addition, the city recognized that concurrent changes in the CBD and transportation improvements were key to the success of its downtown revitalization projects. This combination of efforts also opened up the range of funding sources. The Church Street ARZ was funded primarily by UMTA, yet much of the project focused on retail improvements. The city also tapped local historic preservation organizations and the National Endowment for the Arts for additional funding.

The importance of community support for downtown projects was clearly illustrated in Burlington. The favorable response to Church Street fairs, during which the street was closed off to vehicular traffic, spurred citizen involvement in the planning of the Marketplace. Community groups, such as the Downtown Burlington Development Authority, became an active voice in the revitalization efforts within the city.

Promotion of the downtown as a desirable place in which to work and shop was another significant point

in the Burlington study. The Church Street Marketplace Commission has advertised not only the pedestrian mall and public events but the improved transit system as well. The bus/park program has provided an incentive for both public transportation and automobile users to shop downtown. The location of bus stops and parking facilities within the CBD has allowed easy access to the downtown by both pedestrians and automobiles.

Burlington was the only city that explicitly integrated transportation improvements and downtown revitalization efforts. As noted earlier, the Church Street Marketplace renewal was funded by UMTA grants. This effort was successful for two reasons. First, the scale of investment in transportation developments was proportional to the size of the community. Second, with the assistance of key individuals in UMTA (one of whom was originally from Burlington), transportation planning was designed to address the needs of pedestrians, parking, and transit facilities.

CONCLUSIONS

Each of the four case study cities showed signs of downtown revitalization. It can be observed from Figure 2 that CBD retail sales increased slightly in Portland and that sales stabilized (or leveled off) in Hartford and Springfield. The efforts undertaken by each city have helped their CBDs to bring in new investments and rejuvenate the economy. The extent to which transportation improvements affected downtown revitalization varied from one city to another. Portland and Burlington stand out in their efforts to use transportation improvements to revitalize their downtowns. Hartford and Springfield, though successful in their efforts, did not provide much in the way of transportation improvements. None of the

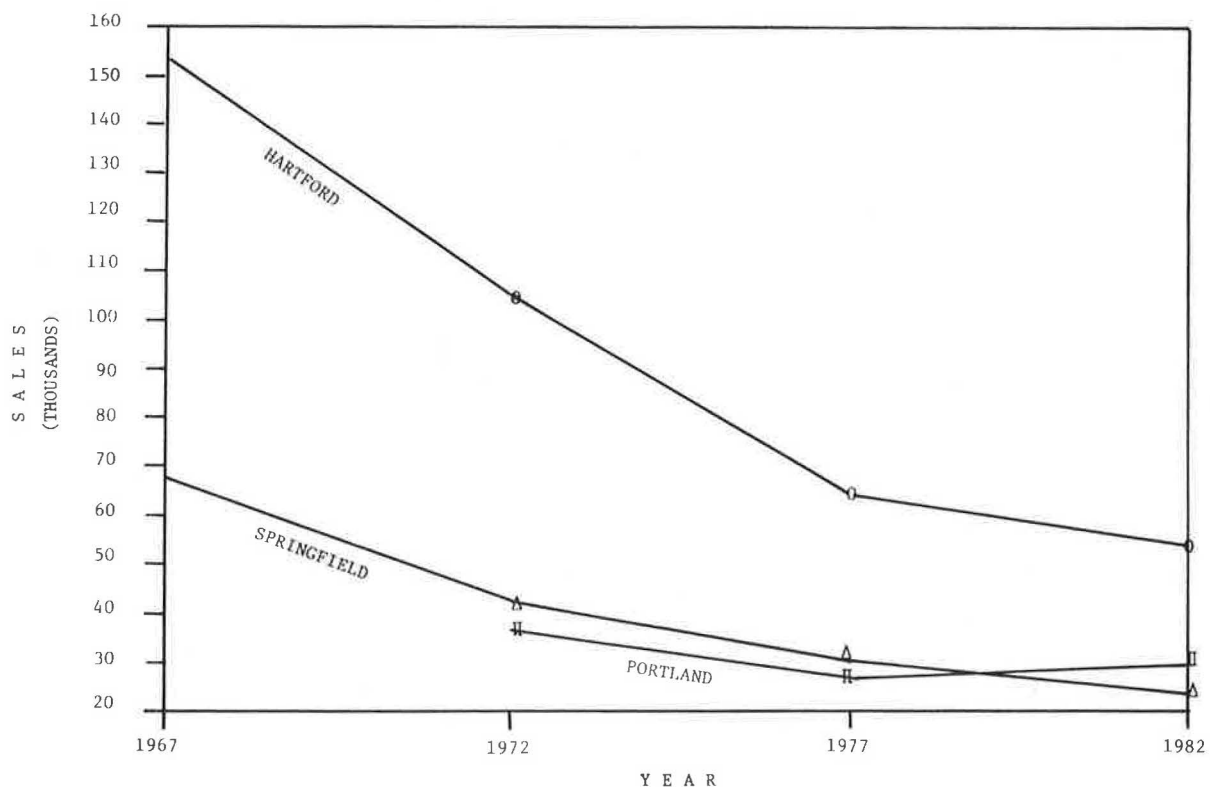


FIGURE 2 Total CBD retail sales (\$000 adjusted to 1967 constant dollars).

cities except Burlington had an explicitly coordinated transportation and downtown revitalization plan.

The Portland case study clearly shows that off-street parking is a crucial element to downtown revitalization. The city's commitment to meeting the parking needs of private developers and businesses helped to bring new investments downtown. Other improvements, such as arterial streets, transit system routes, sidewalk maintenance, and increased police presence, also contributed to making downtown Portland an attractive place in which to work and shop. Though there was no comprehensive plan developed for revitalization, city officials realized early that transportation improvements were necessary to make downtown Portland accessible. The city recognized that it needed to attract investors, and the investments required transportation access.

Hartford's revitalization experience in the late 1960s shows that successful urban renewal projects may not always serve as a catalyst for continued growth. The planned development of the Constitution Plaza and the civic center set the pace for development and the subsequent office boom in the 1980s. However, this has not led to the revival of the retail sector. Although the office boom has continued, improvements to the transit and parking (on-street and off-street) systems have not been adequate to meet the requirements of shoppers and tourists. This has deterred residents from traveling downtown for shopping and recreation. Only recently has the city developed a comprehensive approach (including the Downtown Hartford Transportation Project) to alleviate such problems in the downtown area.

Springfield's revitalization is one of the best examples of public and private partnership. As noted, Springfield Central, Inc., has been instrumental in providing financial incentives for private-sector investment and mixed housing development. Transportation improvements (signalization, transit service, parking) were few and there was no clear attempt to integrate transportation improvements with downtown revitalization efforts. Though these efforts have improved the image of the city, downtown Springfield is still unable to compete effectively with regional malls.

Burlington's successful revitalization was a joint effort that involved planners, transportation officials, and citizen groups. A clear effort was made to integrate downtown revitalization and transportation planning efforts. Also, the city successfully used fairs, bus/park programs, parking facilities, transit service improvement, and pedestrian amenities to promote downtown Burlington as a desirable place in which to work and shop.

These case studies show clearly that the efforts undertaken by small and medium-sized cities in some respects are no different from those of larger cities. The revitalization techniques include public investments to improve the physical image of the shopping district, improved transit services, street and sidewalk maintenance, traffic restrictions, and coordination of sponsored activities and promotions. However, there are two aspects that appear to be particularly important in small and medium-sized cities: ease of access and parking (to meet the needs of shoppers and workers) and mixed housing development (to bring more middle-income people into cities).

Given the attraction and convenience of competitive suburban centers, the ability of a smaller city to attract regional shoppers downtown depends greatly

on ease of access and parking downtown. Parking fees deter shoppers from coming in from the suburbs. Also, badly designed parking structures tend to heighten fear of crime. Strategies such as park-and-shop or bus-and-shop programs to draw more people to downtown areas can be helpful in this regard.

The presence of a substantial middle-income population in the central cities is another factor in downtown renewal. Except Springfield, none of the cities appears to have paid attention to this important factor. Downtown retail districts can draw on a variety of sources--residents, office workers, tourists, and business visitors. However, local retailers usually cannot depend on business visitors, office workers, and tourists for the necessary volume of trade. Local residents are essential to sustain sales.

Large cities, such as New York, Chicago, and Boston, have a substantial affluent resident population surrounding downtown on which downtown retail establishments can rely. But in most small and medium-sized cities the middle-class population lives in the suburbs, closer to regional centers than to downtown. Building up the residential base of the central area may be a way of overcoming this disadvantage.

ACKNOWLEDGMENT

The authors are most grateful to James W. March, Economist, Office of Program and Policy Planning, Federal Highway Administration, for his valuable comments and suggestions and to John E. Doyle, Jr., RSPA Procurement Office, U.S. Department of Transportation, for his assistance in the administration of this contract with the U.S. Department of Transportation. In addition, the supervisory and research responsibilities of John Mullin, Associate Professor in Landscape Architecture and Regional Planning, and Samuel Seskin, Center for Economic Development, should be recognized. The involvement of Mullin in the Springfield case study, Seskin in the Portland case study, Robert Bennett in the Hartford case study, and Nancy Oxenhandler in the Burlington case study is also acknowledged. Finally, the exceptional editing assistance of Sue Lee and Barbara Ustaitis should not go unmentioned.

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The research reported herein was conducted with the support of the U.S. Department of Transportation, Office of University Research. This support notwithstanding, all opinions expressed in this report are those of the authors alone.

Publication of this paper sponsored by Committee on Social, Economic and Environmental Factors of Transportation.

Transportation: Tell Us Where To Go— A Report on Televote '85

TIMOR RAFIQ and BRAD WILLIAMS

ABSTRACT

The process and results of Televote '85 are summarized and evaluated in this paper. Sponsored by the Southern California Association of Governments, Televote provided television viewers and radio listeners in Southern California the opportunity to participate in an electronically assisted "public opinion poll." Televote '85 used an interactive (two-way) format. After receiving information on a transportation issue through the media, individuals were asked to express their opinions through a vote-by-phone process. In this manner five issues were presented and voted on, one each night during a 1-week period. In an effort to validate the results of Televote '85, a scientific, random survey was conducted during the same week that the Televote program was aired on television and radio stations. A close examination of the results reveals that the general direction of the responses is the same in both the Televote and the random survey, but the random survey results are less extreme or polarized than the Televote results. In other words, both methods agree on the public preference; the only difference between the two is the level of preference. Reasons for these differences are examined and suggestions are made for improving the consistency of the results. Among the suggestions is a recommendation to choose issues that have previously received some public discussion.

On May 13, 1985, the Southern California Association of Governments (SCAG) and its Regional Advisory Council, in conjunction with KHJ-TV Channel 9 and KHJ Radio, presented Televote '85. The theme for this program was Transportation: Tell Us Where To Go. The first such program to focus exclusively on a regional issue, Televote '85 set out to pursue the question of how traffic managed to move smoothly during the Olympics and how Southland commuters can keep it moving year round.

INTRODUCTION

Televote '85 was aired for five consecutive nights, May 13-17, 1985, on KHJ-TV during the "News at Nine." Each program presented a brief examination and discussion of a transportation issue. Viewers were then presented with two options to vote on. This they were to do by calling the designated telephone numbers that were specifically set up for Televote. State-of-the-art telecommunication equipment was used to monitor and register the high volume of calls that came in. The radio program followed the same format as the television program. KHJ Radio presented Televote to its listeners during the 8:00 a.m. and 5:00 p.m. newscasts.

In addition to the week-long television and radio news programs, two special half-hour live public affairs programs, one for television and one for radio, were produced. The television half-hour "special" aired at 10:00 p.m. on May 17, 1985, and the radio half-hour "special" aired at 10:00 p.m. on May 19, 1985. Both programs had a common purpose: to gather a group of panelists to review and critique the Televote results, discuss major transportation

issues facing Southland commuters, and explain the position and the vision of the region's policy makers and decision makers. Furthermore, both programs provided an opportunity for the public to pose questions on the air to the panelists.

Olympics Experience

Horrible traffic jams and severe mobility stoppages were expected to occur during the Olympics. As it turned out, however, traffic conditions actually improved. The reason for this was, in part, that individuals made changes in their normal travel behavior. The understanding of the anticipated traffic conditions during the Olympics and the cooperation of the media, private business, and public agencies contributed greatly to the success. Consequently, the challenge became: can we continue the same on a long-term basis? To pursue this further, Televote provided an excellent vehicle for getting the message across and at the same time obtaining public opinion on specific issues. To this end, Televote '85 had the following objectives:

- Communicate to the public that transportation problems are not insurmountable, provided everyone makes an effort to cooperate;
- Emphasize that the cumulative effect of minor changes in travel behavior by individuals can be quite significant (e.g., changing work hours, sharing a ride); and
- Provide an opportunity for the public to express their opinion on specific transportation issues.

Choice of Issues

When the objectives of Televote '85 had been defined, the next step was to select a set of issues for the

Televote presentation. To make the best use of the time and resources available, as well as to ensure thoroughness and clarity, the following parameters were established at the outset:

- Present one issue per night to keep public attention focused and
- Present five issues, Monday through Friday, to provide continuity yet avoid monotony.

After lengthy discussion and careful consideration the following line of thought was developed and adhered to:

- The issue presented on Monday was to provide a tie-in with the Olympics.
- The issues presented on Tuesday, Wednesday, and Thursday were to examine transportation measures that were successful during the Olympics. The responses to these issues would be usable in developing specific transportation strategies.
- The issue presented on Friday was to provide a wrap-up for the series.

Telephone Voting System

Essential to the entire Televote program was the telephone system. It was considered imperative to design a telephone system that met the following criteria:

- Have sufficient capacity to handle a large volume of calls coming in at once,
- Have a reliable method of enumerating the calls, and
- Be free of charge to callers who phone in their responses.

To this end, the services of an independent consultant was sought. The consultant provided 12 multiline answering machines with automatic counting devices. Pacific Bell was requested to install 66 (800 service) toll-free lines. Of these, 33 lines were given a designated number to register "Yes" or "Choice a" calls; the other 33 lines were given another designated number to register "No" or "Choice b" calls. The answering machines were set up on a rotary basis and had a brief prerecorded message saying, "Thank you for calling Televote; your vote has been recorded, please hang up." This message was repeated till the caller hung up. Each call was electronically counted and displayed on a counter.

TELEVOTE PROGRAMS

To maximize participation in Televote '85 and to reach different audiences, a variety of media was used. To improve effectiveness, a separate program was developed for each medium, but particular emphasis was given to ensuring that these programs inter-related and complemented one another. The media included television, radio, a school program, ballots, and a random survey.

Television

KHJ-TV Channel 9 was selected to air Televote '85. The series was scheduled for the week of May 13-17, 1985, which coincided with National Transportation Week. Both the News Department and the Public Affairs Department of KHJ-TV showed enthusiastic support for the program. Given the interest shown by the two departments, two separate but complementary programs

were agreed on. Detailed next are the format of those program and their manner of presentation.

The News Department of KHJ-TV presented five nightly segments, each of 3- to 5-min duration, during the "News at Nine" from May 13 through May 17, 1985. Each night a separate transportation issue was presented and discussed by news reporter Ron Tank. Viewers were then posed a question relating to the topic of that night and were given 1 hr to phone in their votes by calling the designated telephone number. The results of each night's vote were presented the following night before that night's Televote segment.

On the last night of Televote, the Public Affairs Department of KHJ-TV presented a half-hour special live broadcast during which invited guests reviewed the week's results and discussed major transportation issues facing Southlanders. The panelists were Pat Russell, President of the Los Angeles City Council; John Dyer, General Manager of the Southern California Rapid Transit District; Sabrina Schiller, Project Coordinator for the Coalition for Clean Air; and Tad Widby, President of Commuter Computer. The program was hosted by KHJ-TV's Vice President and Public Affairs Director Fernando Del Rio and KHJ-TV's Ron Tank.

Radio

After agreement was secured with KHJ-TV to air Televote '85, it appeared logical to contact KHJ Radio (930 AM) for the radio programming. Here again, both the News Department and the Public Affairs Department of KHJ Radio expressed an interest in Televote '85. For consistency, the same formats and dates were followed for the radio programs as for the television programs.

The News Department of KHJ Radio presented twice-daily, brief news segments on Televote '85 during their 8:00 a.m. news and 5:00 p.m. news from May 13 through May 17, 1985. Each day a separate issue was presented and discussed. Listeners were then posed a question and given 1 hr to phone in their vote by calling the designated telephone number.

The Public Affairs Department of KHJ Radio presented a half-hour special live broadcast during which invited guests critiqued the Televote results and discussed major transportation issues facing Southern California residents. The panelists were Councilwoman Jacki Bacharach, Chair of the Los Angeles County Transportation Commission; Gary Edson, Rideshare Manager for the Orange County Transit District; Pamela Williams, Director of Governmental Relations for the Central City Association of Los Angeles; and Mark Pisano, Executive Director of SCAG.

School Program

The Audubon Junior High School, which belongs to KHJ's Adopt-a-School Program, became an active and enthusiastic participant of Televote '85. For a period of 1 week, 75 students selected from the leadership classes of 8th and 9th graders studied transportation issues covered by the Televote '85 program. SCAG staff were available to participate in this process. Televote questions were given to the students in the form of a ballot. They were asked to debate and discuss the issues with their families and then to fill in their responses. A week later, on May 6, 1985, they were asked to report on their findings. Five student "news anchors" reported on the students' responses to each question and conducted interviews with sample respondents. At the completion of that presentation, students were given

additional Televote '85 ballots and asked to distribute them to their families and to the community. The completed ballots were then collected by the students after completion of the Televote program and returned to the school on May 20, 1985. A total of 478 completed ballots from a total of 1,800 distributed were returned by the students.

Ballots

The ballot was designed so that the one-page flyer announcing the Televote '85 program contained the five Televote issues in a questionnaire format and also had a brief description of pertinent program information folded into a self-addressed, postage-paid envelope.

Because the Televote '85 program was part of SCAG's Regional Advisory Council's Transportation Outreach Program, the council members, who comprise a wide range of private entities and citizen groups, agreed to distribute the ballots to their member organizations. About 2,000 ballots were distributed in this manner.

Random Survey

Critics of media-based experiments such as Televote claim that programs of this nature fail to measure or even adequately monitor a representative sample of public opinion. Unlike respondents to traditional survey techniques, media-generated respondents are self-selected from an already unrepresentative audience.

To address this concern, a separate random survey to validate results of the Televote program was conducted in parallel with the Televote survey. Northcutt and Associates was hired as consultant to conduct the random survey. The random survey was administered much like a traditional public opinion poll. A description of the procedure used by the consultants in conducting the random survey follows.

Random Survey Population and Sampling Plan

The sampling design used in the survey was simple random. Specifically, the method of random digit dialing was employed. Five Southern California counties were surveyed: Los Angeles, Orange, San Bernardino, Riverside, and Ventura.

Because the data to be collected were to be representative of the entire five-county population, all working residential telephone numbers within the study area had to have an equal chance of being selected. To ensure that the sample selection was truly random, the following procedure was employed by the consultant:

- All working telephone exchanges (the three-digit prefixes immediately preceding the last four numbers) were identified for the five counties of Los Angeles, Orange, San Bernardino, Riverside, and Ventura. The prefixes were identified through an examination of all the relevant telephone directories. To ensure that no new exchanges had been added since the publication of the latest directory, all telephone companies in the survey area were contacted for information concerning new exchanges.
- Using a computer, sheets of randomized four-digit numbers were generated for each of the three-digit telephone prefixes in Los Angeles, Orange, San Bernardino, Riverside, and Ventura counties.
- To ensure that no county within the five-county study area was under- or overrepresented in

relation to its population, the total number of respondents (1,000) was proportionately allocated to each of the five counties.

In addition, elaborate screening procedures were used to reduce or avoid bias resulting from interviewing whoever answered the telephone.

The method of random digit dialing produced a survey population representative of the entire five-county population. Table 1 gives a comparison of the demographics of the survey population and those of the general population.

Questionnaire Design and Development

One of the most critical elements of a telephone survey is the design and development of the survey questionnaire. When such a questionnaire is developed, care must be taken to ensure that the instrument gathers the information sought. The literature on questionnaire development was thoroughly researched before the first draft of the questionnaire was begun. The following principles are a sample of the guidelines that were followed in developing the questionnaire:

- Are all of the important phases of the survey adequately covered?
- Does the questionnaire format flow smoothly?
- Does the questionnaire stimulate respondent cooperation?
- Does the wording avoid ambiguities?
- Are the response options mutually exclusive and sufficient to cover each conceivable answer?
- Are the questions relevant, interesting, easy to answer, and applicable to everyone in the study?

Because interviewing by telephone is totally dependent on what can be verbally communicated, considerable care was taken in wording questions so that

TABLE 1 Comparison of Survey Sample and Total Populations

Characteristic	Populations		
	Survey Sample (%)	Total Five Counties ^a (%)	Difference (%)
Sex			
Male	48	49	1
Female	52	51	1
Education ^b			
High school	27	31	4
Some college	28	22	6
College or more	28	20	8
Political party			
Republic	35	39	4
Democrat	45	51	6
Independent	7	8	1
Income (\$)			
Less than 5,000	6	6	0
5,000-14,999	24	25	1
15,000-24,999	23	26	3
25,000-34,999	20	20	0
35,000-49,999	12	14	2
50,000 or more	15	9	6
Ethnic identification			
Caucasian and other	68	74	6
Black	13	6	7
Hispanic	19	20	1
Age (yr)			
18-24	15	17	2
25-34	24	25	1
35-44	20	17	3
45-54	17	14	3
55-64	12	13	1
65 or older	12	13	1

^aData for the five-county total were compiled from the 1980 U.S. census.

^bAge 24 and older.

they not only read well but also sounded good to the listener. As a result, the draft questionnaire was extensively pretested.

During the pretest, frequent debriefing sessions were conducted with the project staff and the interviewers to discuss the format and the content of the questionnaire. Interviewers were able to provide insight about the amount of time needed to administer the questionnaire, respondent willingness to answer the different questions, and other important elements of questionnaire design. On the basis of the pre-testing results, a survey schedule was determined and the questionnaire was given its final form.

RESULTS

For each Televote question presented, four sets of results were gathered:

- Television--telephone call-ins by viewers,
- Radio--telephone call-ins by listeners,
- Ballots--mail returns by the students and the community at large, and
- Random survey--telephone interviews with a sample group of the population.

Presented next are a summary and a comparison of these results. For simplicity, the information is presented in the following order: a brief statement explaining the intent of the question, the question, a summary of the number of responses, the results in tabular form, and a brief statement interpreting the results.

Question One

Some people believe that actions such as changing work hours and using buses helped avoid major traffic jams during the Olympics. With the population of the region continuing to increase, more of these types of action are needed to prevent such traffic jams from occurring every day. Therefore the question posed was

Would you be willing to change your work hours or means of getting to work?

- a. Yes
- b. No

This question elicited 1,401 phone-in responses from the KHJ-TV and Radio audiences, 586 ballot responses, and 1,000 random survey responses. The responses shown in percentages by medium are

	<u>Television</u>	<u>Radio</u>	<u>Ballots</u>	<u>Random Survey</u>
Choice a	80	72	71	60
Choice b	20	28	29	40

In all cases, a clear majority of respondents indicated that they would be willing to change their work hours or means of getting to work.

Question Two

Traffic congestion occurs when a lot of people commute at the same time; this results in longer travel times. However, if people were to adjust their work hours, travel demand would spread over a longer time and congestion would thereby be reduced. Therefore the question posed was

If you could change your work hours, would you rather

- a. Start earlier or later in the day?
- b. Work more hours each day and get an extra day off?

This question received 939 calls from the KHJ-TV and Radio audience, 586 ballot responses, and 1,000 random survey responses. The responses given in percentages by medium are

	<u>Television</u>	<u>Radio</u>	<u>Ballots</u>	<u>Random Survey</u>
Choice a	21	18	48	43
Choice b	79	82	52	57

The results indicate that the television and radio responses are more polarized, with close to four out of five respondents preferring to get an extra day off, than are the ballot and random survey results, which are not as dramatic. Nevertheless, in every case the clear preference was for fewer days and longer hours.

Question Three

The costs of driving and maintaining the roadways will increase as the population of the Southland increases. Therefore the question posed was

The costs of travel are going up. Who should pay?

- a. Only drivers and riders?
- b. All taxpayers?

This question elicited 951 phone-in responses from the KHJ-TV and Radio audience, 586 ballot responses, and 1,000 random survey responses. The responses given in percentages by medium are

	<u>Television</u>	<u>Radio</u>	<u>Ballots</u>	<u>Random Survey</u>
Choice a	23	27	39	44
Choice b	77	73	61	56

Responses to this question follow the same pattern as those in Question 2. The television and radio responses are more polarized than the ballot and random survey results. However, in all cases, the general indication is that all taxpayers should pay for the increased cost of transportation.

Question Four

It has been suggested that some people would give up driving alone if they had some other convenient and reliable means of getting around available to them. Therefore the question posed was

If you were able to choose not to drive to work, would you prefer to

- a. Take a bus or other mass transit?
- b. Carpool or vanpool?

This question received 1,051 phone-in responses from the KHJ-TV and Radio audience, 586 ballot responses, and 1,000 random survey responses. The responses given in percentages by medium are

	<u>Television</u>	<u>Radio</u>	<u>Ballots</u>	<u>Random Survey</u>
Choice a	76	33	36	37
Choice b	24	67	64	63

The radio, ballot, and random survey results are fairly consistent, which indicates that the majority of commuters prefers to carpool or vanpool. However, the television results show a reverse trend that indicates that the majority of people prefers to take the bus or other mass transit system. A closer scrutiny of the videotapes of the televised news segments

indicates that comments made by the news anchor personnel may have biased viewers' responses.

Question Five

Some people think that traffic congestion is becoming intolerable. Therefore the question posed was

Are we in or close to a transportation crisis?

- a. Yes
- b. No

This question received 1,109 phone-in responses from the KHJ-TV and Radio audience, 586 ballot responses, and 1,000 random survey responses. The responses given in percentages by medium are

	Television	Radio	Ballots	Random Survey
Choice a	96	95	70	74
Choice b	4	5	30	26

The response to this question was an emphatic "yes." Once again the television and radio results were more extreme than the ballot and random survey results. This should not come as a surprise because those who thought there was a crisis would be more willing to make the effort to register their opinion.

Evaluation of Results

One of the primary objectives of the random telephone survey was to validate the results of the televised Televote program. One way to check the validity of the Televote results is to measure the statistical variation in attitudes toward transportation among respondents of the Televote program and the random telephone survey.

The underlying assumption of this approach is that the results of the scientific telephone survey are an accurate reflection of the population at large. Although no researcher can be absolutely assured that the results of a random survey will be an exact reflection of the attitudes and behavior of a larger population, it is possible through statistical evaluation to calculate what the chances are that the results of the survey accurately reflect the larger population.

In a probability sample, sampling error is largely determined by the size of the sample, not the size of the population being surveyed. In general, the larger the sample, the smaller the sampling error that can be expected. For this survey, a survey population of 1,000 respondents was selected using the proven and widely accepted method of random digit dialing. Based on probability theory and a sizable amount of empirical evidence, a margin of error in the results of plus or minus four percentage points could be expected. In other words, it can be expected with 95 percent certainty that the mean of the sample will be within 4 percent of the true mean.

On the surface, the comparison of Televote results and the random survey results is not encouraging to those who argue that Televote can accurately measure public opinion. However, a closer examination of the results reveals that although the random survey results are less extreme or less polarized than the Televote results, the general direction of the responses, with the one notable exception of Question 4, is the same. In other words, both methods agree on the public preference; the only difference between the two is the level of preference.

Table 2 gives a comparison of the results of the Televote and the random survey. An examination of

TABLE 2 Comparison of Televised Televote Results and Random Sample Results

Question	Televote Results (%)	Random Telephone Results (%)	Difference (%)
1. Would you be willing to change your work hours or your means of getting to work?			
a. Yes	80	59	21
b. No	20	40	20
2. If you could change your work hours, would you rather			
a. Start earlier or later in the day?	21	42	21
b. Work more hours each day and get an extra day off?	79	56	23
3. The costs of travel are going up. Who should pay?			
a. Only drivers and riders?	23	43	20
b. All taxpayers?	77	55	22
4. If you were able to choose not to drive to work, would you prefer to			
a. Take a bus or other mass transit?	76	33	43
b. Carpool or vanpool?	24	57	33
5. Are we in or close to a transportation crisis?			
a. Yes	96	71	25
b. No	4	25	20

Note: Percentages do not add to 100 because "No Opinion" and other categories were omitted for purposes of analysis.

the table indicates that the percentage direction is the same for each question in both samples with the notable exception of Question 4 (chose not to drive to work). However, even though the percentages are going in the same direction, the percentage differences between the two samples are large, and in all cases the differences exceed the range of statistical chance. In other words, the percentage differences for each question presented in Table 2 are statistically significant at the 0.05 level. Restating the probability, there are only 5 chances in 100 that the data presented in Table 2 are due to chance.

One possible explanation for these differences may be that the media-generated respondents, because they are self-selected from an already unrepresentative audience, do not represent a cross section of Southern California residents. Overall, the data suggest that Televote viewers may be somewhat different from the general population in terms of demographic characteristics.

Another possible explanation of the statistical difference in attitudes concerning transportation among respondents of the Televote survey and the random telephone survey may be related to the context in which the questions were asked. The random survey respondents were asked questions with no prior discussion of the issue. The Televote respondents, on the other hand, were given a 3- to 5-min presentation on the issue and up to an hour for considering it before voting. It would appear that the Televote respondents used the information they received in forming their opinions. Whether this information biased their opinion or whether it assisted them in making a better informed decision, thus providing a better measure of their true opinion, is a question that needs to be explored further.

Probability theory suggests that, in a nonrandom sample, the larger the response rate the more likely it is that the sample will be representative. If it is the case that a large response rate is required for a successful media-based survey, then future Televotes should be based on higher profile, emo-

tional, controversial, problem-solving issues. This would also mean that the issues covered would have been discussed fairly often in the media and among individuals. A more uniform context would then be provided for the various survey mechanisms to be used. This would probably result in a close correlation between Televote and random survey outcomes.

Lessons Learned

These conclusions have several implications for future Televotes. First, issues covered in the Televote program should have had previous public exposure and discussion. This will help to increase the response rate and help ensure that the Televote results are actually representative of the population at large. Also, using more salient issues that are on the public's agenda will help to ensure that the Televote respondents, and the random survey respondents, have a full understanding of the issues being discussed.

To test these hypotheses, future Televotes should contain a mixture of salient and highly controversial issues along with less controversial issues. There should also be a diversification of the media markets to ensure wider public participation.

CONCLUDING REMARKS

The data compiled from Televote '85 will serve an important role in the transportation planning work of SCAG. At a technical level, results of Televote

'85 will be used in the development of SCAG's Regional Transportation Plan, which serves as a blueprint for all transportation planning in the region. Specifically, the data will be used to develop transportation strategies that can be implemented in the region on a permanent basis. At a promotional and publicity level, the material produced for Televote '85 including the audiovisual material will be used to help perpetuate and maintain the spirit of cooperation that was experienced during the Olympics.

In view of the success of Televote '85, which had transportation as its focus, SCAG intends to explore the applicability of the Televote concept to other important regional issues, such as hazardous waste, housing, air and water quality, and economic development. SCAG firmly believes that Televote can make a major contribution to a better informed community and provide direct linkage of the public to the development of regional planning policies.

ACKNOWLEDGMENTS

The Televote '85 project was made possible by funds from the U.S. Department of Transportation and contributions from the following organizations: Audubon Junior High School, General Telephone Company of California, KHJ-TV and Radio, and Pacific Bell.

Publication of this paper sponsored by Committee on Social, Economic and Environmental Factors of Transportation.