

# Measurement of Central Business District Change And Urban Highway Impact

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The problem of evaluating the impact of urban freeways on the city center has not yet been studied in any systematic way. In fact, no approaches to the subject have been developed and no ideas have been advanced as to just how to go about such an investigation (1, 2). At this elementary stage in the development of knowledge concerning land use structure and its relationship to transportation, the problem must be presented in very broad terms involving some degree of subjective analysis. Nevertheless, it is clearly realized that a proper assessment of highway impact on any land use or activity must necessarily evaluate conditions within the freeway network itself, which may alter impact; secondly, it must fully understand the characteristics of the object supposedly receiving the impact. In addition, closely related variables must also be understood. Of course, in evaluating the role of freeways on the central business district (CBD), it is critical that trends within the CBD be fully realized. Only by considering both inherent and closely related change in the freeway network, and independent change in the CBD, can the impact of freeway development on the city center be fully realized.

Although improvements in both inter and intracity transportation may have a marked effect on an urban economy, there are many other simultaneous changes in the structure of the metropolis which may also have a broad impact. These include inter-regional migration, defense spending, national market conditions, the availability and adequacy of water, industrial waste problems, labor conditions, and the sheer multiplying effects of urban growth itself, as well as many other things. As any urban area increases in population it becomes more self-sufficient in providing the range of goods and services required by its inhabitants. Thus, some new establishments are woven into the economy for this reason alone. With all of the variables operating and having some mutual effect on each other, a substantial research problem arises in segregating the influences of freeways, even in a general manner, and particularly in assessing their influence on the CBD. As a general rule, it is extremely difficult, statistically, to isolate from a complex set of factors, the effects of a single factor (such as the impact of urban freeways on the CBD) unless one has previously determined the effects which some of the other important factors have had on CBD activities.

First, primary variables inherent in the freeway network itself, and then the closely related variables, will be discussed. Secondly, CBD district changes will be presented and analyzed in relation to future freeway development.

## INHERENT VARIABLES IN ASSESSING THE IMPACT OF URBAN FREEWAY DEVELOPMENT

### Extent of the Freeway Network and Its Degree of Completion

The extent and degree of completion of an urban freeway network looms as a significant variable in the study of economic impact. Present highway impact studies essentially reflect the effect of an isolated facility on adjacent land values or on retail sales (3). In the few instances where land values have been studied in conjunction with freeways which were parts of systems, the percentage increases in the value of land over the time span considered were not nearly as spectacular as in the cases where

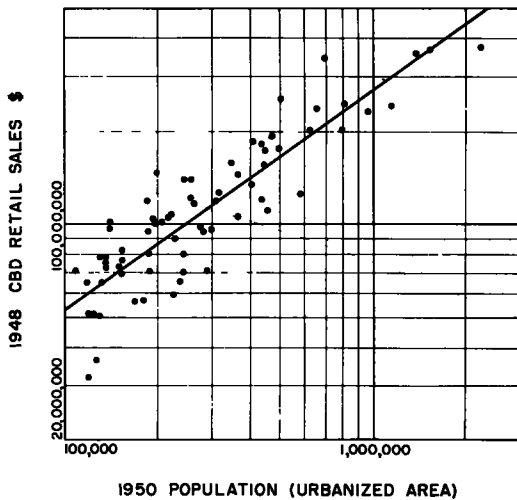


Figure 1. Urbanized area population, 1950 vs CBD retail sales, 1948.

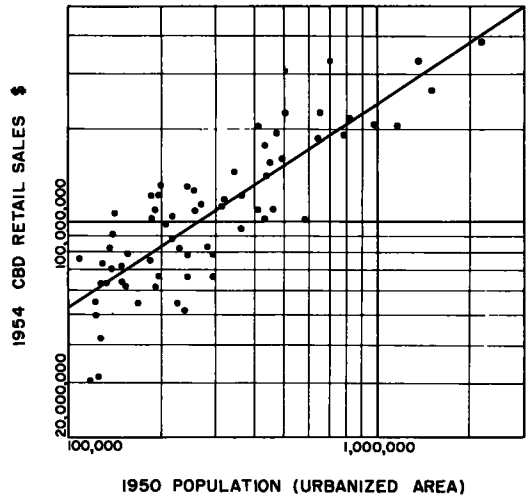


Figure 2. Urbanized area population, 1950 vs CBD retail sales, 1954, (corrected to 1948 dollars).

only isolated freeways were examined (4, 5, 6). As these studies were not designed to examine economic impact of a freeway network, their results are limited.

It is obvious that the completion of one element of a freeway system, say a radial route connecting the city center with the suburbs, will for a time place the land in that segment of the city in a comparatively more favorable position. Excluding the effects of intercity highway improvement, of which the radial route may be a part, this single freeway will only shift demand for land from one sector of the city to another, with no economic benefits from the freeway accruing to the city at large. It follows that as the freeway system develops the impact along any given route is proportionately diminished. Unless the reduction of time-distance from the outlying areas causes more business activities to be located in the city center, it will receive no benefit from the radial route. Actually, the radial route may also encourage decentralization of business activities in the center of the city. In this respect the freeway is a two-way avenue which may promote decentralization or deter it. Finally, on the question of urban freeway network extent, there are variations from one city to another in the possible freeway network as conditioned by topography. In many cities topographic features limit the possibility of providing optimum freeway systems. This may be particularly critical in and around the CBD. On this account, the freeway impact varies from city to city.

#### Degree of Development and Completion of the Inner-Distributor Loop

Of particular importance in determining the effect of freeway system development on the CBD is the completion of the central traffic distribution system. Because radial freeways carrying several thousand vehicles per hour each cannot effectively intersect at a point, the ability of radials to serve the CBD depends on the adequacy and completion of the central distribution system (7). The inner distributors are the most expensive portions of the entire freeway system because of the high cost of central land, the large amount of land used, and the cost of constructing the many interchanges and ramps. Because of the planning and financing problems, most central city distribution systems will not be constructed until late in the current National Highway Program. This time lag will preclude an early test of freeway impact on a city center, even if the mechanics of such an evaluation can be devised.

The ability of the central distribution system to handle the traffic input from radials is recognized as the most critical problem facing freeway planners and designers to-

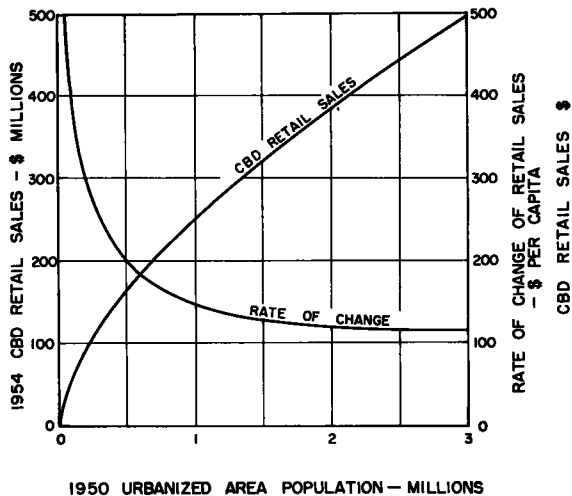


Figure 3. Characteristics of CBD retail sales and city size, 1954.

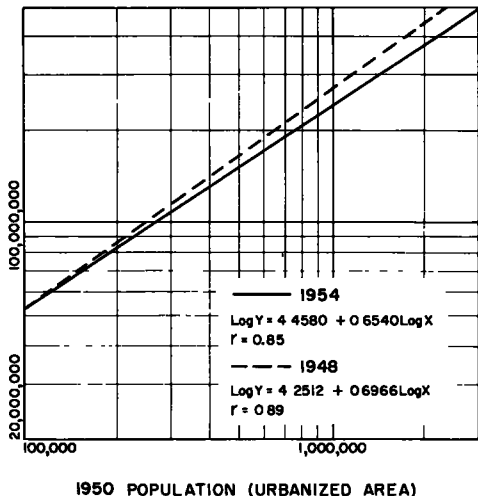


Figure 4. Urbanized area population, 1950 vs CBD retail sales; 1948 - 1954 comparison, (corrected to 1948 dollars).

day. There is mounting evidence that the accumulated ramp capacity of the inner distributor may limit the use of the freeway system during the high volume traffic periods. This serves to illustrate further that aside from its completion in terms of timing, the inner-distributor loop will have a significant bearing on the operational efficiency of the entire freeway system. This introduces another important variable in assessing highway economic impact. The adequacy of design, timing of development, and operational efficiency of the inner-distributor system may all have considerable effects on CBD development.

Extent of Central Space Used for Highways

The critical design feature of central urban freeways is access capacity. This calls for the maximum possible number of access ramps serving the city center consistent with design standards, and thereby requires an extensive amount of land. Under the circumstances, the land demand for the central portions of the freeway network is substantially greater per unit length of highway than for suburban or intercity segments. The central distributors of most freeway networks require about 40 acres of land per mile, exclusive of interchanges with other freeways (8). Suburban locations, on the other hand, require between 20 and 30 acres per mile. Some idea of the magnitude of land requirements for interchanges may be given by two examples from California. The interchanges between the Harbor and both the Santa Monica and San Diego Freeways in Los Angeles will require almost 90 acres each (8).

Another implication of the extensive

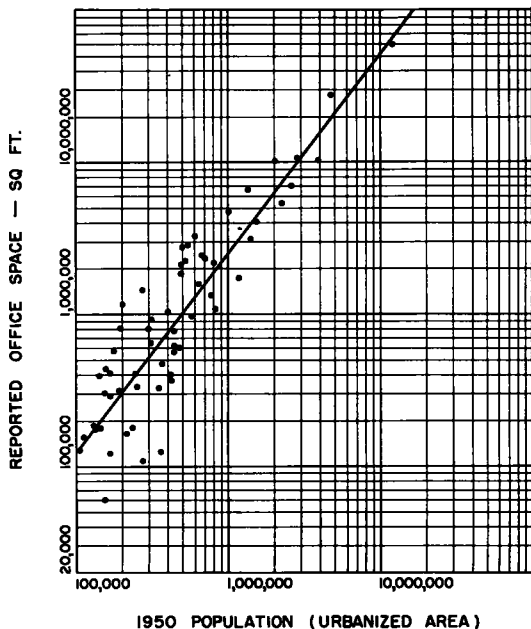


Figure 5. Urbanized area population, 1950 vs reported office space, 1946.

space use for central freeways relating to the evaluation of highway economic impact, concerns the land market mechanism itself. The elimination of a large percentage of central land from the market is bound to influence rents in the entire downtown area. Central land is a very limited resource by virtue of its location at the focus of inter-city and intracity transportation. It follows the normal economic trends of price increase when the supply is curtailed.

Extent of Freeway Interference with Business Linkages

Another important factor of the large space consumption of the freeway in the central region of the city is its capacity to create a detachment in what might formerly have been a relatively homogeneous functional node. In spite of careful attention to land use in the planning of inner freeway segments, this type of detachment will certainly occur in some areas. It assuredly influences land values insofar as this detachment weakens business linkages which formerly contributed to the economic cohesion of an integral portion of the central city region.

In the highway impact studies dealing with land values, relatively symmetrical land use patterns occurred on either side of the new freeway, with a few exceptions (3). This has led to the concept of decreasing land values as distance from the freeway increases. In the case of the inner-distributor loop, however, there are

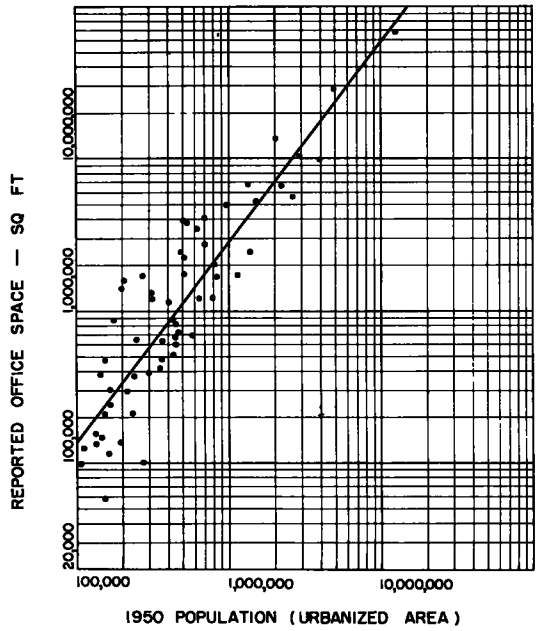


Figure 6. Urbanized area population, 1950 vs reported office space, 1956.

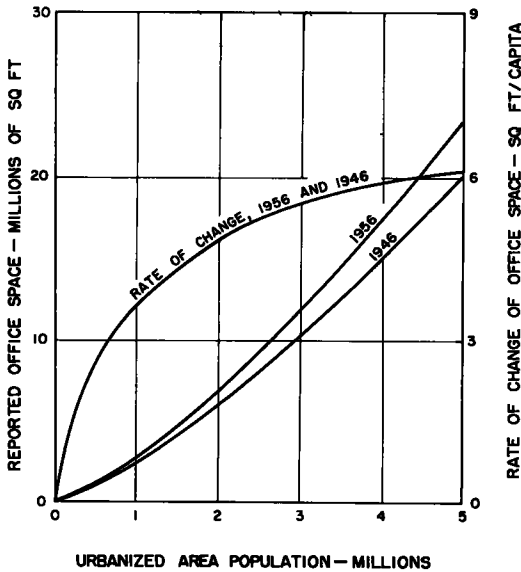


Figure 7. Urbanized area population, 1950 vs CBD office space; 1946 - 1956 comparison.

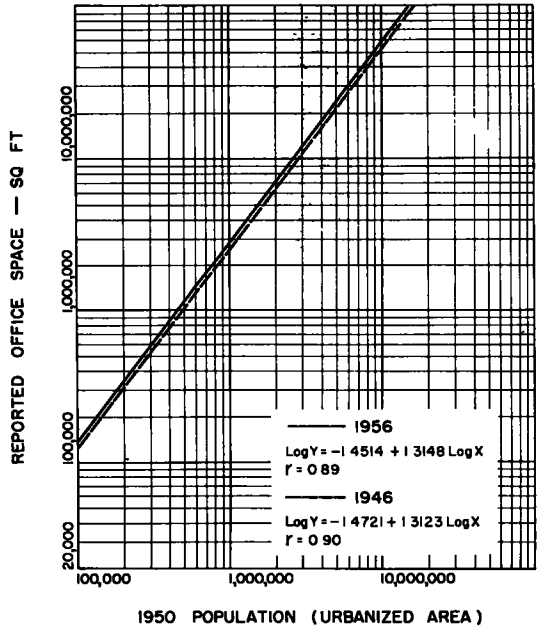


Figure 8. Urbanized area population, 1950 vs reported office space; 1946 - 1956 comparison.

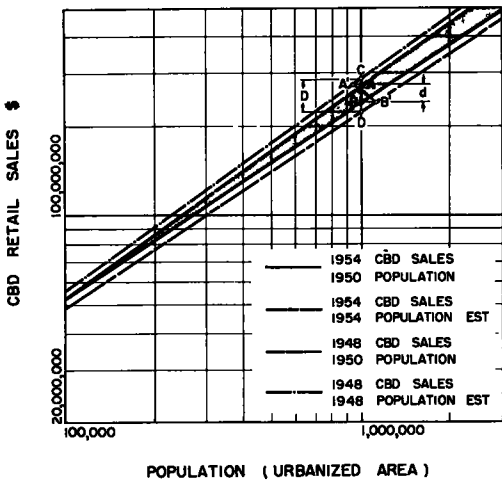


Figure 9. Urbanized area population vs CBD retail sales; 1948 - 1954 comparison, (with and without population correction).

drastically different sets of land values and uses on either side. The CBD core, located inside of the loop, has land values typically twenty times those outside the loop (9). Furthermore, with the construction of an inner-distributor loop, the transition between the two categories of land use becomes quite abrupt, creating a sharp discontinuity in any gradient of land values which formerly existed.

Extended Time Required to Construct System

In general, the extended period of development for an adequate system or urban freeways, even under the best circumstances of planning and programming, is the greatest single obstacle to the study of impact itself. The fifteen-year study of land values and land use along the Gulf Freeway in Houston shows with each successive five-year increment of time the percentage of increase in land values becomes smaller leaving little doubt that impact is variable with time (6).

Unlike the small city highway bypass, a before-and-after study of any urban freeway network requires considerable time. The developing system will preclude a stagnant condition even for a moderate period of time, in which to evaluate highway impact of the CBD.

Extent of Changes in Trade Area Structure

Aside from the specific impact of urban freeways on the city, the intercity routes of which most of them are a part also have substantial implications for change in the

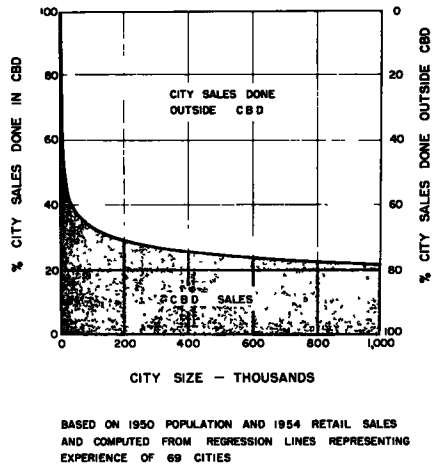


Figure 10. Proportion of city retail sales in CBD.

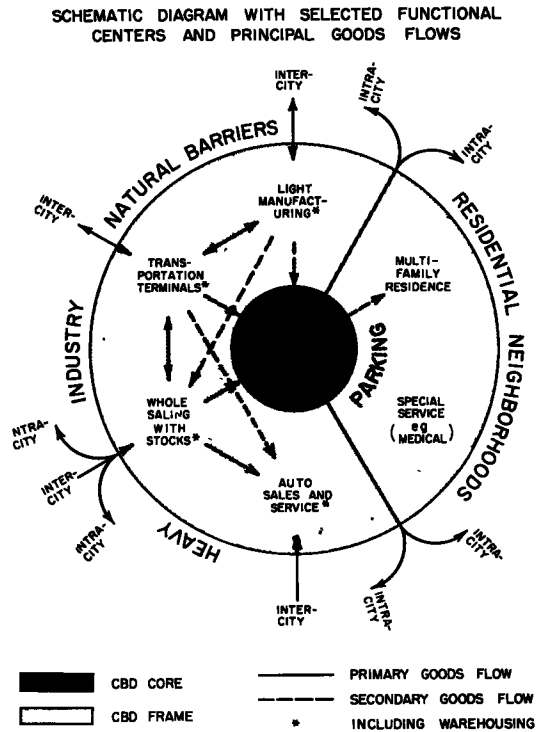


Figure 11. The CBD core-frame concept.

urban structure. Their impact on the city relates primarily to changes in economic activity caused by a reduction in time-distance between cities and between the city and points within its trade area. It is highly probable also that changes in the spatial configuration of the trade area also occur with improvements in the intercity transportation system, as the history of railroad development in the United States indicates. Because of the extension of a rail network into the West from the established trade centers near the Mississippi River, the Plains States were not able to develop regional capitals on the scale of St. Louis, Chicago, Minneapolis, etc., and these older cities remain the primary centers of wholesale trade for the Plains States today.

**Extent of Centralization of Activities**

Some of the general economic effects occasioned by intercity highway improvement undoubtedly show up in an increased demand for some categories of urban land. One aspect is reflected in the centralizing of business activities. A good indication of this is the increasing per capita use of central office space with increasing urbanized area population (7). Another example is the way the service industries of one city can extend the range of their trade area because of better transportation, thus providing competition to their counterparts in outlying areas of the metropolitan complex or in nearby cities. The intensity of this impact will vary from city to city, of course, depending upon its size and position in the regional complex. For instance, the development of a freeway between Seattle and Tacoma, 30 miles apart, may be of greater advantage to Seattle than to Tacoma, a city with only one-fourth as large a population as Seattle's.

**NON-INHERENT VARIABLES IN ASSESSING THE IMPACT OF URBAN FREEWAY DEVELOPMENT ON THE CBD**

**Planning and Urban Redevelopment**

Land use determinants arising out of public policy will naturally affect the market mechanism controlling the price of urban land. This introduces another variable in

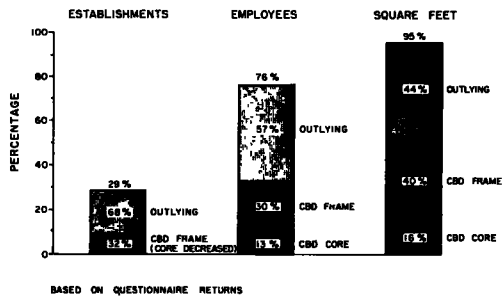
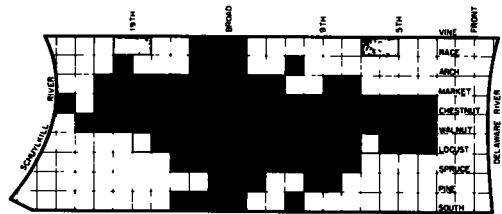
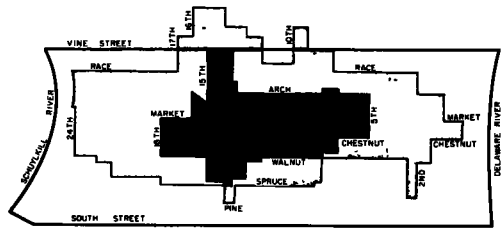


Figure 13. Percentage increase in insurance activities 1946-1958; headquarters and regional offices.



SOURCES: DIAGRAMMATIC MAP FROM MANNHELLS THE CORE OF THE CITY, COLUMBIA UNIV PRESS, 1946. SPACE USE DATA FOR 1949 FROM ALDERSON AND SESSIONS PHILADELPHIA CENTRAL DISTRICT STUDY, 1950.

**INNER AND OUTER CENTRAL RETAIL ZONES OF PHILADELPHIA, 1935**



AREA \$ MILLIONS OF RETAIL SALES (1935) SOURCE: U.S. CENSUS OF BUSINESS 1935. INTRA-CITY BUSINESS STATISTICS FOR PHILA. M. J. PROUDFOOT SUPERVISOR. SCALE: 1 2 3 THOUSAND FEET.

Figure 12. Philadelphia central business district, delimited by the Murphy-Vance-Epstein technique (above). Inner and outer retail zones of Philadelphia, 1935 (below).

Figure 12. Philadelphia central business district, delimited by the Murphy-Vance-Epstein technique (above). Inner and outer retail zones of Philadelphia, 1935 (below).

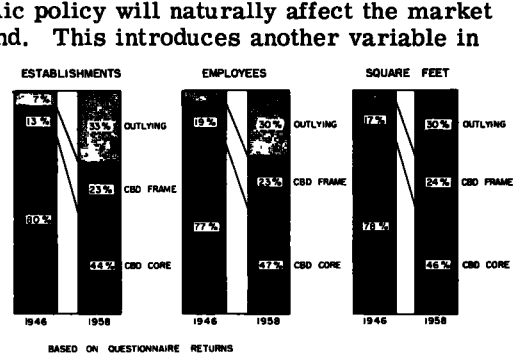


Figure 14. Relative location of insurance companies; headquarters and regional offices.

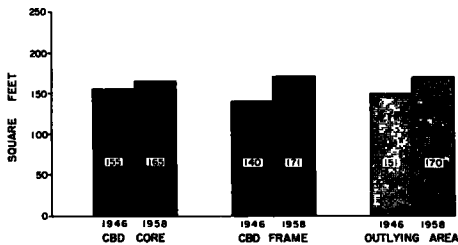


Figure 15. Average floor space per employee; headquarters and regional offices.

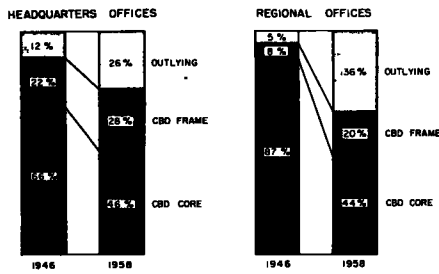


Figure 16. Relative location of insurance establishments.

the evaluation of urban freeway impact. In most of the freeway impact studies to date care has been taken to segregate land in different zoning classifications so that comparisons are always made between land parcels in the same classification. Besides land use zoning, urban redevelopment is a planning measure which may have even greater effect on the assessment of highway impact on central land.

Although urban redevelopment may occur in many areas of the city, it is the central and older sections which are becoming the first concerted objects of this activity. The large areas coming under redevelopment in the central regions of many cities remove land from the market, as in the case of freeways. Most central redevelopment projects have been for housing. The decision to construct housing in central areas is not necessarily based on economic reasoning, but may, and usually does, involve a different set of determinants than in the original development of the land. These may include a wide range of social goals, as well as the preservation of central land values. These urban redevelopment projects have a substantial economic impact of their own, and may be of such magnitude as to interfere with the possible measurement of freeway impact. An example is the redevelopment of the lower Eastside of New York City into "highrise" apartments adjacent to the lower end of Roosevelt Drive.<sup>1</sup>

In addition to the development and exercise of public policy in municipal planning, collaborative planning effort by private central interests is a variable to contend with in evaluating highway impact on the CBD. In over a dozen large cities central associations of private businessmen are active in promoting "downtown" as well as specific collaborative projects (10). Notable examples of effort from such groups are the Gruen Plan for downtown Fort Worth and the Charlestown Project in Central Baltimore. In the latter city a highly competent technical staff has been retained to aid the Central Baltimore Association in formulating and planning major redevelopment projects. The

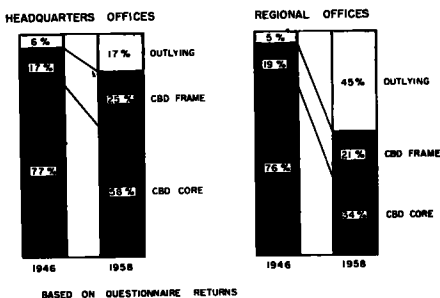


Figure 17. Relative location of insurance employees.

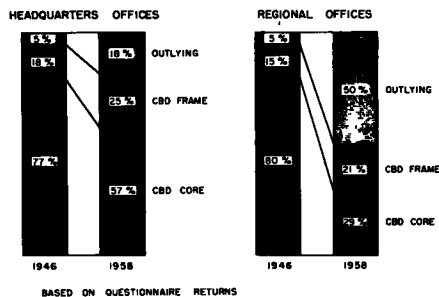


Figure 18. Relative location of insurance floor space.

<sup>1</sup>For example, the recent housing projects completed adjacent to Roosevelt Drive in the lower Eastside of Manhattan account for a population of approximately 30,000 people. See New York City Housing Authority, "Project Statistics," N. Y. (June 30, 1955).

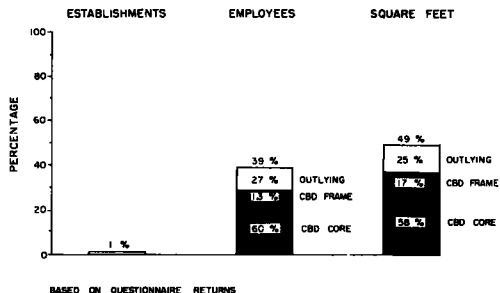


Figure 19. Percentage increase utility activities 1946-1958; headquarters office.

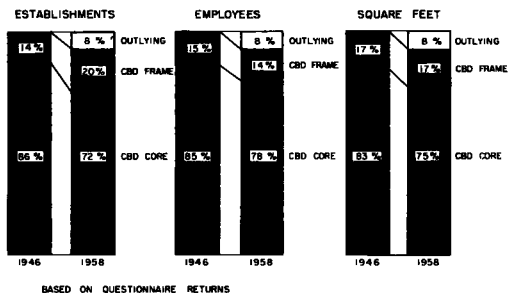


Figure 20. Relative location of utility companies; headquarters offices.

point here is that this type of positivistic effort may have a profound effect on the CBD regardless of highway development itself.

Provision of Off-Street Parking near the Core

The development of central parking garages is another significant variable in the evaluation of freeway impact on the city center. Without central off-street parking improvements the freeways will not be able to increase the daytime population of the CBD core. The responsibility for these terminal facilities may be that of either private or public enterprise whereas freeway development is a public function, exclusively. This division of responsibility, plus the inevitable problem of formulating public policy on the local level, may well preclude the provision of sufficient parking in time to meet rising demands induced by freeway development. Without central parking, the full potential of the freeway system may not be realized, and a consequent reduction of its impact on land values and land use in the CBD may occur.

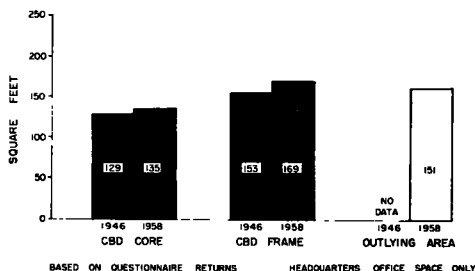


Figure 21. Average floor space per employee; utility companies.

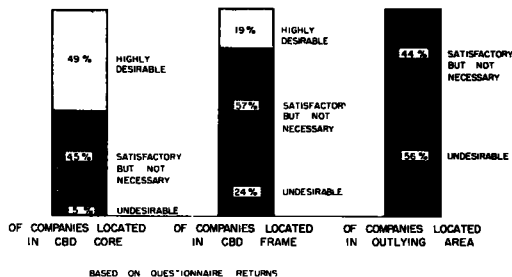


Figure 22. Opinion on location of headquarters office in CBD core.

Development of Mass Transit

Although few major cities in the United States have made substantial inroads in integrating the development of mass transit with freeways, sufficient advances have been made to imply widely differing schemes and possible degrees of success (11). Also, like urban freeways, the benefits from a modernized mass transit will only be realized with the development of a full system of routes and terminals, all of which will require many years to be realized. Transit service, therefore, looms as an important variable to contend with in analyzing the central impact of urban freeways, not only from the magnitude of the system developed, but the extended time required for its completion. Actually, mass transit and the freeways are competitive in serving a portion of the person-trips to the CBD. In this respect the economic impact of these two systems is almost inseparable.



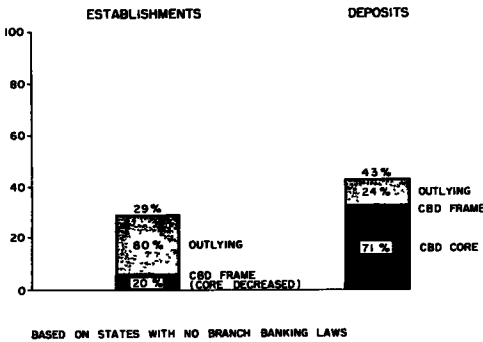


Figure 23. Percentage increase in banking activities, 1946-1956.

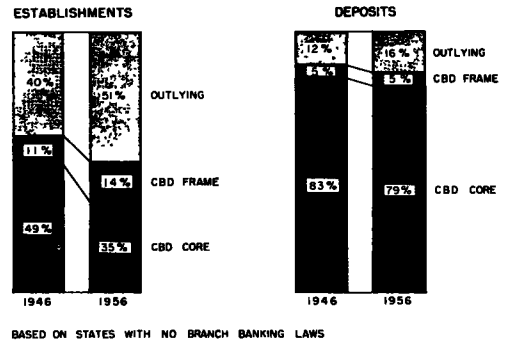


Figure 24. Relative location of banking activities, 1946-1956.

**A SPATIAL FRAMEWORK FOR THE ANALYSIS OF CBD CHANGE**

Any study analyzing central land use changes is concerned with an appropriate spatial framework. That used here is the Core-Frame Concept as developed elsewhere by the authors (7). The "core" and the "frame" are viewed as two separate functional areas of the CBD.

For purposes of this analysis three terms relating to the spatial organization of the city are utilized: the central business district core, the central business district frame and the outlying areas; referred to in the figures as CBD core, CBD frame, and outlying.

The CBD core refers to the concentrated grouping of large buildings in the city center and is characterized by a dense daytime population and intensive land development. Floor space is essentially devoted to retail trade, consumer services, and office use. The core has limited lateral dimensions, is geared to the pedestrian scale, and is easily recognized from an aerial view by the clustering of tall buildings. This area is devoted primarily to people, paper, and parcels.

The CBD frame is the predominantly commercial area surrounding the core and contiguous industrial land use. Here the land development is extensive, as compared with the CBD core, including a measurable quantity of unbuilt-on land for parking, storage, and the maneuvering of vehicles. Few buildings in the CBD frame have elevators, and the linkages between establishments are vehicular rather than pedestrian. Predominant uses in the CBD frame are wholesaling with stocks and warehousing, automobile services, transportation terminals, service industries, and sometimes medical and governmental services. The CBD frame has been characterized in the literature as a zone of transition; an interstitial area between the intensely developed land in the central

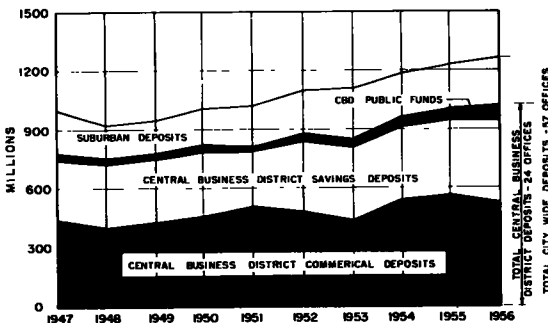


Figure 25. Comparison of central business district and citywide deposits, 1947-1956.

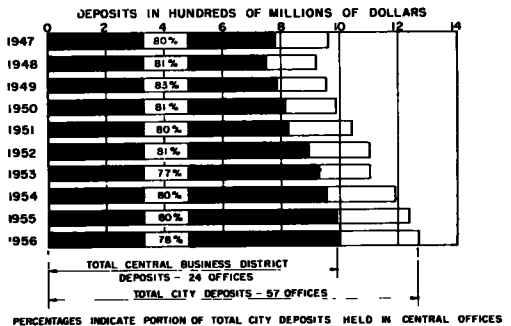


Figure 26. Comparison of downtown and total city bank deposits, Seattle.

core and the inlying residential areas. Here outmoded housing has given way to the uses previously mentioned. The CBD frame typically has between three and six times the area of the CBD core, depending to some extent on topographic conditions. It is of particular interest to the study of decentralization because the frame area is seen to be the focus of a substantial number of establishment moves from the CBD core. This change is not to be considered as merely an expansion of the core into the adjacent area, but represents a reorientation of location based on changed requirements for transportation linkages. For example, the headquarters offices of insurance companies are relocating in the CBD frame and outlying areas because of the changing characteristics of the activity, rather than for reasons of expansion (7).

The outlying area includes all other portions of the urban complex not included in the CBD core and CBD frame. This category may include the suburban areas of the central city, incorporated areas of perimeter cities, or unincorporated areas which are urban in character.

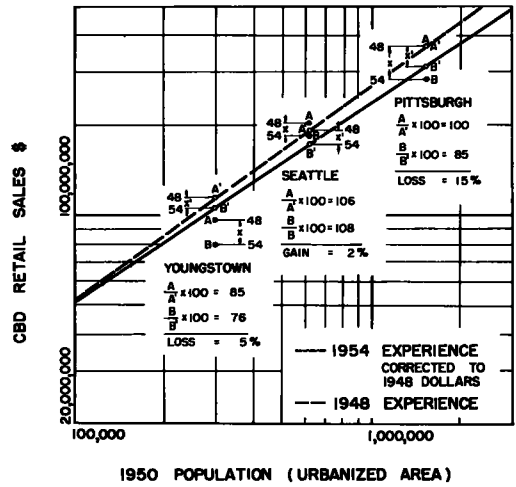


Figure 27. Deviation and relative change in CBD sales, 1948-1954.

### CENTRAL BUSINESS DISTRICT CHANGE

#### Nature of Central Change

In addition to the previously discussed variables, changes are occurring in the city which may be entirely independent of transportation improvement. A knowledge of these is especially important in assessing transportation impact on the CBD, which is an area that is constantly acquiring, discarding, and rearranging activities. In contrast, other parts of the city, while changing the intensity of settlement, do not exhibit the same degree of assimilation and discard of functions. For example, office buildings have a continually fluctuating range of establishments.

Evaluation of CBD change on a national scale is a considerable task, even without considering transportation improvements. For example, technological change influences merchandizing, office operations, and location advantage, as in the increasing use of business machines, which may alter the composition of the labor force and its patterns of travel.

Regardless of the complexity of evaluating and understanding CBD change, some insight into gross trends can be gained. Studies of central office space and retail sales have been undertaken to determine trends in the functions accounting for well

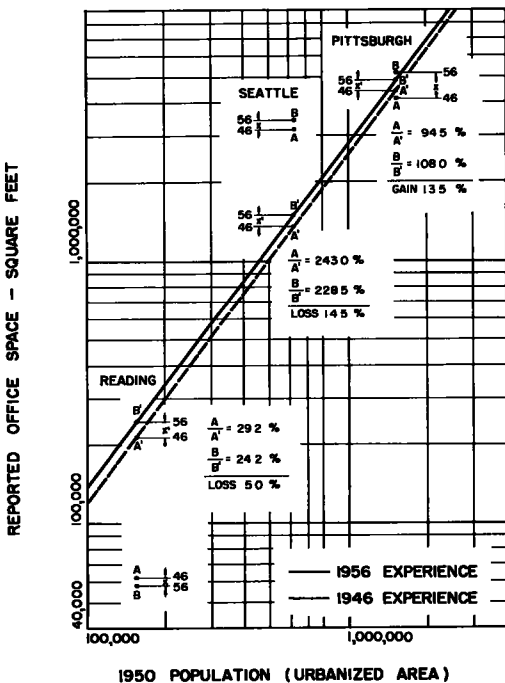


Figure 28. Deviation and relative change in office space, 1946-1956.

over one-half of the CBD core uses. (Figures 1 through 8 show results graphically.) In addition, specific studies were undertaken (7) on the decentralization of a range of activities which by tradition have been centrally located. These studies record trends generally concerning the post World War II decade, a period actually preceding the development of urban freeways in all but a few cities. Even in the few cities with freeway construction, complete systems were not developed. Thus, recorded CBD trends cannot be considered attributable to highway transportation improvement.

CBD trends will be discussed within the context of centralization and decentralization. Centralized activities are considered to be those which are located within the CBD, although they may not necessarily be clustered. The terms clustering and dispersal are not synonymous with centralization and decentralization, respectively; certain centralized activities may be dispersed throughout the CBD and certain decentralized activities may be clustered in one outlying area.

### Findings on Change

CBD change will be first evaluated on two bases: (1) trends adjusted for population growth (termed "per capita" basis) shows CBD change relative to the estimated urbanized population growth within the time interval, and (2) trends based on no change in urbanized area population (termed "absolute" basis) shows CBD change independent of population change. Trends determined on a per capita basis are of greater magnitude than those found on an absolute basis.

On a per capita basis (urbanized area population) there has been a slight diminution of CBD core activities. This is substantiated by the following, based on the generalized experience of the cities studied (7).

1. Absolute CBD retail sales (adjusted for changes in dollar value) have decreased between 1948 and 1954 for 69 cities, ranging linearly from 14 percent in a city of 100 thousand to 28 percent in a city of 3 million. This directly accounts for an approximate loss of 265 retail workers in the smaller city to about 4,500 in the larger.<sup>2</sup> (Fig. 9)

2. CBD reported office space has decreased between 1946 and 1956 for 60 cities, ranging linearly from 20 percent in a city of 100 thousand to 9 percent in a city of 1 million (7). This accounts directly for an approximate loss of 133 office workers in the smaller city to 6 thousand in the larger city.<sup>3</sup>

3. Between office and retail workers, there has been an approximate reduction of between 400 in the city of 100 thousand people to 10,500 in the city of 3 million over the time span. This amounts to roughly a 5 or 6 percent reduction in the core labor force in both cases.<sup>4</sup>

On an absolute basis there has not been any perceptible diminution of CBD core activities. This is substantiated by the following as based on general experience curves. (Figs. 4 and 8)

1. Absolute CBD retail sales (adjusted for changes in dollar value) have decreased between 1948 and 1954 for 69 cities, ranging linearly from an imperceptible amount in a city of 100 thousand to 20 percent in a city of 3 million. This accounts directly for approximately no loss in CBD workers in the smaller cities and about 3,200 in the larger (7).

2. CBD reported office space has increased between 1946 and 1956 for 60 cities, ranging linearly from 20 percent in a city of 100 thousand to 9 percent in a city of 1 million. This accounts directly for an approximate increase of about 133 office workers in the smaller city CBD to 6,000 in the larger city (numbers coincidentally the same as in No. 3 above) (7).

3. Between office and retail workers, there has been approximately an increase of between 133 in the city of 100 thousand to 2,800 in the city of 3 million over the

<sup>2</sup>Based on a 69 city average of \$26,500 in retail sales per person.

<sup>3</sup>This calculation is based on 150 sq ft per office worker.

<sup>4</sup>This is a conservative estimate.

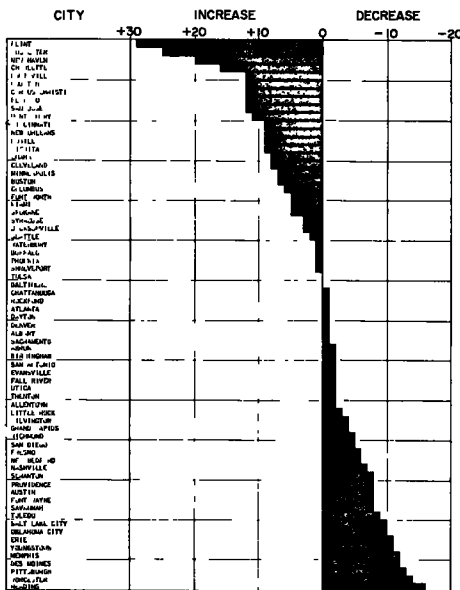
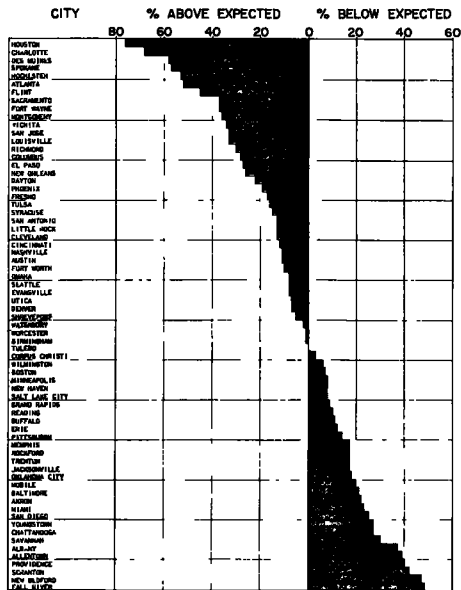


Figure 29. Deviation status of cities, 1954; CBD retail sales. Figure 30. Relative change in CBD retail sales, 1948-1954.

time span. This amounts to roughly one percent increase in the core labor force in both cases.

The foregoing demonstrates that CBD sales diminished slightly on a per capita and an absolute basis, whereas office space declined on a per capita basis, but increased an equal percentage on an absolute basis. In effect, the loss in retail sales is compensated for by additional office space.

Studies of selected business activities, which have been traditionally centralized, reveal a range of decentralization trends.

1. Administrative office space in the insurance business has decentralized 41 percent from the CBD core and 26 percent from the entire CBD between 1946 and 1958. The CBD frame has increased about 40 percent in importance as a locational zone.<sup>5</sup> (Figs. 13 through 18)

2. Administrative office space in the electrical utility field has decentralized 10 percent from the CBD core and 8 percent from the entire CBD between 1946 and 1958.<sup>6</sup> (Figs. 19 through 22)

3. Bank deposits have decentralized 5 percent from both the CBD core and the entire CBD between 1946 and 1956, although banking offices have decentralized 28 percent from the CBD core and 18 percent from the entire CBD in the same time period.<sup>7</sup> (Figs. 23 through 26)

It is cautioned that most of the above findings are determined from regression analysis of many cities. While this gives the general experience of the group of cities in terms of the variables tested, it must be used with caution in its application to any particular city. For example, many cities have good reason to be high or low in respect to the regression line. As has been mentioned, the cities with high central place importance are consistently higher, while others in the areas dominated by regional

<sup>5</sup>Based on questionnaire returns from 69 of the 150 largest mutual, life and fire and casualty companies in the U. S. (7).

<sup>6</sup>Based on questionnaire returns from 106 of the 142 largest private and municipal utility organizations (7).

<sup>7</sup>Based on a sample including all deposits and establishments in 20 standard metropolitan areas in 11 states (7).

capitals are consistently lower. Regardless of the conclusions drawn above, the basic data are shown so that the reader may draw his own conclusions for the status of the CBD.

Significance of CBD Change

The preceding findings immediately suggest interpretation. One may be initially inclined to extrapolate all trends into the future, but, in most instances, the procedure would be contrary to current happenings and to the underlying causal factors of the trends.

In respect to the retailing function, recent changes reflect the continuation of long term trends in the use of outlying shopping facilities. Prior to the high degree of family mobility attained by the use of the automobile, shopping in outlying locations was primarily of a convenience goods nature, and outlying businesses occurred only in small aggregations. As cities grew and distance to the CBD increased, these small shopping clusters began to assume a larger share of total city sales. Nevertheless, the CBD was still the only business area of the city where major shopping goods could be purchased. In the last decade or so, however, the increase in automobile ownership and its use has permitted large aggregations of outlying businesses to develop. These large aggregations have in turn been able to support shopping goods establishments which are much more competitive with the CBD than the convenience goods establishments associated with the small outlying business clusters in former years.

In view of the rapidly increasing family mobility in outlying areas and the decreasing number of residents near the CBD, it is not surprising that there has been a significant absolute decline in CBD retail sales. Nevertheless, family mobility in relation to the automobile cannot be expected to increase substantially more, as virtually no family in suburbia is without an automobile. The ability of each family to own two or even three automobiles will not increase family mobility for the purchase of goods to any significant extent. Thus, it would be illogical to project the retail trends demonstrated in this research, and elsewhere, very far into the future. As a matter of fact it is highly probable, in view of central city redevelopment projects and increasing

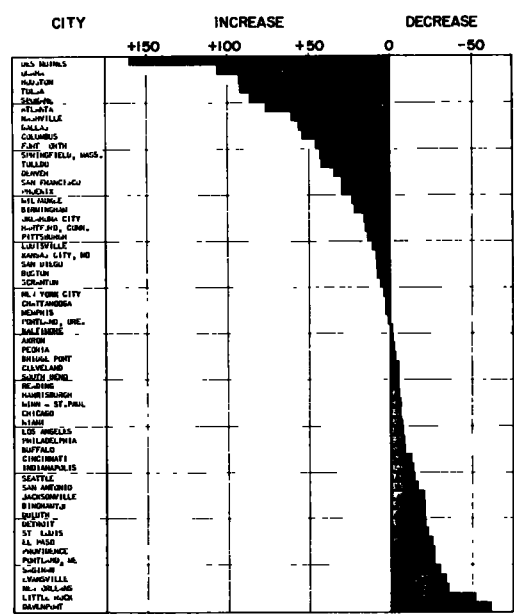
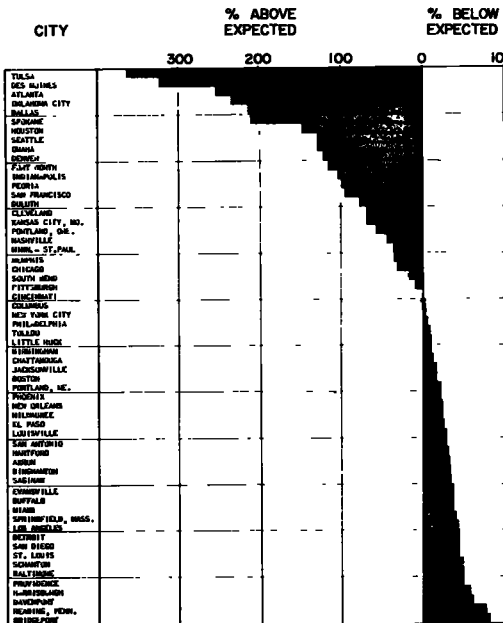


Figure 31. Deviation status of cities, 1956; CBD office space.

Figure 32. Relative change in CBD office space, 1946-1956.

**TABLE 1**  
**CITIES WITH SIGNIFICANT CBD CHANGES<sup>1</sup>**

Retail Sales		Office Space	
City	Relative Change 1948-1954	City	Relative Change 1946-1956
Flint	29	Des Moines	160
Rochester	25	Omaha	106
New Haven	20	Houston	93
Charlotte	16	Tulsa	92
Louisville	12	Spokane	86
Houston	12	Atlanta	76
Corpus Christi	12	Nashville	60
El Paso	12	Dallas	56
San Jose	12	Columbus	54
Montgomery	11		
Erie	-11	Little Rock	-52
Youngstown	-11	Davenport	-62
Memphis	-12		
Des Moines	-12		
Pittsburgh	-13		
Worcester	-14		
Reading	-16		

<sup>1</sup> See (7).

central city transportation facilities, that an equilibrium between the forces of retail centralization and decentralization will soon be reached. Any realistic appraisal of the future status of CBD retail sales would be one closely based on the changing central city labor force.

The core labor force is derived mainly from office use rather than retail sales. And unlike retail sales, there has been an absolute increase in CBD office space during the past decade. This reflects the emerging role of the CBD as the center of regional intelligence functions. Although this research has shown evidence of the decentralization of certain office activities which do not require extensive inter-establishment linkages, such as the decentralization of insurance headquarters offices, it is also evident that there is a continual increase and new formations of intelligence, management, and service activities in the CBD core.

Generally, thinking on the CBD has been conditioned in recent years by the retail outlook. Trends have been expressed predominantly by the gain or loss in retail sales. The research indicates that the basic role of the CBD core is changing from a retail-oriented complex to an office-oriented one. By and large, the absolute gain in the office labor force, as determined by space change, has more than offset the loss in retail sales employees. Further, if the increasing trend in office space continues, it is bound to have a secondary effect on the retention of CBD retail sales because of purchases by the central labor force.

#### HIGHWAY IMPACT IMPLICATIONS

The only possible clue as to urban highway impact on the CBD from the foregoing research requires an analysis of those cities which have had marked CBD changes in relation to transportation improvement. To select these cities retail sales and office space were used as criteria for change. Ranges of significant change were selected for both criteria on the basis of distribution curves of relative change over the time spans studied. Specifically, an increase in relative change of over 10 percent for retail sales and over 50 percent for office space was considered significant. Roughly these changes of significance correspond to the upper and lower deciles of the cities

examined. Table 1 lists the cities meeting these requirements. (See Figures 27 through 32 for graphical results.)

Changes in both CBD sales and office space are bound to be reflected in core rents and land values. CBD retail sales changes are generally indicative of internal city shifts in marketing, whereas changes in CBD office space reflect regional trends. In terms of traffic generation, however, office space accounts for approximately three times as many work trips to the core as does retail sales.

The question now arises as to whether any of the cities shown in Table 1 owe their high relative change, either positive or negative, to urban freeways. Of these only Houston had an urban freeway in operation servicing the CBD over most of the time span studied (6). Dallas had a radial freeway operating only in the latter year or two of the time interval (5). The Atlanta freeway, as late as 1956, had no CBD distribution facilities, nor was Pittsburgh's Penn-Lincoln Parkway anywhere near completion as late as 1953 (12). In Connecticut the Wilbur Cross Parkway does not serve central New Haven, nor is the Connecticut Turnpike complete.

In any event, transportation-induced changes would be minimal because of few urban freeway routes and particularly the absence of networks. It is worthwhile to note that Houston is the only city in Table 1 to have improved its CBD's relative position in both retail sales and office space, however, the significance of this is lessened when the nature of the associated cities with high relative change in office space is considered. All of these cities are regional capitals. Not only do they exhibit high relative change between 1946 and 1956, but they were exceptionally high on the scale of office space per capita in 1946. The chances are more than likely that Houston's increased CBD improvement is more a result of its central place importance than its Gulf Freeway.<sup>8</sup>

### SUMMARY AND CONCLUSIONS

There are many variables, both related to and independent of the urban freeway network, which make it an extremely difficult task to isolate the effects of highway development on the CBD. Furthermore, the many findings derived from single freeway elements cannot logically be extrapolated to cover network effects.

Although the utility of this research is limited in the sense that it does not reflect the effects of completed urban freeway networks, which are still in the early stages of development, they nevertheless supply a basis for some deduction as to the nature of freeway effects on the CBD.

The most significant deduction is that situational factors relating to the central place importance of cities far outweighs any other factor in contributing to CBD change. The CBD core daytime population is geared to the regional importance of the city, not to intracity considerations. Furthermore, the concentration of central activities relates more to CBD establishment linkage than to intracity transportation amenity.

Undoubtedly intercity transportation improvement will have a greater impact on the CBD than improvement in intracity transportation; and this impact will vary according to the position of the city in the regional structure. In this respect, the regional capitals should experience more CBD growth from intercity transportation improvements than the economically dominated cities in their hinterlands. This relative change should not be attributed to intracity freeway or mass, rapid transit development. True, there has been, and continues to be, decentralization of non-retail activities which no longer require extensive linkages with other establishments, but there is also a continual formation and concentration of new activities in the CBD which require central linkages.

<sup>8</sup>The following study is the only highway impact research which includes the core of the CBD as a distinct study area. This study reveals that of the 22 areas delimited for land value analysis the CBD core, by one method of analysis, ranked nineteenth in land value improvement during the 15-yr time span, and fifteenth by another. In fact, the CBD actually lost in value by the first method. On the other hand, the zone of study nearest the Gulf freeway and closest to the CBD ranked seventh in land value increase by one method. Not knowing the size of the sample or the specifics of the study, its validity in respect to these findings cannot be fully evaluated (6).

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