

# Interactions Between Transportation and Urban Economic Growth

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• SINCE the dawn of recorded events, commerce has been a dominant force in shaping the spread of culture, the development of continents and the growth of urban settlements. Anthropologists have recognized the significance of trade and transport in the diffusion of cultural concepts and the infusion of populations, among both primitive and prehistoric peoples (1).

In the history of the economic development of the United States, the record is clearer, and the causal relations more direct. Harold U. Faulkner (2) reports:

Along with the increase and westward movement of population went its concentration in cities. The causes for this were many, most of them attributable to the Industrial Revolution. . . . The development of means of communications by canals and later by railroads allowed a greater distribution of agricultural produce and an expanded foreign commerce, leading to the growth of cities at collecting and transfer points. The market for agricultural products speeded up the western movement, which in turn added to the population of important points on routes of travel.

Charles and Mary Beard (3) also describe in some detail how the frontiers of transportation released dynamic forces that changed the social currents of the U. S., first with the introduction of the steamboat, then with the grand trunk canals, and shortly thereafter, with the railroads: "All over the Middle West, crossroads hamlets grew into trading towns, villages spread out into cities, cities became railway and industrial centers."

Thus the record clearly shows that urban development in the United States was largely spawned by commerce and the utilization of natural resources. The selection of the original location of many settlements that grew into towns and then into cities was governed chiefly by the economic feasibility of access, which in turn generated traffic in the movement of both goods and people. The shape of urban growth within cities has been greatly influenced by terrain and transportation. Only in relatively recent times have zoning and other land use controls been factors in the shaping of city patterns.

A cursory examination of early maps of the United States will indicate that settlements sprang up where favorable transportation induced commerce. Along the seaboards, natural harbors led to the earliest of villages, which grew apace with immigration, trade, and manufacturing. Inland settlements often arose at the confluence of navigable rivers, along lakes and canals, at the crossing of prairie trails, or near the entrance to mountain passes. The juncture or intersection of two or more traffic routes was particularly likely to give rise to a trading center. Time has all but erased the record of these early transportation advantages as trails vanished or became highways, as canals were abandoned and river traffic was generally confined to barge shipment of bulk materials. But in the places where the economic feasibility of commerce dictated original settlements, cities now survive, supported by a complex pattern of productive activity, nurtured by trade and the exploitation of resources.

The economic feasibility of commerce at settlement locations is a reflection of the marginal cost of transportation. As transportation technology has evolved, the thresh-

old of this economic feasibility has both broadened and declined. Because transportation costs, measured in real terms, are generally less than in the days of the stage-coach, canoe and flatboat, their relative importance to total costs has become less critical to many entrepreneurial decisions. Nevertheless, the role of transportation in shaping the pattern of urban growth is still very significant.

In his classic volume on "The Structure and Growth of Residential Neighborhoods in American Cities," Homer Hoyt (4) traces the form of city growth in many major cities, showing the successive impacts of new means of transit on both axial and central growth. Though this study is now close to 25 years old, the forces of growth that it identifies with electric surface lines at the turn of the century and the subsequent spread of highways are just as applicable to the urban scene today. Only the means of transportation has changed. Economic feasibility—now measured as often in terms of time as dollars—is a companion to physical access in governing the shape of urban growth.

As cities have grown into metropolitan areas, diversified frameworks of production, employment, and residence have evolved. Due in part to their geographical enormity, the modern metroplex has generated two major forms of traffic that are largely absent in smaller places.

One of these is the internal movement of large quantities of goods between destinations within the area. Such movements include both the successive stages of manufacturing processes, and the distribution of finished products through wholesale and retail trade channels toward end uses. The other is the daily trip of workers between homes and jobs and family travel within the community. In smaller places, manufacturing is more apt to be vertically integrated and simpler; distribution is also more direct from supplier to retailer. Shorter distances permit more people to walk to their destination, or confine their trips to a mile or two.

Both of these forms of traffic peculiar to metropolitan areas have sharp daytime peaks, placing burdens on traffic facilities and creating congestion in central business district corridors and in their approaches. This problem has been described in a recent article by Anthony Downs (5), "The Law of Peak-Hour Expressway Congestion," which applies the neoclassic tool of establishing an equilibrium when marginal costs are equated between the supplies of scarce commodities (i. e., time and travel routes). The economic consequences of travelers' choices, as they seek to minimize the real cost of transit—measured in elapsed time and in convenience as well as in dollars and cents—will have far-reaching effects on the pattern of future land use for residential and industrial purposes and on the rate of urban growth itself. One obvious consequence of congestion is spin-off from the central business district and an increase in crosstown traffic.

Recognition of congestion and the personal and public diseconomies that mount from its intensity has clarified both the need of more extensive public planning for highway locations and transportation routes, and also the desirability of controls over urban land uses. For example, in describing the projections of travel patterns in the Greater Hartford area, Charles F. Barnes (6) says,

Starting with a regional projection of population and employment, a highway system is assumed to handle this generalized land use. . . . Historically, most transportation studies have worked within a framework which presumes that the metropolis will grow in accordance with an established city plan or zoning ordinance. Thus in the horizon year, the projected land uses conform explicitly to these predetermined plans. Although this may be a perfectly realistic approach, to the critical onlooker and the analyst alike, it does leave many questions unanswered.

Over periods of a decade or more, the degree of conformance of public and private actions to a land use plan and the degree of success of various measures taken to assure good conformance will probably be influenced by the care and the judgment that entered into the economic and demographic projections on which the plan is formulated.

And, of course, a transportation plan that is based on a misconceived land use plan or an unrealistic zoning concept will prove to be impractical or uneconomic. Hence, it is of particular importance that the employment and population forecasts be carefully and expertly derived.

A preferred starting point for an urban economic study is an examination of national and regional growth patterns that identify the expanding, static, and declining job-producing components of the economy likely to be present in the area during future years. Long-range local economic trends usually conform in general direction to the national patterns. Continued improvements in communication and transportation technology are likely to strengthen rather than weaken this conformance. For example, the introduction of new technology and automation in manufacturing industries during the last two decades has led to a decline in blue-collar employment and a counterpart rise in the hourly productivity of applied labor that has made substantial wage gains feasible. Further, the accelerated rate of investment in research, development, and engineering during recent years makes it more than likely that these employment and productivity trends will continue, but not with uniformity throughout industry. Electric trolley-car producers have recently joined the ranks of the buggy-whip craftsmen.

Although the precise nature of the techno-economic impacts of innovation on a particular plant—or a subject city—cannot be forecast with precision as to timing and extent, the identification of nationwide trends will point toward the sectors that call for closer study to determine their likely impact on firms now present in the area. The longer the term of the forecast, the greater the prospects of local conformance to nationwide patterns.

Thus the total picture of national growth components is a base to which local forecasts can be anchored, and from which local departures can be projected with greater realism. There are few large communities today that are not trying to induce the establishment of research activities (particularly, electronic) in their area. Others, both large and small, are striving for industrial diversification to counteract the probable continued decline of employment in heavy industry. But success of any particular community in maintaining its share of national growth rates and in shifting its employment and production structure toward more rapid growth will depend largely on the resources it has at hand and in prospect.

With nationwide and regional growth perspectives as a framework, a careful identification of local resources is the next step in particularizing data for the urban area. The focus of this descriptive inventory will be on the comparative advantages of local resources in relation to those of other places with which it must continue to compete, both for the attraction of new firms and the retention of those now present.

The resources of an area can be grouped under four major headings. First is the composition of the labor force, including those in the population not currently working. Among the characteristics to be studied are occupations by industry and by wage rate, as well as age, education, race, and sex. Second is the fixed private investment in plant, equipment and commercial structures, plus the public investment in community facilities essential to production. The fixed capital investment in the area is one measure of current productive capacity, both its absolute potential and its economic limits.

The third group covers natural resources of the area, including mineral, agricultural and timber assets, qualities of the terrain, and soil, water and air, as well as climate and physical location as they bear on the economic life of the community. The fourth group may be labeled "amenities," blanketing in all of the more subjective factors that comprise goodwill, and coloring the reputation of a locality as a good place in which to work and live. The ability of local government is a major amenity, along with the quality of the schools, recreation facilities, adequacy of the housing supply, and the history of labor-management relations. The efficiency of local transportation facilities is also an important amenity in major metropolitan areas.

In compiling a study of economic growth opportunities under these four major categories, the depth of detail required will depend on the time-span of the forecast sought, size and complexity of the locality, competitiveness of the economy with other communities with similar opportunities, and also availability of data and the size of the survey budget.

The sort of study that would be forthcoming under these four categories would appear to be only descriptive of things as they are. But the opportunity to do much more is large. Appropriate time series permit an inspection of rates of change and provide the basis for projections to guide forecasts of the future. Cost and price data, productive capacity, natural resources and local amenities, when placed in conjunction with significant counterpart information from competitive areas and from other regions, bear directly on the basic question of the share and shift in national growth that will be experienced in the locality as a result of the locational decisions yet to be made by business concerns and workers.

The secret of successful analysis of a local economy involves two talents. First is asking the right questions while selecting study data, and keeping these questions foremost at all times. Second is applying judgment and familiarity in appraising the significance of the facts. Often the outlook for a small or medium-size city may be more difficult to judge than the prospective growth rate of a major metropolitan area, even though the latter is more complex and its data sources more extensive. The largest places are more likely to grow with the national economy if their productive activity is well diversified. And a larger share of total employment will represent service-type activities rather than production of goods. Where the initial inventory of productive activities shows such diversification, some details that may be omitted in metropolitan areas will require careful scrutiny in smaller and less diversified localities.

Many purposes may be served by the conclusions of an economic study that leads to a forecast of local growth probabilities, expressed in terms of employment, personal income, population, and output by industrial classification. Plans involving housing requirements, transportation and highway needs, schools, public facilities, and land uses in broad terms can all be derived in the aggregate from the dimensions of the growth prospects for the area. Public and private capital investment requirements, as well as tax revenues and the quantity of various municipal services, will also be shaped by the same economic growth prospects.

However there are some needs that will not be served by a study of the kind being discussed. For example, such a study will not tell very much about where land uses will be changed within the city. It will not tell where new highways will be needed, where schools and housing will be built nor new shopping centers located. These are matters that have to be planned from an examination of detailed land use records, coupled with an intimate knowledge of internal shifts of population and places of employment within the area. Broad macro-economic studies will answer the questions of "how much" and "what kind," but not "where." Yet within the work papers of the economic growth analysis, there should be a wealth of detail that can be reoriented in terms of land use opportunities to throw light on the "where" question for subregional or micro-economic studies.

Similar information is often assembled by business management in making locational decisions regarding the construction of a new plant, an office building, a shopping center, an apartment building or a housing project. By employing the same methods and the same data that entrepreneurs would apply in land use and marketability studies, it may be possible for public officials to anticipate private decisions that may be made at later dates. Competence in this technique may be as important to public bodies as are various planning and land use controls.

In urban life there are some characteristics whose rates of change are so gradual and which lend themselves so nicely to forecasting that they may have a high degree of reliability for periods of a decade or longer. For example, population fertility, structural deterioration, thrift, consumption habits, and educational attainment usually change gradually, and the secular patterns of these components can be measured with some reliability in a stable population. But where marked changes occur in the age, income, and ethnic composition of an urban population because of changes in employment opportunities, even these normally sluggish elements may shift sharply as a result of the changed mix or composition of the population. Many other volatile elements of urban areas respond even more rapidly to population mobility and render earlier forecasts inaccurate.

Annual surveys by the Bureau of the Census have shown that about 20 percent of the

U. S. population change their place of residence every year. In this shifting between 1959 and 1960, 13 percent of the population moved to a new residence in the same county, about 3 percent moved to another county in the same State, and another 3 percent moved to a different State (7). Of all the data series that must be employed in an economic or a land use study, probably the most crucial, yet the most esoteric, is gross population mobility. Because of the importance of migration statistics, more attention is being paid to the characteristics of movers and their motivation. But until such information is widely available from direct enumeration, estimates of growth in employment opportunities probably provide the best approximation.

Besides population migration, innovations in technology that result in new means of production and new habits of consumption inject major elements of uncertainty in economic forecasts. Scientific, engineering, and commercial "break-throughs" have been tremendous. Some have come as by-products of research for national defense and space exploration. Others result from greater national emphasis on science and mathematics, coupled with larger numbers of scholars in university and industrial laboratories. Still others follow from heightened competitive pressures to devise new products for the mass markets.

The tempo of technological progress is rising, probably at an accelerating pace. The analyst of long-range local and national economic trends who is seeking to forecast growth potentials must be humble in the handling of data, and recognize a wide range of probable variation to allow for unforeseen changes in technology.

On the positive side, there has been an opportunity to learn quite a bit about the forces that have shaped urban development during the past decade. The pattern of growth has been repeated in many cities, particularly in metropolitan areas. Concurrent with the zooming rate of marriages and family formation following the end of World War II, single-family home construction rapidly spilled over city limits into the suburbs. The lack of public transportation from these outlying locations dictated the use of private automobiles for worker transportation. Rapidly rising family incomes made the purchase of an automobile possible, partly because of more liberal financing arrangements for the purchase of both the home and the car. A large number of working wives added to the family income, and soon the two-car family became commonplace.

The combination of the suburbanization of most new families coupled with marked increases in private automobile traffic and rising incomes led to a series of corollary results. First, urban traffic congestion became acute and pressures grew for new roads and highways to escape the central city. Second, public transportation either stagnated under rising operating costs or suffered absolute declines in passenger-miles. Third, outlying shopping centers with adequate parking space sprang up close to suburban housing concentrations, reducing the volume of trade, relatively even if not absolutely, in downtown department stores. Fourth, the decline or dormancy of central business districts brought new pressures on city tax revenues and led to plans to compensate for the changed shopping habits of families. Fifth, the lower income families that could not arrange to move to outlying locations remained in the older and depreciated housing surrounding the central core, forcing higher densities of housing use than had existed in these structures earlier in the century. Sixth, the schools and public facilities in the suburbs experienced the same kind of use-congestion that arose on the highways.

These symptoms of metropolitan growth during the decade of the 1950's have been well documented, and fortunately are widely known. In the last few years, the pace of growth has been not quite as hectic, and construction of housing, highways, and community facilities has made some headway in catching up with earlier accumulated demands.

But the end is not in sight. On the contrary, prospective increases in family formation as soon as the generation of post-war children finish their education will start the cycle over again. Meanwhile there are a few years in which to compensate for some of the needs that are unmet, and to develop longer range plans to guide future urban growth into more orderly patterns.

Yet because of the many local variations and unforeseeable events, long-term fore-

casts need to be reviewed and updated every few years, where it is feasible to revise plans and the course of action based on them. This does not help much when highways and buildings have to be constructed now to serve a need for decades ahead. But it does provide a way to take other compensatory actions that may help to validate the original decision.

Highway engineers and urban economists have many complementary problems and parallel decisions to make. The engineer can better gauge traffic densities in future years by using the forecasts of jobs and production made by his economist colleagues. Estimates of the length of trips, the number of workers, and the quantity of goods to be moved are governed by limits derived from macro-economic studies of urban growth prospects. At the same time, the judgments of the engineer in the design and location of highways will have a profound influence on not only the urban shape but on the efficiency of urban life. Today as in the days of early settlement, the kind of transportation and its setting is a major force in the locational decisions of many families and entrepreneurs.

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