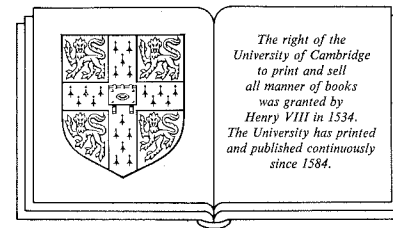


The decline of transit

*Urban transportation in German
and U.S. cities, 1900-1970*

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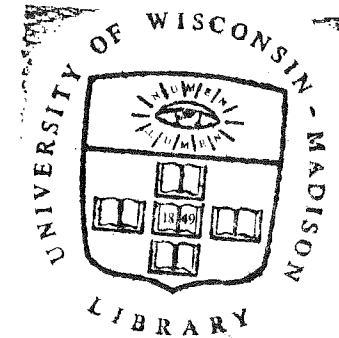
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Preface

Transportation captured and shaped Americans' vision of themselves and their country. The image of the railways and the open road reaches deep into our national memory. Physical and geographic mobility often substituted for social mobility—from the westward movement of the nineteenth century to the northern urban migrations of the twenties and thirties to the sunbelt flights of today. The romanticism of the railways and the animism of "Cougars," "Mustangs," and "Broncos" symbolize our collective identification with and sometimes alienation from a sense of place and a means of motion.

Today, most Americans live, breathe, and walk within the sight and sound of heavy traffic. Cars, keys, style changes, repair bills, and gasoline prices are so omnipresent in our lives that we have almost ceased to think about them. Transportation, deeply ingrained in our culture, is transparent; its impact on our daily lives is invisible and inevitable, beyond our vision of what can and could change our cities and our lives.

We confront the phenomenal cost of our urban transportation system—oil shortages, rising auto prices, highway repair costs, transit budget crises, mass unemployment in the automobile and tire industries, and rising environmental and highway safety problems. Less tangible, but no less real, are the effects upon community life. The division of urban space resulted in the isolation of the workplace from community life, the invisibility of the elderly and the young, and the erosion of social cohesion that preserved socially mixed and stable neighborhoods. Patterns of residential segregation by groups within classes (ethnic, racial, or age) drained community life

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of political vitality. Community interests are now perceived as separate from workplace concerns; the primacy of private over public life weakens political participation; and the socialization of children isolated from diverse income, age, and social groups reinforces the privacy of consciousness. The decline of mass transit narrows the range of urban experiences, isolating communities and workplaces and insulating urban travelers from the world between. These costs of the decline of transit are really a shorthand for the impact of transportation on ordinary lives.

The urban transportation policy question is usually posed in fragments: How must our means of travel change in the face of energy scarcity? How can we solve the fiscal crisis of transit? How can we improve the accessibility of jobs and services to the poor, elderly, young, women, and handicapped? How can we improve transportation productivity? These questions strongly challenge our past policies and suggest that a reassessment is in order. National policy prescribes bailouts, tax credits, and massive federal subsidies for the auto industry, while Americans are chided for their "love affair with the automobile." Consumers are urged to forgo car travel for a transit alternative that does not exist. The impossibility of rail development is countered by arguments of the energy limits of auto dependency. The options and accounts are contradictory and muddled.

First we must know what happened—the calculated abuses of political and economic power, the well-intentioned, although flawed, designs of planners and policymakers, and the structural changes in technology and the economy. This research hopes to link fragmentary questions and to sort out diverse issues in our urban transportation past by merging quantitative and historical methods in a comparative analysis of German and U.S. cities.

The years of research have produced many debts. I would like to thank Bradford C. Snell, whose work introduced for the first time consideration of economic institutional impact on transportation, for his cooperation and encouragement. I would also like to thank Maurice Zeitlin, Michael Aiken, Manuel Castells, Yudit Jung, David Kramer, Aage Sorenson, Erik

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Glenn Yago

October 1983
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Introduction

After World War II, most urban analysts greeted highway transportation as a solution to urban congestion. Increasingly, mass transit was considered marginal to urban travel, limited to older, densely populated cities. Accordingly, policy decisions limited subsidization to transit in favor of the construction of highways.

Mass transit's decline was consistent with theories about urban change: Urbanization, housing, and industrial location patterns resulted from successive changes in the technology of transportation. Electrical traction first expanded transit's role but simultaneously dispersed urban residents, who came to prefer the automobile; changing consumer tastes reinforced this pattern. The most obvious factors associated with transit's decline—population, economic, and consumption changes—became central to theories accounting for it.

The prolonged energy crisis, beginning in 1973, shattered most accounts about the role of transit, which was suddenly promoted as central to energy-efficient and rational land use. If transit was now possible and desirable in new, automobile-oriented, low-density cities—whether Los Angeles, Frankfurt, or Tokyo—why had it declined in the first place? Why had researchers from fields as diverse as geography, sociology, economics, political science, and urban planning argued for decades that the population, income, and spatial characteristics of cities impossibly constrained mass transit services, thereby promoting motorization by federal, state, and local planners?

Heretofore, changes in urban spatial structure, consumer preferences, transportation policy, and business were ex-

plained in terms of technological developments that organized human activity and structured social life in our cities. Population and the supply of urban land grew as cities participated increasingly in the interregional economics made possible by technological advances in transportation (Berry and Garrison, 1958; Berry 1958; Berry and Horton, 1970).¹ These successive changes, in which new innovations overcame old spatial boundaries, characterized urban growth—the pedestrian, streetcar, or automobile city, the suburb, exurb, or agglomeration. The resulting size and density characteristics of cities thus predisposed them to “optimal” transportation solutions through both individual choice and the policies that reinforced them.²

Further elaboration of this theory in geographical, sociological, and historical studies came when economists focused upon how firms and urban residents choose to minimize their costs. Assuming rational choice, their econometric models postulated a trade-off between land and travel costs (for industry and individual alike) as changes in transportation technology increased access to cheaper land.³ Historical decisions and institutional changes affecting urban services were considered irrelevant; current market costs of travel or land could explain urban changes “without reference to the heritage of the past” (Muth, 1969:47).

But what if cities were more than empty maps willed by railroads, highways, suburban developments, and office buildings whose location was determined by the last generation of technology and, in turn, structured the next group of market choices? How might the shared or conflicting interests of individuals and groups, and the results of their actions and policies, shape technology and, perhaps, limit it? Could the demographer’s analysis of urban population characteristics or the cartographer’s view of economic activities shaped by geography account for all the processes causing transit to decline?

The present research connects unexplored changes in the politics and the economy of the transportation industry and government policy, both at the national and local levels, to previously observed technological developments, urban growth, and consumer behavior. Which economic and social

factors create transportation policy, the decision-making environment of consumers, and the spatial expansion of cities that diminish public transit? Why does the balance between public and private transportation vary within urban systems and between nations? How do state and economic policies operate to produce so many different outcomes?

In earlier research, the emphasis on technology, urban space, and/or consumer behavior resulted from studies within single nations. Such studies were unable to isolate variations in social, economic, and political structure highlighted by comparative analysis. The purpose of comparative analysis is to “manipulate groups of cases to control sources of variation in order to make causal inferences” (Skocpol and Sommers, 1980:182).⁴ This process is accomplished at various levels of analysis (both statistically and through comparative case studies) addressed to specific issues: the shared pattern of transit decline, the different rates of decline between societies, and the decline within them.

Although automobile transportation is ubiquitous, as are urban processes of metropolitanization, suburbanization, and industrial decentralization, the patterns of mass transit decline are by no means uniform. Comparative analysis identifies those factors in transit decline common to industrial societies, yet also isolates unique features within each society that account for differences in the rates of decline. By contrasting cases, analytically focused generalizations about sources of variation between urban societies and the political and economic factors favorable or unfavorable to motorization and transit decline can be made. Finally, local case studies within those societies illustrate the mechanisms of these macrosocial processes.

The study that follows compares urban transportation history in Germany and the United States since 1900, combining cross-national comparisons, cross-sectional analyses within countries at different points in time, and local case studies to present quantitative and qualitative historical evidence of how corporate power and state policy control urban development. As the most dynamic and powerful economies of their respective hemispheres in the twentieth century, Germany and the

United States are uniquely suited for comparative analysis of transit change.⁵ Although the processes of capital accumulation and economic growth in these industrial societies are putatively similar, the composition of growth industries, the timing of economic concentration, and the process of state formation differed substantially. In both countries, transportation investment, first in railways and later in automobiles, was crucial to expanding industrial investment and output. Wildly changing forms of state intervention in the economy also occurred in both countries after the turn of the century. The similarities and differences of the two societies, and their political and economic institutions, allow the construction of a multilevel research design to explore the decline in transit in both societies and the differing dimensions and rates of urban transportation change.

Structural conditions affecting transportation decline

Chapter 2 introduces and compares subtle changes in urban structure and corporate power that may precede changes in urban transportation systems. In that chapter, the shared pattern of transit decline is elaborated by measuring the location and composition (diversity or specificity) of economic production in a city, changing city functions (administrative, commercial/financial, and manufacturing), and regional and national differences in the growth of corporate power. Data for the largest German and U.S. cities in 1900 and 1970 are presented. Structural factors in these two sets of cities are discussed, and the following changes are compared: (1) ecological factors—physical characteristics of the city, and population size and density; (2) the position of the city in the national urban system; (3) the economic structure of the city as indicated by its pattern of industrial employment; and (4) the structure and role of corporations, as indicated by the number of corporate headquarters, their industrial composition, and their influence on transportation planning.

Descriptive data on transit decline and panel data analysis of German and U.S. cities address the following questions:

How did the different rates of capitalist development in Germany and the United States, reflected in their urban systems (indicated by differing rates of economic concentration, the composition of growth industries, and metropolitanization), result in transportation change? Did the scope and timing of corporate presence affect local transit decline? Was the diversity or specificity of corporate interests a factor? How do these complex relationships reveal why transportation-producing or consuming industries become dominant influences in transportation policy?

National transportation policy

Although Chapter 2 presents quantitative evidence on the structural conditions of transit decline, it cannot explicate the mechanisms involved. Historical evidence is necessary to link the analysis of macrosocial structural forces at both national and local levels with the mechanisms of corporate strategy and state planning policies.

Chapters 3 and 4 look at changes in economic growth, corporate structure and strategy, political institutions, and policy organizations at the national level that constrain transportation choice. Marxian and neo-Weberian theorists have argued in recent years that economic concentration and political centralization are the primary processes governing social and technological change. This claim will be examined by contrasting the timing and nature of economic concentration and political centralization, which condition the development and structure of transportation interests in Germany and the United States.

In the United States, the companies that produced transportation equipment and services favoring automobile use dominated transportation policy earlier than in Germany. Until the Great Depression, corporate strategy was sufficient to undermine public transportation. However, during the economic crises in the Depression and the post-World War II period, greater state intervention occurred to accommodate automobile expansion. German economic concentration occurred earlier in industries that consumed, rather than produced, trans-

portation services (coal, steel, mining, and other heavy industries), allowing diverse transportation interests (particularly railroads) to survive longer. The emergence of the German automobile coalition (including the growing oil and rubber industries), however, led to the promotion of state policies encouraging motorization. How did this change in industrial interests alter the pace and direction of transportation changes?

To understand transit decline, we must examine the strategies of companies and coalitions involved in transportation production, the history and orientation of national transportation policy, and the conflicts within government and industry over specific transportation proposals. How did industrial coalitions around transportation issues emerge from the different methods of capital accumulation in Germany and the United States? How did these coalitions impinge upon state policy, blocking alternative transportation technologies? What are the organizations, political institutions, and historical conditions that turn corporate interests into state policy? What characteristics of government (e.g., political fragmentation and centralization of political authority) facilitate or hinder the emergence of transportation policies?

Local transportation politics

The urban structures and historical processes elaborated in the earlier chapters are illustrated in Chapters 5 and 6, where case studies of Frankfurt and Chicago are presented. These cities were selected because as major growth centers, they have served comparable functions in their respective national systems. This comparison demonstrates the macrosocial processes operating at the cross-sectional and national levels. This examination of two cities with similar production structures and national standing links the national processes of corporate strategy and state policy to local transportation politics.

Local histories reveal how changes in transportation systems are related to changes in local political organization and economic structure. Public participation in transportation deci-

sions, the bureaucratization of transportation planning, and the insulation of local corporate interests from public opposition are all examined. The class composition of cities and their neighborhoods changes, thereby shifting spatially linked political interests and the constituencies mobilized in transportation conflicts. As urban government becomes increasingly centralized, local control decreases. This local decline in an environment of growing corporate power concentrated in specific industries nationwide affects transportation policy.

To illustrate this process, conflicts by transit workers and consumers over strikes, routes, rates, public control, and highway construction; changes in urban transportation planning and local government organization; and the link between urban planning and transit decline are all presented in these chapters. Class-linked organizations, interests, and decisions contributing to local transportation politics are identified.

The case studies address the following questions: How did changes in the urban economy affect transportation development? What was the interplay between economic changes in the city and corporate involvement in transportation planning? Did the organization of local government facilitate corporate intervention? If so, which organizational forms permitted penetration of special interests? What business associations, civic groups, or policy organizations provided the forum for corporate interests to develop and popularize their position? How did communities with less voice in local government organize around transportation issues? Which factors blocked the transportation alternatives formulated by conflicting or competing class interests?

2

Twentieth-century mass transit in German and U.S. cities

Why did mass transit decline? Which processes, common to German and U.S. history, account for the shared pattern of decline in public transportation? The automobile is the easiest and most misleading answer and moreover underscores the primacy of technical explanations of social change. As we shall see, increased car ownership did not always mean decreased use of transit. At times, the two modes coexisted peacefully; at other times not. What accounts for the variation between nations and cities in the rate of transit decline?

In this chapter, we consider data on U.S. and German cities and their transit systems before and after the rise of the automobile. The aim of this quantitative analysis is not to provide a definitive theory of what determined mass transit and its decline (such time-series data are not available) but to explore systematically and to approximate the structural factors of cities affecting transit's role.

This chapter presents a correlational and multiple-regression analysis of the largest U.S. and German cities in 1900 and 1970 to explore and identify urban structural processes of transit decline. The statistically minded reader should examine Appendix 1 for details about the data and procedures used. First, however, we should consider the extent of transit decline in Germany and the United States over this time period. These nationally aggregated figures describe the broad contours of urban transportation change. Next, the focus shifts to city-level data examining intercity variations of that process. The analysis concentrates on four sets of characteristics and their relationship to transit ridership and its decline: the level

Mass transit in German and U.S. cities

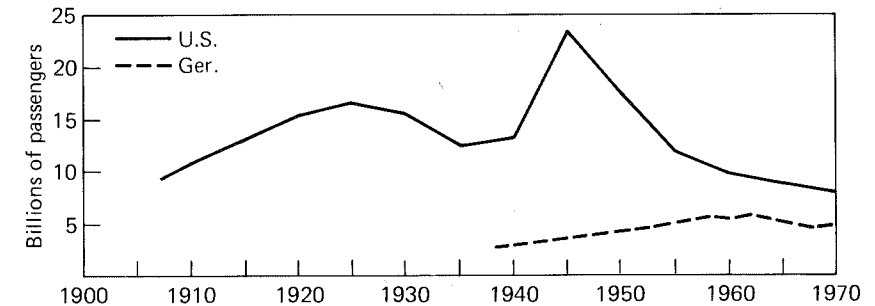


Figure 2.1. Decline of total public transit ridership in the United States and Germany, 1900-70. (Sources: for United States: American Public Transit Association, *Transit Fact Book*, 1975-76; data for 1907-40 are from Wilfred Owen, *The Metropolitan Transportation Problem* rev. ed. 1965; for Germany: *Jahrbücher des Deutsches Reich*, 1920-71.)

of urbanization (i.e., ecological characteristics of the city), the location of the city in its national urban system, the industrial structure of the city, and the presence and composition of corporate power.

The results of this exploratory analysis suggest the complex interaction of ecological and politicoeconomic characteristics of urban structure that produce transit change. How strong is the relationship between any of these factors and public transit? How are the observed relationships changed when controlled for by historically antecedent factors? What can these statistical observations tell us about urban structure and its impact upon public transportation?

The extent of transit decline

Figures 2.1 and 2.2 show the changes in public transportation in Germany and the United States over the past decades. Since 1900, public transportation has declined in both countries. Although the data comparing transportation development and use in their respective cities since the turn of the century are incomplete, several observations can be made on

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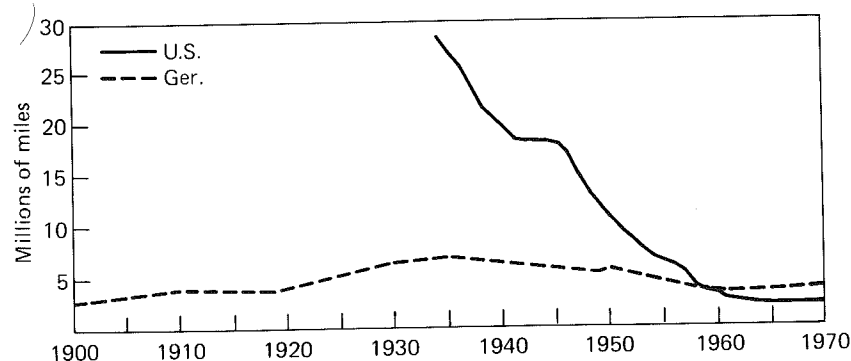


Figure 2.2. Decline of rail transit in the United States and Germany, 1900-70. (Sources: for United States: *Historical Statistics of the United States*, U.S. Census Bureau, 1975; for Germany: *Statistisches Jahrbücher des Deutschen Reich, 1920-71*.)

the basis of national data. Transit ridership in the United States began to decline immediately before World War I and stagnated throughout the twenties. This decline was hastened by the rapidly rising transit failures of the thirties. The decline leveled off during World War II, but ridership fell sharply and consistently afterward.

The impact of the automobile in Germany is evident in the decline of rail transit that began during the thirties and continued after World War II. (Aggregated ridership data for all transit modes for the prewar period are unavailable.) Although overall ridership increased gradually during the reconstruction period (1945-59), all transit modes suffered a decline that persisted until 1970. This decline was hastened by the substitution of buses for rail lines, producing an overall reduction in ridership.¹

Since the 1930s, the use of the automobile has risen dramatically in both Germany and the United States.² Nevertheless, the relationship between public and private transportation has been neither constant nor continuous. However, both countries have seen fluctuations in the decline of mass transit, and there have been differences in the national experience. Germany's decline in mass transit came later and less suddenly than in the United States.

Mass transit in German and U.S. cities

In the thirty largest German cities for which data were available, and which are in what is now West Germany, public transit ridership peaked later than it did in the United States. The greatest period of transit growth occurred during the Weimar period and peaked in 1929. From 1900 to 1970, average ridership in transit increased by about 210 percent, from 67.7 to 209.5 passengers per inhabitant. However, nationally aggregated figures show a decline of 27 percent by 1970, whereas the decrease in our sample of largest cities was only 16 percent. This indicates that the heaviest decline in mass transit occurred in middle-sized and small cities. During the same period, the automobile swept the country. In 1920, 422,000 private automobiles were registered, compared to 13,168,000 in 1970 (Krämer-Badoni et al., 1971: Tables I, II; 11, 16).

These shifting fortunes of mass transit reflect the massive "municipal industrialization" of infrastructural services by local governments between 1900 and 1929 (McKay, 1976). Transit decline between 1929 and 1970 indicates the impact of growing motorization policies of the Nazi and post-World War II periods.

Transit ridership in the United States peaked rather early, in 1908, and declined nationally by about 75 percent by 1970. In the thirty-one major metropolitan centers for which the best data were available, the decline was over 82 percent. This indicates that the pattern of decline was more uniform among cities of all sizes in the United States than in Germany. By 1970, U.S. operating deficits were about \$2 billion annually, and nearly 90 percent of all operating systems that had existed before World War II had gone bankrupt and were municipalized. The reduction in passengers per inhabitant, from 205.8 in 1900 to 44.58 in 1970, is consistent with the massive reduction of transit service. From 1915 to 1957, 815 transit operating companies abandoned 18,082.54 miles of electrical rail service, which were not replaced by bus service (ATA Files, memorandum, New York City, November 18, 1958). Details on such abandonments in our sample cities are given in Appendix 1.³

What accounts for both the overall similarity between the two countries and the different rate of decline? By disaggre-

gating national data and observing the magnitude of mass transit in cities and its change over time, the roles of different urban characteristics can be weighed and assessed.

In the following sections, we will consider the effects of urbanization, urban industrial structures, the place of cities in their national urban system, and corporate presence. For each effect, we shall examine the role of these characteristics upon the level of mass transit ridership in 1900 and 1970, and upon the rate of decline over that period.

The effect of urbanization

Heretofore, it was thought that mass transit was determined by spatial (or ecological) characteristics describing the degree of urbanization of a city. Ecological research argued that the time of urbanization (a city's age) and its population structure (size and density) determined the level of transit services. Market scale and operating costs benefit from large populations and high density. The physical structure and settlement pattern of older cities were likely to be relatively dense, optimizing the access and efficiency of public transportation. Urban analysis in both the United States (Hawley, 1950; Schnore, 1968) and Germany (Löscher 1952; Christaller, 1966; Iblher, 1970; Klemmer, 1971; Weber, 1928) viewed transportation infrastructure as the outcome of its spatial location and population characteristics.

This argument is also the basis for conventional explanations of European and U.S. differences in mass transit. High national population density in Germany compared with the United States is considered to result from preindustrial and early industrial settlement patterns. The density and age of German cities allegedly account for their more advanced transport systems (Adams, 1981; Dunn, 1981). The same argument is used, of course, to explain intercity variations within countries—with older industrial cities more predisposed to transit than newer, low-density cities.

A closer look suggests that this argument oversimplifies the social processes of transit change. Although U.S. population

density in all urbanized areas is half that of Germany, the population size and density per capita of the largest U.S. cities are only slightly greater than those of the top German cities in our sample. The greater proliferation of small and medium-sized cities in the U.S. national urban system, *not* vast differences between German and U.S. major metropolitan centers where mass transit is most important, misleads researchers to state that ecological characteristics determine the level of public transportation. For example, Hamburg and Los Angeles have similar population densities and totally dissimilar transportation systems—the former with a balance of auto, rail, and bus systems, the latter largely auto dependent.

The statement that urban size, age, and density determine the demand for transit services is widely repeated in sociological and planning studies of U.S. cities (Schnore, 1965; Kain, 1967; Council on Municipal Performance, 1975; Guest and Cluett, 1976; Legitt, 1974; Mamon and Marshall, 1975). The large correlation and multiple regression coefficients between these characteristics suggest spurious relations between them and mass transit; statistically, this indicates "multicollinearity," that is, that theoretically unspecified (and therefore unmeasured) variables inflate the effect of these characteristics on mass transit.⁴ This suggests that characteristics causally prior to urbanization exist, and that by identifying and controlling for them, the observed relationship between ecological structure and transit would be reduced and more variance between cities would be explained.

In order to eliminate the problems of multicollinearity of these ecological variables and statistical problems of small sample size in both national groups of cities, factor analysis was used to reduce these measures to a single measure of the concentration and distribution of population in German and U.S. cities in 1900 and 1970. Many urban variables were included in this index, although they differed slightly due to time period and country—population size, population density, number of industrial establishments, rank of the city on a scale of national dominance (Abrahamson and DuBick, 1977: Table 3, p. 763), city age, value added in manufacturing, total retail sales, and volume of wholesale trade. In both countries,

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similar patterns of population and spatial structural change occurred; mean population size doubled, and density declined by more than 50 percent in the sampled cities.

For German cities at the turn of the century, a high level of urbanization was strongly associated (.56) with extensive transit ridership and accounts for 29 percent of the variation between urban transit systems. However, when we control for other characteristics of urban structure, the impact of urbanization disappears and the amount of variance explained by a model including political and economic factors increases by 48 percent. Pre-twentieth century patterns of urbanization neither promoted nor inhibited mass transit system development. As we shall discuss later, the role of the big-city mayor in encouraging and accommodating industrial expansion was crucial to infrastructural development in cities (Hoffman, 1974).

By 1970, German cities had undergone cataclysmic changes associated with Nazism, war, and the "economic miracle" of the Federal Republic. Mass transit in the thirty largest German cities recovered from wartime destruction but never achieved the level of ridership of the Weimar period. Urbanization characteristics had an independent effect upon public transportation in 1970, illustrating how the cities' ecological structure was historically derived from the political and economic conditions of an earlier period. Population and density characteristics developed simultaneously with twentieth-century industrialization centrally linked to pro-rail industrial consumers of transit services. This interpretation is consistent with historical evidence discussed in later chapters. Urban spatial structure conducive to higher levels of public transportation in 1970 is the legacy of urbanization linked to capital accumulation and national urban system development during the earlier part of the twentieth century.

The above results relate to the role of urbanization under static conditions; focusing upon transit change as measured by declining ridership is a separate theoretical issue. To the casual observer, German urban dwellers enjoy more transit services than do their U.S. counterparts. This observation, although obviously true, obscures processes in both countries

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that have taken a toll on mass transit; it also obscures processes operative in one nation, but not the other, that slowed the decline. In Germany, as we shall see later, those processes were muted by support of mass transit by business leaders historically tied to rail transit and municipal social democratic policies. Nevertheless, despite the various countertendencies to transit decline, the role of mass transit was transformed and greatly changed by transportation policies. Did urbanization create spatial structures that promoted the demand for transit services and reduced mass transit's decline? Did larger, strongly urbanized centers experience less decline than lower-density, smaller cities? Was the degree of urbanization the salient feature of a city that reduced transit decline? According to our results, urbanization played no significant role in affecting the pattern of transit change in German cities.

In 1900 in the United States, ecological characteristics of cities measured in the urbanization index had a highly significant, positive impact upon the level of public transportation, accounting for much of the variation between pre-World War I cities. However, as in Germany, controlling for other urban structural characteristics reduces the impact of the urbanization index to zero; the variance in transit systems explained nearly doubles. The urbanization index serves as a proxy for generic processes of political and economic change that influenced urban spatial form.⁵

In 1970, U.S. urbanization factors had an increased impact on public transportation. The political and economic processes of the earlier period predisposed city development toward the spatial distribution of economic activity in residential, industrial, and commercial areas that supported mass transit. Urbanization became the central factor through which other structural effects of the city upon public transport are mediated. Rather than a proxy, urbanization was now an intervening variable between other determinants of mass transit. The spatial and population structures of the city were the result of its earlier position in the national urban system and its current role as a coordinating center requiring some level, although a greatly reduced one, of mass transit.

The effects of urban centrality

Public transportation needs are defined, in part, by the role of the locality in the larger national system of cities. Cities have different functions in the organization of production, consumption, and distribution in broader regional economies. Geographers and sociologists have long noticed how these distributions of functions result in a stratification of cities (Duncan et al., 1960; Duncan and Lieberman, 1970; Pred, 1974; Berry, 1978; Preston, 1978). The position of a city within an urban hierarchy shifts with changes in market expansion and the location of growth centers in changing waves of economic development (Alonso and Meredich, 1970).

The more central a city is within the national urban system, the greater are the demands upon it to coordinate regional activities and control economic development. Consequently, the role of tertiary industries increases in those cities in order to coordinate agricultural and manufacturing activities in the broader region. In these cities, service employment, trade, and transportation are attracted from the hinterlands to a central place where sufficient service infrastructures, including mass transit, are provided. Transit is necessary to expand the boundaries of urban settlement, absorb migrants to the cities, and spatially distribute economic activity.

The effects of centrality upon urban transportation are specific to the types of industrial activity that dominate a city and a nation during a given economic period. The more diversified the national industrial structure, the more likely the transportation system is to include and preserve mass transit. On the other hand, if the city exists in an economic environment strongly linked to auto-oil-rubber growth industries, highway transportation is more likely to be the preferred solution to regional integration of urban and hinterland activities.

Because of the small sample used in this study and the large size of the cities within it, it was impossible to use some of the potential measures of urban centrality used by others (Aiken and Bachrach, 1976; Preston, 1978; Newton, 1979). Most studies of urban centrality have large samples representing a wide distribution of city sizes and types. This allows the re-

searcher to capture broader variations of central place functions between regional cities. Nevertheless, all previous studies have used the level of tertiary sector employment in the urban labor force as a dimension of the city's coordination function in the national system. The proportion of tertiary activities in a city indicates its functional specialization in servicing economic expansion. Higher demands for service, trade, and transportation reflect the city's position and function within the national urban system. This characteristic of urban labor force provides an approximation of the complex coordinating and integration functions of central places within the national urban system.

The role of tertiary sector employment, and thereby the centrality function of the largest German and U.S. cities for their regional economies, increased similarly between 1900 and 1970. The number of people employed in personal, business, government, educational, trade, and transportation services increased from 28.1 to 50.2 percent in Germany and from 32.1 to 51.8 percent in the United States.

Before the automobile era, the impact of urban centrality upon public transportation appears to have been quite strong. The concentration of central service, trade, and transportation functions during the height of German industrialization and regional economic expansion created structural demands for urban and regional circulation that were satisfied by growing mass transit.⁶ Urban migration and work-related and commercial travel were all facilitated by transit developments. Also, in the United States, urban centrality before World War I was tied to a diversified industrial base requiring mass transit for spatial expansion. By 1970, urban centrality had no significant impact upon mass transit or its decline. This finding can be interpreted in two ways: (1) with the reestablishment of the national urban system in a divided Germany after World War II, tertiary employment varied less between the cities in our sample; or (2) tertiary employment after the war was too limited a measure, since the relevant centrality function is not national economic coordination but international integration. By the 1970s, Germany had achieved a dominant economic position in the European Economic Community. City functions characterizing inte-

gration and domination of the European market might have more relevance in explaining an infrastructural development such as transit. In any case, a more refined measure appears to be needed.

The growth of the service sector and its role in coordinating urban activities also do not play a significant, direct role in the United States. However, by affecting the form of urbanization, urban centrality of an earlier era indirectly affects the city's ecological structure, which in turn shapes and limits mass transit. The situation in the United States illustrates the possible role of urban centrality, in a specific economic context, in advancing transit decline. The more central a city was in the national urban system by 1970, the greater the level of transit decline. By 1970, corporate groups dominating cities and the national economy were closely linked to highway transportation. This more specific, economically concentrated corporate power differed substantially from the diversified and competitive corporate presence in U.S. cities in 1900, which encouraged transit development through urban centrality.

The effects of urban industrial structure

Urban sociologists have long argued that the structure of local economic activities affects urban public policy (Mills, 1946; Crenson, 1971; Green, 1976; Friedland, 1981). Local economic activity organizes markets and spatially structures social interaction (Fischer, 1976). The distribution of commercial and residential neighborhoods and social activities is believed to facilitate or hinder political responses by city dwellers to social and political changes. It is also believed to direct flows of daily traffic patterns in ways amenable to public or private modes of transportation. These processes are assumed to be linked to the structure of economic activity in a city. Categorizing cities by their industrial activities allows us to identify the period of economic growth associated with the city's expansion, the city's integration with nationally important economic sectors, and the link between spatial patterns and different periods of economic growth (e.g., centralized versus decentralized manufacturing locations).

We are particularly interested in the impact of automobile, oil, and rubber industries—the major growth industries of twentieth-century U.S. and German economies—upon local economic activity and public transportation. The role of these growth industries is believed to have had an important influence on the types of transit systems that emerged and survived. In cities with relatively diversified economies the dependence of industries and consumers upon mass transit would encourage its continuation. Where local industry was specifically linked to transportation equipment-producing industries (e.g., automobile, tire, oil) through employment, branch managers, and employees, a political constituency and an economic market for highway transportation were assured. These newer industries, which were more likely to locate on the urban periphery, were important in structuring the urban market for automobile consumption and in mobilizing political support for highway building.

Unlike U.S. cities, German cities were formed before the industrial period. Nevertheless, German cities and the national urban system were fashioned by Germany's belated industrialization (Kölmann, 1976; Rüleke, 1977). Increased investment by German banks in heavy industry at the end of the nineteenth century initiated massive metropolitan growth that was sustained by the movement of workers to urban industrial centers. The increased industrial demand for labor, I will argue, resulted in more public transit to aid work-related travel and channeled explosive growth toward the urban periphery.

In these leading industrial centers, German social democracy found its strongest political base. The urban working class demanded more transit service as a central goal of local policy. Thus, demands by both business and labor contributed to Germany's level of transit service and its survival. After World War II, as Kindelberger (1967) has shown, investment and labor were concentrated in key growth industries: automobile and rubber manufacturing, oil processing, and construction. This later specialization of industrial and urban growth in transportation-producing industries might harm mass transit.

To test these arguments, it is necessary to measure the specialization or diversity of urban industrial employment in relation to old and new capital growth sectors (steel-electricity-mining or auto-oil-rubber) and industrial complexes. This measure shows the relationship of the local economy to national forces in order to ascertain the linkage between them and with mass transit. In Germany, no auto-oil-rubber sector really existed in 1900. Therefore, we measured the level of the older industrial group in 1900 and 1970 and found that it had increased slightly, from 27.3 percent to 36.7 percent in 1970. Thus, the old industrial sector survived and grew during this period.

However, the old sector's growth was far outstripped by explosive gains in the auto-oil-rubber group that started in the 1930s and accelerated after World War II.⁷ By 1970, that sector accounted for 42.1 percent of the industrial employment in our sample German cities. In the United States, growth in the highway share of local industry had increased by over 360 percent.

The hypothesized relation between old industrial employment and transit is confirmed in German cities before World War I. Cities whose industrial labor force was concentrated in those core sectors of German industrialization—iron, steel, electrical manufacturing, mining, and other heavy industries—had more transit service than other cities. Because of class competition for urban residential space, business leaders attempted to resettle workers in suburbs where work-related travel would be subsidized by local and central governments. Additionally, as we shall discuss later, the steel-electrical-mining industries had the most unionized and politicized workers in Germany. This urban working class pushed for transit services as part of an expansion of all urban services.

For 1970, the evidence is clearer still. The finding that local industry is specialized and helps to shape the urban transportation system is particularly well demonstrated in German cities. The composition of the industrial labor force reflects both the structural requirements for work-related travel and the political base that can be mobilized to support specific transportation solutions. In cities with a higher concentration

of workers in the older heavy industries, public transit is significantly more important. In contrast, in cities specializing in transportation-producing industries (auto-oil-rubber), public transportation significantly declines.

In accounting for the decline in transit, the specialization in automobile-related industries seems to play a role. In the United States, urbanization, industrialization, economic concentration, and specialization coincided, compromising the position of transit in American cities. As local economies became more dependent upon the prohighway industrial group, the decline in mass transit increased in both German and U.S. cities.⁸ Cities economically tied to the dominant growth industries were more likely, it appears, to sacrifice transit to highway development in order to promote the consumption of locally produced goods, create employment, and strengthen their connection to national economic interests.

The effects of corporate power

Social scientists have long investigated corporate intervention in local policies.⁹ Previous studies emphasize the importance of the composition and economic concentration of industry in communities. Based upon observation of other policy areas, there are two ways in which we might expect corporate power to influence urban transportation systems. First, the concentration of major corporations indicates that the city is the place where business strategies are coordinated and implemented, and where those strategies might affect local public policies when business interests are conveyed to public officials. Corporate policy can cover a wide range of issues, including, of course, transportation. Second, when national corporate power is linked to a particular set of industrial interests (e.g., auto-oil-rubber), local corporate representatives might intervene to pursue and protect business interests in regional planning projects.

Most previous urban and community power studies were case studies of this articulation of class power. In considering the effect of corporate power, corporate presence (as indicated by headquarters location) suggests the capacity to intervene,

manipulate, and possibly control local transportation planning decisions. The ability to mobilize local support for its transportation interests might be linked to the corporation's presence at headquarters.¹⁰ Thus, we might expect variation between urban transit systems to depend upon the distribution of corporate power and its role in local politics. The mechanisms of this process can be demonstrated only through an examination of the historical record.

Although German industry was highly concentrated late in the last century, it was composed of diverse industrial interests that fought over transportation policies.¹¹ The early cartelization of heavy industry and its connections to mining and banking created a powerful lobby by the end of the century that supported rail transportation between cities to subsidize lower prices and within cities to provide access to cheap labor. Thus, the older base of corporate power in Germany reflects the interests of industries requiring and promoting mass transit between and within cities.

However, the rise of automobile, rubber, and oil-processing firms in Germany during the thirties and after World War II could be expected to weaken public transportation. The decline that finally did occur by 1970 might be largely attributable to the recent link between German capitalism and highway transportation. Over the past century, highly concentrated elements of German industry competed for hegemony. These clashes influenced urban transportation policies as corporate power shifted to include growth sectors of autos, oil, and rubber. The mean number of top corporate headquarters in German cities increased from 1.6 to 10.9 from the period before World War I to 1970. But the smaller rate of transit decline in Germany, compared to the United States, can be imputed to the longer survival of competing industrial and consumer interest groups and their institutionalization.

The organization of corporate power in the United States took a different form. Since the turn of the century, the structure and composition of U.S. business shifted from competition and diversity to oligopolies linked to major growth industries, primarily automobile, oil, and rubber manufacturing (Weiss, 1962; Duncan and Lieberman, 1970; Evans, 1972). The mean

number of corporate headquarters in the largest U.S. cities increased by about 19 percent between 1900 and 1970. Economic concentration and the rise of highway-linked growth industries, two coinciding processes not present in Germany, greatly weakened mass transit in U.S. cities.

How did corporate power influence mass transit? The statistical evidence is strongest when we examine mass transit in German cities in 1970 and its decline until that time. By 1970, the auto-oil-rubber industrial group had become one of the most influential business blocs in German politics. Highway building stimulated economic expansion both under the Nazis and during the postwar period. The pro-highway industrial group became rapidly concentrated and competed heavily with older industries over economic issues. The regression analysis indicates that by 1970 corporate power had weakened mass transit ridership; when we consider only the auto-linked industrial corporations, the negative impact is even greater. In terms of transit decline, this finding is even more dramatic. With economic growth dominated by automobile interests, transit decline in German cities depended entirely on local corporate power. The results, although not definitive, suggest that the political power of local corporations encouraged transit decline.¹²

In the United States, multiple regression analysis indicates that corporate effects vary with the composition of business power and competitive conditions of different historical periods. During the pre-auto era, corporate power was linked with an increase in public transportation. This finding is consistent with an analysis of the diversification of corporate power before World War I, when the auto-oil-rubber group was scarcely represented among the top U.S. corporations (Navin, 1970). The rapid expansion of mass transit at the time is associated with the rise of the coal-steel-electricity group, the major growth industries at the time. The electrification and expansion of transit pushed back the borders of cities; the use of electricity increased dramatically both domestically and in transit.

Although corporate power appears to have had no significant direct effect upon 1970 transit usage, it acted indirectly

through the historically derived demographic structure of the city. Nevertheless, it appeared to accelerate the pace of decline between 1900 and 1970. By 1970, the corporate groups predominant in U.S. cities and the national economy were closely linked with highway planning. This monopolistic corporate power differs substantially from the diversified and competitive economy of U.S. cities at the turn of the century. Concentrated corporate power may have furthered highway solutions to transportation problems at the expense of transit ridership, thereby maximizing the interests of transportation-producing firms.

The effects of corporate and state intervention

In considering mass transit decline from 1900 to 1970 in the United States, attempt was made to measure corporate and state intervention in transit planning. Although such efforts oversimplify the processes involved and are difficult to interpret, they do approximate the impact of these interventions, which will be described more fully later.¹³ Both intervention measures had little statistical significance, but the *direction* of their impact—with corporations increasing and municipalization decreasing the pace of decline—is worth noting.

As later historical evidence demonstrates, corporations furthered transit decline. For study purposes, corporate intervention was noted if the transit company of a city had been bought by National City Lines (the transit operating company created by the auto-oil-rubber firms to dismantle electrical transit) or if the local system participated with those firms in noncompetitive supply contracts for bus conversion, which led to reduced transit service. More than half of the largest U.S. cities met one of these criteria for corporate intervention. Although other tie-in arrangements could not be categorized, this finding supports later historical evidence presented in Chapter 4.

Did public ownership of mass transit inhibit its decline? In order to answer this question, we categorized cities according to whether or not they were controlled by public corporations.

* Apparently, public ownership did lessen the rate of decline in

the largest cities.¹⁴ Where municipalization occurred, transit declined less.

A closer look at this process suggests conditions under which public ownership reduced transit decline. If municipalization occurred when transit was a popular issue in local politics, as in the Populist era, a tradition of transit service was institutionalized locally. However, when failing private transit operators were simply bailed out, public takeovers probably had little impact. This interpretation is suggested when we examine transit decline in the handful of cities municipalized under popular pressure prior to 1945 (New York, San Francisco, Cleveland, and Detroit). In those cases, mass transit declined less than the mean of other large U.S. cities.

Conclusions

Traditionally, social scientists have focused on spatial and population characteristics of cities to account for variation between transit systems. Theoretically, this explanation concentrates upon the most proximate, visible, and easily measurable dimensions of urban structure. But in some cases, when we compared data on German and U.S. cities with nearly identical population size, density, age, and other ecological characteristics, we found little more difference than among random cities. Urbanization, when it seemed to play a role, had a strong historical component—that is, how it was developed and shaped by the political and economic conditions of earlier eras. How, then, can we explain variations in the level and decline of transit among cities with similar population and physical structures?

This comparison of German and U.S. cities over the past century introduces dimensions of urban structure previously ignored. To measure and assess the role of these dimensions is a complex undertaking, and this study is only exploratory. We suggest that the difference in transit between Germany and the United States and between the largest cities in those two countries can be traced largely to the following characteristics: the position of the city within its national urban system; the link between the local economy and national economic

interests; the industrial composition, level of economic concentration, and presence of corporate power; and the influence of these factors upon urbanization.

By examining sets of cities in these two countries over the past century, this study reveals aspects of cities that are causally prior to the ecological structure of cities shaped by technology. This chapter has explored possible indicators of the political, economic, and social structure of cities, but the measurement of these theoretical categories is by no means complete. Many potentially relevant variables—plant locations of top corporations, industrial trade associations, financial organizations, real estate market data, and so forth—are missing given the limitations of our data. No information is available about the changing economic, ecological, or transportation structure of cities at this level of detail between 1900 and 1970, or of transportation market changes that might have affected them.

Although we can account for some of the variation between cities in their levels of transit service and the transit decline common to countries, quantitative analysis cannot identify the mechanisms involved or the historical and socioeconomic forces that activated them. Partially, this problem results from the limits of measurable data on transportation systems and politicoeconomic characteristics of cities during the process of decline, rather than from our before/after statistical snapshots of the largest cities in both countries. The lack of intervening data makes it difficult to construct a causal model, but the material available is suggestive. However, it is also possible that the decline of transit may not be explainable by the characteristics of the cities involved.

Our statistical models deal primarily with factors that structure the demand for transit services; neglected are all the factors beyond the city limits that affect localities and the national industries that supply transportation. Although an attempt is made to identify national linkages between localities, the national urban system, corporate power, and the industrial structure of employment, these city traits are really only proxies, albeit statistically stable ones, for complex historical forces that produced these relations.

Identifying quantitative variables from both ecological theory, which is implicitly functionalist, and political economic theory, which is based on differential power, clarifies more about transit change than either theory alone. Earlier sociological research on transportation used static cross-sectional data to make what is fundamentally a longitudinal argument. By introducing these panel data before and after motorization, this research embeds ecological processes in a broader historical context.

In short, the research in this chapter poses the following questions: What were the major powerful forces in Germany and the United States during the period under consideration, especially forces with direct interest in transportation? Given such a distribution of power and interests, what transportation outcomes could be expected? It follows that one of the emergent power blocs has been the automobile-oil-rubber complex. Transit decline can be expected to be most severe where that complex is strongest—and as the results indicate, it is.

This type of macro-panel study is a fertile methodology that offers the possibility of both quantitative rigor and historical sensitivity. The research taps aspects of cities causally prior to what has heretofore been considered as the technologically derived ecological structure of cities. The research explores possible indicators of political, economic, and ecological aspects of cities, but the measurement of those theoretical categories is by no means complete, as noted above.

Because of methodological limitations we must move beyond quantitative analysis to examine historical processes at the national level. These processes better define the social origins and mechanisms that produced transit decline in Germany and the United States, explain the great variations in the rate of decline, and further illustrate their operation in local case histories.