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population growth has been outside the central city. Maps of greater Toronto, shown in Figure 2-10, illustrate how Canada's largest urbanized area is centered by the city of Toronto. They also demonstrate, however, how the outer suburbs have been the site of most of the region's growth. Indeed, the population of the city of Toronto has fallen by nearly 10 percent since 1950, when it accounted for more than half of the residents in the urban area. Today, with about 650,000 residents, it accounts for about 15 percent of the region's population, as greater Toronto's suburban population has grown by more than 3 million in the same period.[16]

Perhaps the most distinguishing characteristic of Canadian urban development is that population growth in the outer suburbs tends to be in more concentrated and clustered patterns than in the United States. As shown in Figure 2-11, the Ottawa–Hull region has experienced minimal population gains in the central area in recent years, but it has managed to guide significant suburban growth along designated corridors and in planned subcenters. Ottawa's regional land use plan has designated a greenbelt around the central city, as well as several suburban centers outside the greenbelt that are slated to receive most new public infrastructure to accommodate additional residential and commercial growth.[17]

Such coordinated land use and infrastructure planning at the regional level differentiates Canadian and American cities (see the discussion later in this chapter and in Chapter 4). Indeed, this difference is often given as the main reason why large Canadian urban areas have managed to remain more conducive to transit usage despite large suburban population gains and the early proliferation of automobiles.

AUTOMOBILES, CITIES, AND TRANSIT

More than any other factor, the automobile has been linked to the dispersed and decentralized urban landscape found in the United States. Whereas the electric streetcar greatly altered the shape and size of many American cities during the first quarter of the 20th century, the automobile has had more profound and lasting effects. Whereas the electric streetcar accelerated the movement of residents away from city centers, most residential areas were clustered along trolley lines that radiated out from downtown employment centers. By enabling faster door-to-door transportation, the automobile greatly reduced the need for such clustering, spawning residential development both beyond and between the

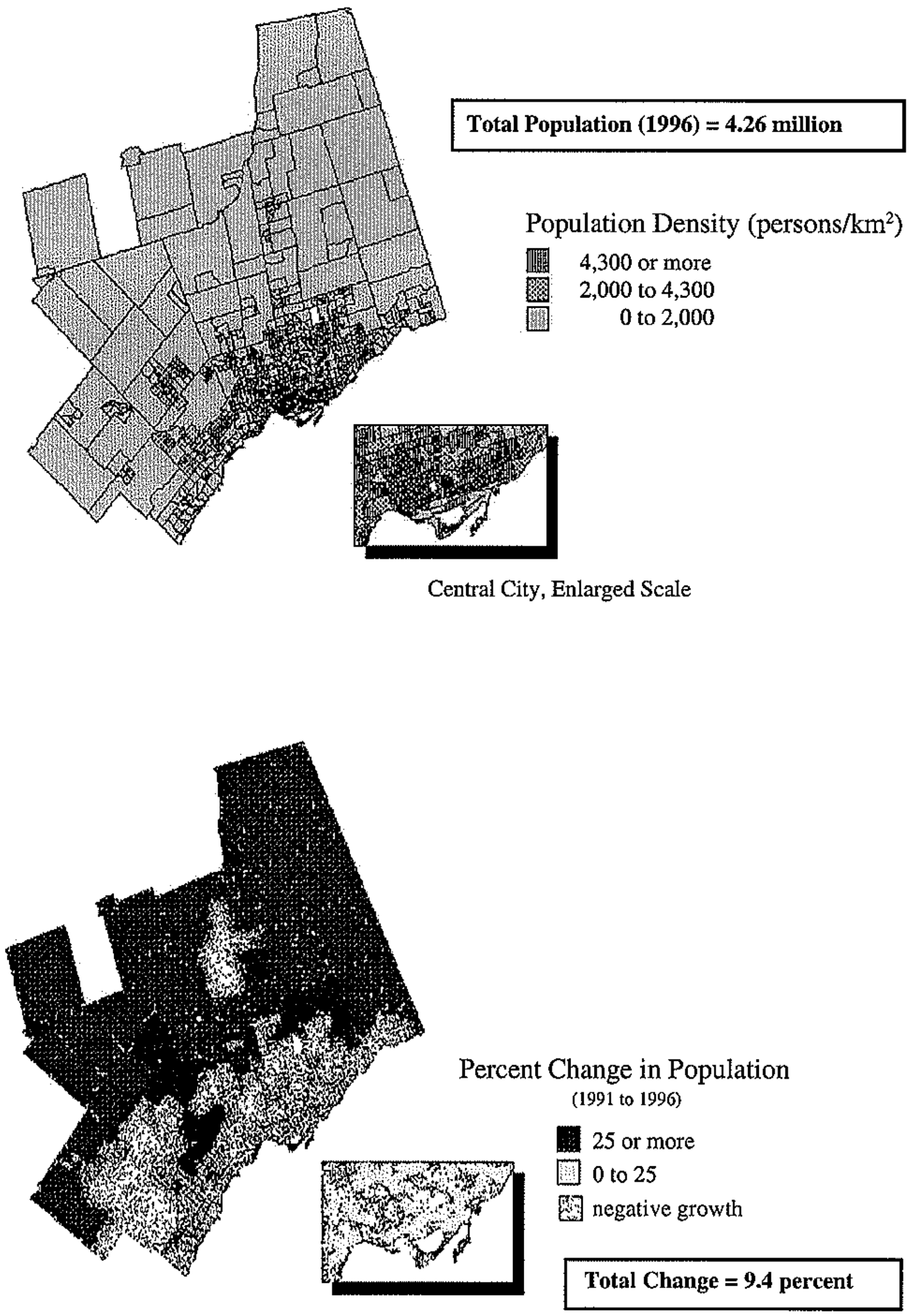

FIGURE 2-10 Metropolitan Toronto's population density in 1996 and change in population from 1991 to 1996. [Source: Statistics Canada (www.statcan.ca).]

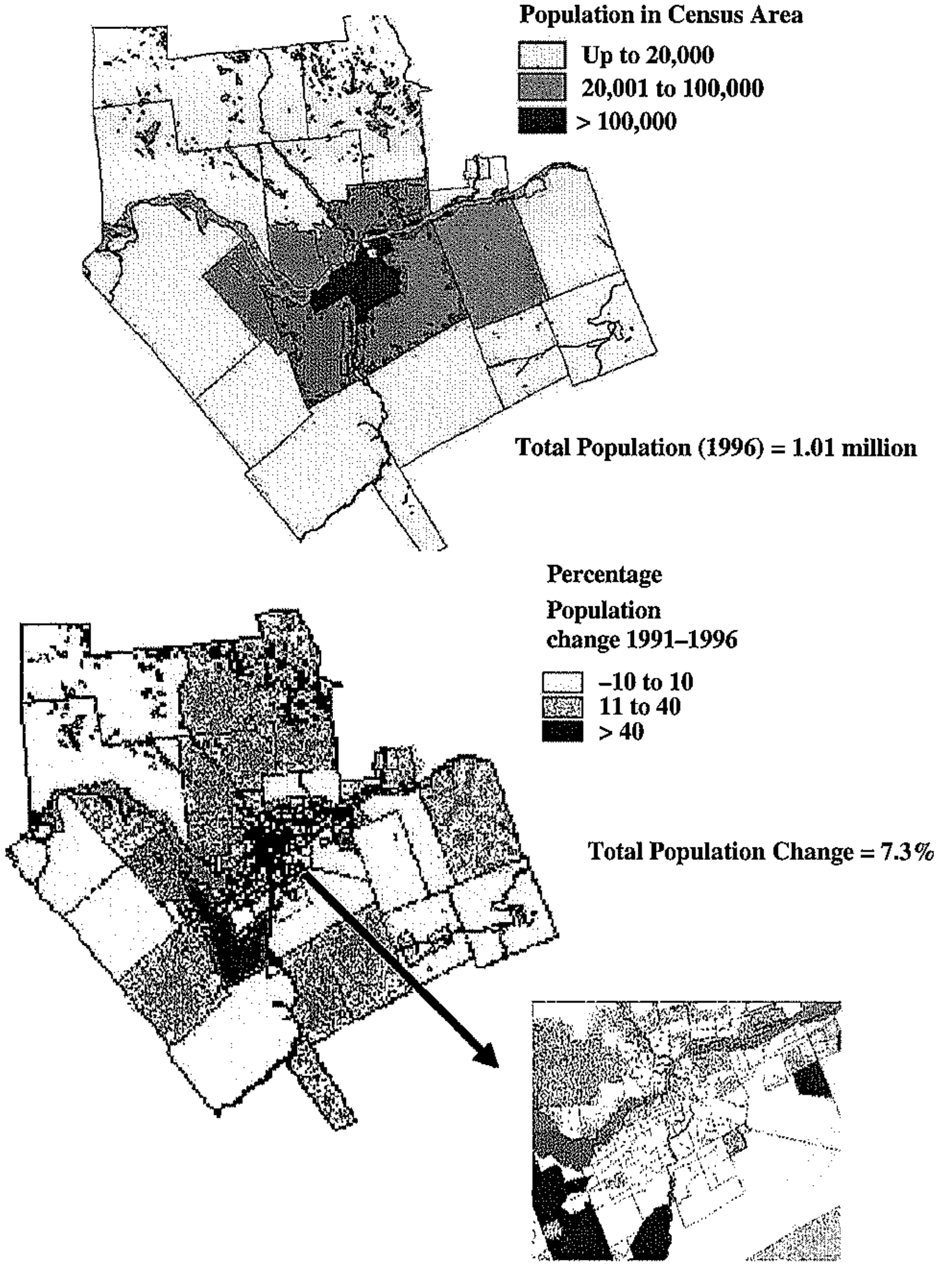

FIGURE 2-11 Ottawa–Hull metropolitan area's population changes, 1991–1996. [Source: Statistics Canada (www.statcan.ca).]

electric trolley lines (Pushkarev and Zupan 1977, 4–5). Retailers and other consumer-oriented businesses soon followed suit. Likewise, larger freight-hauling trucks, introduced widely in the 1930s, permitted land-intensive manufacturers to move farther from city ports and railheads, often to the suburban periphery, spurring further outward movement of workers (Anas and Moses 1979).

Hence while many American urban areas—including many booming "frontier" cities such as Houston and Los Angeles—were shaped initially by the electric streetcar early in the 20th century, all have been fundamentally reshaped by the decades-long dominance of the automobile. Indeed, most large urban areas in the United States have grown significantly since the mass introduction of the automobile during the 1920s. With rare exceptions, even the slowest-growing urban areas have experienced large population gains during this time, all formed in large measure by the automobile.

Meanwhile, urban population growth has been modest in Western Europe since the widespread introduction of the automobile there, beginning in the 1950s and 1960s. In fact, all of Western Europe's largest cities of today were mature when automobiles arrived 40 years ago. Certainly none has emerged in the same manner as Phoenix, Orlando, or Charlotte in the United States—cities that have been thoroughly shaped by the automobile, essentially from their inception.[18]

When large numbers of Western Europeans began driving cars 40 years ago, they did so mostly in mature cities with infrastructure and settlement patterns influenced largely by walking and later by public transit (Tarr 1984; McKay 1988). Even those Western European cities rebuilt following World War II had to meet the needs of residents who at the time had little access to automobiles. Figure 2-12 shows that less than one-third of all passenger travel was by automobile in Great Britain as late as 1952. Travel by bus and bicycle was more popular then, and cars did not account for more than half of all travel until early in the next decade.

Such sharp differences in the timing of urban development and the mass introduction of transport technologies are important when considering why Western European cities have remained more conducive to public transit. As shown in Figure 2-13, nearly all of the 10 Western European central cities sampled earlier had attained at least half of what would be their maximum population by 1920. Moreover, it was during the electric streetcar era, which lasted from about 1900 to 1950 in Western

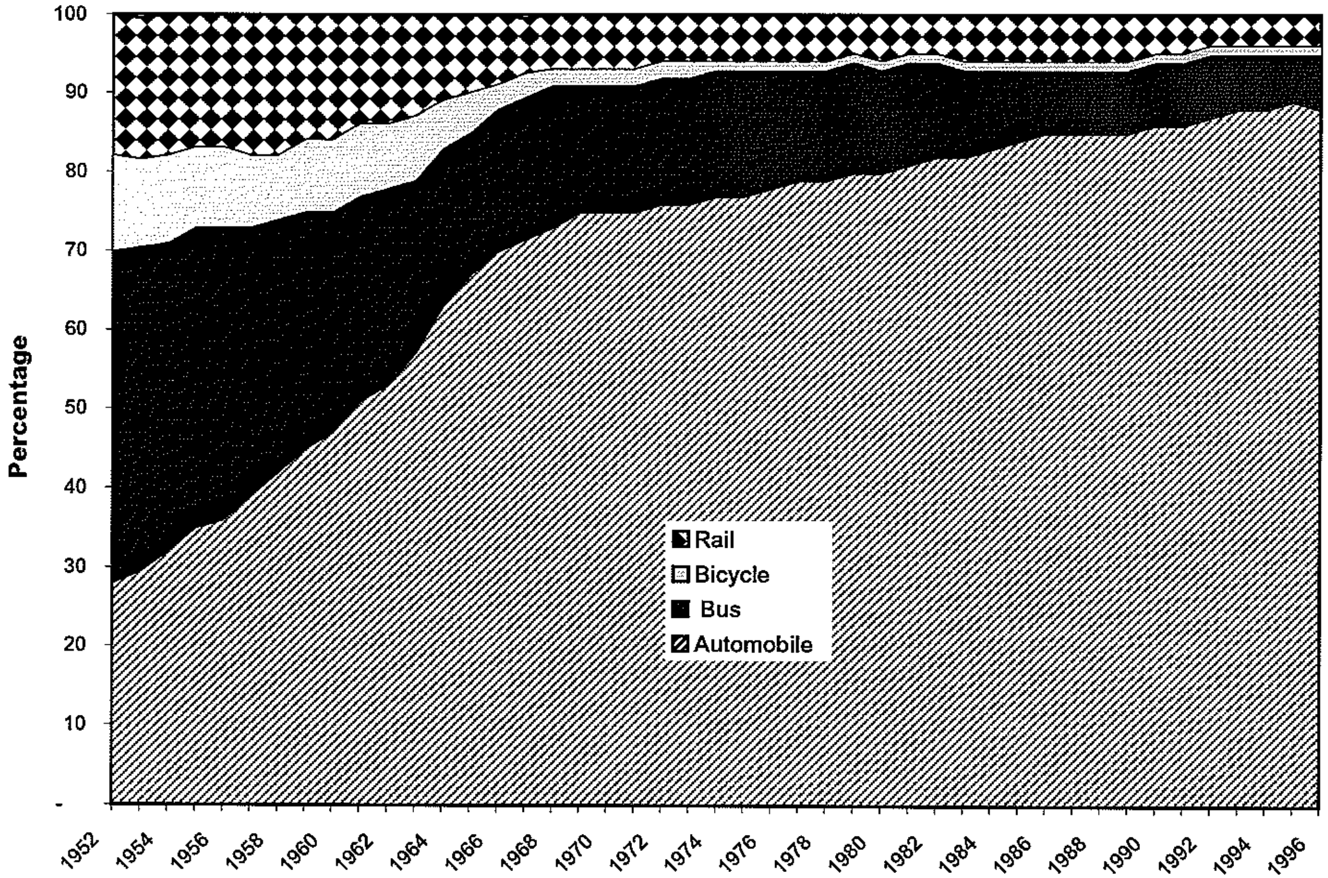

FIGURE 2-12 Share of passenger travel by mode in Great Britain, 1952–1996. [Source: U.K. Department of the Environment, Transport, and Regions (www.detr.gov.uk).]

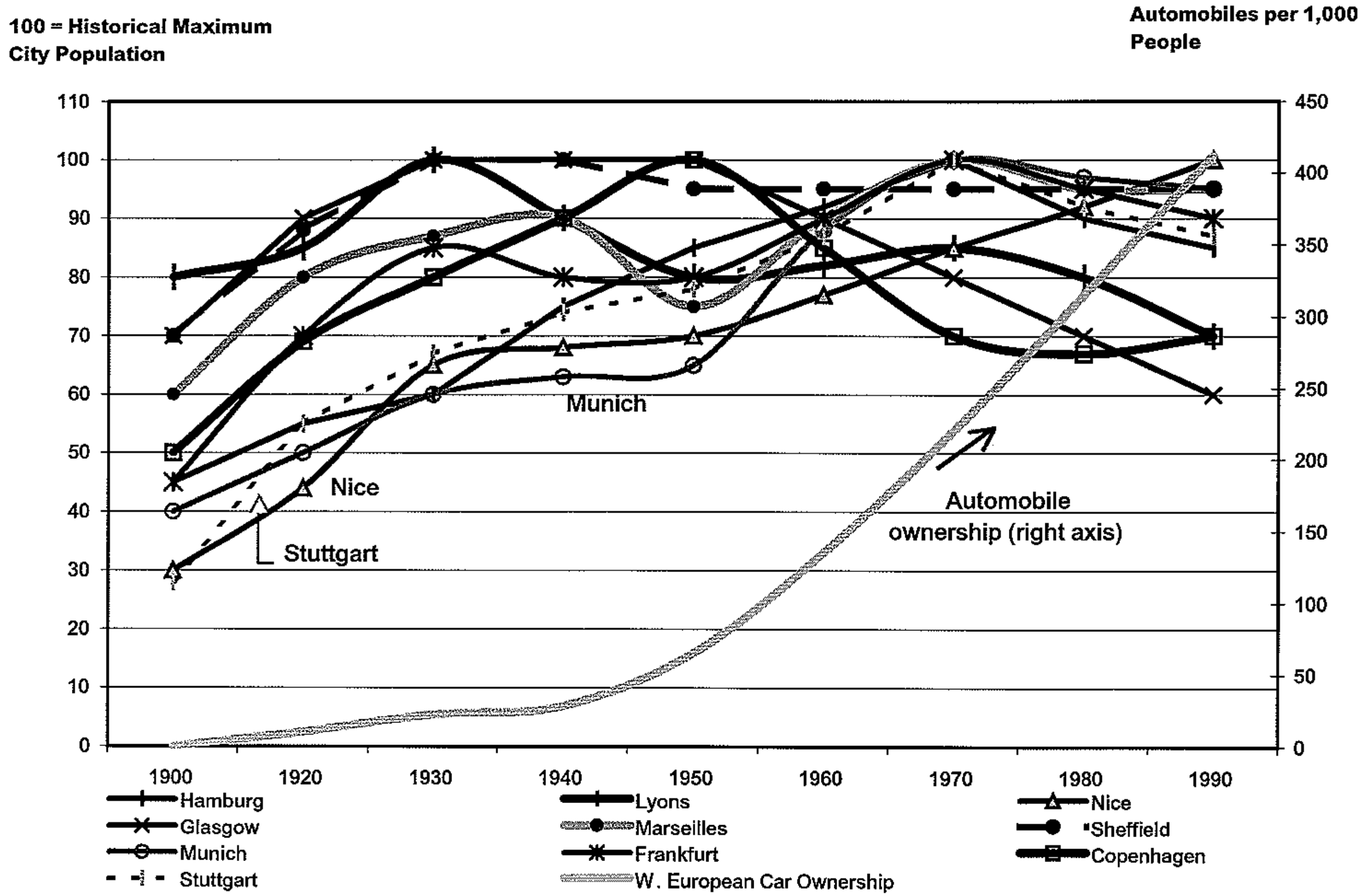

FIGURE 2-13 Timing of central city population growth and automobile ownership for selected Western European cities, 1900–1990.

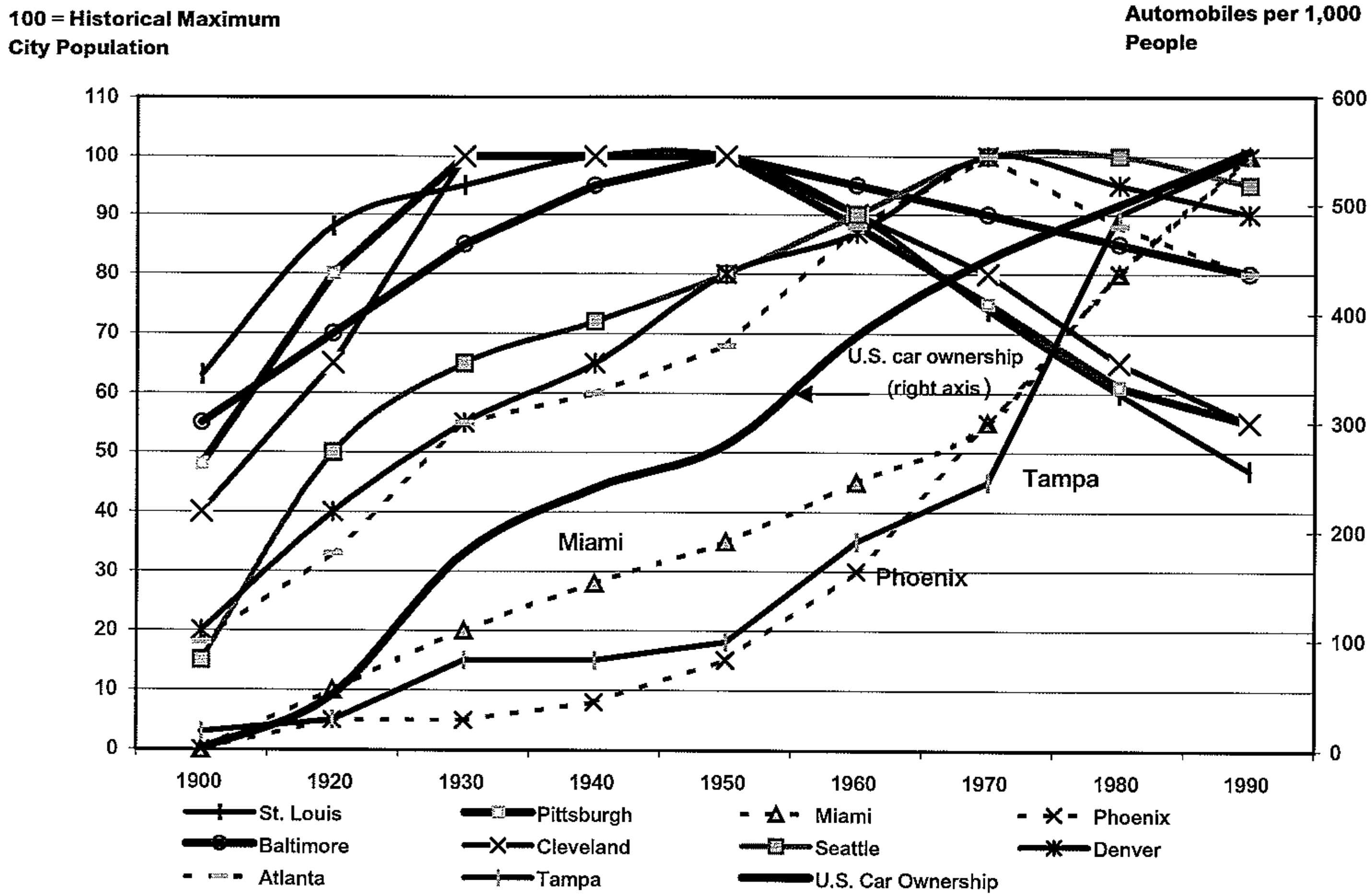

FIGURE 2-14 Timing of central city population growth and automobile ownership for selected U.S. cities, 1900–1990.

NOTES

1. The American Public Transportation Association (APTA 1995, 13–14) observes that transit systems in the United States serve the following two distinct markets: (*a*) nondiscretionary (transit-dependent) riders, consisting of individuals who do not have regular access to a private automobile, including the elderly, disabled, students, and members of households unable to afford a motor vehicle or more than one car; and (*b*) discretionary (transit-choice) riders, consisting of people who elect to use transit for travel speed, comfort, and convenience, often to avoid traffic congestion and parking difficulties.
2. By 1910, however, many of these smaller companies had consolidated into single citywide franchises because of the advantages of having a single coal-powered electric production facility (Hilton 1983, 34).
3. Although few Western European cities introduced electric streetcars as rapidly as American cities, German cities were the fastest to do so, while the cities of Great Britain were among the slowest (McKay 1976, 67–73).
4. Decorative support poles and underground supply lines were installed in many Western European cities as a result (McKay 1976, 74). A few large U.S. cities, most notably Manhattan and Washington, D.C., also required underground conduits for power lines in certain locations, but such requirements were generally less common (Schrag 2000).
5. When Glasgow "municipalized" private streetcar operations in 1894, the streetcar fleet was all horse-drawn. Electric service did not begin until 1898.
6. Per capita transit ridership measures are often calculated using the subpopulation within the transit service territory, usually excluding the unserved but fastest-growing populations in the outer urban fringe. To provide a more complete picture of transit's transportation role for the entire urban region, the ratios used here were derived on the basis of the total population in each urbanized area.
7. In the very largest U.S. cities with rapid transit systems, middle- and high-income riders account for a larger portion of ridership, especially during the peak commuting periods. Transit accounts for about 85 percent of the peak-hour entrants in Manhattan; about two-thirds in downtown Chicago; and more than half in the central business districts of Boston, Philadelphia, San Francisco, and Washington, D.C.
8. Larger cities (population exceeding 5 million) were excluded because of the small number available for comparison. Cities were selected largely on the basis of data availability.
9. As shown in Table 2-4, passenger fare revenues accounted for 38 percent of operating costs for the United States as a whole because of the disproportionate effect of New York, Chicago, and several other large systems on national aggregate figures. These systems recover a higher share of their operating costs from fare box revenues.
10. For instance, see Mieszkowski and Mills 1993.
11. Even in fast-growing central cities in the Western United States, such as Denver,

population gains have been greater in surrounding suburbs (Katz and Bradley 1999).

12. Although the Metro rapid rail transit system has contributed to the development of some suburban regional centers, the Washington Area Metropolitan Transit Authority is challenged to better serve (with a combination of rail and bus services) the growing amount of suburb-to-suburb travel in the region.
13. Still, subcenters, or edge cities, can be found in Western Europe—from the "new towns" outside London and Stockholm to the "metropoles" outside Paris (Meadows 1998).
14. It should be recognized in making such cross-national comparisons that varying definitions are used to delineate urban boundaries. The data provided for the Western European cities are based on Western European Union (EUROSTAT) measures of urbanized areas or "agglomerations" (NUREC 1994). Buildings separated by less than 200 m are defined as being part of the contiguous built-up area comprising and bounding an urban agglomeration. American urbanized areas, as defined by the U.S. Bureau of the Census, comprise contiguous territory with a density of at least 625 people per square kilometer. Because city parks, greenbelts, and other close-in land that does not meet these density requirements are included by the Census Bureau as part of urbanized areas (to eliminate enclaves or to close indentations in the boundary), the comparability of the maps in Figure 2-8 is limited. Nevertheless, the maps of three American and three Western European urban areas offer visual evidence of how the latter remain more concentric and compact.
15. See Regional Plan Association of New York, New Jersey, and Connecticut, "Building a Metropolitan Greensward," available at www.rpa.org.
16. Initially, the municipal region of greater Toronto consisted of a city center of about 170 km^2 and a suburban region consisting of about 600 km^2. Many governmental functions and services were shared by the center city and the suburbs that comprised the municipal region. However, most metropolitan-area growth has occurred outside this region during the past 30 years. Today, nearly half the metropolitan population of greater Toronto resides outside the original boundaries of the municipal region.
17. See Official Plan for the Region of Ottawa-Carleton, April 1999 (www.rmoc.on.ca/planning).
18. Of the 40 largest urban areas in the United States in 1995 (all exceeding 1 million in population), nearly half had urbanized area populations of less than 100,000 in 1900. Moreover, more than one-third barely registered as towns 100 years ago, having a combined population of less than 400,000. Together, these 14 urban areas—Charlotte, Dallas, Greensboro, Houston, Las Vegas, Norfolk, Oklahoma City, Orlando, Phoenix, Sacramento, Salt Lake City, San Antonio, San Diego, and Tampa—had a total population of more than 25 million in 1995.

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3

Policies and Practices Favorable to Transit in Western Europe and Canada

A number of factors have contributed to high demand for public transit in Western Europe and to the many public policies aimed at preserving and strengthening this demand. Historic, geographic, and demographic circumstances, as discussed in the preceding chapter, explain in part why transit enjoys greater popularity in Western Europe than in the United States. However, government policy making has also been important. For many decades, Western European governments have emphasized the provision of high-quality transit services, discouraged automobile driving by raising the cost of owning and operating private cars, and promoted more compact and centralized forms of urban development that are conducive to transit operations. Thus, many of the trends discussed previously have not been merely accidental.

This chapter begins with a review of various actions taken by Western European and Canadian transit agencies to increase transit usage, mainly by enhancing the quality, coverage, and reliability of the service. The discussion then broadens to consider government tax and regulatory policies affecting use of the private automobile, which both competes with rail and bus service and contributes to the dispersed and decentralized forms of urban development that are difficult to serve efficiently with transit. The chapter concludes with a comparison of the institutions and processes for coordinating transit, highway, and land use decisions in Western European, Canadian, and American cities.

DEPENDABLE, HIGH-QUALITY TRANSIT SERVICE

American travelers often remark on how Western European and Canadian transit systems are easy to use, reliable, and generally more inviting than American systems. This section offers some examples of ways in which customer-minded Western European and Canadian transit systems have sought to ensure service dependability, convenience, comfort, and safety and to expand transit's public appeal.

Reliability and Frequency

An important attribute for transit users is timely and fast service. Large gaps in network coverage, low schedule frequency, chronic delays, and excessive transfer waits are troublesome, especially for time-sensitive commuters (Syed and Kahn 2000; Lyons and McLay 2000).

Service speed and reliability have long been important to transit agencies in Western Europe, most notably in Germany. German cities are renowned for their extensive and frequent urban rail service, even in small and medium-sized cities. Traditional streetcars operating in mixed traffic, modern light rail lines that operate on both streets and dedicated rights-of-way, and commuter railways are found throughout Germany, and rapid transit is provided in the largest cities. Perhaps the most innovative urban rail system in Germany is that of Karlsruhe, whose light rail vehicles also operate on mainline track. This system of shared track usage has attracted international attention because it allows the expansion of light rail services without the need to acquire additional rights-of-way (Orski 1995). From the standpoint of users, this versatility has the important advantage of reducing time-consuming interline transfers between commuter and distributor rail and bus lines.[1]

Among bus transit systems, the comprehensive busway of Ottawa, Canada, has been widely acclaimed. Like the Karlsruhe rail system, Ottawa's system of dedicated busways offers versatility and travel speed by combining mainline express, feeder, and distributor services, thus reducing the need for time-consuming interline transfers (TCRP 1997b, 22–23; Syed and Kahn 2000, 3).

It is important to keep in mind, however, that the main form of public transport in Western Europe and Canada is the same as in the United States—conventional buses operating in mixed traffic. Therefore, a major concern for most transit operators is to keep buses moving on schedule

Light rail cars in Karlsruhe, Germany, can be used on existing mainline and streetcar lines for commuter and local service without transfers. (© UITP. Reprinted with permission from ***Public Transport International,*** No. 4, 1999, J. Vivier, The Consumer Is the Centre of Interest, p. 31.)

Buses on the rapid transitway in Ottawa, Canada, are used for commuter and local passenger service. (© UITP. Reprinted with permission from *Public Transport International*, No. 2, 1999, O. Sawka, Ottawa's Transitway: 750 Million Riders and Counting!, p. 27.)

through traffic, often accomplished through a combination of routing and scheduling modifications and technological aids, and sometimes with priority treatments (Reilly 1997). Among the simplest practices, prevalent in Germany, Austria, and Scandinavia, is widening the spacing of bus stops to reduce the number of times a bus must decelerate, accelerate, and reenter traffic flows. Transit operators in these countries typically space bus stops every 300 to 500 m, or about two to three stops per kilometer. U.S. transit bus operators, by comparison, place stops about every 200 m, creating five stops per kilometer.

Another way to increase bus travel speed is to reduce dwell times during passenger boarding and alighting. With this objective in mind, transit agencies in Western Europe have built special bus loading platforms on median islands that reduce the frequency of buses exiting and reentering travel lanes. In Great Britain, extensions from the sidewalk into the curb lane, known as "bus-boarders," have been constructed at many bus stops to prevent obstructions from parked cars, create more space for queuing riders, and reduce the need for buses to maneuver into and out of the traffic stream.[2]

Western Europe has also seen a proliferation of low-floor buses, which have extra-wide doors, often three doors, and no cumbersome steps to climb at the entrances. These vehicles—still rare in the United States but common in Western Europe for more than a decade—have the side benefit of speeding boarding and alighting in addition to improving bus accessibility by the elderly and disabled (King 1994, 12–14).

Prepaid transit tickets and passes also accelerate boarding. For this and other reasons, most Western European transit systems have long offered self-service ticketing and advance-purchase fare cards. To further minimize on-board fare collection, most Western European transit agencies charge a premium for single-ride tickets purchased on the vehicle.

Even with such measures, Western European bus and streetcar schedules are prone to disruptions caused by traffic congestion. Western European and Canadian transit agencies, in concert with local highway departments, have therefore taken many innovative steps to give transit vehicles priority in traffic (Brilon and Laubert 1994). To a greater extent than in the United States, Western European and Canadian traffic management practices are designed to discourage car use, both to facilitate transit operations and to deter city driving in general. Among the first large cities in the world to formally espouse a decidedly transit-first approach to

Modern fare payment machines like this one in Paris make transit ticketing easier and boarding faster. (© UITP. Reprinted with permission from ***Public Transport International***, No. 3, 2000, A. Ampelas, The RATP and the Transition to the Single Currency, p. 6.)

traffic management were Zurich, Switzerland; Gothenburg, Sweden; and Bremen, Germany (Cervero 1998). Zurich has given traffic priority to transit for more than 30 years.

Transit priority programs include traffic rules that give buses priority when reentering traffic, staggered stop lines and special bus lanes and traffic signals that give transit vehicles a head start in traffic queues at intersections, and technologies that allow buses to activate green lights on traffic signals (TCRP 1997a). More than 90 percent of the intersections in Zurich and Vienna are equipped with sensors that detect approaching transit vehicles. Bus-activated signals are also common in Toronto and Quebec City. In greater London, a demand-responsive traffic control system known as BUSCOOT gives intersection priority to traffic lanes with heavy bus flows. Lower-technology solutions include longer green light settings on routes served by transit and special bus turning provisions, such as allowing buses to make unimpeded left turns from center or curb lanes (e.g., in Ottawa). Though traffic control measures, such as bus lanes, have also been adopted in some American cities to give transit vehicles priority, they are seldom as well coordinated or routinely enforced as in Western European and Canadian cities.

Comfort, Safety, and Convenience

Whereas creative marketing and promotion can attract more riders, transit agencies in Western Europe and Canada recognize that comfort, personal safety, and convenience are essential to retaining customers (Syed and Kahn 2000; Lyons and McLay 2000). Accordingly, they appear to spare no expense in equipping vehicles with amenities such as ergonomic seats and state-of-the-art suspension systems. Even simple amenities such as wall clocks on board vehicles and pay telephones, shelters, mailboxes, and bicycle storage stalls at bus stops are common, as are clean vehicles with good ventilation and pleasant and knowledgeable drivers (Reilly 1997; TCRP 1997b, 6). In Ottawa, stations along the busway system are integrated with shopping facilities. Transit stations in many Western European cities serve as connecting points for a variety of activities; many contain restaurants, news kiosks, bakeries, flower shops, and other retail services that are complementary to their transit function. Many transit stations are attractive places to visit in their own right.

Transit operators in Western Europe and Canada usually provide convenient means for riders to purchase tickets. Many offer tickets for sale in post offices, student unions, and shopping malls, often supplemented by hundreds of automated vending machines at rail and bus stations. Sidewalks leading to transit stops, intersection controls that allow safe street crossings, and well-lit and secure waiting areas are also the norm throughout much of Western Europe and Canada. Ensuring the safety of public transit riders and maintaining the perception that riding on transit is safe are of particular importance to transit operators in Western Europe and Canada.

In German cities, transit services are often supplied by more than one public or private operator. However, regional transit associations, known as verkehrsverbunds, play a central coordinating function, establishing complementary routes, setting uniform fare structures, and allocating government subsidies among individual operators (Pucher and Kurth 1995). These regional transportation entities provide uniformity and consistency in levels and quality of service, helping to make transit riding convenient and uncomplicated. In general, Western European transit services are treated as vital components of the regional transportation system. They are well connected to airports, commuter railroads, and intercity rail and motor bus stations.

Considered individually, such customer amenities and conveniences may not appear to be important. Their combined effects on service quality are significant, however. Many of these practices can be found in the United States, but not as routinely or in combination with one another.

Innovative Marketing

Western European and Canadian transit authorities believe that public transit is, or can be made, suitable for everyone—not just an option for downtown-bound commuters or inner-city residents without cars. This attitude manifests itself in the many innovative marketing approaches aimed at broadening transit's appeal and promoting its use by travelers outside the traditional customer base.

Western European transit agencies have turned to innovative marketing practices in part because they have large amounts of spare capacity to fill during off-peak hours. Hence many transit agencies, especially in Germany, Austria, and Switzerland, work closely with promoters of museums, theaters, and sports events to incorporate a heavily discounted transit fare into the price of admission, thus entitling patrons to transit rides to and from large public events without additional charge (Pucher and Kurth 1995, 124–125; TCRP 1997a). Many hotels include 2- or 3-day transit passes in their room rates. Although these "kombi-tickets" are often promoted as a means of curbing automobile congestion, they also provide an opportunity for transit to attract infrequent or new riders, some of whom may decide to use transit more often. Users of such niche services increase use of public transit in their own right; however, if these strategies are truly effective, they will also cause some new riders to use transit more often (Cronin et al. 2000).

With such longer-term goals in mind, many Western European transit systems sell heavily discounted passes to university students. The idea is to instill a habit of transit use—one that remains long after entering the workforce, even when the automobile becomes a more affordable option. This practice also exemplifies how Western European transit agencies have personalized marketing by providing information and ticketing packages tailored to the needs of individuals and households.